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SENATE STANDING COMMITTEE ON

COMMUNITY AFFAIRS

Monday, 23 October 2006

Members: Senator Humphries *(Chair)*, Senator Moore *(Deputy Chair)*, Senators Adams, Allison, Carol Brown, Fierravanti-Wells, Patterson and Polley

Substitute members: Senator Stott Despoja for Senator Allison

Participating members: Senators Barnett, Bartlett, Bernardi, Mark Bishop, Boswell, Bob Brown, George Campbell, Carr, Chapman, Crossin, Eggleston, Chris Evans, Faulkner, Ferguson, Ferris, Fielding, Forshaw, Heffernan, Hogg, Hurley, Hutchins, Joyce, Kirk, Lightfoot, Ludwig, Lundy, Marshall, Mason, McEwen, McGauran, McLucas, Milne, Nash, Nettle, O'Brien, Parry, Payne, Robert Ray, Siewert, Stephens, Stott Despoja, Watson, Webber, Wong and Wortley

Senators in attendance: Senators Adams, Barnett, Carol Brown, Ferris, Fierravanti-Wells, Hogg, Humphries, Moore, Nettle, Patterson, Polley, Stephens, Stott Despoja and Webber

Terms of reference for the inquiry:

To inquire into and report on:

Legislative responses to recommendations of the reports of the Legislation Review Committee on the *Prohibition of Human Cloning Act 2002* and the *Research Involving Human Embryos Act 2002* (the Lockhart review)

WITNESSES

Committee met at 8.59 am

CHAIR (Senator Humphries)—The Senate Standing Committee on Community Affairs is today conducting a public hearing in Sydney as part of its inquiry into the legislative responses to recommendations of the Lockhart review. I welcome witnesses and other attendees to today's hearings as well as my colleagues on the Senate committee. I indicate at the outset that we are using slightly unusual procedures to deal with this inquiry compared with the usual way Senate committees are run. We will be allocating session times and adhering strictly to those session times today, as we did last Friday in Canberra. I will be inviting witnesses appearing before the committee to make opening statements, but we ask that those opening statements, in respect of most of these proceedings at least, go for a maximum of 15 minutes. If there is more than one witness for any particular session, we ask that the witnesses share their time so that it is possible to proceed to questions after no more than 15 minutes. We hope that these procedures will ensure that we can proceed to examine these issues in a way which is designed to elicit the truth and to ensure that these contentious issues do not divide unnecessarily the community of Australia.

Questions which are not reached in the course of proceedings will be, if possible, placed on notice. We ask witnesses who are asked to take questions on notice to return with an answer as soon as they possibly can. to any questions that they are able to take on notice. I now invite our first witnesses for the day to the table.

[9.01 am]

BEST, Dr Megan, Member, Social Issues Committee, Anglican Church of Sydney

MIMMO, Mr Rocco, Convenor, Don't Cross the Line

SULLIVAN, Mr Francis, Chief Executive Officer, Catholic Health Australia

VOUT, Dr Brigid Mary, Executive Officer, Life Office, Catholic Archdiocese of Sydney

CHAIR—Welcome. Thank you very much for your appearance today and for your respective submissions. You have received information about parliamentary privilege and the protection of witnesses, and I remind you that we can take evidence in camera if you feel that there is evidence that might be best provided in that way. As I said, we invite opening statements in total of no more than 15 minutes. I am not sure if you have caucused or not beforehand to work out how you will divide that time, but I would certainly be pleased to have those statements now. Who would like to open the batting?

Dr Vout—Thank you for this opportunity. The Lockhart review and the legislative responses that have followed represent a significant departure from the way in which science and medicine and society reverence and treat nascent human life. In particular, the Lockhart review argues that the moral significance of a cloned human embryo is most closely linked to its potential for medical research. And yet this reasoning dramatically undermines the widely held understanding that the moral significance of a human embryo is derived from what it is: a very young and embryonic human being.

Human embryos do not gain or lose their humanity on the basis of how or why they are created, yet the Lockhart review suggests that an embryo only counts as someone if there is a chance that it will be nurtured and brought to birth, and otherwise it is just some thing, to be studied in the lab, used for drug testing or dismembered to obtain stem cells. This attitude towards early human life is, I believe, inherently illogical and unjust. The bills for your consideration seek to make this illogical and unjust discrimination law. As legislators, you are being asked to expand a class of human beings who are statutorily expandable for possible benefit of others. Of greatest concern is the move to allow the intentional creation of human embryos solely for research.

In 2002, the creation of human embryos for the purpose of research or therapy was banned by federal parliament without a dissenting voice. Now, less than four years later, the Lockhart committee has recommended that this ban be lifted, without a dissenting voice and despite the fact that the great majority of the 1,000 written submissions to the committee were opposed to expanding destructive embryo research. Are there to be no limits to scientific curiosity, manipulation and exploitation of nascent human life?

To close: from an ethical perspective, no potential good can justify the creation and subsequent destruction of human life. And, from a scientific perspective, refusing to permit the creation of human embryos for research will not hold back biotechnology from delivering

effective and accessible drug and cell therapies. There are realistic alternatives to human cloning and destructive embryo experimentation which can relieve human suffering without abandoning basic ethical principles of respect for human life and dignity. The current legislative responses to the Lockhart review would have us invest in science of dubious medical value and divest ourselves of fundamental ethical values. They should be rejected.

Mr Sullivan—Thank you for the opportunity to address you this morning. In your hearings last Friday, Professor Ian Kerridge from the Lockhart committee stressed several times that the committee did not seek to resolve the moral status of the human embryo. Curiously, though, the committee's findings specifically relegate the interests of the embryo to those of research. Calling for the deliberate creation of embryos for the purpose of destructive experimentation clearly indicates the priorities of the committee and its bias in favour of research. In other words, the committee has evaluated the rights and interests of the embryo as being far less than the potential benefits that can accrue or may accrue from research, even when that research may deliver little or no tangible benefits to the pursuit of disease therapies for one or two generations, as was indicated by the committee's deputy chair, Professor Skene, in evidence before you last Friday.

Let us be very clear: in taking forward the Lockhart committee's recommendations into legislation, which is the purpose of Senator Patterson's bill, the Senate will be taking a moral position on the status of the human embryo which will effectively undermine the principle of protecting innocent human life. The Senate will be enshrining in law a utilitarian evaluation of the human embryo—that is: the embryo is expendable; the embryo is not as valuable as futuristic research. This is a dangerous precedent. The Australian parliament would be making a profound statement about the expendable nature of human life. The parliament would have chosen to side with an uncertain, if not questionable, research agenda, hyped by the lure of miracle cures, and to sacrifice a fundamental principle of Western democracies. Moreover, the parliament will be basing its decision on a committee report that fails to make the case for change.

Putting aside the significant division within the scientific community concerning the necessity or otherwise of embryonic stem cell research, the Lockhart committee has, at best, offered a flimsy case for a shift in community sentiment in favour of such research. The committee's report is less than convincing, both in the methodology it used to assess community attitudes and its assessment that the community is favourably disposed to cloning and destructive embryonic stem cell research.

It is simply sophistry to seek to assuage moral consciences by distinguishing between embryos created for research and those for reproduction; it is more an indication of the committee's recognition that the community would be uneasy about destructive experimentation on embryos as a matter of principle. Yet the Senate is prepared to advance a bill that seeks to clone human embryos, permit their destruction and thus put in place a precedent that effectively renders human life expendable.

This bill does raise moral questions and it does seek to downgrade the moral status of the human embryo. On those grounds alone it should be rejected.

Mr Mimmo—Mr Chairman, I thank you and your senators for the opportunity to address you this morning. It is obviously a very momentous occasion in that we are considering this whole

question of whether we move into cloned human embryos. That alone makes this a remarkable transformation of mind and it is what brings us to this point: to empanel an inquiry on whether Australian laws should permit the cloning of human embryos. I say 'remarkable transformation' to drive home the point that the very senators proposing bills to permit the making of cloned human embryos were among the very senators, who, just four years ago, deemed that human cloning, in any form, was to be out of bounds. Now we are expected to believe that it is highly desirable to go into the area of cloned human embryos. The fundamental question arises: what has changed to bring about this remarkable transformation of mind?

May I entertain the committee by reminding it of what Topol said in that great stage show *Fiddler on the Roof*—'I don't know.' And may I add, respectfully, for those senators who are sponsoring these bills that they do not know, either. Certainly, there has been no significant medical breakthrough in this branch of research and study. Certainly, the scientists involved in both the clinical and research sides of this study do not have an agreed mind on the possible results. Indeed, there is confusion, uncertainty, division and a troubling lack of results from animal experimentation. The proposal to move into human experimentation without exhaustive and definitive results from animal experimentation is, among other things, a breach of the Nuremberg Code. The panel considering the Nuremberg Code, with respect to those scientists who experimented on prisoners in concentration camps, prefaced its remarks by saying:

Scientists justified human experiments on the basis that they yield results for the good of human society which could not be produced by other means of study.

The panel all agreed, however, that certain basic principles must be observed in order to satisfy moral, ethical and legal concepts. The panel then went on to announce the code. I quote the third dot principle of the code:

The experiment should be so designed and based on the results of animal experimentation and a knowledge of the natural history of the disease or other problem under study, that the anticipated results will justify the performance of the experiment

That certainly is not the case here. We do not have exhaustive, more definitive outcomes for animal experimentation. One final point is the very clear ethical issue to be determined by the Senate when these bills are presented for debate: is the resultant entity—that is, the cloned embryo, following the fusion of the nucleus of a somatic cell with the enucleated human or animal ova—the very commencement of human life? If it is then we ought to accord a personhood status to that embryo. If it is not, it requires definition. What is the definition that is required? I note that there was an attempt to redefine 'embryo' and, with respect to the two senators proposing the bills, they may or may not have got to the issue on that but merely accepted the recommendations of the Lockhart report. The truth of the matter is that the status of an embryo, based merely on the complexity of additional cells or dividing cells, does not change a status, the very entity of the embryo. Therefore, is the embryo to be determined as a thing or is it to be determined as a value?

If it is a value, it underscores the very principle on which society is built and on which society bases its ethics. If the embryo is of value, then we do not consign it to the dustbins in such a way that we can dissect it and discard it. If it is of value, then the value of life is attached to it and therefore it is that that becomes the fundamental question. I simply say that, on the basis that

there does not appear to be any great division, the embryo at that very commencement stage is human life in progress and the bills must be rejected in the interests of the values that a society will embrace.

Dr Best—On behalf of the Social Issues Executive, I appreciate this opportunity to address the Senate inquiry because the current debate explores important questions regarding scientific freedom and human dignity. We live in a society where the technological imperative demands that we continue to seek progress whatever the cost. And it is difficult to articulate opposition to such projects, because they are expressed in terms of freedom, choice and relief from suffering, and these are goods which we all endorse. No doubt you will hear many such arguments today.

Scientists have been used to pursuing such goals with no public scrutiny and it is not surprising that they object to any limitations we may suggest now. Our task is made even more difficult when our identification with the church makes our opponents immediately assume that we have no rational arguments to offer, merely religious platitudes. However, it is possible to embrace the need to reduce suffering but rationally desire to pursue it by means other than those recommended in the Lockhart report.

On the international front, we have evidence that rational reflection can lead to a position which rejects cloning. Last year, the United Nations passed a declaration which opposed all forms of cloning. This vote passed by a margin of three to one. As you are no doubt aware, a number of Western countries, including Canada, France, Germany and Switzerland, have all banned cloning. Apart from the moral concerns, there are factual concerns related to cloning which have led other countries before us to decide it is not worth any scientific gain to take the risks involved.

I welcome the opportunity to voice some of our concerns. Firstly, we are concerned that the project which aims to create human beings by somatic cell nuclear transfer in order to destroy them is contrary to human dignity and crosses an important ethical line. Secondly, we are concerned that such a project will require a large number of human eggs, which could lead to the coercion of vulnerable women donors. We are concerned that the development of cloning technology leaves open the risk of reproductive cloning, and we are further concerned that the public debate has not covered all proposals in the Lockhart report—for example, cytoplasmic transfer and hybrid embryos—and that to legislate for them would be premature.

We embrace ethical stem cell research. We want to see medical cures developed. But we also want to protect the most vulnerable members of our society and make sure they receive the respect they deserve as human beings.

CHAIR—Thank you very much to the four of you for those opening presentations. We shall proceed now to questions.

Senator MOORE—I only have a couple of questions, because I know that all of you have been following the debate very closely and that is good. Mr Sullivan, I would like to start with you because I know that you were following very closely on Friday and would be aware of the discussion we had with Bishop Fisher about the Catholic Church's position on IVF and also its position on looking at any kind of process that would be involved in this discussion. I know from your position in Catholic Health Australia that you have a very close interest in what is available

in Catholic health services and what is not. Can I ask you what the Catholic Health position on IVF is now? Also, you would remember that we talked a little bit about this question: if these kinds of therapies or cures became available—through any form of research, either here or overseas, using embryonic cell research or technology—what would be the position of the Catholic Church and Catholic Health on those processes?

Mr Sullivan—Sure. The first one, on IVF, is that IVF as a procedure is not conducted in Catholic hospitals. The second issue, with regard to some type of cell transplant—if it does result from the destruction of an embryo then it would not be available in a Catholic hospital.

Senator MOORE—That would be if there were any knowledge or research in that way. If that were defined, it would not be available in a Catholic hospital?

Mr Sullivan—I think what Bishop Fisher mentioned on Friday—I can only go on the reports on that; I was not in the room—was that the point is that if there is a direct relationship between the destruction of the embryo and the provision of a therapy or the transplant cell then, no, it would not be available.

Senator MOORE—Dr Best, I did listen to you this morning and I have seen your submission. You have actually said on page 3 of your submission that there was a surreptitious definition of 'embryo' in the Lockhart report. In your verbal submission this morning you talked about the fact that—I am quoting, so I am seeing whether I have got the intent correct—there was an attempt by people who were supporting this process to exclude any other voice and to devalue any voice that disagreed with them. I would like to find out from your perspective whether you believe that the Lockhart process was in any way surreptitious in its definition or process and why you believe that alternative voices are not given value in this debate.

Dr Best—We have concerns both about the process of the Lockhart review and also about the current media debate. I was not in Australia during the Lockhart review. I was living overseas at that time. In the report there are comments like, 'The committee believes that religious views, however strongly held, could not outweigh scientific advantages to be gained by the research which was proposed.' Personally, one of my other roles in this debate has been as national convener of Doctors Against Cloning. We sent a letter to all major metropolitan newspapers in the country. Only one newspaper printed that letter in full.

There were subsequently letters to the editors suggesting that the real reason for my heading up that attempt was that I had religious convictions. I had several calls from journalists who, when they asked me about my connections to the church, suggested that they were the motivation for that attempt, when, in fact, Doctors Against Cloning has no religious ties whatsoever. When we attempt to explore the rational objections to things such as cloning and object to the way that semantics have been used to confuse the public in terms of understanding what it is that is to be legislated, we find it very frustrating that our attempts to do this are discarded as being merely from a religious perspective and therefore not to be taken seriously.

Senator MOORE—So the concern is more the media coverage rather than the process that is being followed by the Lockhart review and the Senate?

Dr Best—Some of the comments in the Lockhart report we felt were dismissive of views which came from a religious conviction.

Senator MOORE—I think we will disagree; but in terms of process I think it actually was a disagreement rather than a dismissal. You may not agree with that, but I think it is important to have the discussion.

Dr Best—We felt that some of the comments were dismissive, but particularly in the media we have found it extremely difficult to express our point of view.

Senator MOORE—I think that is an experience we all share in terms of our relationship with the media. It is very important for this discussion that we define, when people make statements about being dismissed—

Dr Best—I quite understand.

Senator MOORE—that it is not the Lockhart committee per se and it is not the process we are following that is dismissive.

Dr Best—No, we very much appreciate the fact that public submissions are requested and read and the public hearings, particularly, were found to be very helpful.

Senator MOORE—Dr Vout and Mr Mimmo, you may both want to respond to this question, because it is important that everyone gets a go. I am interested in what debate and discussion has been held in your organisations on this issue, because we have heard that there was a view—and we heard it on Friday—that there had not been a great amount of debate, that it seemed to be rushed in some way. I am just wanting to find out, from your perspective, what debate has been had within Catholic—I will not even pretend to get the term right, but we know. Mr Mimmo, what has been the process for getting the issues out there and having the clear for and against debate within your organisation?

Dr Vout—I am here speaking on behalf of just one of the archdioceses of the Catholic Church in Australia. Catholics often talk about things that matter, and I think that is a good thing. We often talk about things like the status of the embryo and how we are to treat all members of the human family. We have a clear body of teaching that is principled, to follow on from our previous discussion, that we really believe is grounded in good, sound ethical reasoning—and also in our faith; it is confirmed by our faith—and that we therefore believe we can share with other people, as everybody has deeply held views, based in reason, about how we ought to treat each other. So, in the process involved in formulating a submission on behalf of the archdiocese, we have a clear body of teaching that reflects philosophical and theological arguments.

There has been a lot of interest. Catholics—I speak again here in Sydney—are very interested in this issue. Virtually every week in our Catholic media there would be an article about some aspect of this current debate about cloning and stem cell research and letters to the editor of the *Catholic Weekly*. That is not a huge publication, but that is some expression of the interest that Catholics hold. They have very deeply held understandings about what it means to be a human being, about human dignity and about how research ought to be conducted.

Senator MOORE—So you are confident that within the Catholic media there has been well-rounded coverage of the whole process?

Dr Vout—There has been a lot of coverage in terms of both the science as well as the ethics.

Senator MOORE—Mr Mimmo, would you care to make a comment on that issue—you are a very specialised organisation—in terms of the debate process within your organisation?

Mr Mimmo—You are obviously not asking me in terms of Catholic background or anything like that, are you?

Senator MOORE—I am asking you from the point of view of your organisation.

Mr Mimmo—I just wanted to clarify that. The organisation goes back four years, when the first issue came before the parliament—that is, the status of the embryo. The interest, of course, is motivated by an understanding of fundamental human rights issues; my study and research is in that area. So it was always a search for what are values that communities ought to uphold in terms of having a consistent view to determine the ethical and moral conduct of any society or any individual. What was reached in discussion, debate, was that this was a profound argument worthy of entering into the public sphere—that is, that the embryo is in fact the commencement of human life, in whichever form you wish to approach it. Philosophically and morally, the principles would be sound to say that, if it is the commencement of human life, then it must be given a value. If it has a value, therefore scientists would treat the embryo as an issue of value rather than an issue of a thing.

Senator MOORE—That is the debate, Mr Mimmo. I am trying to find out how many people in—

Mr Mimmo—I am saying how we debated the thing.

Senator MOORE—How many people are in Don't Cross the Line?

Mr Mimmo—You count them. People have a common mind. You could go from the number of people I would have consulted, which would count into the hundreds. I could not define that, because it is not a rank and file type movement in which there are organisational requirements or anything like that. This is a meeting of minds of people who engage in the area in which I engage.

Senator MOORE—Thank you. I just wanted to get an idea.

Senator FERRIS—We have heard some discussion today in the language Dr Best has used about 'vulnerable' women and about the need for scientific freedom and human dignity. Mr Sullivan, I would like to put to you what seems to me to be a very unfortunate double standard given some of the words that you have used this morning. When the John James Memorial Hospital in Canberra was purchased by the Catholic Church just a week or two ago it immediately closed the IVF clinic—and you referred to that in your answer to one of Senator Moore's questions. This forced women who were going to that clinic to take the egg-stimulating drugs that you have talked about this morning in relation to women's vulnerability for an extra

three weeks because they were not able to go to another IVF clinic. Surely the health risks suggested by the evidence you put to us will be imposed on them. So when you made the decision based on your philosophy to close that IVF clinic, where was the scientific freedom for those vulnerable women who were affected in Canberra and is that not a double standard in your philosophy?

Mr Sullivan—On the issue of the purchase of John James hospital probably a lot of the facts have alluded you, and it might be in your interest for us to give the committee a briefing on that. There was no loss of access to IVF services in Canberra; it was organised by Sydney IVF, not the John James hospital. It is my understanding from the media reports that Sydney IVF were happy with the arrangements. These discussions did not happen on the day the hospital was purchased. These issues were raised in discussions beforehand.

Senator FERRIS—That is certainly not the evidence I have heard from the women who have spoken to me.

Mr Sullivan—Clearly what I said was that some of the facts may have alluded you and we are quite happy to give you a full briefing on that. As to your other question about scientific freedom, I can pick up on what others have said. In regard to what the Catholic Church offers in hospitals, it has been pretty clear for a long time what our ethical positions around issues like reproductive technology and the like are. In regard to the John James arrangement, that was an open market process where organisations could tender, for the purchase or otherwise. The decision was taken by the hospital's board and they were fully aware of what services would or would not be available. Your question is better suited to them.

Senator STOTT DESPOJA—I would like to ask Dr Vout about the issue of the harvesting of eggs. Perhaps this goes back to the so-called vulnerability of women. Page 7 of your submission talks about the perceived vulnerability of women or women being exploited in some way because of the harvesting of eggs. Both bills very specifically make it clear that they contain safeguards against the commercial harvesting of eggs and other matters. I am just wondering if you are aware of that. Are you not confident in the safeguards?

Dr Vout—I am aware that the safeguards are there and I am relieved, but this is a mixed issue for us. The Lockhart review dealt quite extensively with the questions that surrounded the vulnerability of women and egg harvesting. I was not satisfied with their proposed solution, nor indeed the solution that is now reflected in the bills. While safeguards will be in place, our solution now is to create animal-human hybrids. I do not think that is an ethically sound solution, for other reasons that I am happy to talk about later.

Senator STOTT DESPOJA—But are the safeguards insufficient in relation to the specific issue of the commercial trading of eggs, sperm and embryos? How much stronger could you make them?

Dr Vout—I think in the specific nature they are. But as a broader issue, which I think is important for us to consider especially in this sort of forum—

Senator STOTT DESPOJA—I do not dispute the broader debate.

Dr Vout—One of the things foremost in my mind at this time are the moves that have been taken in the United Kingdom where women will now be offered IVF at a cheaper rate if they are willing to donate their ova for experimental use. So as a broader issue there are a whole range of questions. I know there has been a lot of concern shown by women in Australia about this issue, and men too, thankfully. I am pleased to see that those safeguards are there but, as a broader issue, I think there is a lot more that we need to be considering at this time.

Senator STOTT DESPOJA—It was the specificity of that issue that I was keen on. I have one other question, which I am happy to have anyone answer but, in particular Mr Mimmo, I was just going to ask you. Would you support—and I acknowledge it is a hypothetical question—the importation and use of cures and therapies that may come about in other countries as a consequence of, say, somatic cell nuclear transfer? Would you be prepared for those possible cures, therapies or medicines to be used in this country?

Mr Mimmo—Thank you for the question. I could answer your hypothetical question with a hypothetical answer, but it would be inconsistent with the very basis of what I say the embryo ought to be accorded in terms of a value. Obviously, the importation of such therapies from overseas would be opposed by me on the same consistent argument that they are derived from a particular product. On another point, it was an interesting exercise for me to address some of the detail with respect to the Nuremberg Code. The British medical people at the time put the question as to whether the inquiry into the Nuremberg Code should go ahead. The question was put like this: if the Nazis had discovered a cure for cancer, would the rest of the world say that this information must be destroyed because of the manner in which it was obtained? They are ethical questions that I do not have the answer to, except to say that it is best that we do not go down that track because, if we do, we never know where we end. What is a starting point and what is a finishing point?

Senator STOTT DESPOJA—Thank you for that broader illustration of the point. I understand your answer. The point is that this may be an issue that people have to confront, because this research happens in other countries. Mr Sullivan, what is your perspective on the issue of importation of treatments that may be arrived at through the use of stem cell research and, in particular, somatic cell nuclear transfer overseas? Do you accept it?

Mr Sullivan—I recognise it is a complex issue. To some degree, if it is hypothetical then you could hypothesise: would the parliament be of the view of banning it here but accepting it from overseas? If that is the case, what is the parliament really saying with regard to the issue at hand? I think I have been pretty clear in answer to Senator Moore and Senator Ferris that, from our position, where you can directly relate the destruction of embryos to the provision of a therapy we would say no, whether it is here or overseas. I do understand that, with the history of therapy—and Senator Patterson will know this—health, research and so on, when you have accretions down the years, the proximity to the actual event becomes more remote in people's minds accordingly. One could argue: do we use the information from a tortured prisoner supposedly for the benefit of others? At what point do we accept that?

Senator STOTT DESPOJA—Thank you for those answers.

Senator PATTERSON—You delivered two papers, Dr Best, and, as a fellow Anglican, I have to disagree with you, but that is fine. Mr Sullivan, you have indicated in your paper that there are

80 clinical therapies deriving from adult stem cells. I think, Dr Best, you have indicated 72. I am not arguing that we should not undertake adult stem cell research; I am arguing that we should undertake adult stem cell research and somatic cell nuclear transfer. I think you said in your submission that we have had that debate about the embryo stem cells, but the debate is now about SCNT stem cells, although some people are still going back to the original debate of 2002. I think a suggestion was made today that some claims have been made for embryonic stem cell research that are a little ahead of themselves, and I have been very cautious in not indicating that they were necessarily going to be miracle cures. Are you concerned that the adult stem cell argument is also overstated? An article in *Science* in July 2002, in a letter to the editor, outlines that only nine treatments from adult stem cells have been approved by the FDA. Some of those claims involve individual patient reports with one physician and a newspaper report. Are you concerned that the adult stem cell argument is overblown and is counter to the benefit that we may achieve from embryo stem cell research?

Dr Best—It is a perennial problem in medicine that any breakthrough in the lab is translated by the media as a cure for patients in their doctor's surgery within a very short period. This is not limited to stem cell research. I think my colleagues in other areas of medicine have come across the same problem as well. That is a general ongoing problem which affects all areas of medical research.

Senator PATTERSON—Why would you continue to use the 72 clinical therapies when, I think, two articles have actually said that that is not really accurate?

Dr Best—It is accurate in terms of the number of clinical therapies which are being developed. The clinical treatments that are in the process of being developed and actually being used in human subjects are compared to the situation in embryonic stem cell therapies where no clinical trials involving human subjects are even anticipated at this stage, due to the problems that I am sure you are aware of.

Senator PATTERSON—For how long have they been doing adult stem cell research?

Dr Best—Forty years.

Senator PATTERSON—For how long have they been doing embryonic stem cell research?

Dr Best—I am told that mouse embryonic stem cells were isolated over 20 years ago.

Senator PATTERSON—I think it is less, so there is a difference in time. You do say—and I will not labour this point:

… but it must be mentioned that the success in this field (now providing 72 clinical therapies) …

Do you stand by that, because that is not what *Science 2006* states?

Dr Best—That is what my information research has obtained for me.

Senator PATTERSON—I would ask you to go back and have a look at that article, because *Science* is a well-refereed journal.

Dr Best—It certainly is.

Senator PATTERSON—I tabled it. If we are going to have a debate about each argument then that is one of them.

Dr Best—Can I just clarify one point. We actually have nothing against embryonic stem cells. What we have an objection to is destruction of human embryos. If embryonic stem cells could be obtained by a method which did not involve the destruction of human embryos, I do not think you would find sensible people objecting to it.

Senator PATTERSON—That leads me to my next question.

Senator MOORE—Sensible people, Dr Best!

Senator PATTERSON—You referred to—I do not know how to pronounce his name—Klimanskaya—

Dr Best—I do not know how to pronounce it, either.

Senator PATTERSON—That makes two of us. People grabbed hold of that piece of research. I am sure you are aware that the embryos were actually sacrificed in that piece of research. There is evidence that we now take cells from an embryo for preimplantation genetic diagnosis to test. I suppose one could argue that is not actually in the interests of the child if it does not have the disease. It progresses and is implanted, but I suppose it lives in a family which does not have a child with a disease. But if you take a cell from an embryo, there is a chance it can die. There is a risk?

Dr Best—Yes.

Senator PATTERSON—And there is also a risk that we do not know about of letting an embryo go on that has a cell taken from it?

Dr Best—That is right.

Senator PATTERSON—In your submission you referred in a positive way to that research. It seemed to me that in some ways that may have ethical problems that are more difficult than SCNT research.

Dr Best—I understood from that paper that it was envisaged that it would be used in situations where a woman was undergoing PGD, anyway, for a clinical indication and that we would not justify the use of such a high-risk procedure when it was not indicated on clinical grounds. But if it were indicated on clinical grounds and it were possible to use that single cell for developing an embryonic stem cell line as well as the genetic testing, which the woman required for her clinical treatment, that might be one way around the problem. As I said, our objection is not to embryonic stem cells per se; it is to the destruction of embryos. There are certainly people all over the world who are looking for alternative methods of producing embryonic stem cell lines without the destruction of embryos, and I think this research should be encouraged.

Senator PATTERSON—One question that was put to me on that piece of research was: if that stem cell line from that single cell is found to be totally potent, would it then pose a problem because it has the potential to develop into a full human life?

Dr Best—I agree.

Senator PATTERSON—The problem is that that, under today's legislation in Australia, would be illegal. It is the same with a couple of other procedures resulting from the mouse work that has been done in Japan, where Jack Martin told me that it could not possibly develop a primitive streak. We do not know whether SCNT can, because nobody has produced it. So somebody doing what they thought was within the law—somebody replicating that research or doing the Japanese mouse research in Australia could suddenly find themselves facing imprisonment because they have produced an embryo rather than an embryo-like cluster of eggs. That is one of the difficulties we have with the restrictions we have on people.

Dr Best—We do not have any restrictions on the animal research as far as I am aware.

Senator PATTERSON—But if they then want to use it on humans?

Dr Best—I would hope that we would be clear on those questions in terms of animal research before we would start doing it on humans. We would clarify those issues at the level of animal research. One of our objections against many of the proposals is that the questions in terms of research at an animal level, particularly in areas of cloning, have not been resolved and it is premature to look at human experimentation when the questions are unanswered. I quite agree with you: we could not possibly go down this route until many more questions have been answered at the animal research level.

Senator PATTERSON—I asked a question of Bishop Fisher the other day about whether someone could be a Christian and support this legislation. What is your answer to that? You do not really have to answer that.

Dr Best—I think that it is very difficult for any of us to say whether someone else is a Christian and that it is a question on which we should not judge each other.

Senator PATTERSON—Thank you.

Mr Sullivan—I understood you had a couple of those questions for me also, Senator, but the last one was, I think, exactly the same. We are not here to run a litmus test over people's religious convictions, and I think that was partly in your introductory comments as well. Senator, a lot of the questions you asked really go to a question of making a judgement about the community's attitude to this bill. It is a public policy issue; it is not a debate about science. As many of us have said, we can all provide references about what one scientist said versus another. But I would have thought that we would be trying to grapple with what is the most appropriate public policy at this time, which is an assessment of where the community is at.

I would like to raise the point with you as to how even the Lockhart committee came to that understanding. It is interesting, if we can go to their report, simply to find that at the end of the

day—and I would like to quickly quote this because I think it goes to all the questions that are being asked—when they had to make this assessment and use their survey, they said:

The terms used were not defined, the survey did not seek to measure knowledge and the focus groups suggested that many participants had limited understanding of cloning or stem cell research, all of which suggest that some caution is required when interpreting the results of this research.

You think to yourself, firstly, that we get asked questions about science and scientific method and evidence based methodology and yet, when it comes to the most crucial part of the Lockhart committee report—which is assessing where the community is at—the report openly makes it clear that it does not have an evidence based perspective. But given that lack of an evidence based perspective, it makes a profound shift and purports to then represent where the community is at.

I find that quite astounding, and I think it is something we need to really discuss, because ultimately this is not about whether one person is a Christian or whether one person is a Jew or whether one person does not cop the show at all; it is about whether we can accurately assess where our community is at. Your questions as to whether one type of creation of embryo is more acceptable than another or whether adult stem cells are being overhyped like, as some would argue, the embryonic stem cell debate is being overhyped—

Senator PATTERSON—I am yet to ask that. We are short of time so I would like to ask that—

Mr Sullivan—I know, but the question you asked was for both of us. I think the point is that it is about an assessment more of what we believe is ethically acceptable to a community.

Senator PATTERSON—As for that question about the research when you claim that there are 70 treatments—

Mr Sullivan—Conditions.

Senator PATTERSON—I would ask you to have a look at that *Science* article of July 2006.

Mr Sullivan—Happily.

Senator ADAMS—You made a comment about the somatic cell nuclear transfer being of dubious medical value. Would you like to expand on that statement?

Dr Vout—Certainly. I think it has already been brought up. One of the first things to say is that there really is no proof of principle that somatic cell nuclear transfer is going to deliver effective cures or even be a genuinely useful model for studying human disease. We talk about hype: perhaps the greatest area where we are seeing it at the moment is where these tremendous claims are being made. Even the Lockhart report's confidence in the potential benefits of somatic cell nuclear transfer all rested on one piece of research which, as we all know now, was subsequently completely and utterly debunked: the Korean scandal. Obviously that is not the Lockhart committee's fault—they were not aware of that—and I am not making that claim.

At the moment, in terms of research that has been peer-reviewed in major journals, there is still no substantial proof of point in animal research. I am happy to provide some information to the committee about that. Some of the key animal studies that scientists often cite as proof of principle really do not go the full way towards saying that we are now ready to even consider somatic cell nuclear transfer in humans. Of course, if we look around to the experience of somatic cell nuclear transfer in humans, at present we have not even had a cloned human embryo reported in a peer-reviewed journal around the world—let alone the thought that we would be able to take embryonic stem cells from a cloned human embryo.

Senator WEBBER—Dr Best, I will paraphrase your opening statement. I got in late from Perth last night, so I am a bit slow this morning. Correct me if I am wrong: you were talking along the lines of the problems scientists have in that there has been no public scrutiny and they object to the limitations. Is that your concern about scientific research per se or just about stem cell research? On what do you base that?

Dr Best—My concern about lack of scrutiny—

Senator WEBBER—and scientists objecting to limitations.

Dr Best—I think we really should not try to explore issues regarding the creation of human beings for research in the light of standard research procedures, because it is different from cellular based therapies in the lab. We are really coming up against questions of what it means to be a human being and which human beings deserve protection in our society. There are questions being asked about this particular kind of research which have never had to have been asked about research in the past. So scientists who are used to the freedom of making up theories and testing them have never had to check whether there are ethical guidelines which they have to check their research against. Sorry—I have lost my line of thought.

This is a new situation. Doctors are used to going through ethics committees to have all their research checked. We have the history of the medical research guidelines which have developed since World War II. We are used to thinking, 'What are the ethical ramifications of my research?', but those involved in pure scientific research have not had those boundaries to be concerned about, so they are coming up against them for the first time. We should expect scientists to think, 'Why are these people who do not know anything about my area of research telling me that I can't do it? There are things there that I do not know that I should be allowed to explore'; whereas in the community we are saying that we do not agree that, just because there is an area of science we have not explored, it has to be explored. There are some things which we have to accept we will never know because the method by which we can discover them is unacceptable on ethical grounds.

Senator WEBBER—To expand on that, I thought the role of not just ethics bodies but the NHMRC and what have you covered this kind of stuff. Surely the fact that parliament is looking at passing legislation and governing this kind of research, when we do not for most other kinds of research, means that there is actually going to be scrutiny and accountability.

Dr Best—I was an original member of the licensing committee, so I am very familiar with the legislation. I think the fact that we needed to pass legislation to allow research on excess ART human embryos shows that it is not your average type of research. It was felt that it could not be

handled by your average HREC. So we are in quite a unique situation when we are talking about this; and that is why we are here today, because many people in the community, including those of us here, are concerned that these are areas of science which need to be left untouched because at the moment we do not have the means to gather that information by ethical means.

Senator FIERRAVANTI-WELLS—One of the important issues in this is the significance of the proposal to change the definition of an embryo. Dr Best, in your paper, in particular at page 3, you deal with recommendations 15 to 17 and 28 and the definition of a human embryo. You make quite a strong point there in saying:

By changing the definition of a 'human embryo', the Lockhart Committee has surreptitiously allowed destructive research on the early fertilised embryo, making a mockery of recommendations 12 and 13.

Could you elaborate for the committee please?

Dr Best—The new definition of the human embryo which was recommended and which Senator Patterson has incorporated into her bill starts the life of a human embryo just prior to the first division of the zygote. In my reading of the Lockhart report and in looking at the NHMRC documents it seemed to me that the decision was made, certainly in part, to allow research on the process of fertilisation of the egg up to the point of syngamy. If we are saying that a cloned embryo deserves protection under the act from the time the full complement of genetic material is in the cell, I have not received any clear indication why that is not the same for a fertilised embryo. I have not been given a good reason why the beginning of the life of the embryo is not taken from when you have the full complement of genetic material—that is, when the sperm and the egg are first fused. Why are we waiting until syngamy, apart from these discussions that we want to be able to experiment on the very early embryo?

I would suggest that, in the same way Senator Patterson has recommended that fusion of animal eggs and human sperm should come under the protection of any legislation because technically it is a cloned embryo under the definition, fertilised embryos from the time of the union of the sperm and the egg should be under the protection of any proposed legislation. I think it makes a mockery to artificially change the definition of an embryo so that the early embryo can be used in this way.

Senator FIERRAVANTI-WELLS—Do you accept the distinction between reproductive and therapeutic cloning? If so, why? If not, why not?

Dr Best—I think it is very unhelpful. I do not like the term therapeutic cloning, for reasons I am sure everybody is aware. It is the same technology. Technology is morally neutral. We develop the technology to enable us to clone humans and then we decide what use we put it to. My concern is that there is no way once technology is developed that we can restrain its applications. I know that we have safeguards in the bill and I think, as I said in my submission, it is very touching that we have such faith in human nature, but our history as human beings has shown that once technology is developed we cannot restrain its application for bad purposes as well as good. I think we all accept that our community is opposed to reproductive cloning and the only way we can ensure that it will not go ahead is to stop the development of cloning technology.

Senator FIERRAVANTI-WELLS—In your view, what does the term 'therapeutic cloning' mean? The word 'therapeutic' implies some positive or benefit.

Dr Best—That is why I do not like the term; it is called 'therapeutic cloning' but it is not therapeutic for the embryo involved. It is called therapeutic cloning, I think, to make it sound helpful and positive and a good thing for our community when, in fact, it involves the destruction of embryos.

Senator FIERRAVANTI-WELLS—Perhaps, Dr Best, it is to help win the PR war, if I can put it as bluntly as that.

Dr Best—Yes! It is certainly a much friendlier term than 'destructive embryo research by cloning'.

Senator FIERRAVANTI-WELLS—For the same reason that you do not refer to 'human embryonic stem cell', and the terminology is a lot more designed to be user-friendly, and—

Dr Best—I think that it is quite clear. In my Doctors Against Cloning hat, I could say that proponents of embryonic stem cell research and cloning have made a point of manipulating the semantics in the debate to make what they are trying to do more palatable to the public—or less understandable.

Senator FIERRAVANTI-WELLS—Indeed, the international stem cell organisation appears to have deliberately stated that they are best not to use the word 'cloning' because of natural community objections and its non-PR-friendly overtones.

Dr Best—Yes, and I could table the Doctors Against Cloning letter, if you require, which explains the reference of where that particular decision was made in a public forum.

Senator FIERRAVANTI-WELLS—Thank you, Dr Best. What are the risks, as you see them, in interspecies fertilisation?

Dr Best—I think that interspecies fertilisation is unlikely to be helpful on a scientific basis in terms of being a substitute for the use of human eggs, as proposed in the Lockhart report, and I think that, if you look at the jurisdictions where human cloning has been allowed, such as the United Kingdom, it was very quickly realised that research has shown that fresh human eggs are really what is needed to have any hope of successful human cloning.

So, in a way, it is just a smokescreen to put off the time when we are told we cannot clone using animal oocytes, we need fresh human ones, and so we need to change the legislation again to allow payment of women, because in the United Kingdom it has been shown that women are not willing to donate their eggs in IVF programs. Therefore we are back to the situation where there is a risk that women will be coerced to provide eggs for research by financial reward.

CHAIR—We have a request from the ABC to come and film. Is it agreed that we should admit cameras to the proceedings? It is so agreed. Thank you very much. Please proceed.

Senator ADAMS—With or without audio?

CHAIR—It is always without audio.

Senator FIERRAVANTI-WELLS—I have one last question. Dr Best, what are the risks in relation to germ line therapy?

Dr Best—Germ line therapy proposes that we change aspects of an embryo's DNA which will be passed on to future generations. I am very concerned that, as a community, we have not debated whether we want to be involved in genetic manipulations that will affect future generations. It is very difficult to know what future generations would want us to do. While it is hard to see that it would not be a good thing to be rid of some diseases and particular problems, we also have to balance that against the fact that it is a very good thing to have a gene pool with wide diversity. As we look at the research from the Human Genome Project, we are finding that some genes which in some settings are unhelpful provide protection against other diseases. So I think that, with our current genetic knowledge, it is premature to say that there are some genes we would be better off without as a species. I think we really do not have sufficient knowledge to make these decisions in an informed way. And the issue of consent—of what our children would have wanted us to do to their gene pool—is, I think, a very complicated issue which has not been adequately discussed in our community for us to really involve ourselves with these things at the moment.

Senator POLLEY—Good morning. My question is to Dr Vout. A mere four years ago, very similar legislation in relation to cloning was banned in the federal parliament. Now we are here again. So it leads me to ask: is the distinction between therapeutic and reproductive cloning legitimate, scientifically or ethically? My concern is that, if this legislation goes through, we could well be back here in a couple of years, going another step forward.

Dr Vout—Dr Best has already made some good comments, but I would certainly concur with that. If anything, we could say that all cloning is reproductive. What is cloning? Cloning is a form of asexual reproduction. Human cloning reproduces another human being. As has been explained, the ends to which that is put—whether that cloned embryo is then used for therapies or whether it is in fact nurtured and brought to birth—is where we come up with these two terms: 'therapeutic' and 'reproductive' cloning, respectively.

It is good that there is such strong public repugnance at the thought of reproductive cloning, but in some sense therapeutic cloning carries an even greater negative value. At least with reproductive cloning there is an intent to create life and to nurture it—something that we would all recognise as a public good—whereas with therapeutic cloning we are creating life for no purpose other than to use, commodify, commercialise and ultimately kill a human life. So if anything it is in some sense—and it is hard for us to get our head around this at times—a greater wrongdoing, a greater offence, against human dignity.

With respect to the scientific distinctions between the two, I think we have already heard those. In many ways this has been a deliberate name game to try to dress up therapeutic cloning as something that will be of benefit to people in delivering therapies—which, as I have said, are a very long way away. Some scientists would say that it is unlikely that therapeutic cloning is ever going to deliver a therapy which at the very least is something that will be accessible to people. As well, it will have a whole range of medical problems. As to whether this is ever going to be a treatment that is accessible, one that we are able to deliver to the Australian community

in a just and equitable way, that is very unlikely. It is extremely technical, and that it will remain prohibitively expensive is the great likelihood. So the use of terms 'reproductive' and 'therapeutic' cloning has largely been to dress up something which the scientific community is aware that the public does not like. The public has deep-seated concerns about this extreme manipulation of procreation and the uses to which these embryos would be put.

Senator POLLEY—Because of the various terminologies that are being used and because there is concern, I believe, within the community, would you place on the record why destructive human embryo research is so unacceptable?

Dr Vout—Yes. Whatever we can say about the embryos in question, I think two things are very clear: they are human and they are alive. It is not a religious argument. It is a philosophical argument, it is a cultural argument and it is a social argument that every human being bears dignity and that this notion of dignity is not something which can be earned by the number of years you amass or the things that you can do or the things that you possess. Crucial to our understanding and to the functioning of our society is this notion that every human being has dignity and has an ethical worth. As Mr Mimmo said, it means that every human being should be treated as a person and not as a thing. So at the very heart of objections to destructive embryonic research are the thoughts that here we have a living human being, albeit a very young one and very small, who is being deliberately used, deliberately killed, for the purposes of another human being and that this introduces a great inequality, a great offence against dignity and the fear—and I believe it is a rational fear and a reasonable fear—that if we start to decide who will and will not count as a human being, so if we start to make that decision about one group of human subjects—as to how that will then impact upon the way we relate to each other and upon our understandings of equality, justice and fairness in Australia.

Senator POLLEY—Mr Sullivan, from a health resource allocation point of view, what is your view as to the best, or optimum, allocation of funds for research? Would it be in adult stem cell research or human embryo stem cell research?

Mr Sullivan—We can only go on what we understand is the general landscape of findings at the moment. As I said earlier, these days, with scarce resources, you would always go at the evidence based track record, and the evidence base at the moment is in the adult stem cell area. So the allocation of resources for research should be heavily weighted there. Secondly, it is a complex answer because it goes to many of the issues that have been raised already about the need to go firstly through the animal experimentation phase if there is an agenda around embryonic stem cell research. So in the first instance—adult—if there is going to be allocation of resources for embryonic stem cell, then leave it at the animal stage.

CHAIR—I have a question for Dr Best. Is the Dr Karin Sowada who is a member of your Social Issues Executive the same Dr Karin Sowada who used to be a Democrat senator years ago?

Dr Best—Yes. She is very sorry she could not be here today.

CHAIR—I am sorry she cannot be here as well.

Senator STOTT DESPOJA—So am I: we are great mates!

CHAIR—Not the only party with a split, apparently! I would like to pose a question to Mr Sullivan. Let us suppose, hypothetically, this legislation is passed and scientists that are working in this area were to come back in two or three years time and say: 'We've decided that we need longer with these embryos that we are creating through SCNT for experiments'—

Mr Sullivan—Longer than 14 days.

CHAIR—Longer than 14 days, yes: 'We need 28 days or 50 days or something of that sort.' Can you think of an argument that might logically be used to argue that that crosses a line that should not be crossed? Is, in other words, there a distinction between an embryo at 14 days, 28 days or 50 days?

Mr Sullivan—Yes. I think the line that we cross in the first instance is permitting the cloning of embryos. I think we all understand that the parliament came to a concession in 2002 because of the use of spare or excess embryos from the IVF program who otherwise would have succumbed. So the very utilitarian principle was that you were taking embryos probably in a position of futility for some utility. I think the principle that we are dealing with now is trying to take embryos from a position of utility to futility. You are turning it around. That is the line you are crossing: you are actually making human life more expendable, whereas, in the other situation in 2002, it was my reading of the matter—not being one of those who voted—that parliamentarians felt this was a concession they could live with on balance. This time you are being asked to make a decision about fundamental principle of utility.

To me then it is not really a question about whether it is extended from 14 to 28 days, because my hunch would be that, if the legislation is passed and researchers come back and say, 'No, it would be better to see what the progress of the disease is like from 14 to 28 days,' I think people will point back to the passage of this legislation and say, 'The fundamental principles have already been settled, so why not make it 28 days? Frankly, why not make it six months?'

CHAIR—Indeed, it would seem to me that the assumption behind this legislation is that this technology will yield these totipotent stem cells that will be capable of being grown into organs that people require for transplant and whatever. It is equally arguable—isn't it?—that science might decide that it is actually more effective to grow these organisms within a complete embryo and harvest them at some point. Again, what is the logical distinction between that kind of practice and the practice of harvesting a stem cell?

Mr Sullivan—My answer to all those questions is that I do not think distinctions are helpful at all here. The real question that we see before you is the question about whether there should be a deliberate action of creating life knowing full well that the life you would create you would destroy albeit for whatever other goals. This is a simple calculation that people need to make: how important is it to safeguard life? I am not going to go into whether life is personhood, because there are debates around 14 days and the like. I think in a sense that is also a debate that distracts. The one question we have to ask is: can anybody say that the embryos created are not part of the human genetic structure? If they are part of the human genetic structure then we have a set of assumptions we need to work from, and those assumptions therefore should determine what is considered to be prudent behaviour. I think that, frankly, is the debate.

CHAIR—You make the point in your submission, a point which I think is sometimes overlooked, that Catholic Health as well as being the largest non-government provider of health services in Australia is also a major operator in research in Australia. I put a question to you about the movement of researchers not only around different research facilities within Australia but also between Australia and overseas. I assume that top-flight researchers would often find themselves attracted to a facility overseas where a particular type of research was going on that suited their particular expertise—presumably it also cuts the other way and sometimes people are attracted here by work going. I assume that there is give and take in that and that in a sense we would have to acknowledge that, at any given point in time, someone somewhere else in the world might be doing things that are not being done in Australia and that a person with expertise here might be attracted to going overseas to do that kind of work.

Mr Sullivan—Certainly in a sense their professional aspiration is to go wherever the research might lead them, and that is an individual conscience decision.

CHAIR—So the loss of specialists in stem cell research to facilities overseas in a sense is part of the natural give and take and movement of research scientists around the world all the time?

Mr Sullivan—Sure. I think there are two issues here, as has been said. No-one at the table appears to be opposed to embryonic stem cell research. Everyone at the table appears to be opposed to destructive embryonic stem cell research. Of course scientists move where their career aspirations lure them. That is the case now. It is the case for anybody about anything. I think we should not get bent out of shape around what probably at the end of the day is a minor issue.

Senator STEPHENS—I would like to go back to some of the considerations in the bill and the explanatory memorandum. I would like to explore the issues that are contained in the bill on informed consent and the cooling-off period. We asked some questions of the NHMRC on Friday and their representative was not able to actually elaborate too much on this, but one of the things that occurred to me was that in the explanatory memorandum it lists the people who must give consent in relation to an embryo other than an excess ART embryo. Each person who donates—I have it here in front of me on page 20—either reproductive, genetic or cell material must give consent. I wonder if you have given any thought to who actually owns a cloned embryo. Can anyone help me with that?

Dr Best—We need to be very clear that in Australia so far we have not seen human beings as a commodity which can be owned by anyone. Certainly in New South Wales we refer to ‘persons responsible’. In the NHMRC we refer to people who are ‘responsible’ rather than those who own excess ART embryos. I would think that, because a human embryo clone is a human being, once again we should not say that anyone can own it.

We will therefore have problems if scientists ask for patents for particular genetic arrangements in a human clone. In the United States, scientists have requested the ability to patent human clones. I think that this is a totally unacceptable way of treating a human being. I think we should remain with the idea that people can be responsible for a human clone if they have donated genetic material to it or it has been made at their request, but I certainly would not support it being seen as property.

Senator STEPHENS—Thank you for that. Going to the informed consent issue, the bill allows the creation of human embryos using precursor cells from a human embryo or foetus. Who gives consent for that?

Dr Best—It is problematic, isn't it? You are basically creating a human being whose parents have never been alive.

Senator STEPHENS—And how does a 14-day cooling-off period relate to this?

Dr Best—It is problematic.

Senator STEPHENS—Thank you very much.

Senator FIERRAVANTI-WELLS—Can I just add to what Dr Best has said. The Lockhart review suggests ways that eggs could be obtained, such as the extraction and use of eggs from cadavers. That complicates the situation that you have already expounded this morning.

Dr Best—We were discussing legislation to allow harvesting of gametes from a dead spouse, for use in an ART scenario where a couple were planning to have children and one spouse has died prematurely. It is a very difficult question because you do not know if that person would have consented to the use of their gametes for the production of children. One also has to think about, if that child comes to term, them knowing that they had a parent who was dead at the time they were conceived or, in the case of foetal tissue, had never actually been born.

Senator BARNETT—I want to ask the members of the panel about the merits of having this debate now. Why do you think we should be having this debate now rather than, say, at a future time when there could be a demonstration that embryo stem cell research was actually delivering therapies or cures, and, secondly, that benefits—therapies, cures—could flow from cloned animal research? It would appear, based on the advice you have given the committee, that no such evidence is there to date.

If you look back four years to 2002, there was a lot of speculation and hopes were raised—indeed, I think, false hopes in many respects, in terms of cures and therapies for different diseases, including type 1 diabetes, which I have—but nothing has been delivered in the last four years. So what is the point of going through this debate and discussion? Let us say we pass the legislation; what can be delivered? Is there perhaps merit in pushing this whole thing back until such time as therapies and cures have been delivered?

Mr Mimmo—I think it is important that we have a public debate, because these are searching questions. There are people who are suffering with very bad diseases and are forever being told that there is hope for a cure. Their sense of expectation must be enormously great and they must be trying to grasp onto the possibility of a cure.

Unfortunately, there has been an emphasis that embryonic stem cell research may deliver those cures and, if I might say so, it might be slightly unethical to raise the bar so high. The people who are suffering expect that there will be a cure in the very near future, whereas all the articles that I have read suggest that we are years and years and years away even if something were to come. This means that many of the sufferers today may not be the beneficiaries.

So it is important that we have a public debate. It is important that we see the issues for what they are. Unfortunately, public debate does not always take a logical path. The fact that there have been no cures of any significance from embryonic stem cell research, in both animal research and the human variety—although there has been some progress in the adult stem cell area—does not satisfy the searching mind. This is one of the dangerous paths that we go down, and I do hope that the Senate, when it comes to debate this, will give due consideration to why we should not allow this legislation to pass into law. There will never be an end to this ongoing search. The point has been made at this table by others that, having developed the technology and the knowledge—this is if it ever comes to fruition in bringing about a cloned embryo—why does it make sense that we should stop at 14 days? Why doesn't it make sense that science suddenly says, 'Look, we've developed the technology and we've developed the information and we just need to go to the next step'—a perfectly logical set of events that will present themselves. The people who said four years ago that we will never go from here to cloning are now saying, 'Why shouldn't we go to cloning? The same set of principles will apply if we develop the science any further, so why shouldn't we go to reproductive cloning? Why shouldn't we harvest organs that are made, as distinct from stem cells?'

So I think it is important that we put all of these matters out in the public square. I think it is important that we debate them and that we have a diversity of views presented. I think that ultimately the critical question comes back to this, a point made by all speakers here: the issue is whether a human embryo is something of value or just a thing. Therefore, how does society develop its ethical base if it does not regard that thing to be of value, to be upheld at all stages? It is important that we have a debate and, hopefully, put it to bed. I think it is important that we see the full issues out there so that the public is fully informed. I would like to see the debate continue for that reason, because if it does not it will come up again.

Senator BARNETT—Professor Skene put to our committee on Friday that cures under this new proposed procedure are unlikely to be delivered until the time of our grandchildren. We had Professor Williamson say that the research will still be undertaken primarily in the area of adult stem cell research. We had Dr Silburn ask of our committee the rhetorical question: why do we actually need this type of research? He actually answered that by saying we do not need it. So what is the urgency for this type of legislation to come before our parliament and be passed? That is my question.

Mr Sullivan—Firstly, obviously the parliament chose to have a review as part of its decision in 2002. I think you would have to recognise that. Secondly, there is always the fascination of the possible in human nature, so clearly there is that attraction to it. I would not like to discount, though, the intentions of people wanting to try and pursue any avenue that they can for an ultimate goal which those people would argue is a social good. I found a great quote that is worth thinking about. It is by Ian Kennedy, who is a professor of law at the London School of Economics and also works in the area of ethics and has been a great adviser to many British governments. He said: 'There are countless examples where knowledge and truth are not pursued because the pursuit would challenge values we hold dear.' I keep coming back to the fact that that is the question here. It is ultimately a calculus about values.

Senator BARNETT—All members of this committee and all members of parliament are often confronted with people with debilitating diseases. We have often heard about type 1 diabetes, spinal cord injuries, Alzheimer's and motor neurone disease—a particularly debilitating

disease. Do you have any comment to us in terms of how we should respond to those organisations? It is confronting, heart-rending and anguishing to respond to those who are calling for more and better research. How would you respond?

Dr Best—I do not think any of us would disagree that the terrible diseases that afflict us as a community need to be taken seriously. We do need to find cures for these as soon as possible. However, there are basic values which we as a community hold, where we respect each other as human beings, which should not be transgressed in the pursuit of these goods. We have always had ethical limitations on medical research: we do not cut up unconscious people to use their organs for transplant, however desperately someone needs that organ, or however desperately someone wants to know what is going on inside someone who is living. We respect those people, and we do not use them as laboratory material. In the same way, even though we desperately want to find cures for things such as diabetes, we do so while holding onto the ethical values which have been upheld in medical ethics since the fifth century BC: that we do no harm, that we respect human beings and that we observe these ethical guidelines and do research which is only beneficial to the person on whom that research is performed.

CHAIR—Thank you very much for that, Dr Best. To all of the representatives here at the table, thank you for your testimony today and for the submissions that you have made.

Proceedings suspended from 10.32 am to 10.47 am

BROCK, Dr Paul Kenneth, Private capacity

OPIE, Mr Graham, Chief Executive Officer, New South Wales, Motor Neurone Disease Association of Australia

SIDHU, Dr Kuldip, Manager, Embryonic Stem Cell Group, Diabetes Transplant Unit, Prince of Wales Hospital

KNOTT, Ms Joanna, Convenor, Coalition for the Advancement of Medical Research in Australia; Director, Spinal Cure Australia

TURNER, Mr Robert, Chief Executive Officer, Spinal Cure Australia

CHAIR—I call to order this hearing into the legislative responses to the Lockhart review. I welcome the witnesses. I believe you have all received information on parliamentary privilege and the protection of witnesses. The committee usually takes evidence in public, but if there is evidence that you would prefer to give confidentially we can consider receiving it in that way. We have received your submissions, for which we thank you. Because of the limited time and the need to get through a large number of submissions, we have allocated 15 minutes for opening statements. Would you like to go first, Ms Knott?

Ms Knott—The Coalition for the Advancement of Medical Research in Australia, CAMRA, is a recognised national peak body patient advocacy group representing over 500,000 Australians with life-threatening disorders and illnesses who may potentially benefit from stem cell research. Our submission to you included a summary of our position, complemented with additional information as a separate document. Our summary said:

• We are in support of the recommendations of the recent Lockhart Review.

• We believe that the current ban on stem cells through nuclear transfer ... does not reflect community sentiment and is not in the best interests of Australia, Australian science ...

• The diverse range of personal opinions on this issue can only be—

CHAIR—I am sorry to interrupt. The ABC seem to be making an audio recording here, which has not been agreed to by the committee. Please take that away. Thank you very much. Please proceed, Ms Knott.

Ms Knott—To finish my point, the summary said:

• The diverse range of personal opinions on this issue can only be justly translated into representative policy through an open discussion in Parliament – and a conscience vote.

Thank you for this opportunity. Why do we believe this? We believe that research shows the majority of the Australian community supports SCNT; that SCNT is therapeutic cloning, not reproductive cloning, which we rigorously oppose; and that maintaining a ban will see Australia

fall further behind international researchers and we will lose more of our best scientific brains overseas.

For the record, one person dies every day from motor neurone disease in Australia; one person, like me, suffers a spinal cord injury every day; over 140,000 Australian children and adults have type 1 diabetes; one person in 100 over the age of 60 will develop Alzheimer's; and 100,000 people in Australia have Parkinson's disease. Stem cell research offers hope for all these conditions and many more.

Before I hand over to my colleagues, I would like to talk about Christopher Reeves's visit to Australia. As you know, he was a leading proponent of SCNT. When he was in Sydney, he said:

... the fear that therapeutic cloning, if allowed, will lead inevitably down the "slippery slope" to reproductive cloning is an absolute falsehood. The reason we know this is because the medical profession is severely restricted by what they can do even within themselves. ... the point is it can be absolutely controlled and legislated and regulated so you need not fear therapeutic cloning.

You should fear reproductive cloning, but you need not fear therapeutic cloning. He continued:

And also we all need to understand what it is and what it is not. So what it is is the use of an unfertilised egg, an egg that has had no special treatment whatsoever, the egg that women lose every thirty days, then scientists are able simply to take an unfertilised egg when it's only a cluster of about 100 cells, not even recognisable as human. In fact if you were to take that unfertilised egg, put it into a petrii dish and then take cells from a hamster and put it there ... you wouldn't be able to tell the difference. ... then what scientists can do, and this is nearly miraculous, is to take DNA from a patient which is easily obtained from a small piece of a patient's skin. That DNA is then put inside this unfertilised egg and before it's even four or five days old, while it still has no human characteristics, stem cells are derived that then can be multiplied by the millions and introduced into patients without the fear of them being rejected by the patients' immune systems. ...

… … …

... if scientists are allowed to use stem cells that are derived from nuclear transfer, my body is likely to receive them and the lesion that keeps me sitting in a wheelchair would probably be cured. This applies also to people with every disease you can possibly consider. Think of it if you have a heart disease, you would not need a transplant because damaged tissue could be replaced by tissue grown using your own DNA. Now that is something that is not science fiction. It is not immoral. It is not the destruction of life.

Christopher is no longer here to see the potential outcome of this research, but I know he would have said that it is imperative that we protect important areas of medical research that offer hope to millions of people. As I said at the Senate inquiry in 2002 and I will say again here, we do not expect a cure tomorrow or even next year or the year after, and we do not intend to overstate the promise of research, but how can you overstate hope?

CHAIR—The ABC has made a request to record Dr Brock but, as this has not been previously discussed with the committee, the committee has determined it is not possible.

Dr Brock—I thank senators for their time and professionalism in attending this committee. I am not a scientist, but I do have a good grasp of the science around these issues. However, I would like to take the opportunity to address some of the ethical and religious issues that have

been a major focus of recent debate. In any multicultural, multifaith and non-faith secular democratic society such as ours, the formulation of principles of community ethical standards cannot be based exclusively upon any or only one religious creed, denomination or subdenomination—and I speak as a Christian. Equally, any form of spineless ethical relativism must also be avoided. The United Nations Declaration of Human Rights is a classic example of an articulation of ethical standards that are not dependent on any one exclusive religious creed or its particular denomination, nor is it hostage to some kind of amorphous ethical relativism. Socrates would argue that, in ethics, we need to address what ought one to do and what one must not do.

During my 15 years in the religious order of the Marist Brothers in the Catholic Church, I spent six years of solid formal studies in philosophy, theology and ethics. One of our lecturers in moral theology who was trained in the Vatican used to stress that the great Catholic philosopher and theologian St Thomas Aquinas would counsel his students faced with a new controversial intellectual or moral proposition such as what is before us today to:

Rarely affirm, seldom deny, always distinguish.

A number of those opposing the legalisation of therapeutic cloning oppose the Lockhart recommendations supporting SCNT on the simplistically asserted grounds that the ends never justify the means, as if that assertion is a self-evident axiom. But, as I argued in one of the chapters of my autobiography, *A Passion for Life*—and I am happy to table a copy of my book, because it pursues these issues in more detail—absolutely central to the ethical and moral debate is the need to distinguish between some ends and some means. I said:

… there are some 'ends' that can only justify the 'means' … The burning of living tissue by torturers is evil: the burning of living tissue in radium therapy to remove cancer, is good. (Digging out a kidney to inflict agony and probable death is manifestly evil—but for a surgeon to excise a kidney from a donor to help save the life of a person with terminal kidney disease, is manifestly good.)

Ethical values find moral expression in living social contexts. It is wrong to kill—

'Thou shalt not kill' is a clear commandment—

But for centuries the ends of collective self defence and striving to achieve a just, secure society have been used by Church and State to erect theological and philosophical 'just war' theories in order to justify the means of killing their fellow human beings in wholesale wars.

We are extremely grateful to the Australian soldiers who fought the Japanese on the Kokoda Trail. This involved killing, but our lads were not murderers; they were heroes defending a country. I had two uncles who served in the Second World War.

Because of the extremely stringent quality and accountability controls in the federal legislation of 2002, articulated in the Lockhart review, the slippery-slope assertions of those claiming that embryonic stem cell research would inevitably lead to human reproductive cloning, as distinct from therapeutic cloning, are as hollow as they are improperly alarmist. It is like saying that fertiliser production and nuclear medical research should be banned because terrorists can use these processes and products to make bombs, as we know they have, or that aeronautical

research should be banned because we know that evil people used civilian aircraft as terrorist weapons to murder thousands of people on September 11. These are central ethical issues to this debate.

In 2002 the federal parliament decided that the ends of eventually hoping to heal, restore life and alleviate incremental heartache and despair endured by families, relatives and friends of those savaged by incurable disease compellingly did justify the means of using excess embryos which were superfluous to IVF implementation and which would otherwise have to be destroyed after either five or 10 years under Australian legislation at the time. For scientific and ethical reasons they cogently argued in the Lockhart review these very same ends do justify the means of the legislative reform articulated in Senator Stott Despoja's draft exposure bill and, I am sure, although I have not seen it, in Senator Patterson's bill as well.

With some difficulty and trepidation, I address the issue of religious opposition. It is a mistake to assume that all religions oppose therapeutic cloning—they do not. It would also be a mistake to assume that every branch or denomination of the whole Christian faith formally condemns therapeutic cloning. The most outspoken opposition to the 2002 bills legalising stem cell research within very strict protocols, as well as to the Lockhart review's endorsement of SCNT, has come from some very senior people within the Catholic Church. I am a Christian with a powerful catholic heritage. I am the eldest of six kids; I spent 15 years as a Marist brother, my brother Peter has been a priest for about 40 years and my sister is a nun and a psychologist. My older sister is the deputy principal of a Catholic school in Newcastle and another brother is a priest. So the Brock family is a Catholic institution in Newcastle—and my mum is still alive at 90. I am proud of the great achievements of the Catholic Church throughout history. The church has a splendid commitment to social justice and protection of the weak from the strong in the context of employment and workers' rights. As I said in my submission:

> ... the Papal Encyclical *Rerum Novarum* on Capital and Labour, written by Pope Leo XIII in 1891 at the height of the Industrial Revolution and its social and economic impact upon working people, remains one of the great statements about the rights of human beings ...

There is the magnificent work of organisations like St Vincent de Paul and the fantastic work by the Catholic Church in Third World countries. The contribution to education, especially of the poor and working class, in this country and throughout the world has been fantastic, and I am really proud, as I always attest, to have spent 11 years of my life teaching in Catholic schools and 15 years as a member of the church.

However, the church has also been wrong. Galileo is but the most celebrated example of the church being wrong not only in its decisions about science but in savagely also persecuting those who held views that dissented from dogmatic ecclesiastical pronouncements on matters of science. In our modern era, the vast majority of the Australian population, I attest, does not agree with, nor does it abide by, the Catholic Church's ban on contraceptive practices like the pill. Indeed, I am confident that most Catholics in both belief and practice dissent from the church's ruling on contraception. The church's banning of the use of condoms as part—only part—of a campaign to alleviate the scourge of AIDS is, I am sure, not supported by the vast majority of the Australian community. I wonder how many Catholics support the church's unequivocal opposition to IVF.

Despite the fierce opposition of the church's leaders last time round in 2002, the general community supported the position of the parliament. Maybe it is not well known, but in 1760 the Catholic Church banned the use of blood transfusions. Even in my lifetime I have seen significant changes in the Catholic Church's position on a range of moral and theological issues.

The church has not had immutable, timeless positions on these issues. As Professor John Burn pointed out—and he is quite right—in the Middle Ages the church adopted the principle of Aristotle about how you determine when a foetus becomes a human being, called inspiritment. Berndt refers to it as 'ensoulment'. Aristotle taught that, if it was male, the embryo became a human being after 40 days—if it was female it had to wait for 90 days—and the church in those days adopted pastoral practices in conformity with that distinction: that you did not become a human being until 40 days for a male and 90 days for a female. It was not until about the 1870s that the church's position on inspiritment or ensoulment became the position of the embryo becoming a human being at the moment of conception. There are forms of the Christian church that have positions—Jehovah's Witnesses, for example, ban blood transfusions and I think Seventh-day Adventists do not permit the eating of meat—but they do not seek to impose those positions on the Australian community at large.

In my submission I talk about the Lockhart committee's position. It was an eminent body of Australian scientists and ethicists. I will talk about motor neurone disease briefly, as Graham will perhaps talk later on it. Nobody understands the cause of the disease unless you are in the 10 per cent of people who have had it in their family. I have not. It progressively paralyses your arms, your legs and your swallowing and speaking muscles. Eventually you end up just a mind inside a vegetable body, perhaps capable of blinking your eyelids before the breathing muscles give way and you die.

There are 1,400 people afflicted with MND at any time in Australia. It now kills somewhere between four and five times the number of Australians who die every year from AIDS. For a disease first identified in the literature in 1869 it is a disgrace that we still do not understand the cause of this terrible disease. It kills most of us within three to four years of diagnosis. I was diagnosed in 1996 and was told I had three to five years to live. I am a bit like Professor Stephen Hawking: I have a version of it which has enabled me to live longer. However, people like Pro Hart died within three months of being diagnosed. It is a cruel, terrible and ruthless disease.

Embryonic stem cell research is not the be-all and end-all of hope for this disease; it is but one of a whole range of potential research areas and therapies that may help us understand the cause, help us prolong the quality of life that we have and eventually find a cure. I am a public supporter of adult stem cell research and of all sorts of research which is ethically valid and scientifically justifiable. Let me say a couple of things in conclusion.

CHAIR—I am sorry, we have run out of time for the opening statements.

Dr Brock—I apologise. I do not have a watch.

CHAIR—It may be possible in later questions for other senators to ask you or others at the table to complete your statement.

Dr Brock—May I make one concluding sentence?

CHAIR—Yes, one more sentence would be fine.

Mr Turner—I am happy to forgo some of my time.

CHAIR—Unfortunately, there is no more time.

Dr Brock—I will not take up that opportunity. I understand the feeling of the chair.

CHAIR—It is a rule that we have established. There will be a chance for others to ask you to complete that statement in the course of their questions. That may well be possible.

Dr Brock—I would have appreciated knowing that before I prepared my statement. That is all I will say.

Senator BARNETT—I want to commend the witnesses at the table this morning and you, Dr Brock, in particular on your passion to, for example, rid the world of motor neurone disease and other debilitating diseases. That is a vision and a vision statement that I think all of us around this table on all sides of politics would support. Certainly as somebody with a father who had motor neurone disease, I can relate to some of the comments of Paul Brock and the difficulty of dealing with that both personally and as a family member.

But I would like to go back to 2002. We had a debate in and around that time with similar arguments that have been discussed today. There was some sense of hope that was passed and relayed to the general community with respect to debilitating diseases in and around that time. In terms of embryo stem cell research, the evidence is on the table that pretty much nothing has been delivered in therapies or cures. We heard from Professor Skene on Friday that it was more than likely the cures would not flow through from the research we are talking about under these bills until the time of our grandchildren. We had Professor Silburn ask the rhetorical question: why do we need this legislation and this type of research? His answer to that rhetorical question was: we do not need it. Professor Williamson said to the committee that most of the research would be undertaken in adult stem cell research, where there have been therapies and cures flowing from that. I wonder whether you would like to respond to those observations that have been made to our committee for the purposes of today's hearing.

Dr Sidhu—I have been head of research on human embryonic stem cell in DTU, Prince of Wales Hospital, for the last five years. I brought that technology from Wisconsin. I am trying to juggle some of those parameters to get it forward to what is happening worldwide. But with regard to your question about whether nothing has been delivered with the application of human embryonic stem cells in a clinical setting, that is a rhetorical question. For example, in research there are two components of the debate. One is that you develop the technology over a period of time, and the other is you then apply that technology clinically.

We all know that developing a simple tablet and bringing that tablet—the Panadol—across the table, takes about 10 to 15 years. The first time the stem cell was isolated from the human embryo was 1998. It has only been six or seven years since we have had this technology on the table. But with regard to the progress made in this particular field, it is tremendous. You ask me, as a scientist who sees these cells all the time in the Petri dish and who sees a number of

publications that are coming through, what progress has been made scientifically, what potential applications are coming out of it.

I want to submit two publications. These came out early on and relate to the application of human embryonic stem cells. The first is in the field of blood cell defects in a mice model, carried out by George Daley. This was published in 2002; I am keeping this copy for the House to go through it. In this particular historical paper, they have demonstrated very clearly in that animal model that they developed a somatic cell nuclear transfer base derived stem cell, corrected those cells with that genetic defect, transplanted those cells into that diseased model and corrected the disease in the mice model. That is a proof of principle, and this particular paper could not go wrong with that. That is one of the papers I wish to submit to the committee. The second paper I want to submit is by Barberi. Again it came from the US. In this, they have shown very clearly, using a somatic cell nuclear transfer, that you can generate those stem cells based on somatic cell and transplant it in a Parkinson's model and show the benefit of that particular technology.

These are two pieces of evidence that I want to submit, but, coming back to the question of how much progress has been made in human embryonic stem cells, I want to bring to the notice of this committee a very good international analysis which has been carried out based on publication. This paper came out only a couple of months ago. In it, somebody did an analysis of what is happening in human embryonic stem cells. If you look at this particular graph, which I will submit to the committee, you will see that those countries which do not have a clear vision or clear legislation on human embryonic stem cells are going backwards in terms of progress made in this particular field. This graph shows that most of the top publications on human embryonic stem cells paradoxically came outside of the US, because the US also does not have a clear vision of policy and the principle on which way to go. This is a paper that is eye opening. Despite the fact a country like the US has made tremendous progress, it is going backwards because it does not have any clear policy about where to go from there. These are the three pieces of evidence I want to put across about what progress has been made.

To expand a little bit on this one, I want to provide some very recent evidence. A paper came out this Friday—which I have downloaded for the committee—which very clearly demonstrated something for the first time. It has been a holy grail for type 1 diabetes. We have been fighting to find a way to convert human embryonic stem cells into beta cells that can produce insulin and cure that disease. This has never happened before. This same group last year published a recipe to convert human embryonic stems into beta cells. I adopted this particular recipe in my lab. It does work, believe me. Within six months, these people have come out with a revised version of that and shown very clearly that 80 per cent of those cells can grow into endoderm cells and some to beta cells and can then secrete insulin. This is proof of the principle, even with a human embryonic stem cell, which I want to submit before the committee. Another one—

ACTING CHAIR (Senator Barnett)—Thank you, Dr Sidhu. Did you have anything else to table? We are just a bit tight on time.

Dr Sidhu—I will submit all these papers, which are relevant in terms of the application of human embryonic stem cells and the progress made in that particular field. I will also submit what we are doing in developing human embryonic stem cell lines from our lab, under legislation, which has an application down the track.

Senator FIERRAVANTI-WELLS—In other words, you disagree with Professor Skene, Professor Williamson et cetera and other scientists who have said that cures and treatments—which was the gist of the question, not research—will be seen in the lifetime of our grandchildren? Just a simple yes or no will suffice.

Dr Sidhu—I would say that is an overstatement in terms of the development in science. This is a new field—

Senator FIERRAVANTI-WELLS—So you disagree. Thank you. What is your position—and can I ask this also of other members—with respect to allowing human-animal hybrids, which Lockhart recommended but which the Chief Scientist has called on to be banned?

Dr Sidhu—I can respond to that question. In the development of science I think we have to keep all the avenues open. When there is a debate such as that about using human eggs, there is an issue of developing this technology further down the track—second-step development. Unless we have an alternative approach to look into technology development, I think the hybrid egg is the way to go. This is not something new in this particular field. A technique using a hybrid scenario—using zona-free hamster egg assay—is used in infertility clinics. Throughout the world clinics are using human sperm and hamster eggs to find out whether the sperm is fertile or not. It is routinely used in all the infertility clinics, although not in Australia, because hamsters are not allowed in here. So there is nothing new in using that technology to make progress in that scientific field using hybrid eggs.

Senator FIERRAVANTI-WELLS—So, insofar as the Lockhart committee referred to use of hamsters, in your opinion that was wrong, because hamsters are not allowed to come into Australia?

Dr Sidhu—That is correct.

Senator FIERRAVANTI-WELLS—The committee heard evidence last Friday from Professor Williamson from the Academy of Science about the likelihood of treatments. We discussed this earlier. The committee also heard from Dr Silburn, a clinician practising in neurological conditions and spinal injuries, about the large number of clinical trials around the world involving adult stem cells and that there are no clinical trials with human embryonic stem cells. In light of the evidence from these experts regarding treatment—and I underline treatment—from a research dollar point of view, would it not be best to promote adult stem cell research?

Dr Brock—May I quickly respond to that and also pick up something Senator Barnett said as well. I understand that this legislation is about research. It is not legislation about being prophetic about therapies. I happen to agree myself with what you quoted about Loane Skene's thing: it is quite probable that it will take many years before therapies are developed. For example, Professor Frazer—the Australian of the Year—started his research on papilloma virus 20 years ago and it was just recently that therapies were authorised. It is about research.

Secondly, adult stem cell research, which I strongly support, has been going for four decades. Embryonic stem cell research started in 1998. I think it is a little bit unfair to ask, 'What therapies have been dramatically produced by embryonic?' It is also worth asking: apart from

bone marrow therapy, how far have we got with therapies from adult stem cell research? I will hand over to—

Senator FIERRAVANTI-WELLS—We have taken evidence about that, as I am sure you will see when you read the transcript. So you feel Sarah Murdoch was wrong when, as patron of the National Breast Cancer Foundation, she told the National Press Club recently:

I truly believe embryonic stem cells will be a thing of the past ... We are looking to the future to adult stem cells.

Would anyone care to comment on that?

Ms Knott—Who knows whether they will be a thing of the past unless we allow this research to continue in Australia? This is the whole thing. To reiterate what Paul says, we cannot possibly know what the outcome is unless we stay in the game. Why should we as Australians be disadvantaged compared to the rest of the world?

Senator FIERRAVANTI-WELLS—So you disagree with Mrs Murdoch?

Ms Knott—Mrs Murdoch is one person with one opinion.

Senator FIERRAVANTI-WELLS—Indeed, and there are many opinions. You are expressing a view here this morning.

Ms Knott—The Roy Morgan research that has come out shows that 80 per cent of people are in favour of this research continuing.

Senator FIERRAVANTI-WELLS—You mention Morgan, but are you aware that there is other polling research which contradicts the Morgan poll you cite?

Ms Knott—I am aware of quite a lot of research that has come out, but I think that the Roy Morgan and ACNielsen research is truly independent. I am not convinced that some of the other research is as convincing, because it is not necessarily as independent.

Senator FIERRAVANTI-WELLS—So you are saying that only the Morgan poll is the appropriate one. Is that what you are saying?

Ms Knott—I am probably not aware of every piece of research that has come out, but the Roy Morgan and ACNielsen research has been done by independent research companies.

Senator FIERRAVANTI-WELLS—But you are aware that there is other research which does deliberately contradict the Morgan poll?

Ms Knott—I am not aware of any other research that—

Senator FIERRAVANTI-WELLS—All right, if you are not aware. I have one last question. There has been a readiness, I think, to criticise religious views in this debate, but I ask: are your associations aware of persons with disabilities who are opposed to cloning and destructive human embryonic stem cell research for ethical reasons and because of the medical risks

associated with human embryo stem cells, such as the formation of teratomas and their general instability?

Mr Turner—Yes, we are, but you have to go a long way to find them. Amongst the thousands of people who support it there would be one or two. Obviously they are people who have been approached for a particular reason.

Mr Opie—I would have to agree with Bob. As Paul mentioned before, 90 per cent of cases of motor neurone disease are sporadic, so we represent a broad church, for want of a better term. To date we have not had direct contact from any of our members, Australia wide or in New South Wales, who oppose our published stance. If we knew of any, we would be addressing that situation, but to date we have not.

CHAIR—Mr Turner, could I clarify what you meant by saying that certain people have been approached?

Mr Turner—It is clear that there has been a search for people with a contra point of view to embryonic research, both in the scientific community and in the patient advocacy community. They seem to be few and far between.

CHAIR—Who has made those approaches?

Mr Turner—The people who are arguing the contra point of view, as happened in 2002. Two scientists were brought out from America who were clearly brought out for a particular reason. They were discredited by world opinion on science for the stance that they were taking.

CHAIR—I am not clear why people who are found to be advocates of the case for cloning are necessarily people whose credibility is greater than those who are solicited for the purpose of opposing it.

Mr Turner—Weight of numbers is what I am saying, I suppose. I think there are far more scientists and far more patients in favour of the potential—and it is only the potential—of embryonic stem cell research than there are against it. You have to look a long way to find people with a disability who are prepared to say they would refuse the treatment if it were found or refuse the treatment for their children if it were found.

Senator POLLEY—The submissions of both your organisations claim that SCNT is not cloning. This is at odds with the standard medical dictionary definitions, such as in *Stedman's Medical Dictionary*, of cloning. Do you stand by your assertions?

Ms Knott—What we stand by is that it is not reproductive cloning. We want to differentiate between reproductive cloning and therapeutic cloning. The latter we support; obviously we do not support reproductive cloning.

CHAIR—I want to clarify something. In your submission where you say SCNT is not cloning, you actually mean SCNT is not reproductive cloning.

Ms Knott—If you want to be specific, yes.

Senator POLLEY—What is the evidence for your claim that Australia will be prevented from 'sharing in the international collaboration, research knowledge and intellectual property'?

Ms Knott—We have already lost some of our scientists to other countries. Martin Pera has chosen to go overseas and work over there. We have lost some other scientists too, and we believe that this will continue. Professor Burn, speaking on SBS's *Insight* program last week, said that countries like the UK would steal our scientists if legislation does not change. We think there is enough of an indication that that will be very bad for science here.

Senator POLLEY—We heard evidence earlier today, and on Friday, in relation to why scientists go overseas. Obviously they are lured by opportunities that are not necessarily just based on whether or not something is legislated for or against. But I want to move on and ask the panel: does the current legislation environment allow further human embryonic stem cell research into the areas of proof of concept of treatment in animal experiments, overcoming their teratoma cancer problem and the instability of human embryonic stem cell properties and learning whether disease-specific colonial embryonic stem cell lines will be helpful? Can all of these things be studied now without changing the law?

Dr Sidhu—Absolutely; we can do that with the existing legislation in place. But, when you are talking about cutting-edge science like somatic cell nuclear transfer, we cannot live in isolation when in the neighbourhood we have the technology which can frustrate what we want to do on a slow train. That is a question of competition.

Senator BARNETT—Ms Knott, I just want to ask you about your opening comment. You said the human embryo created under the SCNT technology—and I am seeking clarification that this is exactly what you said—is not even recognised as human. That would seem to contradict all the other evidence we have received. The US presidential commission has looked into it and states that it actually is human. I am wondering what evidence you have got to suggest it is not human.

Ms Knott—I am not a scientist, so I will defer to Kuldip on this one. But my understanding is that we are talking about cells the size of a dot at the end of a sentence. As my quote from Christopher Reeve said, they are not distinguishable from hamster cells at that point either.

Senator BARNETT—Ms Knott, I would like to pursue this with you if I could. You are saying that the size of the organism is relevant to its humanity?

Ms Knott—I am not making a comment on that; I am just saying that you could not distinguish these cells as being human or animal at that point.

Senator BARNETT—Does the size of the human embryo determine whether it is human or not?

Ms Knott—I am not going to be drawn into an emotive issue. The whole point is that what we are talking about with SCNT is copying cells, not reproducing humans.

Senator BARNETT—The evidence put to the committee by various scientists pretty much unanimously—I am not sure of anybody who has a contrary view—agrees that the human

embryo created by the SCNT approach is human. Notwithstanding that it is small and notwithstanding that the method of creation is an alternative to the human sperm and egg—the method of creation is different, and that is agreed—everybody agrees that it is human. But you seem to have a different view.

Ms Knott—I do not think any scientist using the SCNT approach ever has any intention of creating a human. It is about copying cells and finding out diseased models and maybe eventually—even though it may be a long time—getting to the position of being able to treat terrible diseases that people live with.

Senator BARNETT—I would like to ask one other question, if I could, if we have time. On the question of the 14-day limit, some people would say it is arbitrary. It should remain a maximum of 14 days under this particular procedure. Would you have any problem, for example, if it were extended to, say, 21 or 30 days?

Ms Knott—I am not going to get into the actual days, but my understanding is that, with SCNT, the work is done in the first few days.

Dr Brock—Can I come at it from a different way. If it is as it is—that is, for superfluous embryos created under IVF, if it is legal for those embryos to be used for scientific research in Australia, rather than being destroyed, with strict scientific and ethical protocols, with the permission of the parents and so on—why is it not right that it be legal for embryos created by somatic cell nuclear transfer, without sperm? Why is it logical for that to continue to be illegal? For me, that is the absolutely central issue in this matter.

Senator BARNETT—I guess I am not on trial here.

Dr Brock—I feel we're on trial at the moment!

Senator BARNETT—But I am happy to respond to say that it is based on the fact that you are creating an embryo which is actually human and you are therefore creating an embryo for the purposes of research and its destruction, and that is what is anathema—at least to some people in the debate.

CHAIR—I have a couple of questions before I pass over to Senator Stephens. Dr Brock, you made comment about the slippery slope assertions being false, and I want to come back to a question that was asked of Ms Knott, I think by Senator Barnett. Let us suppose this legislation is passed and, in a couple of years time, scientists come back to us and say, 'We can't get the material we need from these embryos within the first 14 days but we can get it if we have 28 days.' What, logically, is the argument—if any—for saying that 14 days is the cut-off and 28 days cannot be the cut-off? That is the slippery slope. But what is the argument against saying the 28 days is too far?

Dr Brock—I thought you were going to ask me a different question, which I might address as well. I am not—

CHAIR—I would rather you addressed the question I asked you, if you do not mind, rather than other questions.

Dr Brock—I am not a scientist. I am not in a position to answer that question.

CHAIR—Perhaps Dr Sidhu would be able to answer that.

Dr Sidhu—In terms of the 14 days from conception, derivation of human embryonic stem cells starts on day 5, so, whether it is SCNT or the normal fertilisation process, 14 days is good enough to get what you want to get from the embryos. Otherwise it becomes foetal tissue, and that is different legislation altogether.

CHAIR—But we have already acknowledged that this research is at very early stages and we have not moved much past proof-of-concept type research at this point. No-one has actually produced a cure in any of the research going on around the world from human embryonic stem cells. So isn't it too early to make the pronouncement that 14 days is definitely the convenient cut-off and we do not need to go beyond 14 days?

Dr Sidhu—No, we do not, because, being a person who is involved in deriving stem cells, I can say that inner cell mass comes out on day 5. Those are the cells that are required to do the subsequent research on. We are not interested in foetal tissue at the present moment. What we are talking about after day 14 is foetal tissue. We are not asking for permission to use human foetal tissue to derive stem cells. We are asking only to use the early embryos.

CHAIR—I appreciate that that is what you are asking for, but I am saying: are you absolutely ruling out the possibility in the future that science could reach a point where in fact it was useful, to discern the answers to the questions that this research is seeking to find, to take those cells beyond 14 days?

Dr Sidhu—No, at this stage.

CHAIR—But my question is—

Dr Sidhu—It is a hypothetical.

CHAIR—Yes, it is hypothetical.

Mr Opie—We have not even gone down the first path; how can we possibly—

CHAIR—Indeed, it is hypothetical, but that is my point. You cannot rule out at some stage in the future that the answer to that question might change.

Dr Sidhu—Then we will have to make another review on where the progress has got to and make an assessment there.

Dr Brock—Our position is that we are considering before us the Lockhart recommendations. If and when that hypothetical situation were to occur, I presume we would then proceed once again, and quite properly, down this kind of process to ask those very questions. To pick up Senator Barnett's point on the slippery slope argument, I, for example, would oppose any slippery slope suggestion of: 'We can't produce these things by SCNT. Why don't we have people procreating to make an embryo for research purposes?' I personally would be strenuously

opposed to that, as an example of it. So we have to consider before us what is before us, and what is before us is the 14 days.

CHAIR—The point I am getting to is whether by going to 14 days we have already crossed a serious ethical line and whether in fact there is no line to be drawn between 14 and 28 days or, in fact, almost any other point after that point. The creation of a human entity for the purpose of scientific research to be then destroyed is already the line that is crossed, and the question of whether it is 14 days, 28 days or some other point is irrelevant from that point on. That is the point of my question. Dr Brock, you mentioned that not all faiths oppose therapeutic cloning. Which ones do not oppose therapeutic cloning?

Dr Brock—Judaism does not. Again, I am not an expert on all religions, but I think you will also find differences within Islam. Judaism certainly has quite a different position on when life commences.

CHAIR—We might make some inquiries.

Dr Brock—There may be sections within the Christian community which have a different position on that as well, but I certainly know that Judaism has a different position on it.

CHAIR—I am not aware of any, but I take it you also are not aware of any other Christian churches that do not oppose therapeutic cloning.

Dr Brock—The fact that I am not aware does not mean it is not true.

CHAIR—Indeed, but, with respect, you made the assertion that there are other churches that do not oppose therapeutic cloning.

Dr Brock—With due respect, I made the assertion that other religions do not.

CHAIR—But Judaism is the only one that you can name.

Dr Brock—Yes, but, again, I have not gone to the Uniting Church, the Anglican Church or the Baptist Church and asked for their positions. It might be useful for the committee to see what the positions of those other Christian churches are.

CHAIR—I go back to the point that was made about the time frame for these cures to be found as a result of this research. I think Dr Sidhu said that he rejects the comment by Professor Skene last Friday that we are looking at our grandchildren here rather than any contemporary beneficiaries. The point that was made in other answers by Mr Turner was that a great many people, particularly those with disabilities, were strongly supportive of this sort of research happening. Ms Knott mentioned in her submission that ‘over 500,000 Australians with debilitating diseases and conditions will need to look overseas for hope for a cure’, implying that those 500,000 are in prospect of having those cures provided by these developments now.

Ms Knott—What I am saying is that if we do not allow research to continue then Australians potentially will not be able to benefit from treatments in the future. But we are very aware that the treatments are not going to be next year.

CHAIR—With respect, comments like that in your submission create an impression which I suggest has been certainly shared by many people with disabilities that these developments will give them a cure—it is them personally, not their descendents or future generations, who will get a cure, which is why so many disabled people have been supportive of those developments.

Ms Knott—With respect, I think that this whole issue of peddling false hope, which the Minister for Health and Ageing keeps referring to, is actually very patronising to people like me who have worked in this area for a long time and to other colleagues and friends. Of course we cannot be assured that there will be a treatment, but to have that hope taken away would potentially destroy people's lives. I have a quote here from Peter Williams, the brother of David Williams. He was on SBS's *Insight*. He suffers from Parkinson's. He said that he has a balance in living his life as it is now but it would be a terrible thing to take away that hope that allows him to feel that there could potentially be treatments. I think people are very realistic about this being not something that is going to happen quickly, but unless we are in the game we can never find these treatments.

Mr Opie—Speaking on behalf of a member driven organisation, we are very careful not to peddle false hope. I think that, as Joanna said, it is incredibly patronising to think that people cannot understand that research takes between 15 and 20 years to evolve into something that is usable. I think cancer is a classic example. Every day there is something new that comes about cancer research about a new treatment or cure, and people understand that. Paul Brock is the classic case in point. I think Paul is doing this not for himself but for future sufferers of motor neurone disease. Paul has said that many times, because the understanding is that, if we do not go past this point, we will never know whether 28 days make a difference over 14 days or whether we are peddling false hope or real hope. The fact is that it is one of a complement of treatments and research that we are actually pushing. To marginalise people and to call people such as our members naive, which I gather is—

CHAIR—I did not use that term.

Mr Opie—No. That is the inference that I am taking. It really is a patronising point of view. I think people understand these things, and we have to give them a lot more credit for that, because these people are suffering and their families and carers are really suffering.

Dr Brock—It is unfortunately true—to agree with you in a sense, Senator—that some poor people do get sucked in by false hopes. They go off to quacks and they go overseas for miracle cures. We get quacks like that South Korean scientist who, had he been in Australia and had the Lockhart recommendations been implemented, could not possibly have done the research because of the tight protocols. There is no question that there are people who are sucked in by false hopes. The importance of improving this legislation is that it supports ethically and scientifically justifiable research rather than people going to snake oil salesmen in times of desperate despair—and we all know that that happens. This is not snake oil stuff.

I also make the point I get quite distressed at times when I feel that my position is being misrepresented as somebody who is being seduced by false promises. I am not a fool. I know that I will probably be killed by this disease, but I am fighting for the next generation. As Ian Frazer says, a lot of the research will come through in the next generation. But, having said all of that, it was once said that they were 25 years away from finding a cure for leukaemia and within

a decade some of the childhood leukaemias were being cured. So never rule out the possibility of some kind of hope coming out of the blue from basic science.

Senator STEPHENS—Thank you very much for your evidence this morning. We have had quite a lot of discussion about community expectations around changing the legislation. I have two questions. Firstly, if this bill is not passed by the parliament, what do you think will happen then in terms of the legislation?

Mr Opie—Within Australia, or on the whole issue of somatic cell nuclear transfer?

Senator STEPHENS—In Australia. What do you think will happen if it is not agreed to?

Dr Sidhu—I can comment on that. The question is about whether, in science, you become uncompetitive. Australia has made tremendous strides in stem cell research. If we are barred from using the technology that is available out there, we will be pushed backward in the competition and in the application of that knowledge in the community. I think it is relevant that, when we are living in a world where are in parallel with what is happening across the street, we have to be competitive, follow up and take the maximum benefit from the technology. Why should we be disadvantaged in Australia?

Senator STEPHENS—Does anyone else have a comment?

Dr Brock—People like us would have to think about the fact that we could not afford to go to places like England, Northern Ireland, Scotland, Wales, California, Israel or Sweden—places in this civilised community of the world that have approved this sort of legislation. As a fiercely proud Australian, I would feel desperately let down by my government if they told me it is okay if you were born in those countries or you can afford to go to there but you cannot do it if you are Australian. That would devastate me as an Australian.

Senator WEBBER—I thank you for your submissions, particularly Dr Brock for his very personal and powerful submission. I want to return to the issue of false hope. We have had half the debate on that already. The other half of the debate—the accusation that is levelled at people like me—is that we are exploiting people like you, Ms Knott and Dr Brock, by creating that false hope. Do you have a response to that?

Ms Knott—Only that it is a ridiculous thing to say. We are encouraged by the fact that this debate is taking place. Obviously we hope that the outcome will be that the legislation will go through, but it is good to live in a society where we can discuss these things and open up the debate so that people really can put their views forward. There can be a lot more said about why this research is so important for potentially huge numbers of people.

Senator WEBBER—Dr Brock, other submissions to this inquiry have discussed various religious views and Christianity. The covering letter to another submission, No. 50, from Anthony Bernauer says:

My Mother, who had a very strong religious upbringing has always told me that ‘The magnificence of God will be further revealed by Science’. She supports Stem Cell Research because it’s not ‘playing God’ but showing his magnificence through the people he created and what they can achieve.

Is that something we should take on board?

Dr Brock—I think so. One of the tragic lessons of history is the damage too often done by those who 'know' what God wants. I have just returned from the battlefields of the First World War. I have been on sites where German priests were offering mass for the victory of the Germans and other sites where English priests were offering mass for the victory of the English. They were both praying to the same God and they were members of the same church. I think God has blessed us all with human intelligence, creativity and exploration. I think sometimes God might be a bit embarrassed by some of the pronouncements of his or her acolytes, whether Buddhist, Islamic, Christian or whatever. So, yes, I do believe that God has given us that capacity to search, but, as a Christian, there are ethical principles by which we must abide. I believe this research does abide by those ethical principles and I do believe God has given us the strength, intelligence and imagination. I think God is revealed that way. As Saint Paul says: 'God is love.' But I will not go into theological preaching here.

Senator STOTT DESPOJA—Dr Sidhu, can I ask you about your earlier comments about the success that you have had in converting embryonic stem cells into insulin-producing cells? I understand that those results are not optimal at this stage. I also understand that your attempts to do that with cord blood have not been as successful. Could you explain some of the differences in outcomes? Chair, I do put on record that I have an interest. It is not a pecuniary one. I am on the DTU advisory board, and I do think the issue of progress in this area is absolutely important.

Senator BARNETT—DTU?

Senator STOTT DESPOJA—Yes, the Diabetes Transplant Unit advisory board, which we have spoken about before, Guy. I just put that on the record—not that it is a pecuniary interest.

Dr Sidhu—I provided that paper, which has come out very recently in *Nature Biotechnology* in the US, which has very clearly shown that human embryonic stem cells can be converted into beta cells very efficiently. This is the first time the recipe has come in. It was published earlier on in 2005. We tried to follow up that recipe in my lab and we have seen that it does work.

You raise the question of differentiation of embryonic stem cells into a particular lineage versus adult stem cells, maybe umbilical cord. This is a very relevant question. A very specific example of this one is type 1 diabetes. If you want to transplant into type 1 diabetes patients you need to have three donors to cure one patient. In other words, if you are to cure one type 1 patient you need at least one million to three million cells. It is an established fact in the world literature that adult stem cells cannot meet the number of cells required down the track for cell therapy, whereas we can produce millions of human embryonic stem cells within no time. So the number issue is very relevant here. Although I strongly believe that both these areas—adult stem cell and embryonic stem cell research—should go in parallel, the reality is that the practicality of it is that tomorrow the demand posed in the number of cells required for therapy will not be met by adult stem cells alone.

Senator STOTT DESPOJA—Thank you. I was not going to get into this issue until later, but it was something that Senator Fierravanti-Wells asked about. I think she mentioned the issue of tumours earlier. That is obviously a criticism that you have heard a lot in relation to embryonic stem cell research. How significant an issue is that?

Dr Sidhu—It is a very significant issue at the present moment. We all know that this might be a difficulty in terms of going in one particular direction. Our experience shows—for example, this paper which has come out and the research in my lab where we have shown that if you follow through very rigorously, eliminate all undifferentiated stem cells and then transplant them into the mice—that no tumours show up. I have done it in my lab. Provisions are there which are a fail-safe mechanism. Tomorrow if some therapy comes out of those cells not only is there the precautionary measures—you develop these cells through a particular lineage, which is very efficient and 100 per cent—you also have a fail-safe mechanism, where you try to eliminate those cells if they crop up later in the event of like transplantations. So there are provisions out there in science where you can handle that issue, but that is an issue in itself.

Senator STOTT DESPOJA—Thank you for that.

Senator NETTLE—Thank you for your submission. I want to ask about the issue of the rights of donors in the process of this research. In particular I wanted to ask you about recommendation No. 45 of the Lockhart review, which says:

Donors of tissue that is going to result in an immortal stem cell line should be informed by means of processes monitored by human research ethics committees about the potential use of that stem cell line, including the potential for commercial gain and the fact that they may not have any rights in potential stem cell developments.

In particular I wanted to ask people's views not only about this recommendation but more generally about what rights donors should or should not have in this research and what the views of your organisations were on that issue?

Mr Turner—The people who we have spoken to are voluntary donors, generally family members, who are very keen to make eggs available should therapies be developed. There is no thought of any commercial gain in their minds. For every person with a disability there are hundreds of people around them who are prepared to make a voluntary donation.

Senator NETTLE—One of the issues that has been raised in a number of different submissions is about whether or not anyone who donates eggs or tissue should have a right to access any treatments or cures that may come down the path. That is a difficult one. There is that issue and then there is also issue that, if, for example, women are donating their eggs for altruistic purposes in terms of public research, they may have some concerns about the commercial gain that private biotech companies are able to make. They are two issues of interest that have been raised in a number of submissions. I wanted to hear your views on them.

Dr Brock—There is no question. That is a difficult issue, as it is with any voluntary giving of one's body. We all know, quite rightly, the ethics around kidney donation. You are not allowed to sell your kidneys for kidney donation. I suppose there is a bit of an analogy with blood donation. If we give our blood voluntarily—although I cannot give blood, because I was in England in the 1980s—we probably understand that some of that blood will be made into plasma. I have forgotten the name of the stuff, but there are commercial products produced by the blood in certain plasma forms which are injected into people with multifocal motoneuropathy, for example. I guess it is probably an in-principle agreement. I think we have to protect things that involve commercial enterprise. But I am not a lawyer; that is just my response to your question.

Senator NETTLE—Is anyone aware of the current processes followed by the NHMRC in relation to that donating and whether or not people are asked those questions and provided with the information about commercial gains and their views on that? It is okay if you are not. It is an area of interest to me.

Dr Sidhu—I can make a statement in this regard. For example, there are exclusion statements. When a patient gives consent to donate eggs, embryos or sperm, you go through a whole process—you sign documents. In the exclusion document, for example, you sign off that any intellectual property coming out of that material will not be part of that patient. So that is excluded at that time, when we sign off those papers when we take the donation.

Senator NETTLE—Thank you.

Senator FERRIS—I think this question is for Dr Sidhu. We heard earlier this morning that it would be advisable to delay this debate to allow the success of adult stem cells to be better demonstrated and yet, in an interview just a week ago, the Nobel Prize winning medical scientist Sir Paul Nurse said to me that this research—embryonic stem cell research in particular—has the possibility to be as exciting as mapping the human genome in terms of what could be developed from it. Could you respond to those two statements and draw the points of contrast in relation to yourself?

Dr Sidhu—I made a statement early on that I strongly believe that both embryonic and adult stem cell research should continue in parallel. We cannot wait until something comes out of one and then apply that knowledge to the second one. Both sciences are important at this stage. In regard to the idea that one is superior to the other, I do not want to get into that debate at all. But one should not be exclusive to one—that is, we should not stop one and go on to the next one. Who knows where we will get the hand on?

As you said very correctly, the human genome project was very ambitious and a very big project, and that came through very well. Today, the application of the human genome has come to a level where we can analyse those genes and apply our knowledge in human health. The same is true about human embryonic stem cells. If you look at the power and enthusiasm that have gone into the human embryonic stem cell research world wide, people are getting a bit crazy in terms of getting into it to explore the possibility because there are so many possibilities. Those who are working with these cells see these cells on a daily basis and, yes, what is being published is what you see under the microscope. There is a hope out there, and there is a possibility that you can develop and expand that hope down the track. Parallel research in both areas would be very constructive for human health.

Senator FERRIS—My second question is to Dr Paul Brock. What do you say to people who claim that a living person should have the same status as an embryo that has not been fertilised by a male sperm in terms of the way it is treated?

Dr Brock—Part of my nature is to try and avoid black-and-white, either/or sorts of things. Obviously, at one level you would expect me to say, 'Of course, yes.' I noticed that the other day a very famous Australian priest—remind me, Chair.

CHAIR—Father Frank Brennan?

Dr Brock—Yes, whom I have enormous regard for.

Senator FERRIS—He is right behind you!

Dr Brock—Whom I can now say I have enormous regard for—I was going to say that anyway!

Senator FERRIS—I think he is watching over you.

Dr Brock—I have been wanting to meet him for God knows how many years. I was a little uncomfortable with an analogy Frank—I hope I can call him Frank—used in his piece in the *Age* the other day, where he said you would save a person with motor neurone disease before you would save a Petri dish with embryonic tissue in it, but that is not to say that one is not important. My own view is that, in a practical sense, because I believe that the embryo created in somatic cell nuclear transfer will never be implanted in a uterus and will never become a human being, the rights of the living human being have precedence over the embryo created from SCNT. But, as Frank would remember, in theology we used to have this great problem: a woman is in labour and the doctor says, 'Either the woman will die or the baby will die.' This used to be put up as a theological conundrum to try to solve. It is the same kind of very difficult issue.

Senator FERRIS—What was the answer in that case?

Dr Brock—We used to refer to the thing called the principle of double effect—that is to say that you would try to save the life of the woman and, if the life of child succumbed, that was an unfortunate consequence of a determination to save the life of the mother. But, mind you, there was a contrary theological position as well. My long-winded answer is that I get uncomfortable with being backed into a position of having to say what is more important, but in the real world I would think that the rights of the living human being, if you have to make a choice, have precedence over the embryo created not by sperm and ova but by SCNT. Having said that, I respect very much those who have a different viewpoint.

Senator ADAMS—Ms Knott, I would like your view on some public comments made by Dr Jim Peacock regarding the Lockhart committee's recommendation on the use of animal eggs. Are you familiar with those comments?

Ms Knott—Yes. We are standing by all the recommendations of the Lockhart report. Our understanding in consulting a majority of scientists is that the idea of the hybrid, using the animal egg, is for drug testing and it means that development of drug testing would allow another opportunity to do that. So we would stand by it on that basis. But there is no possibility that the hybrid would ever be put back into a human, so we feel very safe about the way that Lockhart recommended it.

Senator PATTERSON—I thank everybody for appearing. Firstly, Dr Sidhu, is the paper that was produced last Friday one of the ones you are tabling?

Dr Sidhu—Yes, that is the one.

Senator PATTERSON—There has been criticism that nothing has happened since 2002, and just about every Friday I seem to get somebody sending me a new paper that has just been published and, of course, we do not know about the ones that are still in publication. Could you outline in a little more detail what would be enabled in your research if the Lockhart recommendations were implemented? What would you be applying for?

Dr Sidhu—I will definitely be applying for a licence to go for SCNT, because that is a patient-specific therapy down the track. With the success we have in converting these cells into different lineages, the time is not far away. There was a reference to the use of this research for our grandchildren; there is nothing wrong with that, but why not do it now for your grandparents as well? But my hope is that this particular field is developing on such a fast track at the present moment that within a short period of time we will have a lot of progress. And I will be the first person to apply, given the opportunity that we will have with the legislation in place.

Senator PATTERSON—There has been criticism of embryonic stem cell research that possibly stem cell lines would cause tumours in treatment. But hasn't adult stem cell research had to overcome some problems with cancers and other things? We have not stopped doing adult stem cell research because there are some problems in terms of therapies that might be derived.

Dr Sidhu—Absolutely. If you compare embryonic and adult stem cells, the stability of the adult stem cell in in vitro culture is a serious issue. And the proliferation—

Senator PATTERSON—Sorry, the what?

Dr Sidhu—The division of the cell. To keep these cells growing in culture is a serious issue with adult stem cells in terms of duplication and the chromosomal abnormality coming into adult cells because they are a seemingly differentiated cell at some stage. To keep them alive and keep them stable in culture is a big issue. Ask that question to those who are dealing with adult cells. I am also dealing with adult stem cells. Compare them with the human embryonic stem cells, which are stem cells. They proliferate, they divide and they increase their number without being transformed into a cancer cell. What we see in adult stem cells is that the stability goes and they start dying off in culture. So we have to keep a balance between the two and then also be realistic in terms of what we are handling these cells for—down the track for therapy. Some of those issues may be addressed by adult stem cells, but where the number is a big issue—like type 1 diabetes and Parkinson's disease—you have to keep in mind that it is a numbers game to transplant these cells for those kinds of patients. Adult stems cells will never meet that demand at all.

Senator PATTERSON—There was a question asked in one of the library seminars by one of our colleagues, who put the proposition that you would need millions of women's eggs to create a treatment. That is not what you are saying to us now—you do not need one ovum for each person who is going to be treated for type 1 diabetes.

Dr Sidhu—To get a line up and running in the Petri dish, you may need a number of eggs to initially develop that line. At the present moment, the success rate is 20 per cent with the normal fertility. I am not talking about SCNT. With SCNT the success rate is very low at the present moment. So you would have a number of eggs to generate that cell line. However, once that cell

line has been created it is an immortal cell line. So you can produce millions and millions of those cells within no time.

Senator PATTERSON—I just wanted to clarify that because it was a question that was asked and I could not remember that the answer was as clear as that one. So thank you very much for that. You obviously have PhD students and other young postdocs working with you. Do you think, if the legislation does not go through and they see the opportunity that you seem to be enthusiastic about, that we might see them leaving for Singapore, Harvard and Karolinska?

Dr Sidhu—Some have already made that decision in anticipation of what may happen. One of my students—a very brilliant student—has already left for Singapore or the UK to go further with the stem cell research. As I mentioned earlier on, the enthusiasm in this human embryonic research worldwide is so great that everybody wants to get in—because of the powerful nature that is emerging in this particular field. At the present moment I have seven students working with me, and all are working on human embryonic stem cells and all want to pursue this field more vigorously.

When I was growing up as a graduate student I never cared what the legislation was down there because I was focusing on what I waned to do. Now the amount of pressure these students have in terms of what they can do and cannot do with the legislation is huge. Now they know, if we do not grow from what is happening in Australia, where else they would like to go. I fully endorse that pressure on them. Given the opportunity tomorrow, if this field does not come up, where Australia has made a big lead in stem cell research and we are withheld, I do not think I will hesitate to think otherwise.

Senator PATTERSON—You personally?

Dr Sidhu—Yes.

Senator PATTERSON—Senator Nettle, and rightly so, has concerns about people who donate tissue or donate cells and, if it is then found to move towards a cure, what rights they have. One of the things that concerns me is, if there is research done from SCNT stem cell lines or from embryonic stem cell lines that informs adult stem cell research and the treatment comes from adult stem cell research, whether it would be difficult down the track to go back to the original donor and see whether that donor led to this treatment. I can see Senator Nettle's desire for them to maybe have some benefit from it, but I see the problem of tracing back to the original donor when you get some steps removed in terms of the IP that is involved in the research.

Dr Sidhu—That is a big issue at the present moment but, as I said, when the patients sign those papers what the regulations say from an ethics point of view and other points of view, depending on your institution, is that they sign that anything subsequently developed from that donation will not be the property of the patient.

Senator PATTERSON—I know, but that is the issue that Senator Nettle is struggling with, and I see her point of view. The argument came up in the 2002 debate, but what I was asking you was: are there difficulties in trying to trace back the benefit that that individual's donation had some time down the track? They have made a donation here and somebody in Queensland does

the research or someone in America does the research and has that IP. How do you trace back the benefit of that original donation for them to benefit from? Do you see a difficulty in that?

Dr Sidhu—There is a difficulty at the present moment, but I think we are improving at tracing back day by day—for example, keeping track with a database and other stuff. Possibly, yes, we can trace back to the donors, but the issue remains of the intellectual property at the present moment and which way we want to go.

Senator MOORE—Dr Brock, it is going back a while, but you had a sentence to finish off a while ago. Was there anything you wanted to throw in before I ask questions?

Dr Brock—Thank you, Senator. At the end of my submission I pointed out that I had tried to be rational, arguing from a position of principle throughout my submission. But at the end I think I said something like—and I know it is emotional, but emotion is part of the human spirit—'Can you imagine looking my 90-year-old mum, my 43-year-old wife and our 15- and 11-year-old girls in the eye, and looking me in the eye, a bloke who 10 years ago was running around like a lunatic, playing golf, playing cricket, playing the piano and doing all the things in my life, now reduced to two fingers that move a bit, a brain that still works, a voice which obviously works too much'—and I apologise, Chair, for earlier on—'and telling us it is evil?' I think you need to support this because it is the right thing to do. That is all I was going to say.

Senator MOORE—Much has been made about the fact that the original legislation was from only a few years ago, and why are we back here having this discussion now? In fact, could we be having a similar discussion in years down the track? I know each of you have been involved in the debate over a period of time. Have you got any responses to that? We had legislation and there was a debate in 2002, people came to a view and yet we are doing it again. We are coming back asking for another go. That is what has been said—it is another go at it. Do you have any comments about whether that is a good thing or a bad thing, or whether there should be anything made about that fact that we had legislation four years ago?

Dr Brock—That is the story of public policy. We do it in climate change; we do it in the economy; we do it in education. We constantly re-examine policy issues further down the track in parliament in the light of experience, new knowledge and changing circumstances. Why should this issue be any different from any other issue of public policy? If you look at the debate today, for example about climate change and Kyoto, and then go back to 2002 you see that there are new issues, different issues. So, with respect, I do not think this is different from anything else you guys do all the time. All the time you review and put up subsequent bills and legislation in the light of new knowledge, so why should it be different in these circumstances?

Senator MOORE—Any other comments?

Ms Knott—In 2002 it was envisaged that the legislation would be reviewed because a number of people were in favour of SCNT at that time. So it was always the requirement that in three years time it would be reviewed. I think the time is right, and we hope that it will be not only reviewed but introduced.

Senator CAROL BROWN—I will open this question to anyone who would like to take it up. Submissions and comments to this hearing have already called into question the suitability of the

Lockhart committee to come up with these recommendations and they have called into question the quality of their report. Would anyone like to put forward a view about the Lockhart committee members?

Mr Turner—It was made up of a team of eminent people, well chosen and unbiased. I wonder where that sort of comment would have come from. It beggars belief.

Mr Opie—I would also like to refer back to the minister's press release in 2000, which spoke about the eminence of the committee chosen by the government of the time—which I think is this government at the moment. There will always be a calling into question of people who disagree—or otherwise—with a view. The fact remains that I have to commend this government, because I have seen reviews swept under the table and not thought of again. Firstly, I must commend this government for, after three years, taking the bull by the horns and publishing the committee review and recommendations. Secondly, I commend Senator Paterson and Senator Stott Despoja for pushing this forward. I think this is a very brave move given the adversity from some quarters.

If we look at the committee list, I don't think that at the time, in 2002, anybody argued with their eminence. Looking down the list now I see that there is a Nobel Prize for Medicine winner in there. I do not think anybody can argue with that group.

Dr Brock—I have enormous regard for John. He was a fantastic man. On the day after the report was tabled—I will not quote who said these things—it was said that these people have no experience or expertise in the field of ethics. I know who said that. It was said on *AM* the next morning. It is just not true. This committee was made up of an eminent jurist, at least two distinguished people in the fields of ethics and the law and some highly distinguished Australian scientists. So it is almost a travesty for those comments to be made. There were people on the committee, well versed in ethics and law, who were able to address the legal and ethical issues which they expressed. My PhD is not science; it is in English. The English of that review—the language, the arguments, the expression—was superb. Like Graham, I commend the government for setting up that committee, and for the nature and the calibre of people on it.

Dr Sidhu—I will answer the question, if I may. I fully endorse my colleague about the credibility of that committee. If we take technically the term of reference for that particular committee I think the outcome—in terms of the balance they have created between emotional reactions and rational progress in that document—is fantastic. From a personal point of view, I think they have created that balance very nicely between the public opinion and the scientific progress in this field and very nicely set it out in that commissioned report.

Senator PATTERSON—So, Dr Sidhu, you would not agree with one of the submissions that they were a poorly outfitted group?

Dr Sidhu—No.

Mr Turner—Was that referring to their clothing?

Mr Opie—It was referring to the fact that they are no good at peace negotiations!

CHAIR—I thank each of you for your appearance here today and for the submissions that you have provided to the committee. We appreciate your time.

[12.22 pm]

DILL, Ms Sandra Kaye, Chief Executive Officer, ACCESS Australia

POPE, Dr Adrianne Kristina, President, Fertility Society of Australia

JANSEN, Professor Robert, Managing Director, Sydney IVF Ltd

CHAIR—I welcome the representatives of Sydney IVF, ACCESS Australia and the Fertility Society of Australia. Information on parliamentary privilege and the protection of witnesses has been provided to you, I understand. We do prefer that evidence be heard in public but if there is evidence of a confidential nature we can consider meeting in camera to receive that. We have submissions from the organisations represented here. You may be aware that, in order to proceed through a quite full load of witnesses today, we would like to limit the opening statements to 15 minutes. I think that has been brought to your attention. I am not sure how you want to divide the time. I invite one of you to make an opening statement, after which we will proceed to questions. Who would like to go first?

Prof. Jansen—Thank you for the opportunity. Perhaps I could start with a brief story which illustrates how in, say, five or 10 years time therapeutic cloning might work. Your 20-year-old daughter, your 20-year-old niece or your 20-year-old granddaughter has acute myeloid leukaemia which is mostly a fatal disease in someone's 20s. It is the deadliest form of leukaemia. Unfortunately, no umbilical cord stem cells or her own bone marrow cells free of leukaemic potential can be isolated for her treatment. Unluckily, her brothers and sisters do not share her tissue groups and cannot be donors. Distressingly, no compatible cord blood stem cells are available from the Red Cross.

We track her ovarian cycle and immediately before an ovulation, under light sedation and taking just five minutes, her pre-ovulatory ovarian follicle with its egg is aspirated and the follicle cells surrounding the egg—called the cumulus cells—are recovered with the egg. The nucleus from one of those cumulus cells is transferred into the egg as its own nucleus is removed. The cumulus cell nucleus, just like a horticultural cutting taken from a plant and placed into fertile soil, is placed into the only environment that will allow it to reprogram and divide into cells that collectively will briefly look like an embryo.

In every practical way the cells look like an embryo of just about every animal under the sun, except that there is nothing genetic here that is not your daughter, niece or granddaughter. No sperm is involved. A stem cell line has been developed and the easiest tissue that can be differentiated from such stem cells, which are haematopoietic stem cells, results. They are transfused after a course of chemotherapy that is fatal to the leukaemia and would be fatal to this woman if it were not for therapeutic cloning.

I am disappointed to hear members of the parliament say that 2002 was somehow a definitive vote against the therapeutic cloning that I have just described. Notwithstanding personal conservative positions, it is misleading to deny the difference between reproductive cloning,

which is the cloning of a human being, and therapeutic cloning, which is making stem cells from an adult cell by placing the nucleus of such a cell into an egg.

The distinction is a crucial one. With good legislation it is a lasting one and it has a long history. In 1999 Michael Wooldridge, then Minister for Health and Aged Care, referred an Australian Health Ethics Committee report on cloning to the House of Representatives Standing Committee on Legal and Constitutional Affairs after expressing his support for the development of stem cell technology and therapeutic cloning in Australia. Between 1999 and 2000 the Australian Health Ministers Conference, including all the states' ministers, indicated its support for stem cell technology. In 1999 the Hon. Kevin Andrews, then Minister for Ageing, chaired this House of Representatives standing committee. Under his chairmanship, the committee voted six to four in favour of enabling therapeutic cloning for stem cell technology in Australia, as I understand it. I also understand that in committee and in cabinet Minister Andrews argued for a moratorium on therapeutic cloning for three years, and this was essentially the origin of the three-year review, which is taking place now, of the 2002 legislation.

There was unanimous support for the Prohibition of Human Cloning Bill and a clear majority support for the Research Involving Human Embryos Bill. That is history. The bills were enacted in a conscience vote, as we know. In 2005 at the United Nations, for the technical reason, I understand, that in March of that year therapeutic cloning was suspended here by law, Australia voted against a non-binding proposal by Costa Rica that member countries ban all forms of cloning. We were inadvertently placed therefore among 12 OECD countries to vote against cloning. Sixteen OECD countries including New Zealand and the United Kingdom voted in favour of using stem cell technology for therapeutic cloning. So that is the history of it, as we believe it to be. I also believe that it is immoral to intentionally confuse reproductive cloning, which nobody wants, and therapeutic cloning, which is capable of saving the life of a person using no cells other than her own. Thank you.

Ms Dill—I have a brief statement and then I would be very happy to answer questions. As a support organisation, ACCESS appreciates the opportunity to bring the concerns and wishes of those who may donate embryos or may choose to donate them. As we have said in the past, we ask that the wishes of the couples who created the embryos to be our children be respected. In relation to this bill, we welcome the commitment of Senator Patterson and Senator Stott Despoja in recognising the findings of the Lockhart review and trying to bring something formal to the parliament so that we can move forward.

A couple of the things that we have referred to in our submission are minor adjustments that may bring clarity to clause 13 in relation to the concern about reproductive cloning. We agree that that is not appropriate. The simple insertion of the word 'nuclear' prior to that would really allow research to be undertaken that would investigate the problem of the ageing of women's eggs. That would have enormous benefit for people who are trying to conceive and would be able to address that. We very much welcome the removal of the requirements for exporting embryos. That was proving to be very difficult for people who were moving countries and needed to have their embryos with them in order to further their own treatment. So we are very grateful for that, thank you.

We are concerned about the implications of the idea about embryos that are unsuitable for implantation and seek some clarity about that. The other thing that we were a little curious about

was the introduction of eggs into the section and we were wondering—not wishing to be flippant—if the parliament saw eggs as having the same status as embryos. Because we are always arguing for equity, perhaps you could legislate to govern sperm as well. We are wondering whether that was not really meant to be in relation to research for humans. We would like that clarified. We are very grateful for the legislation. Thank you.

Dr Pope—Thank you for the opportunity to present some comments today on behalf of the Fertility Society of Australia. I would like to reinforce some of Sandra's comments in relation to this, because we are looking very much at the logistical issues that relate to how these changes may affect people who are genuinely undergoing infertility treatment and the areas that may relate to that. The Fertility Society was quite actively involved in the discussion that went on with the development of the Research Involving Human Embryos Act and, as a result of that, we are very positively receptive to the whole concept that the Reproductive Technology Accreditation Committee is now named in legislation. We now have an active role to play within this whole area.

There are two areas that I wanted to mention today which, again, follow on from Sandra's comments. They relate to the introduction of the concept of eggs along with embryos. There are some implications that relate to this that could have far-reaching consequences that were not at all designed in relation to Lockhart's review. They merely comment on the fact that there were opportunities for additional research components that related to eggs and what the impact of this is going to be upon women undergoing IVF who are donating their eggs to other women or who are donating them to research related activities. Again, it would be important to have some clarity on how that is meant to be approached in the bill and the loopholes that it may allow to occur.

The other area is the definition of 'unsuitable for implantation'. It would be my understanding, not as a solicitor but in reading Senator Patterson's bill, that this relates very much to the concept that embryos that would have been tested for PGD, pre-implantation genetic diagnosis, and maybe deemed unsuitable for transfer at that stage would be available for donation. The difficulty with that is that, in the way the bill has been worded at the moment, it relates back to the NHMRC ethical guidelines that talk about ART. There is a reference in that to PGD and it talks about what defines PGD and the conditions under which you can utilise it, and it clarifies it as 'what defines a condition that does not seriously harm a person?' You can imagine that, when that was drafted, it was never intended to be tied into legislation because it leaves it very much open to the consideration of those looking at it and, in some states, there is actually legislation that allows for the determination of what those things will be.

What is a bit alarming is the fact that this whole component is going to be determined—and the criteria as listed here—by the CEO of the NHMRC. I would like to suggest at this stage that the Fertility Society of Australia would value an opportunity to be involved in some of that discussion on the criteria, because it has far-reaching implications for people undergoing IVF as it relates to issues of the use of PGD in this day and age, and situations like Huntington's disease, where a number of people are choosing to have PGD to try to select for embryos that might not be carriers of the disease. There are often situations of exclusion, where the embryos are chosen purely because of the line in which they may be developed, not because they have tested for that particular disease. The reason is that many of these people do not wish to know

whether they will develop the disease, because there are devastating effects in having it and having to live with that for the next 10 or 20 years knowing the consequences.

So there are a few areas that could fall slightly within the legislation, and it was not intended, I am sure, to cover any of these areas. I am just raising them more from the point of view that they are areas of some concern. They are areas that may not have been recognised in view of the way in which the bill was drafted, and I think it is quite important to recognise the consequences of some of these, which I do not feel are deliberate—and all directed towards those areas. I thank you for the consideration in this area.

Senator FIERRAVANTI-WELLS—Professor Jansen, as Sydney IVF, you are the holder of four licences. Three of the licences relate to ART research. Licence 309703 refers to the isolation of embryonic stem cells for use in diagnosis and eventually for the treatment of human diseases such as juvenile diabetes and Parkinson's disease. Does Sydney IVF have any expertise in relation to medical research into juvenile diabetes and Parkinson's disease?

Prof. Jansen—Not directly. Our strength is in embryo culture, and licence 309703 was to derive embryonic stem cells. We have achieved that now, notably producing what is highly likely to be the first set of human embryonic stem cells made under the strict criteria of good manufacturing practice, which is required for any future human therapy. So I think we have made substantial progress with our licence in advancing the medical treatment of the conditions you foreshadow.

Senator FIERRAVANTI-WELLS—Following on from that, are there any peer reviewed published papers? How many licensed embryos have you used so far for both juvenile diabetes and Parkinson's disease research?

Prof. Jansen—Fifty.

Senator FIERRAVANTI-WELLS—And published papers?

Prof. Jansen—The papers have not been published yet, but I do not know that that is relevant.

Senator FIERRAVANTI-WELLS—I have asked about any peer reviewed published papers, so obviously the answer to that is no.

Prof. Jansen—On what subject?

Senator FIERRAVANTI-WELLS—On the research you have been doing.

Prof. Jansen—We do research in lots of areas, and we publish lots of papers—

Senator FIERRAVANTI-WELLS—I asked you specifically—you have this licence which deals particularly with juvenile diabetes and Parkinson's disease. My question pertained to that research. I asked whether any peer reviewed published papers had been produced in relation to that, and I think the answer to the question is no. I ask all witnesses: what risks are there for women suffering from diseases such as diabetes in donating eggs?

Ms Dill—Could you clarify that?

Senator FIERRAVANTI-WELLS—An issue has been raised about women donating eggs. My question is: with regard to women who suffer from diseases such as diabetes, what would be the risks for them in donating eggs?

Prof. Jansen—The example I gave you and which is on the record would be a good scenario to bed this down. In that woman's case it was acute myeloid leukaemia. For that woman suffering from acute myeloid leukaemia, are you asking what the risks would be in recovering one of her eggs?

Senator FIERRAVANTI-WELLS—Yes.

Prof. Jansen—Negligible.

Senator FIERRAVANTI-WELLS—Negligible. So what you are saying is that for women, notwithstanding that they may have some disease, there are no risks associated with them donating the eggs?

Prof. Jansen—Not compared with the daily hazards of their disease, no.

CHAIR—You said there were negligible risks involved. Can you describe what those sorts of risks would be?

Prof. Jansen—You really need to extend this into extraordinarily rare events. This is something we do every day in IVF programs. That does not mean it is trivial—it is certainly not for the person concerned—but it is done under local anaesthetic. To retrieve an egg requires a vaginal ultrasound at the time that the egg is about to be released. The follicle is about two centimetres in size, there is a couple of millimetres of tissue between the top of the vagina and that follicle and there are no dangerous structures in between in the vast majority of cases. It is little more complicated than taking a blood test, other than the fact that it is occurring through the vagina. It is less painful, say, than taking a bone marrow sample. So it is certainly not out of proportion to the benefit, whether it is for that woman or for someone she is going through that procedure for.

Ms Dill—May I just say, as someone who has had egg collections, that in relation to your question the issue for us as potential donors would be whether or not the risks had been fully explained, and then the decision about whether to take that risk is surely one that should be taken by the person concerned as part of a fully informed consent process. I think that highlights some of the things that we have been concerned about since 2002. It seems that the parliament is wishing to enter the area of informed consent when Australia has, through our common law, one of the most rigorous protections for people undergoing any kind of medical treatment. When we wish to donate eggs, usually our brains are not affected. We are able to make informed decisions about the kind of medical treatment that we may wish to choose and we will do that in a very careful and considered way, just as anyone who has any medical procedure does.

Senator POLLEY—For each of you, do you support interspecies fertilisation?

Prof. Jansen—Fertilisation is probably the wrong word. If you mean that a sperm is introduced to an animal egg in order to answer biological questions, then this is not a new procedure. Notwithstanding the fact that hamsters are prohibited imports into Australia, hamster eggs have been used around the world as a test of sperm function since perhaps the 1960s without it arousing any particular fear of disruption to the order of society. In Australia it was never a terribly popular procedure, but frozen hamster eggs were brought into the country by some researchers keen on pursuing that particular investigation of human sperm function.

The number of sticks of genetic material called chromosomes that a hamster has is different, of course, to the number of chromosomes that are present in human cells, so 'fertilisation' is an emotive term that does not describe the events—or the lack of events—that follow such an adding of a human sperm to an animal egg. Nothing genetic can come from it. It is simply biologically impossible.

But remember that you can encourage an egg by metaphorically sticking a pin in it—almost literally by sticking a pin in it—and causing it to divide and look like an embryo. Over the next three days it will divide once, twice and a third time. For an egg to form an eight-cell embryo requires no genetic input from a sperm. It is the egg's job description. To go further than that the new genome is required, but for the first three days a human egg will divide and look like an embryo without any input from a sperm—just the physical penetration by a needle. So we have a situation where you can introduce an animal sperm to an egg, and the egg might three days later look like an embryo but it is not the genetic product of such a process. So I would question that there is any value in referring to that as fertilisation.

CHAIR—Can I just clarify that. Why is it not the genetic product of those two species?

Prof. Jansen—As you know, the genes are stretched out on sticklike structures called chromosomes, and in every cell they are in pairs and there are 23 pairs of such chromosomes in every cell. Putting it fairly straightforwardly, a sperm and, eventually, an egg have half that number of chromosomes. When a sperm and an egg come together in the process of fertilisation, those chromosomes match up again to form the correct pairs. Then they double their number and divide into the two daughter cells and that happens again and again. That does not happen with an animal egg and a human sperm. It might look like the cells are dividing, but they are doing so without dividing chromosomes up in any ordered way. So it is biologically impossible for that to turn into a living, hybrid creature.

CHAIR—I understand a number of different species in nature have been successfully hybridised—tigers and lions, for example.

Prof. Jansen—In very closely related species it occurs with relatively low efficiency and often the product is sterile—the mule being an example.

CHAIR—True, but nonetheless they do occur and you can have a live birth from such a joining, can't you?

Prof. Jansen—Yes, but you cannot if the number of chromosomes is different. The chromosomes have to be able to match up and they will only match up for the most extremely closely related species, such as a horse and a donkey.

CHAIR—So there is no possibility, say, of an ape or a monkey and a human being making that connection?

Prof. Jansen—No-one knows, but there are differences. The chimpanzee does have 23 pairs of chromosomes and the genes are in more or less the same order as human genes, but they are not identical. In particular, the epigenetic programming of those chromosomes is quite different, so how they would behave in culture we do not know.

CHAIR—You said before though that it was impossible for an animal and a human hybrid to be developed.

Prof. Jansen—Of a rabbit and human kind of admixture.

CHAIR—I did not mention rabbits and humans; I said animals and humans. Is that impossible? Is that the case, or is it possible that there are some species that might be compatible?

Prof. Jansen—That a human might be compatible with—

CHAIR—An animal such as a chimpanzee?

Prof. Jansen—It is guesswork, but possibly with a chimpanzee for a time. It is misleading to hoist that on this argument. Medicine is capable of doing lots of things which it never does. For example, a well-trained surgeon could graft an arm onto the middle of the chest and make all the vascular connections and have a viable arm growing from the middle of the chest. Does anyone do it? No. It is easy to regulate against it but you do not need to regulate against it to stop surgeons from doing it; they simply have no reason to do it. You can easily regulate against putting, if you like, chimpanzee eggs with human sperm, but what you really want to stop is an animal or a pregnancy developing from it and that is very straightforward: you make it illegal to put such a thing into a uterus. Without a uterus, it can develop nowhere. In fact, medicine would probably benefit from knowing just what is involved in two chromosomes coming together because so many mistakes occur in nature that the sooner we can understand the process a bit better then arguably benefits will flow.

Senator FIERRAVANTI-WELLS—You said earlier that hamster eggs had been brought into Australia. We know that is illegal, but they were still brought in—

Prof. Jansen—No, it is not. Bringing hamsters into Australia is illegal, not bringing hamster eggs. I am afraid you are wrong. It is perfectly plain: hamsters are prohibited imports, but not hamster eggs.

Senator POLLEY—If we could just move on. Professor Jansen, do you support the Lockhart review's recommendation No. 46 on page 180 regarding the promotion of the development of biotechnology and pharmaceutical products arising from human stem cell research?

Prof. Jansen—I will just make sure that I have the correct recommendation. No. 46 states that the development of biotechnology and pharmaceutical products arising from stem cell research should be supported.

Senator POLLEY—Human stem cells.

Prof. Jansen—Yes, absolutely. This is what we have been doing under license 309703. The aim in that work is to provide cell therapy for disease for the conditions such as the ones that were mentioned. There are other roles also for stem cell research in the laboratory, which I am happy to elaborate on if it is of interest.

Senator FIERRAVANTI-WELLS—Presumably, this would involve the granting of patents, would you agree?

Prof. Jansen—It might, yes.

Senator FIERRAVANTI-WELLS—And if so and in the absence of payment to pharmaceutical companies under license agreements would this not prevent other researchers from accessing knowledge?

Prof. Jansen—Patents have a definite purpose in society—and have had for more than 100 years. I do not think I have anything to add to that. How patents are dealt with is, more than any, the realm of parliament. This is a matter for Australian law. I feel as though I am describing the obvious but the point of a patent is to give someone a temporary monopoly in exchange for making the information that they have public. That is what a patent is. I do not see how it comes into this legislation particularly.

Senator FIERRAVANTI-WELLS—Just a couple of points—why do you support human cloning, even with the qualifications that you stated earlier, when Australia's chief scientist has called for it to be banned.

Prof. Jansen—I think that is oversimplifying the matter, Senator, to say the least.

Senator FIERRAVANTI-WELLS—Assuming this legislation were passed, what is to stop Australian human cloning technology from being used for reproductive cloning overseas?

Prof. Jansen—I do not know anyone who wants to pursue reproductive cloning. Why would you want to?

CHAIR—Scientists have purportedly attempted to do so, haven't they, overseas?

Prof. Jansen—I think to label them as 'scientists' is stretching it, quite frankly.

CHAIR—It would be very hard for a layperson to engineer such outcomes, surely?

Prof. Jansen—I think some of the religious—I am trying to think of the name of them. Who were they?

Ms Dill—The Raelians.

Prof. Jansen—That is what we are talking about. We are talking about people on the absolute fringe. One conclusion that might be drawn from it is that the best way to protect responsible

science is to not deny your best scientists the opportunity to do the work, because that way you marginalise it and instead the third rate get involved in places like islands in the Mediterranean. That is least likely to occur if it is embraced by countries where regulatory environments are strong, such as Australia.

Senator FIERRAVANTI-WELLS—The Lockhart review suggests ways that eggs could be obtained, such as the extraction and use of eggs from cadavers. Do you support this?

Prof. Jansen—Not particularly, no.

Senator FIERRAVANTI-WELLS—Would you support the extraction and use of eggs from, say, aborted foetuses?

Prof. Jansen—Again, not particularly but remember that foetal tissues are used in medical research and general considerations apply including fully informed consent and the separation of research from medical care.

CHAIR—Do you agree that the current legislative environment—that is, the legislation that is there at the moment, not the new legislation—already allows researchers to work with embryonic stem cells on proof-of-concept treatment through animal experimentation, for example, and that that kind of approach overcomes the problem with teratoma and the instability of embryonic stem cell properties and learning whether disease-specific clonal embryonic stem cell lines are instructive?

Prof. Jansen—I am sorry, Senator, I really do not understand your question.

CHAIR—I understand that there are provisions in the existing legislation which allow a number of uses of embryonic stem cells.

Prof. Jansen—I am very familiar with what the present legislation allows because we have four licences under the present legislation and we are researching under those licences. We have a further two licences under application.

CHAIR—Your licences, I assume, do not entail you using hybrids—experimentation involving animals?

Prof. Jansen—None of our plans are to use 'hybrids', if you wish to use that term; they are to explore, say, the reprogramming that occurs of sperm chromosomes within the egg of another species or the human species. What is relevant here is that eggs are very good at taking the coatings off chromosomes and preparing them for subsequent genetic events. That is a very complex biological process and it is one that we would do well to understand further. It is quite probable that many of those questions can be answered. It does not have to be a human egg, because these are properties that eggs have in common. So it makes sense to use mature animal eggs, even rather than, say, immature human eggs which are about to be discarded in an IVF treatment cycle.

These questions should be answered by whatever is the most straightforward means. If there are questions that can be answered with animal eggs then why not use animal eggs to answer those particular questions?

CHAIR—That could happen under the present legislation, couldn't it?

Prof. Jansen—I would have to think about that for a moment. I do not believe so. I do not think so: I think it has been illegal since 2002 to mix the human sperm with an animal egg. Yes, it is.

CHAIR—I was not thinking of a mixing animal and human genes; I was thinking simply of animal experiments.

Prof. Jansen—That is done. It is done in mice. We have scientists who are very familiar with studying this process in mice, but humans are not mice; they are different, and sooner or later you need to answer these questions for humans and not for mice.

Senator STEPHENS—Professor Jansen, there are currently nine licences, I understand, and you have just indicated that you are in the process of applying for two more.

Prof. Jansen—Yes.

Senator STEPHENS—And currently I think there are about 1,800 approved embryos under those licences. I think it is about that.

Prof. Jansen—For Sydney IVF's licence it is of that order.

Senator STEPHENS—What will happen, do you think, if this legislation is passed in terms of licences and in terms of—

Prof. Jansen—It is not obvious to me that it will be different. For the types of questions that we are answering with our licences under the present legislation, I do not envisage that situation being markedly altered in substance. It may be that the processes are smoothed.

Senator STEPHENS—I have a final question, and it goes to your submission to the inquiry. You raised some of the issues that you provided to the national ethical guidelines for the conduct of medical research in Australia and some of the tensions that you see in that process at the moment. You have suggested that on the basis of the second draft there are still potential serious tensions between, on the one hand, ethically proper commercially cognisant biomedical research in the area of embryonic stem cells and, on the other, the ethical guidelines issued by the Australian Health Ethics Committee, which had recently become at once explicitly faith based instead of outcome based and effectively compulsory in the biotech industry sector. Could you just explain to the committee a little bit about what it is you are getting at here?

Prof. Jansen—The Australian Health Ethics Committee has a publication, as you are aware, of ethical guidelines and assisted reproductive technology, treatment and research. Broadly, it is split into two sections, one being research and the other being clinical practice. The guidelines, for example, ban therapeutic cloning as well as reproductive cloning. In its submission to the

Lockhart review committee the Australian Health Ethics Committee made the point that this was its established position and it would not be altering it despite any changes that the Lockhart committee recommended, presumably even if they found their way into legislation, as they did with the bills we have been discussing. There is an obvious point of tension there.

I made the point that if you trace the documents the Australian Health Ethics Committee refers to in its submission to the Lockhart review, it uses the term 'deontological considerations' as being predominant. This is a worrying development for a principal committee of the National Health and Medical Research Council. 'Deontological' is a term used in philosophy and ethical vocabulary as an alternative to evidence based or outcomes based ethical considerations. It is not to say that one is correct and the other is incorrect but, of the two, outcomes based evidence, which is experience in the community as to whether good or harm results, is the way of medical research and clinical medicine. Public confidence in the National Health and Medical Research Council must be put in some jeopardy if a faith based or minority based consideration overrides direct experience of good or harm done. They are the points of tension I draw attention to.

Senator FERRIS—Professor Jansen, it was put to me by Sir Paul Nurse that in 20 years time we may see human embryonic adult stem cell research as representing the biggest and most significant breakthrough since the mapping of the human genome. If this legislation were to be passed, could you take us through what your centre would be doing in 10 to 15 years? In particular, I wonder whether you could refer to the work you mention in submission 2 that you have put to us on ovarian ageing and female sterility.

Prof. Jansen—Thank you for the question. There are a number of areas of our activity that I could see developing to clinical purposes here that would be an extension of what we do now—that is, to treat infertile couples and to reduce the frequency of miscarriages and for genetic testing of embryos when there are genetic diseases in the family which the family wish to spare their children from without having to have testing during a pregnancy and thus the likelihood of needing to make a decision on terminating the pregnancy. You mentioned PGD—the pre-implantation genetic diagnosis. We have one of the most developed PGD programs in the world. There is an article on the front page of today's *Sydney Morning Herald*, for example, on Sydney IVF's use of pre-implantation genetic testing to detect the BRCA1 gene which confers a very high risk of breast cancer on women—using the process for that. When we test the embryos, as we did for the woman discussed in the *Sydney Morning Herald* this morning, the family will have the security of knowing they will not live in fear of breast cancer developing in any girls who are born.

The embryos that are affected by the gene are also going to help sufferers of breast cancer because studying the expression of those genes in a cell line derived from those embryos can be used to develop inhibitors of the gene, drugs, which not only might be useful for treating breast cancer but might also be able to be used to prevent expression of genes such as this in a safe way that removes the risk for people who have been born with that gene and who are living under that fear. So that is an example and I think that Senator Humphries was referring earlier to what might be done from a therapeutic perspective with abnormal embryos such as this. That is an interaction with the pharmaceutical industry that we envisage and which is behind one of our embryo research license applications that have been referred to.

In terms of ovarian ageing, we know that the human egg is needed for the ovary to make oestrogen and oestrogen is necessary for health. As in evolutionary times the time to independence of an adolescent grew longer—now we know that it is somewhere around 30 years if the experience of my daughters is anything to judge before people are ready to start a family in some cases—and it is still the case that we have a system which is protecting the health of young mothers very appropriately. Because until very recent times there was such a high risk of dying every time a woman gave birth, nature has devised ways of putting the brakes on fertility as a woman gets older. A number of genetically based conditions become commoner in a woman's 30s and 40s for this apparent evolutionary purpose. On average in times gone by the woman would have had several children by these years and it is then in the interests of her having grandchildren that she not be put at further risk regularly by having yet another child.

One of the mechanisms by which that seems to have occurred is that the ovary begins to release eggs that are intentionally faulty, that will not produce children, because that is the way that the ovary continues to produce oestrogen which then protects the health of the mother as her family is growing up. That gap which can be anywhere up to about 10 years before menopause is a very natural phenomenon but of course it is at odds with modern society and its pressures, and understanding that is something which would benefit very many women. We are prohibited under the present legislation from researching into just what it is about the egg that changes as you get older. We know it is not the number of chromosomes. This happens independently of, say, the risk of Down syndrome that increases as a woman gets older as a parent.

It is not easily tested in animal eggs because animal eggs do not have a menopause and their decline of fertility is not as predictable and might anyway have evolved by different biochemical pathways, for instance. But we are prevented from intentionally fertilising an egg with sperm for the point of obtaining scientific information. That was legal in New South Wales until 2002 but, under the Commonwealth and state agreed legislation since, it is no longer possible, but the Lockhart review does recommend that that form of research be resumed.

Senator FERRIS—Thank you for that comprehensive answer. I will not ask another question but I do want to go back to the comment from Sir Paul Nurse. Would you therefore agree that human stem cell research does represent as significant an advance in medicine as mapping of the human genome?

Prof. Jansen—Phenomenally so, yes.

Senator FERRIS—Thank you.

Senator NETTLE—I have a particular interest in this area in ensuring that any treatments that are able to come about as a result of embryonic stem cell research are available in the public domain and ideally through the public health system so that the broadest range of people are able to access them. It is a very difficult thing to do.

One of the suggestions that has been put to me about a way in which that could be combined into the legislation is that, when people are making applications to the licensing committee, one of the areas that they and the committee could address is what impact they were intending on having on the global health burden. Looking at that issue as a general way to allow entry into this arena—particularly because you have a number of licenses at Sydney IVF—I was

wondering whether you could comment on the feasibility of doing that, and also whether you have any other suggestions on ways to inject the public interest component into the legislation at this stage.

Prof. Jansen—One of the beauties of stem cells is that they continue to replicate indefinitely, so the number of cells that are available for research are infinite. That is not to say that you do not need to spend a lot of effort getting there, but putting the cells to one purpose does not deny another good purpose access to those eggs. Since its earliest days, Sydney IVF has run a public access program at Royal Prince Alfred Hospital in Sydney, so we are quite comfortable and experienced at having a foot in the public and the private sectors. We also protect the interests of families that are donating embryos for stem cell research—for example, the commercial contract that we had to produce to pharmaceutical grade for the Singaporean company ESI in Brisbane. That is an example, incidentally, where the cells might be made available for research, but obviously the pharmaceutical grade ones have very special value to the client in that case to commence therapeutics with embryonic stem cells, so they are not going to make those available to their competitors except under commercial terms. That is the way forward with that sort of circumstance.

Notwithstanding that, they agreed—so, by implication, have all other subsequent users of those cell lines—that they will not stand in the way of those cells being used for the treatment of children in the donating family should the need arise in the future. Sydney IVF will retain cells specifically for that purpose and at no cost to the donors. In a sense, they do share in the benefits from the research that occurs with the stem cells because each of those cell lines has a slightly less than one in four chance of being a perfect match for one of the existing children in the family. There is no match to either parent, that is biologically impossible, and the children's children also will not be a match, but the children within that family have a high chance of a match, particularly if there is more than one cell line derived. So it is not as if they cannot share in the benefits; they can.

Senator NETTLE—Is it your view that, were such a clause to be inserted into the legislation as a requirement for both applications and the licensing committee, that would be able to operate as a mechanism for ensuring that public interest in whatever way the licensing committee determines it could do that?

Prof. Jansen—I cannot see any objection to it. We do not require such a regulation for us to do this. It was obviously a good thing for everyone involved and our ethics committee saw it in the same way.

Senator STOTT DESPOJA—Ms Dill and Dr Pope, I am conscious of the comments you made in your submissions and your opening statements—and I think Senator Patterson is too—in relation to eggs specifically being included in the legislation. I note that your comments deal only with Senator Patterson's bill. I am not sure if you have examined the bill that I have put forward, but if you cannot answer me now perhaps you can take it on notice. I am wondering about this because in the legislation that I have cosponsored with Senator Webber we do not mention eggs. Again, this is based largely on the premise that both of your organisations have put forward and that is dealt with in guidelines et cetera and also, Ms Dill, for the very clear reason that you put forward about whether we are going to start dealing with sperm and

everything else under the legislation. Would you have a look at the bill and see if that satisfies your concerns, because that may be something that we can discuss as a committee.

Ms Dill—Yes.

Dr Pope—Certainly.

Senator STOTT DESPOJA—Professor Jansen, I am very conscious, and have been for a while, of your concerns about the apparent conflict between recommendations 16 and 25. Can I just give you an assurance that in relation to your question about the research into parthenogenetic activation being permitted up to 14 days of development et cetera, my understanding of both the bills—but certainly the one that I have—is that there is certainly no intended conflict. In fact, the idea is that the testing of oocytes up to the first cell division applies to those only involving fertilisation. So, parthenogenetic activity is not held to the same limit. That is the intention, and my understanding when I look at the wording is that that is covered. Does that give you any assurance or are you still concerned that there may be conflict? You said you were requiring clarification.

Prof. Jansen—Thanks, Senator Stott Despoja. I believe that that concern is addressed in relation to those two recommendations and that it is one of interpretation.

Senator STOTT DESPOJA—You discussed in your submission some of the concerns about whether or not the legislation allows for the adequate research of mitochondrial disease. Is this an issue you have with both bills? Is that something we both need to look at? Do you feel that the section in our legislation dealing with the creation or development of a human embryo containing mitochondrial genetic material provided by more than two persons under licence gives you the kind of research opportunities that you want in relation to that area?

Prof. Jansen—To rephrase the challenge, it is related to that phenomenon that I have described at some length: an egg will divide as an apparent embryo to the eight-cell stage, in the right laboratory circumstances, without any genetic input from a sperm. The flip side of that is that we cannot use three days of development as an indicator that, biologically, reproduction is on track. Therefore, to limit studies on, say, the health or otherwise of the fleshy part of the egg, where the mitochondria are and which contain some mitochondrial DNA—that is essentially identical for anything other than forensic purposes in all of us—means that we cannot really test hypotheses there by limiting it to the first cleavage division, which is the point taken up by the Lockhart committee. So in that sense it is common to both bills.

Senator STOTT DESPOJA—And you see that as a clear limitation in terms of that research?

Prof. Jansen—Yes, but perhaps you could clarify for me the role of the National Health and Medical Research Council here, because I think we can rely on the National Health and Medical Research Council to take an evidence based approach in the long run. And if it were to be left to others to define at what point embryonic development can be continued to—recognising that it will always fall short of placing the embryo or embryo-like structure in a uterus—then that is one way that everyone could win.

Senator STOTT DESPOJA—Well, maybe that is something the committee can have a look at. I have been conscious from day 1 of your concerns in that respect, even before the bill was finalised. It is not a lack of understanding or willingness to assist in that area, but a matter of shaping the legislation. It may be something that is more appropriately dealt with, as you say, by one of those statutory bodies.

Prof. Jansen—Thank you.

Senator STOTT DESPOJA—Dr Pope, you might answer something for me. You would know that throughout this process there has been a lot of debate and discussion about the definition of an embryo. I note in your submission that you say that an embryo 'cannot be defined until a physiological marker is observed'. Do you want to elaborate on that for the committee? Why is it that your organisation—and maybe other groups—do not necessarily consider conception being the point at which an embryo begins?

Dr Pope—From a biological point of view, the issues that relate to this are being able to actually determine visually some type of activity that may have been undertaken in relation to fertilisation. When an egg and a sperm are placed together, many biological activities are taking place. Down a microscope it is impossible to determine exactly what those are and, as such, in being able to see where the process may have been completed—if that is truly how we want to look at it—it would be when the genetic material from the male and the female have come together. Indeed, there may have been a fusion of that and something has started to happen, and that may be at the start of that first cellular division.

Professor Jansen has made reference to that. It is the egg's role in those early days to drive that process, but it is impossible to know if anything has actually taken place. It does not necessarily confirm that fertilisation has occurred, because, as Professor Jansen has referred to, you can actually use a needle or something that could provoke the egg to undertake some of those divisions as well. But from the point of view of the initial definition of an embryo, which was the observation of two pronuclei, again this does not necessarily confirm that that is the process that has taken place because that may not necessarily have been observed in the process of something like IVF, where embryos are in culture and only come out at certain times to be observed. Thus the reason for this other marker, which would be having two cells within the embryo.

Senator PATTERSON—Professor Jansen, I wanted to ask if you could explain in more detail the issue of the mitochondrial disease and the way in which you think the current legislation hampers research in that area.

Prof. Jansen—The DNA that is in the mitochondria differs greatly from the DNA that we all understand DNA to be, which is the genes that govern the way we look and so on which are present on the chromosomes in the nuclei of cells. Mitochondrial DNA is circular rather than stick like. It codes for just 13 or so proteins, which are all proteins involved in metabolism and they are essentially identical in all of us. There is a tiny area of mitochondrial DNA that is more family specific and that can be used for forensic purposes, but it has no genetic effect in terms of finding expression in the way people look or are, unless one of those 13 proteins is wrong. Then it becomes a critically important difference.

The main source of energy in our cells is a process called oxidative phosphorylation and it involves about 100 proteins, most of which are encoded by the nucleus. But these 13 are coded very locally, and the reason for it—I hope it is not too esoteric—is that in such metabolism it is so powerful that electrons are flying in all sorts of directions, ready to electrocute molecules that are stray, and you do not want such a busy process taking place until the cell can actually use the energy. So it keeps these last 13 of the 100 or so proteins made locally within the mitochondrion—think of it as a little self-charging battery that every cell has lots of—and then, just at the last moment, it completes the electron transport chain that makes all this energy that drives it and it can do so safely.

Every cell has hundreds or thousands of these mitochondria, and each self-charging mitochondrion has, in the case of eggs, just one mitochondrial DNA loop, but in adult cells the mitochondrion has many spare ones. The egg endows this DNA to the new organism. Sperm have mitochondria—they need it to kick—but they have had such a busy time kicking their way to the egg, with electrons flying all over the place inside the sperm, that the DNA that is in those mitochondria is not something that a self-respecting egg, if you like, would want to place too much store in. They have had a job description, which is to get the sperm there, but the egg, which has been quiet for the whole of the woman's life leading up to ovulation, carries the mitochondrial DNA for the next generation.

It is there in its hundreds of thousands in the egg. Unlike the chromosomal genes, which are just about every gene and which the eggs endows one set of to the new organism and the sperm endows a set, the mitochondria are there in the hundreds of thousands and need to be partitioned amongst all the daughter cells as the embryo forms for about two weeks before it starts to replicate. So with mitochondrial DNA it is not whether you have a mutation or not, it is what proportion of your, say, 100,000 copies of it have the mutation and how many do not. For most of the dangerous mutations, you need more than about 70 or 80 per cent of it to be mutant before the child will be incurably sick as a result of that mutation. Ordinarily that would be a good thing to use PGD for testing the embryos. We could even test the eggs quite straightforwardly. The problem is that nearly always, all the eggs have about the same concentration of the mutation and so there is no differentiating between them.

In clinical practice that means that, in the case of Leigh's disease, a woman's every child, every baby, dies by the age of two or three. It is unremitting, unlike any other genetic disease, which might affect half the children or one in four of the children, a mitochondrial mutation affects all the children. It is hard to imagine a more depressing scenario than having every child die at the age of two or three because the brain and the muscles do not work properly. It is a situation where a sister or a friend could donate the fleshy part of an egg and replace a proportion of those mitochondria. That could enable that woman to have genetically her own child in good health. It is an example of something that we ought not to inadvertently stop with legislation. It has been recognised specifically in the British parliament and this work is possible in Britain for this specific disease. There is no other treatment other than donating the whole egg, in effect compelling someone to have genetically someone else's baby when scientifically they can have their own but free of the high level of mutation which causes the grief.

CHAIR—Thank you all very much.

Prof. Jansen—If I may add one thing, Senator Fierravanti-Wells asked if we had a peer reviewed publication. I am glad to advise that we do have a paper in press. It will be published in *Theriogenology* in January.

Ms Dill—With the introduction of this legislation consumers of ART services were always concerned that it might impact on clinical IVF. Our fears were realised when the act came into place. We welcome this bill because it goes some way towards respecting the difficulties that couples face when they are having difficulties conceiving. With some very minor adjustments we feel that this will be a demonstration, particularly to women, where research may be allowed that will investigate what goes wrong with our eggs as we get older. We feel that there will be respect for our reproductive choices and that we will not be marginalised just because we can be marginalised, which is what one parliamentarian told me, and that it will be something that allows us not to go through invasive treatment for longer than is necessary. We would certainly believe, as Dr Brock does, that it is the right thing to do.

CHAIR—Thank you.

Proceedings suspended from 1.29 pm to 2.04 pm

MACKAY-SIM, Professor Alan, Director, Eskitis Institute for Cell and Molecular Therapies, Griffith University

WILKINS, Dr Barry Howard, Private capacity

CHAIR—Welcome. Information on parliamentary privilege and the protection of witnesses has been provided to you. We prefer evidence to be taken in public; however, if there is anything of a confidential nature, we can consider taking that evidence in camera. Do you have any comments to make on the capacity in which you appear?

Dr Wilkins—I am appearing on my own behalf. I am a children's intensive care physician, and I am not appearing on behalf of any organisation or group.

CHAIR—We have submissions from you both, which we thank you for. We have determined that, in order to move through these sessions as quickly as possible, we will invite people to make an opening statement lasting no more than 15 minutes in total—in this case it will be a total of 15 minutes between two witnesses—and then we will proceed to ask questions. I am not sure if you have worked out who is going to go first or for how long, but could I invite Professor Mackay-Sim to start.

Prof. Mackay-Sim—I made my original submission to the Lockhart review in my capacity as a stem cell researcher. I work on adult stem cells. My particular specialty is adult stem cells from the human nose—the olfactory organ—and they are particularly relevant to the issue of making therapeutically cloned stem cells. I see the proposed outcomes for therapeutically cloned stem cells evident in the ability of adult stem cells. In my view, that is relevant to the debate because there is a big ethical step in developing the techniques for human cell cloning. Whether the blastocysts so formed are going to be used for reproductive cloning or therapeutic cloning, the same set of techniques apply. As a scientist and as an individual that is the big ethical step to weigh up.

In relation to this legislation, parliament will have to weigh up the ethics between the perceived good of supporting the development of that technology versus the scientific evidence of whether it will have the outcomes or whether there are other alternatives that may obviate the need. I think adult stem cells are already obviating some of that need. I suppose a short way of saying it is that the debate is premature; the science to support an argument for therapeutic cloning has not matured; the science is not there even to need this debate at this time.

The other aspect is that, for whatever reason, a lot of misinformation is being presented on adult stem cells in the public debate. I find this when I go to international conferences and talk to people from all around the world who are working on adult stem cells. For some reason the potential for adult stem cells is often denigrated as an alternative to embryonic stem cells. I suppose that is in order to strengthen the argument for embryonic stem cell research.

Adult stem cells have the capacity through transplanting them either in the appropriate environment or in a culture dish to turn into many different cell types. Whether they can turn into 'every cell of the body' as an embryonic stem cell is thought to do has yet to be proven, but

in terms of their utility that is probably irrelevant. For example, if you want to make neural stem cells from embryonic stem cells, you have to pass through the stage of making neural stem cells as you grow them from adults. For example, if you can find a neural stem cell which is therapeutic for nervous system diseases that comes from the adult, that obviates many of the tissue rejection and other immunological issues of transplanting a foreign host. If one can take one's own neural stem cells, it obviates issues of teratoma or other tumour formations that you get with embryonic stem cells.

The case for adult stem cells is that they are already in therapies, particularly for blood therapies but also for some inborn errors of metabolism in which blood stem cells have been modified genetically and transplanted. The advantage is that they can be transplanted into the same person. Despite the press and other comments I read, adult stem cells from bone marrow, the olfactory organ, fat and skin can be propagated in vitro to generate multiple cells and transdifferentiated into multiple cell types. Therefore, they have the potential for both therapeutic use, particularly from an individual back to the same individual, and the other purpose of growing stem cells—that is, cellular models of disease. If you want to study motor neurons from somebody with motor neuron disease, potentially you could take an adult stem cell from that person, grow the cells in a dish and look at the biology of those cells. Currently this is possible with adult stem cells.

To sum up my presentation, adult stem cells have a great capacity for proliferation and for transdifferentiation into a particular cell type. They have the potential for transplantation into the same individual and, hence, they do not have the immunological rejection problems and do not appear to form teratomas or tumours when transplanted. In all of those areas the evidence is out that adult stem cells provide a very good alternative for the proposed purposes of therapeutic cloning. The purpose for using therapeutic cloning can be achieved with adult stem cells.

I should preface all of this by saying that all of this stem cell science and the way it is presented in the media is full of hype and hope and a lot of ignorance. The science is not out there to back most of the hype and hope, whether it is for embryonic stem cells, for therapeutically cloned stem cells or for adult stem cells. So it is quite possible that this debate is premature. I will leave it there.

Dr Wilkins—First of all, please forgive me. I am at the end of a dose of the flu and my voice is very fragile and may not last. I wish to make it clear that I have no direct association with stem cell research, cloning, in vitro fertilisation or any groups that conduct them. I therefore claim no direct expertise in these areas. The purpose of my submission to this committee, which was also signed by a number of other individuals, was to address ethical issues from my perspective as a children's critical care physician and as a participant in current clinical research in the area of children's intensive care but not in stem cell therapy. I wish particularly to address the argument that we should redefine 'embryo' and the semantic argument that cloning should be renamed 'somatic cell nuclear transfer'.

Caring for critically ill children brings one up against the cruellest of diseases which afflict children, including some of those diseases named as possible beneficiaries of stem cell research—spinal cord injury in its acute stage; muscular dystrophies in their chronic stage; burns; brain injury; and a particularly nasty one, spinal muscular atrophy, which has similar end results in infants to motor neurone disease in adults.

My practice also confronts me with serious ethical dilemmas relating to the treatment of children with these and other conditions. Sometimes we have to balance the benefits of therapeutic intervention against the harm that that intervention might introduce. I have seen it written that some of these diseases are amenable, or are likely to be amenable, to the end results of research into embryonic stem cells and that it is necessary to clone human embryos in order to obtain sufficient evidence, yet I read and I hear of other experts in this area of stem cell research saying that cellular therapy for these diseases is not a biologically plausible goal. If we cannot deliver biological plausibility in our research, then we are delivering unrealistic hope and indeed it is unethical to conduct such research.

In my clinical practice, for other reasons I sometimes see unrealistic hope delivered to the families of critically ill children, only for those hopes to be dashed by unforseen progression or complication of disease. As clinicians and researchers, we have to be scrupulously clear in the language we use about what can be achieved both in clinical medicine and in medical research. If the experts are divided, then the public also will be confused or misinformed. The biological plausibility that I mentioned is in the clinical research and the feasibility of doing such research, both regarded as the first stepping stones in the development of ethically acceptable research projects when they are considered by ethics committees.

One argument has been made that the 2002 legislation needs to be updated because it was perhaps based on excessive popular emotion in the use of the word 'cloning'; hence the suggestion that the term 'cloning' should be abandoned altogether in favour of the term 'somatic cell nuclear transfer'. I see this as unnecessarily calling a spade a horticultural excavation implement rather than a spade because, for one, somatic cell nuclear transfer is simply the mechanism by which the other, the production of a clone, is achieved. A clone, I submit, remains human because a clone intended for experimentation is identical to one intended for reproduction; therefore, we cannot dehumanise and legalise the one if we humanise, at least in concept, the other and make it illegal. Both should therefore remain illegal, I submit. Redefining an embryo as excluding a clone up to beyond blastocyst stage does not change this reality; it only changes the arbitrary definition.

Members of the Senate committee, we have already crossed one ethical boundary in permitting the use of surplus embryo stem cells on the grounds—and I support this—that those embryos were originally created for life. But even that step of crossing that boundary is not without its ethical implications. Whereas some have said that these surplus embryos are destined to die anyway, I have heard mothers who have had in-vitro fertilisation speak of their spare embryos as 'my babies', hence I cannot flush them down the toilet. So, even there, there is an ethical dilemma, but I believe we can address it. However, to create human clones for any purpose is I believe going to involve us in crossing another boundary which is much further removed from where we sit at present and too far for us to consider, for the reasons that I have just enumerated. I shall be happy to clarify or enlarge upon any of these or related points if I am able.

CHAIR—Thank you.

Senator MOORE—Professor Mackay-Sims, I am aware of your research at Griffith University, as I come from Queensland. We have had other evidence from people who have

worked on both adult stem cell and embryonic stem cell research. Have you had any experience in working in embryonic cell research?

Prof. Mackay-Sim—No, I have not.

Senator MOORE—I am not a scientist, and I do not know whether any of us are, but it seems to me that the current debate is being portrayed in some ways as adult stem cell research versus embryonic stem cell research. I am interested in the strength with which that contest seems to be fought and the process. Do you see this as an either/or situation, or in your scientific opinion is there room for science to work side by side on stem cell research? The evidence we have had from some people is that there can be a complementary kind of process in which these areas can work together in the hope that, somewhere down the track, there will be success.

Prof. Mackay-Sim—Perhaps it is the function of the media to enlarge this debate and to find spokespeople who will make it into this big competition, and perhaps it is the ethical and other views in the community that fuel that debate. Scientifically there is no competition. It is all about an advance of knowledge about both the ability and the biology of cells for therapeutic or other uses, so scientifically there is no issue. For me the debate is—and was on this that I made my original proposal to Lockhart and to this hearing—when it comes to weighing the decision at this point to go ahead with therapeutic cloning, because the science for either embryonic or adult stem cell research is still lagging, probably in order to make the best informed decision. So that is a major issue that is just not out there.

Senator MOORE—So it is the development of the science. You are saying that, in terms of the process, it is difficult to establish the science if the research is unable to occur. From the argument you have made, I am searching from the perspective of a nonscientist to see why some groups of scientists seem to think that it is appropriate to stop other research rather than to encourage that research and to continue in a complementary fashion?

Prof. Mackay-Sim—I cannot answer for other scientists, but embryonic stem cell research is legal and is funded in Australia, as is adult stem cell research. There is nothing to prevent the research happening, so I am not quite sure what the point is.

Senator MOORE—It is in terms of the process. The legislation we are discussing is looking at extending the area in which the research can happen. If you are building an evidential base, I would have thought the idea would be to get as wide a body of evidence as you can.

Prof. Mackay-Sim—Are you referring to legislation to do therapeutic cloning specifically?

Senator MOORE—Amongst other things, because the legislation covers a range of things.

Prof. Mackay-Sim—Scientists tend to be individualists—they like to do what they want to do and they do not want interference from governments or others—so I think there is a lot of debate out there. That is my belief. I do not think there should be any interference from anybody. Science has grown and developed because of the unfettered imagination of scientists; however, I think all scientists—at least, all of the people who profess publicly and in private that I have spoken to—do not support human cloning.

Senator MOORE—All scientists with whom you have spoken do not support it?

Prof. Mackay-Sim—Yes, human cloning—as in making humans.

Senator MOORE—Absolutely.

Prof. Mackay-Sim—So there is an ethical line that everyone would agree on. The development of stem cells—the development of the technology to make blastocysts to make therapeutically cloned cells—is, to my interpretation of the science, no different. You do the somatic cell nuclear transfer—you make your blastocyst—and, on the one hand, under some jurisdictions, you put those into a dish and make embryonic stem cells; however, in other jurisdictions, and in an international context, you could clone human beings with that technology. So, despite my similar view of the unfettered scientific imagination being a good thing and leading to all sorts of unknown directions, I have to make ethical decisions every day in my life. I apply to ethics committees for all the animal and human experimentation and, then, I have to make my own ethical decision about what kind of research I want to do. In this case, my ethical decision-making process or my scientific decision-making process does not discriminate between the technology to make a blastocyst by somatic cell nuclear transfer. So I would say that, if you are making an ethical decision to do this—and I would suggest that this is what you have to do—you have to decide whether that is the same technology and whether that is an enabling technology for human cloning. That is the only argument.

On the other hand, if the science for therapeutic cloning has developed in animals to such an extent that you could show that therapeutically cloned cells would not be rejected—because they are not identical; there are 13 mitochondrial genes that are carried in the egg—I think you would need all of the scientific information there before you made that ethical decision to go ahead and develop the technology in humans. That would be the essence of the case. If you could show in animals that those cells would not be rejected and that they are therapeutic in the sense that they hoped and you could show that you could control proliferation and differentiation such that they did not form tumours, it is at that point that you would say, 'Yes, we could have a pretty good bet that they will be useful for therapy in humans,' and therefore you could weigh up the public good over making this decision to step over this ethical line.

Senator MOORE—You have no sense that regulation would be able to control things?

Prof. Mackay-Sim—I have absolute faith in regulation in Australia and that it would control this but I have no faith that it can be controlled at an international level.

Senator MOORE—I do not think we have any power to look at international situations.

Prof. Mackay-Sim—Obviously, but as a scientist I have to make these decisions and I work on the international scene. I cannot think of what happens here; my science is going to be international and it is going to be perennial. That is the kind of ethical framework that one works in as a scientist.

Senator FERRIS—What do you say to the comments that have been made by a number of scientists and researchers that it is too soon to know whether embryonic or adult stem cells will

provide the answer? Sir Paul Nurse, who I am sure is known to you, is a prize winning scientist and medical researcher. He said:

To hold up knowledge while we pursue one pathway or the other would be wrong. We must look at both pathways and see where they lead.

What do you say to that?

Prof. Mackay-Sim—Admirable words. In Australia, we allow embryonic stem cell research in animals as well as in humans. We would allow therapeutic cloning in animals. When you are working on a cell therapy or a drug therapy, you go through a series of animal experiments and then you make the ethical decision on whether you should now do this in primates. If that is effective, you then ask, 'Should we now do this in humans?' It is a kind of sequential series of steps that we all know about. In my view, parallel research should be happening before we make a very wide ranging ethical decision to allow the technology for human cloning.

Senator FERRIS—If you were doing research on adult stem cells and some very promising work on embryonic stem cells was published and the pathway followed by the scientists in the published work was similar to yours, would there be any circumstances under which you and your research institution would undertake that work, or does the grant of $20-odd million that you have received preclude you from ever using embryonic stem cells in your work?

Prof. Mackay-Sim—We have not really addressed that issue. We work on adult stem cells, and so we are going to work on adult stem cells. That does not mean to say that, if somebody working on embryonic stem cells were to identify the genes that switch a pathway that switches stem cells to make, for example, motor neurons or dopaminergic neurons for Parkinson's disease, we would not use that information to see if the same would work with our cells.

Senator FERRIS—But you would not move to using embryonic cells?

Prof. Mackay-Sim—My expertise, as I have pointed out, is not in embryonic stem cells.

Senator FERRIS—But you could buy in that research if you wanted to.

Prof. Mackay-Sim—Yes, but it is like this: there is this set of uncharted territory that needs to be explored and there is that set of uncharted territory that needs to be explored. I feel very happy to be in this territory. There is a lot to be explored here.

Senator FERRIS—I raise the question because I was in Washington just 10 days ago and, as coincidence would have it, while I was there the *Washington Post* published a story which showed that cells grown from human embryonic stem cells slowed vision loss when injected into the eyes of rats with a disease similar to macular degeneration—the leading cause of blindness in people over 55. I am trying to establish whether you would consider doing work on embryonic stem cells if the work was similar to what you were doing, or whether you are precluded from doing that because of the framework in which you operate at the centre.

Prof. Mackay-Sim—We have not signed a contract. I do not know whether that contract will preclude it. If I had read that article, my first response would have been, 'I wonder if olfactory

stem cells would work in that animal model of macular degeneration.' Rather than say, 'Gee, could I use embryonic stem cells in macular degeneration?' I would say, 'Gee, could I use adult stem cells?' because that is what my expertise is in.

Senator WEBBER—I will take up where Senator Ferris has left off. Professor Mackay-Sim, you said in your opening statement that you were a bit concerned that the potential of adult stem cell research had been denigrated in the process. I am not a scientist. I see my role not as an adjudicator in the turf war that is science trying to pick winners but as providing the framework around which any future development takes place, whether it is in adult or embryonic stem cell research. Leaving aside your concerns about the process, do you support embryonic stem cell research?

Prof. Mackay-Sim—I think I made it clear before—

Senator WEBBER—The principle of it, not whether you are carrying it out. Is the principle of it a good thing?

Prof. Mackay-Sim—It is legal. It is funded in Australia. I have no problem with embryonic stem cell research.

Senator WEBBER—In your submission you say that there are no animal studies to show that therapeutically cloned cells are therapeutic in animal models of disease. Are you aware of the work that has been done by Chang et al and the paper that they have published?

Prof. Mackay-Sim—There are a lot of Changs. Could you give me more information?

Senator WEBBER—That is fair enough.

Senator MOORE—We will provide that to you.

Senator WEBBER—Their paper has already been tabled in this inquiry. It was brought to our attention on Friday. It is a study that uses genetically treated cloned embryonic stem cells to treat sickle-cell anaemia in mice. It was published in the proceedings of the National Academy of Science in the US.

Prof. Mackay-Sim—There are a lot of studies using embryonic stem cells and adult stem cells in mouse models. There are no studies that I am aware of where cloned embryonic stem cells that might have been genetically modified have been used. Here is a good example: somebody takes a cell from the mother of Dolly the sheep, makes embryonic stem cells out of some of those blastocysts and puts them back into Dolly's mother or the donor of Dolly's original nucleus. As a form of shorthand, the cells are often referred to as 'cloned cells'—identical to the donor of the nucleus. However, they are not exactly the same because they have inherited DNA from the egg. Those 13 genes have the potential to raise an immune response in the donor of the nucleus. In this case, if you wanted to make cells out of them to use for therapeutic purposes, they have the potential to raise an immune response. The information is not out there in animal studies to show that they would be effective. That is the issue I am raising.

Senator WEBBER—Perhaps we will refer you to the paper. You also say in your submission that granting legislative approval for the development of therapeutic cloning is at the same time legislative approval for developing the techniques for human cloning. Isn't the case, though, that both the proposed legislation and the current legislation prohibit human cloning? There is no talk about developing techniques to create cloned human beings and that the NHMRC would not grant a licence to allow the development of those specific techniques.

Prof. Mackay-Sim—Quite true. As I mentioned to Senator Moore, this is quite controllable in Australia. I believe that our regulatory system would be able to control it. However, in making an ethical decision as a scientist, one has to look beyond national borders. In going down this path, you would have to recognise that any technology that is developed in Australia will be abused or, in another context, used in a different way. It is an international game that we are playing.

Senator WEBBER—How do we marry that? I accept that, and it is one of the reasons that I needed you to go through this again. On the one hand, you are saying that there is not a lot happening at the moment and that we need to wait for developments in this area before we look at a legislative framework; but, on the other hand, you are saying that there is no point in having a legislative framework because it is going to happen anyway. Where does that leave me as a legislator?

Prof. Mackay-Sim—You need to decide whether you need the embryonic stem cell research field to mature further to show that, for the therapeutic purposes of embryonic stem cells, you can overcome a tumour formation or that you can overcome the immunological rejection either of embryonic stem cells or of therapeutically cloned embryonic stem cells. Then you would revisit it and say, 'We now think there is enough evidence that these cells are going to be therapeutically successful, at least in animals, and it is worth going down the trail of cloning adult cells.'

Senator WEBBER—At the moment in Australia you cannot do somatic cell nuclear transfer, SCNT.

Prof. Mackay-Sim—But you can in animals.

Senator WEBBER—So you are saying that either we should keep practising on rats or we should allow other people to do it overseas before we provide the framework for Australian scientists to do it in Australia?

Prof. Mackay-Sim—It is an ethical issue; that is the point. You might make a decision, but somebody else might make a decision that is contrary to your ethics. That happens internationally now. It is simply a matter of belief and ethics.

Senator WEBBER—What are you saying to me? Are you saying that we should wait for other people to work out the ethics before we do it in Australia? Or, are you saying that we should ethically decide at the moment that it should not take place?

Prof. Mackay-Sim—I am saying that you need to see more science before changing the status quo?

Senator WEBBER—But seeing 'more science' overseas?

Prof. Mackay-Sim—The science on embryonic stem cells can be done in Australia to answer issues of tumour formation, for example. The science for SCNT can be done in animals to show that it is feasible. We are currently carrying out an adult stem cell therapy clinical trial in humans, and the process for that was to carry out a lot of animal research before we moved to humans. This is surely no different. We on the ethics committee had to make a decision weighing up the ethical decision of the risk and the benefit to the individuals and to society. The data had to be there in the animals before the ethical decision could be made that would allow it to happen in humans. This is surely no different in that framework.

Senator STOTT DESPOJA—Professor, on that note, I had assumed, maybe incorrectly—after looking at your submission today and hearing your comments to Senator Webber's questions—that you had a philosophical objection to the notion of somatic cell nuclear transfer being enshrined in law. But the answers you have just given to Senator Webber relate very much to proof of principle, whether you would like to see more advances, documentation, results, successes or whatever it may be, in the area of embryonic stem cell research generally before you believe people should contemplate the next move. So you are not inherently philosophically, morally, opposed to the notion of somatic cell nuclear transfer; is that correct?

Prof. Mackay-Sim—I have no moral objection to Dolly the sheep. I have a moral objection, a philosophical objection, a deep-seated concern about cloning human beings.

Senator STOTT DESPOJA—I have a few concerns about Dolly, but let's keep going.

Prof. Mackay-Sim—And most people share that. But I do not see a distinction in the technology between making a blastocyst one way going to therapeutic cloning and one way going to cloning human beings. I think that process is the same, and I think that is the ethical decision that is being made. If you go by the history of technology, that technology will be used for purposes for which it was not intended in the particular jurisdiction—that is, to do therapeutic cloning. We already know about the crazy sect the Raelians, who claim to have already cloned a human being. There are people in the world who would clone a human being.

Senator STOTT DESPOJA—Surely, this must be one aspect of the legislation that you would welcome—that is, enshrining in the private member's bill the Lockhart recommendations that ensure that we can monitor unlicensed premises as well, so that in the future, as opposed to legislation in the past, we can actually find out what dodgy organisations are doing.

Prof. Mackay-Sim—I have no problem with that in Australia, as I mentioned.

Senator STOTT DESPOJA—I might get you to take this on notice, because this is where I would like to pick your brains a little. I know that you made a submission to Lockhart, but I am wondering, post the Lockhart recommendations, whether you would supply the committee members with a list of what you and do not accept among the recommendations—if you want to take that on board. There are a couple of things I would be curious to know about, and I am happy again for them to be taken on notice. I would really like your views on some of the ART recommendations that theoretically are designed to address unintended consequences of the original legislation. I would also like to know whether you support the notion of a national stem

cell bank. That is something that certainly I have not sought to legislate for through the exposure draft, but I have looked at perhaps other ways of getting more information on it. I do not know whether you want to respond to the stem cell bank question at this stage?

Prof. Mackay-Sim—I would be happy to respond on the stem cell bank. I think that you probably have national stem cell banks, because it is a bit difficult to separate the technology to make particular stem cell types. You can store them, but at some point you have to grow them back again and you have to do quality control on them. There are different kinds of stem cells that might be stored, and they might be stored in different places. They would certainly need different technology. There are umbilical cord stem cells; there are bone marrow stem cells of various kinds; there would be olfactory stem cells; there would be embryonic stem cells.

Senator STOTT DESPOJA—Believe me, I have grappled for some years with the complexity of a national stem cell bank, because there is part of me that likes very much the idea and there is the other part that recognises some of those issues to which you refer, not to mention the whole intellectual property debate around it. But are you therefore leaning towards the notion of banks as you have just outlined, or do you think it is possible to contemplate a national repository? It does not have to be enshrined in law, obviously; we have seen from the UK that you do not require legislation. But is a national bank something that you think we should be pursuing as a committee?

Prof. Mackay-Sim—Again, you need to know what the purpose is. It would change the complexity of it. If it were a bank as a place to store and to send out stem cell samples for researchers, that would require one certain level of complexity and one level of, let us say, patient information and whatever. If it were a bank to supply cells for potential therapies, that is a whole different level of complexity.

Senator STOTT DESPOJA—Sure.

Prof. Mackay-Sim—So one has to be clear. Certainly I would say that, for scientific research on stem cells and the lower complexity, I would support the former. I am not quite sure whether the latter is practical at this point, because there are no therapies in most cases.

Senator STOTT DESPOJA—There is just one other thing, if I may. Not only in your submission but just then in response to one of my questions, you talked about the issue of unintended and unexpected consequences resulting from any scientific research. For instance, in the examples you have given us in your paper, you refer to the atom bomb leading to nuclear energy. You talk about EPO for medical purposes obviously being abused in sport. So where do we draw the line? All science, all this research, regardless of what its intent or motivation is, has the potential to have the unintended and often negative consequences to which you refer, and you have done so with this specific case as an example. But I am trying to get an idea, from your perspective: how do you decide what justifiable research is? Is there not the logical conclusion from some of your comments that if you do not do research you do not have to deal with negative consequences? Inevitably, surely there are unintended consequences, and surely, is it not the role of this committee to ensure that there are guidelines and frameworks so that we do not get those unintended consequences?

Prof. Mackay-Sim—With respect, my interpretation of the role of the committee is to weigh up evidence as an ethics committee might. Whether it is this committee or the parliament, it is rather like an ethics committee getting together and each individual weighing up what they believe to be the scientific proven evidence—the potential good and the potential risks at individual and society levels—and coming to some agreement or consensus. That is the way science progresses in our society. I do not know whether that is answering your question.

Senator STOTT DESPOJA—That will do fine. Can I ask you on notice, when the *Hansard* is available, to refer to Dr Sidhu's earlier evidence in relation to embryonic stem cell research and that vexed issue of tumours. I was wondering whether you would have a look at what he said today about overcoming those problems, while not denying that it is a significant issue, and how his research is seeking to overcome some of those issues. Perhaps you would get back to the committee if you want to respond to his comments, given your comments in your submission about teratomas.

Senator PATTERSON—I want to go through something you said in your submission. You said:

There are no animal studies to show that therapeutically cloned cells are "therapeutic" in animal models of disease.

Would you comment—and, if not, take it on notice, because I am not sure and I want an answer to the question—on whether Barberi's article, which looked at the treatment of Parkinson's disease in mice, using cloned cells of Parkinson's type disease in mice, and also Ridder's research with regard to immunological cells in mice. I was wondering whether they used cloned cells. I read their articles ages ago, and I cannot remember whether they did. You said there were no models, but people have told me there are and I need that clarified.

Prof. Mackay-Sim—I will take that on notice.

Senator PATTERSON—I think Ridder's was in cells, but I cannot remember which Barberi's was in.

Prof. Mackay-Sim—If I can get the names of the authors later on, I am sure I can find them, but my reading is that certainly there are papers out there showing embryonic stem cells are useful in Parkinson's disease or blood diseases, as there are with adult stem cells being useful in animal models of therapies, but I am unaware of any studies where people have cloned embryonic stem cells—that is, they have taken a cell and grown a whole population of cells from that individual cell. What you would need is an animal whose embryonic stem cells were made in a similar way to Dolly's.

Senator PATTERSON—You are talking about SCNT animal cells?

Prof. Mackay-Sim—Yes, and whether those cells differ from the donor of the nucleus in these mitochondrial genes, whether those mitochondrial genes will result in an immunological reaction if they are put back into the donor and then whether that will work in an animal model of therapy.

Senator PATTERSON—I do not remember whether they were SCNT cloned cells. My reading of it may not have been a perfect reading, which is why I wanted you to have a look.

Prof. Mackay-Sim—I am not aware of any.

Senator PATTERSON—If they are SCNT cells and they have been used, they do not get an immunological response. I will have one or two others look at it as well. Professor Jansen's view earlier today is totally diametrically opposed to your view. Your view is that, if we do the research here, it will open the door in countries where there is no regulation. Professor Jansen's view was that it is better to have the research done here where it is regulated rather than forcing it into places where it is less likely to be regulated. I do not know whether we can ever resolve those two totally different points of view.

Prof. Mackay-Sim—I was not here for Professor Jansen's view. Research is going on around the world. If we do not do some research here it will not be forced anywhere; it is going on somewhere else anyway.

Senator PATTERSON—Doesn't that counteract your argument that—

Prof. Mackay-Sim—No, it does not. If I make an ethical decision about robbing my neighbour just because somewhere in another suburb somebody robs their neighbour, it does not mean I should—

Senator FERRIS—But that is a crime.

Senator PATTERSON—You and I might agree that that is a crime.

Prof. Mackay-Sim—But it may not be a crime in another jurisdiction; that is the point I am making.

Senator FERRIS—That is a poor example.

Senator PATTERSON—We have a difference here. If you see SCNT research as a crime, which can attract a penalty of a maximum of up to 10 years in jail, then I suppose you do have that view. But I do not see it as a crime, and I would prefer the research be done here than be done overseas. If any therapy is derived from somatic cell nuclear transfer research being done overseas—and I always stress that this is down the track, because we get accused of giving people false hope—do you think that it should not be used in Australia?

Prof. Mackay-Sim—That is a highly theoretical argument that I do not even think we need to address.

Senator PATTERSON—I beg your pardon?

Prof. Mackay-Sim—That is a highly theoretical argument. I do not mean to raise the tone of this but there are ethical issues about Nazi science, for example, and whether one should use or not use science that is done unethically according to your values. The view normally is: no, one should not.

Senator PATTERSON—That is an answer we were given earlier in the week. I am not sure the Australian public would accept that answer down the track. From what you have said—I do not want to put words in your mouth—I presume you would permit a student who came with a grant application to do embryonic stem cell research in a laboratory but not somatic cell nuclear transfer if it were legal?

Prof. Mackay-Sim—I do not know. I would probably suggest that, if you are going to work on embryonic stem cells you should work in a laboratory where they are experts on embryonic stem cells.

Senator ADAMS—Evidence was given to us about adult stem cells, the way that they age and that as they go on they do not divide in quite the way they used to, whereas the other argument was that the embryonic stem cells tend to multiply a lot more and go on a lot further. Would you expand on that argument, as you are the adult stem cell specialist.

Prof. Mackay-Sim—I wonder if that was evidence or opinion?

Senator ADAMS—It was a scientist who gave it. There are opinions and there is evidence.

Senator FERRIS—All evidence is opinion.

Prof. Mackay-Sim—It is assumed that embryonic stem cells coming from the very early embryonic stage will not be as aged as an adult stem cell. What that means for a useful therapy from the use of an adult stem cell—

Senator ADAMS—That is really what I am looking for.

Prof. Mackay-Sim—I think is an entirely open question. The question of changes in adult stem cells from different people of different ages, I suppose, is most explored with bone marrow stem cells. We know that, as people age, it is more difficult to do bone marrow transplants because their stem cells are not as productive. But how that bears out with other adult stem cells is entirely unexplored. In the case of olfactory stem cells, we have been able to grow stem cells from people up to 80 years of age, and another laboratory has done a comparison of the genetic structure—I suppose that is the best way to put it, or the chromosomal structure—of olfactory stem cells from people in their 20s out to people in their 80s and grown them for different periods in culture to see how they age in culture. It found that there was no difference between the cells from somebody who was 20 and those from somebody who was 80.

Senator ADAMS—So there is no change at all as to how they divide and how prolific they are?

Prof. Mackay-Sim—In that there was no evidence that there was an effect of age in culture or age in the person under those tests. But I do not think you can make blanket statements about adult stem cells or embryonic stem cells—

Senator ADAMS—No, I was just asking—

Prof. Mackay-Sim—No, I just mean one cannot—I am not saying 'you'—because it is all so unexplored. It is still unexplored territory in most cases.

Senator WEBBER—Doctor Wilkins—I am sorry; I have forgotten—are you still currently working at Westmead?

Dr Wilkins—Yes indeed.

Senator WEBBER—In that case you are not the person who has been referred to in the paper. That is fine.

Senator MOORE—Dr Wilkins, I meant to ask you this question earlier, and I do apologise for not asking it at the same time. Professor Mackay-Sim talked about the international world in which we operate, in which research is produced. Your paper is very clear about the reasons you think at this stage it is a step too far. Would that be a fair assessment of your position?

Dr Wilkins—Yes indeed, but I think it might be unlikely that I would change that position in the future.

Senator MOORE—And you have spelt out your rationale behind that. I want to ask you a question similar to the one that Professor Mackay-Sim was asked: if down the track there were some form of treatment or therapy that could be seen as beneficial, which could be traced back to embryonic cell research in another country, as we have heard about, what would be your position as a practitioner working in the field about using that or giving it a go with your patients? I know that is theoretical, but we are working in this realm at the moment.

Dr Wilkins—Yes, I fully understand that. Unfortunately, as a practitioner I am bound by the ethical constraints which are imposed upon me, so I cannot do what I like—even if I had a strong opinion, absolutely polarised one way or the other. I would have to do what legislation would have me do, because as a public servant, which I am, I am obliged—

Senator MOORE—I see: a public hospital.

Dr Wilkins—I am a public servant; I am not a private practitioner. If I were, say, a private obstetrician, I would be able to choose whether or not to perform therapeutic abortion, but at the moment I choose not to do that because I do not want to have to face that issue. But I am a public servant. It is the only way I can practise my art and science, which is looking after critically ill children. That is all I do. It is all I want to do, and the only opportunity for that is in the public medical system.

Senator MOORE—So that would be using the law of the day.

Dr Wilkins—Absolutely.

Senator MOORE—So that would be the process.

Dr Wilkins—I would be very uncomfortable with being ordered to do that, and I would have to make my own decision as to whether I could do that. I would have to make my own conscious

decision. In this theoretical, hypothetical future scenario, I would have to weigh up the pros and cons in my own mind, and I would hope that the legislation would allow opt-out clauses if it is still a controversial area, because—

Senator MOORE—Either controversial generally or controversially personally?

Dr Wilkins—Or both.

Senator MOORE—Both.

Dr Wilkins—I cannot imagine that this will ever be totally uncontroversial in the public arena. There is room for us all. I have the greatest respect for those who do not have the same opinions as mine.

Senator FERRIS—Dr Wilkins, point 3 of your submission says:

We see no distinction between producing an embryo by uniting sperm and egg on the one hand, and cloning on the other. The end result is identical in each case - an embryo capable of developing into a mature human.

That is purely theoretical, isn't it? In fact, there has been no development into a mature human and there is a lot of conjecture about whether it is even possible.

Dr Wilkins—My colleague here has said that the techniques to produce a reproductive clone are the same to produce a therapeutic clone.

Senator FERRIS—I noticed he said that, and that is why I wanted to clarify with you that even internationally we have not done it. Although it is theoretically thought that it might be possible, the techniques to do it have not been developed.

Dr Wilkins—Indeed.

Senator FERRIS—So that comment is a theoretical comment.

Dr Wilkins—Yes, indeed. What I am saying is that I see no distinction between the end result, if it were to happen, and being shown that it was capable of happening.

Senator FERRIS—So you regard a fertilised egg which has been fertilised by stem cells as having the same status as a fertilised egg that has been fertilised by sperm?

Dr Wilkins—As Professor Mackay-Sim said, they are not absolutely 100 per cent identical.

Senator FERRIS—They are fundamentally different, because the normally accepted process of fertilisation has not occurred and we do not know—and no-one knows—whether the pathway that you have described here—'capable of developing into a mature human'—will ever be able to be done.

Dr Wilkins—No, I am making the assumption that that would be the case.

Senator FIERRAVANTI-WELLS—Professor Mackay-Sim, before I ask you to follow on from that question, I would like to ask you how many years you have been working with stem cell research. Do I understand that in 2003 you were Queenslander of the Year, specifically or generally for your contributions to science?

Prof. Mackay-Sim—I work on stem cells from the olfactory organ and I have been working on the regeneration of this organ for 20-odd years. At the root of that has been a question about the stem cell responsible. Probably 15 years ago I published the first paper in which I mentioned the words 'stem cell' as a concept in this tissue.

Senator FIERRAVANTI-WELLS—Given your background and the position that you hold, you are probably, modestly, one of the pre-eminent stem cell experts in Australia?

Prof. Mackay-Sim—I would say I have expertise in adult stem cell research.

Senator FIERRAVANTI-WELLS—Could you please outline the state of play with respect to adult stem cell research compared with embryonic stem cell research—for example, clinical trials, risks et cetera? Basically what are some of the practical things you are doing at the moment and the objectives in relation to those?

Prof. Mackay-Sim—In a general sense, as I have said, both embryonic stem cells and adult stem cells from various sources—adult stem cells from umbilical cord, from bone marrow, from fat, from skin, from the olfactory organ—have all been shown, from different groups, in different groups and in different ways to be able to make different cell types from the tissue from which they were generated. All of those cell types have been shown in a culture dish to be able to make nerve cells. Stem cells from the brain and stem cells from the nose have both been able to make blood cells. Stem cells from the brain and stem cells from the nose have been shown to make all sorts of different tissues when they were injected into a one-day chick embryo, which has all the molecular instructions to tell cells how to develop. So, put in the right environment these adult stem cells, particularly the nerve cells, and in our case the olfactory cells, have been able to make heart, lung, kidney and a multitude of other cells. So, in a general sense, adult stem cells are multipotent, a term you have heard before; they can make many different cell types.

The second part of your question was about therapies. Adult stem cells from a variety of different tissues have been used in a variety of different animal models, such as for Parkinson's disease, spinal cord injury, stroke and multiple sclerosis, and they have had some therapeutic effect in all. They have alleviated the effects of whatever the disease was.

Senator FIERRAVANTI-WELLS—So, in practical terms, Professor, your work with adult stem cells is now producing results which will in turn, and are in turn, assisting in treatments. That is the net effect of what you are doing.

Prof. Mackay-Sim—There are only a few areas in which adult stem cells are being used in clinical trials, and even fewer in which they are used clinically. Those areas are mostly to do with the blood diseases. Our own clinical trial is using a cell that we also get from the nose, another adult cell that is not a stem cell. It illustrates the fact that you can take a cell from the nose and, if it is the right cell, an adult cell can have the potential to repair a tissue. Even if it is unipotential, if it is the right cell for the job it could potentially do the job.

Senator FIERRAVANTI-WELLS—What advice would you give to legislators regarding the allocation of limited health resources on the basis of this evidence and on the basis of the prospects of treatment benefits to patients? For example, has a scientific case been made that would warrant investment of limited dollars in human embryo stem cells rather than in adult cells?

Prof. Mackay-Sim—I would rather just talk about the ethics at this point. I think the funding is another issue.

Senator FIERRAVANTI-WELLS—On the ethical point that you were making earlier, if I understood your evidence correctly you were basically saying that it is a question of community standards and whether community standards in Australia would accept the leap to human cloning. Is that in effect what you were saying?

Prof. Mackay-Sim—That is right. After all, given the way that an ethics committee is constituted now at a university they are representing the community standards. In my mind I was thinking of the parliament being a giant ethics committee on this issue of whether the community standards will accept that.

Senator FIERRAVANTI-WELLS—Much has been made in these hearings of the potential criminal sanctions of 15 years for, in effect, ethically crossing the line—if I could put it that way. In the privacy that a scientist has in his laboratory, with his microscope in front of him, how do you effectively police that sort of crossing the line?

Prof. Mackay-Sim—I do not think you can stop anyone doing one experiment. But a scientist would need funding, and a scientist's actions are judged at many levels. They are judged at the ethics committee level, at the grant-writing level and at the publication level, so the normal run-of-the-mill hunter type scientist is governed by all of those different aspects. However, there are scientists who undertake criminal activity out there in the world. They make amphetamines or they do something else. One cannot control those by any legislation, only after the fact when you catch them and commit them to the system.

Senator FIERRAVANTI-WELLS—Thank you. I will just leave it there for the moment, I think.

CHAIR—I will ask a couple of questions at this stage. Professor Williamson from the Australian Academy of Science in evidence on Friday before the committee suggested that the treatments, cures and so forth will most likely come from adult stem cells as opposed to embryonic stem cells at this stage of our knowledge. Let us suppose that this legislation is passed, that human embryonic stem cell research is allowed in Australia and that we have people like you doing research in adult stem cells and others presumably taking up the option of the SCNT type research. Can you give us an idea of what sort of likelihood those two areas have, comparatively speaking, to produce the answers to the big questions, the cures for diseases and so forth?

Prof. Mackay-Sim—It is a bit like asking the trainers at the Melbourne Cup. You will speak to an embryonic stem cell person or an advocate of somatic cell nuclear transfer or an adult stem cell researcher, and you may get a different view based upon their knowledge of their own

science and their belief in the ability of their field. So this comes to the competition that was referred to earlier, I suppose. I personally see—I guess from the outside—that embryonic stem cell research has a lot to overcome before you could get therapies. In that regard, I would agree with Professor Williamson. As for using somatic cell nuclear transfer to make therapeutically cloned cells, one of the proposed purposes there is to use those to get at diseases. In the same way that one studies cancer cells from breast or prostate, you can understand the cell better and hence find targets for drugs.

On the other hand, I would have faith in what I am doing. I would say: I can tell you now that we have over 50 cell lines from people with disease, and they are much easier to make than somatic cell nuclear transfer therapeutically cloned cells, which cannot be made currently in humans. You could take them from people with a range of diseases, for some of whom you know the genetic cause and for some of whom you do not, but they have the same clinical symptoms, and you could compare the cell biology of those and find out what is commonly going wrong. That is unlikely to happen with somatic cell nuclear transfer or therapeutically cloned cells because of the difficulty. You are not going to be able to make them from lots of people; you are going to pick them from those people for whom you already know the genetic cause of the disease. And it is only going to be useful when there is one gene, because you do not know the cause in most people. So I can only speak with the conviction of one's life work, I suppose.

CHAIR—You say you back your work, and it sounds very promising, but I must say that Professor Williamson on Friday was not quite as complimentary. In fact, when your work was raised, he said:

I am very aware of Alan Mackay-Sims's work. That work is extremely controversial. Although there are two or three laboratories that have agreed with that work, there are also several laboratories that have failed to reproduce that work, particularly with respect to heart tissue.

That seems to be a criticism of your methods.

Prof. Mackay-Sim—I do not know the knowledge from which Professor Williamson speaks. He is certainly an eminent Australian scientist. I know of nobody who has tried to reproduce specifically the heart cell work—and, if they had, they would publish, like everyone else, and say: 'We couldn't reproduce it.'

The way the science has progressed, there are several labs in the United States that have shown that these cells can make the non-neural tissues of the nose—of the organ from which they come. There are several labs which have shown they can make nerve cells, and the glial cells—the other cells in the nervous system which we have shown.

There is another lab that has used them in spinal cord injury in an animal model of spinal cord injury. Since these are neural stem cells, our own work was repeating work done with mouse brain neural stem cells in making lots of cells in the chick embryo and, in another study, making blood from neural stem cells. So our own work is a replication of a different type of neural stem cell. I can only suggest that Professor Williamson does not know the literature in this specific way and that he is making assertions which are not true.

CHAIR—You are not aware of any publication of a paper that says it is tempted to reproduce your work and has failed to do so?

Prof. Mackay-Sim—No.

CHAIR—The committee has heard quite starkly different evidence from, in their own right, fairly eminent scientists. Would it be fair to say that, although there is probably a preponderance of opinion in favour of scientists, by scientists, to allow scientists to proceed with SCNT in Australia, the scientific community is in fact divided on that question and there are significant numbers of qualified and authoritative sources within the science profession who would be uncomfortable and concerned about the direction this legislation will take?

Prof. Mackay-Sim—Yes, I think that is a true statement.

CHAIR—Dr Wilkins, you were answering some questions before about the difference between an egg fertilised by sperm and one that became potent by virtue of being implanted with the nucleus of another entity or another organism, and you commented on the difference between those two. What is the difference? Is there a difference in the potential of those two organisms—one implanted with a nucleus and one fertilised with an egg? Assuming the genetic material was the same, is there any difference in the result of that process at the end of the day?

Dr Wilkins—My understanding is that Dolly the sheep was essentially a sheep, although the techniques may not be absolutely identical. My purpose in making that No. 3 statement in the submission was simply to flag a worry that, should reproductive cloning of humans be allowed to occur anywhere, the genetic make-up of that cloned cell will be a complete complement of the DNA library. This is really a library of information for making proteins, which essentially defines the shape and characteristics of the human such that it is expected that it will be near-identical to the donor of the nucleus should implantation be allowed to occur and should all the techniques that permit it to mature to birth and then to adulthood occur. I am simply voicing the concern that that is essentially the same process, in its result, as the production or the creation of an adult human through all the stages of development from the natural process of fertilisation. Therefore I am worried—as a human but also as a scientist—that, because the putative clone developing into a human is identical to the putative clone for experimentation purposes, that clone for experimentation purposes should be regarded as the same as a human reproductive clone. Therefore it should be regarded as human. That is the essential argument I was making.

CHAIR—Is it possible to, say, take two cases in which you have the same set of genetic material? Say you have two eggs from the one woman, and one egg is fertilised naturally with the sperm of a man and the other is fertilised by virtue of this process of transferring the nucleus into the ovum. If those two ova were transferred—I suppose you would have to do it in sequence—into that woman's uterus and allowed to develop, would they be different in nature at the end of the day? How different would they be?

Dr Wilkins—They would be completely different, because they would have different genetic make-up.

CHAIR—No, I am suggesting that both ova are from the same woman and both sets of genetic material are from the same man. Would they be different?

Dr Wilkins—Yes, because, when sperm meets egg, you have half woman and half man DNA; whereas, with SCNT, you have all man DNA, so it is going to be identical to the man. The whole point of what we call sexual reproduction in the animal kingdom—not just humans and not just mammals but the whole animal kingdom where sexual reproduction occurs—is to create different individuals who are different from their parents. Interestingly, I am already a clone, because I am an identical twin. There you have two identical people with the same genetic make-up, but we are a rarity. It is already creepy having someone identical to you, but the thought of having someone identical to you—

Member of the committee interjecting—

Dr Wilkins—It is hard enough, yes. But the thought of having someone identical to you who is 53 years younger than you—because I am 53—is even creepier. That makes me very worried. But, no, the two processes are completely different. Cloning produces someone who is essentially identical, although we still have this worry about mitochondrial DNA—and even identical twins are thought to be not necessarily absolutely 100 per cent identical because they may receive slightly different complements of their mother's mitochondrial DNA, because that comes from the mother not the father.

There are theoretical worries, which Professor Mackay-Sim has alluded to. Dolly was not a perfect sheep. She looked like a sheep, she bleated like a sheep, presumably, and ate like a sheep, but she was a sick sheep and died prematurely. So we do not know what the effect is of marrying the parent nucleus with the mother's cytoplasm. It is still an unknown quantity. So that again introduces ethical concerns that we are playing with the natural process.

I think we are all in agreement that reproductive cloning is not just undesirable but unconscionable, but Professor Mackay-Sim has already alluded to the fact that someone is going to do it one day, if they have not done it already. Going further down this road just increases the possibility of that happening somewhere in the world, and that is what worries me.

CHAIR—It is comforting to know that the only clone to appear before the committee does not like the idea of cloning! I will take that as a clear indication, speaking on behalf of clones!

Senator POLLEY—Thank you both. Professor Mackay-Sim, in your submission you refer to a range of concerns about human embryonic cell research as well as misleading claims that are often made. One of the concerns you note relates to immunology rejection, and another refers to the lack of evidence in relation to human embryonic cell research. Can you elaborate for me on those comments?

Prof. Mackay-Sim—This addresses the point that, with embryonic stem cells—in fact, with any tissue that is taken from one individual and put into another individual—that will raise, to a greater or lesser degree, an immune response and hence a rejection. With organ transplants and tissue transplants, first of all you try and find an immunological match that is as close as possible. The person then will usually receive, for the lifetime of that person, drugs to suppress their immune system in order to accept the tissue or the organ.

The same would be true of any stem cell therapies based on cells coming from a different individual. So this would be true of embryonic stem cells being transplanted into anybody else.

It would also be true of an adult stem cell being transplanted into anybody other than the person from whom the original stem cells came. So that is an unresolved issue in embryonic stem cell research, and it is one of the issues that somatic cell nuclear transfer and therapeutic cloning of cells wishes to address.

The point I was making earlier was that there are still a handful of mitochondrial genes that produce proteins that provide a potential for rejection of those cells as well. To my knowledge, there is no evidence from animal studies that would show that that therapeutic cloning will solve that immunological rejection problem.

Senator POLLEY—So if you use a patient's cell as a nucleus in an embryo clone, there is no guarantee that the stem cells from that clone would be accepted?

Prof. Mackay-Sim—There is no guarantee because the genetic make-up of that clone contains the nucleus of the patient plus the mitochondria, the energy manufacturers of the cell, which have their own DNA passed down from the mother through the egg. So those mitochondrial genes have the potential to raise an immunological response. That was the issue I raised before. To show that that procedure is potentially useful in humans, one would first need to see that if you were to do the same procedure in animals that those cells would not be rejected, and that has not been done, to my knowledge.

Senator POLLEY—Some evidence has been given to the committee that says that adult stem cells cannot transmutate—that is, that liver cells can only give liver adult stem cells. What adult stem cells have you shown can be grown from the nose?

Prof. Mackay-Sim—We have grown adult stem cells from the nose. We have differentiated them into heart tissue, lung tissue, kidney tissue and muscle tissue. The way we show that is by doing that with particular molecules that are a mixture of molecules in which we grow the cells in the culture medium. If we do not know that—and we do not know that in most instances—we can grow them with a piece of developing tissue that releases its own molecules to direct the stem cells. In other cases we have also transplanted them into a chick embryo in which all those molecules and directions, those signals that tell cells how to develop, are current in that chick embryo, and that is the other way we have shown cells to have this potential. We have also irradiated rats to destroy their bone marrow and taken tissue from the nose and injected it into the bloodstream and, nine months later, the cells had blood cells which could only have derived from cells that came from the nose cells from the donor. As I mentioned earlier, that was a replication of a study in which that was done with brain stem cells in a mouse. I am not sure whether I have answered your question.

Senator POLLEY—No , that is good. Thank you.

CHAIR—Once you have developed some heart tissue, say, through this process, presumably that puts you well on the road towards actually growing a whole heart to replace one that might have been defective. Is that how that would ultimately work?

Prof. Mackay-Sim—No, I think the steps are much more likely to be that you grow developing heart tissue and you put it into a heart. Stem cell therapies are going to be patching-up jobs long before they are actually going to be making whole new tissues or organs. A heart is

much more than simply heart muscle; it has got connective tissue around it, it has got blood vessels and it has got nerves. The first step in any therapeutic use of cells will be making a particular cell type and using it as a patch, as it were.

CHAIR—Having overcome the problem of actually growing the tissue, how far is that down the road to making it possible to have those patch jobs done in, say, a human being? Have we got any idea of that? Is that the biggest obstacle we have overcome, or are there a number of equally large obstacles before we reach that point?

Prof. Mackay-Sim—Are we talking about adult stem cells?

CHAIR—Adult stem cells, yes.

Prof. Mackay-Sim—With a number of different types of adult stem cells there are animal studies where people are using cells in this way in animals. Usually you will need several labs to repeat the work, and you will need to have some idea about how many cells to put in and where to put them in. Each of these takes time. In most cases I cannot imagine a human clinical trial—that is, an initial, phase 1 safety trial, putting cells in in a limited way to see if it is safe—happening in five to 10 years. Although there are currently—

CHAIR—That is more a case of time going by. I am asking whether the intellectual hurdle has been overcome with that breakthrough. Or are there further intellectual hurdles, as in other applications of science, that are necessary before you could actually get this technology to work in a human being?

Prof. Mackay-Sim—I think the biggest intellectual hurdle that has been overcome is the concept that it could happen. That has certainly been overcome, and I think that now the intellectual hurdles are more technical.

Senator FIERRAVANTI-WELLS—Professor, do you agree that the current legislative environment allows for much further work to be done using embryonic stem cells, without cloning being required—for example, working on the teratoma cancer problems and instability of embryonic stem cells working towards proof of concept of treatment in animal experiments and even learning whether disease-specific clonal embryonic stem cell lines are instructive?

Prof. Mackay-Sim—That about sums it up, yes.

Senator FIERRAVANTI-WELLS—Thank you. The answer is yes?

Prof. Mackay-Sim—Yes.

Senator FIERRAVANTI-WELLS—Is there anything being proposed in this new cloning legislation that would prevent Australian technology on cloning being used by someone overseas for reproductive cloning?

Prof. Mackay-Sim—Not that I am aware of; as soon as something is published, either in a paper or in a patent, it is in the information cyberspace.

Senator FIERRAVANTI-WELLS—Thank you. Dr Wilkins, perhaps I could ask you: from the perspective of an intensive care physician at a leading children's hospital, what are the risks of giving false hope to patients regarding claims that therapeutic treatments will be readily available when there is no proof of concept regarding human embryo stem cells?

Dr Wilkins—I need to clarify that in intensive care management of critically ill adults and children we are not looking at stem cells being used for treatment. Take, for example, the situation of a patient with spinal cord injury. They come into intensive care at the time of their injury; that is unlikely to be the time when stem cells are going to be used. Take somebody at the other extreme, such as muscular dystrophy or spinal muscular atrophy—one is a muscle disease and one is a motor-neurone wasting disease. They come into intensive care at the end of their lives, when their disease has got so severe they can no longer, in those two cases, breathe adequately on their own.

So the ethical decisions we are making there are end-of-life type ethical decisions, and very serious ethical decisions like whether we should—and this is coming to the answer to your question, without using the stem cell bit—impose a treatment such as assisted ventilation to prolong the life of that child where the gain is length of life but at the cost of an impossibly bad quality of life. You have a totally locked-in infant who can do nothing other than move its eyes and not in any way communicate with parents and yet it has a normal sensorium—that is, a normal mind. Those are huge ethical issues.

I have seen such children where the parents have held out—I am not saying they are wrong—and insisted that we apply the treatment to lengthen life at the cost of a horrendous quality of life in the hope that something will come up. I have not heard of stem cells being mentioned by parents. In my career over the last 15 years as an intensive care specialist at the children's hospital at Westmead, I have never heard parents ask for stem cells. That has not yet come into the public awareness but they do simply hold out in the hope that some treatment might become available.

Senator FIERRAVANTI-WELLS—Why do you contend that SCNT is a way of avoiding the term 'clone'?

Dr Wilkins—I have said in my submission and in my opening summary that SCNT is a mechanism for achieving something. SCNT is the process of producing a clone, so SCNT is cloning.

Prof. Mackay-Sim—I would agree with that—SCNT, somatic cell nuclear transfer, is the mechanism and the outcome of that might be a human clone, which goes by the name of 'reproductive cloning', or it might be stem cells generated from that clone, which goes by the name of 'therapeutic cloning'. It is really a semantic issue. I do not have a particular problem using the term at all, as long as one recognises what it means.

Dr Wilkins—I do have a slight problem with the term 'therapeutic cloning' because it is really cloning for experimentation. At the moment we have no expectation of any therapy. That again is a semantic issue.

Prof. Mackay-Sim—It is a historical kind of thing.

Dr Wilkins—We understand what the two terms mean. I do not think we can escape from the fact that SCNT is cloning.

Senator STEPHENS—Dr Wilkins, in your submission you make the point in paragraph 7 about cord blood stem cells already being used, including by you. Can you explain to the committee how you have used those stem cells?

Dr Wilkins—Not by me but in patients that come under my care. Cord blood stem cells are stem cells from the umbilical cord of newborn infants, but they are essentially adult stem cells of a blood nature. They are not embryonic although they are from an immature human, namely, a newborn infant. When you hear of children having bone marrow transplants for leukaemia, that would normally be leukaemia that has been successfully treated and then has relapsed, and that gives them a much worse prognosis than if they do not relapse.

Once they have relapsed once, they have a bad prognosis and then they go on to what is called a bone marrow transplant. That bone marrow transplant can either be bone marrow from a donor or cord blood stem cells. The two are used interchangeably. The cord blood stem cells are not necessarily any better than bone marrow, although there is some hope that they might be less immunogenic. That has not been completely borne out, and unfortunately when the children come into intensive care after a bone marrow transplant it is usually because things have gone very wrong—not because someone has done something wrong but simply because of a natural complication of the whole process and the immunosuppression that has to be endured. The children get serious infection, sepsis, blood stream infection or multiple organ failure and their outlook is very poor, unfortunately. That is my only interface with the use of stem cells in my clinical practice.

Senator STEPHENS—One of the witnesses at the hearing on Friday suggested that, if the bills are implemented in their entirety, the legislators will have not just overtaken but be far ahead of what the scientists want. Is that your view?

Prof. Mackay-Sim—In my view we put the legislators way ahead of the science. I cannot speak for all scientists, but I think scientists have a similar set of views to the Australian community, so I am not quite sure whether they would be ahead of or behind the legislators in this.

Senator STEPHENS—It takes us to the issue of community standards, I suppose. We have had various submissions about opinion polling and some research that the Lockhart committee did trying to gauge what the community support for cloning is. Do you have a comment on where you think the community is on this issue?

Dr Wilkins—I think that questionnaire evidence is highly dodgy. In clinical research we sometimes use questionnaires. They might seem rather harmless and surely liable to lead to a clear answer, but if the questionnaire is constructed mischievously or erroneously then it can be rather like a barrister asking a very leading question in court. If you precede a question like, 'Do you agree with cloning?' with a question like, 'Do you know that cloning can cure cancer?' then of course the answer is more likely to be, 'Yes, I agree,' than if you make a much more neutral statement. I am aware that different questionnaires have yielded different results, and it has been suggested that that is because of the way the questions have been ordered and constructed. You

have to be very careful. How to construct a questionnaire that yields a meaningful result is an ethical issue as well. I suppose it is like polling in a federal election or whatever. It all depends on what the public's understanding is of the issues and who is who.

Prof. Mackay-Sim—My response is really with respect to the last. The public possibly understands the issues as well as members of parliament do or as well as journalists do, and perhaps less so. I know that these are contentious issues with which members of parliament are struggling, with all of the knowledge and all of the opinion that they are getting. When I speak to journalists I get a similar confusion. I think polls are a rather invalid way for exactly the reason that people are not really informed as to what the issues are.

Senator BARNETT—The Lockhart committee said, at page 14 of their report:

> In framing the recommendations for these reviews, the Committee considered that the higher the potential benefits of an activity, the greater the need for ethical objections to be of a high level and widely accepted in order to prevent that activity. Conversely, where benefits are not yet established, or where there is widespread and deeply held community objection, then total prohibition through the legal system may be justified.

In evidence to the committee last Friday, Professor Skene stated in regard to cloning:

> ... it is going to be our grandchildren by the time the research is done.

In light of this admission, and the exposure of the Hwang fraud, do you accept that, in relation to cloning, the benefits are not yet established?

Prof. Mackay-Sim—I would agree with that statement.

Dr Wilkins—I agree.

CHAIR—Professor Mackay-Sim, I think you spoke before about the propensity of science to want to use reproductive cloning to actually create a human being through this process. I think it was Professor Jansen earlier today who asked the question: why would anyone want to clone a human being? But you said that if the technology was being employed in a laboratory, it would sooner or later lead to someone wanting to do that. Do you see that the creation of clones in a laboratory under the legislation that requires them to be destroyed within 14 days nonetheless creates some kind of base in terms of knowledge for that development to eventually happen?

Prof. Mackay-Sim—Yes, I do. I remember hearing Professor Wilmut being interviewed on the radio when Dolly the sheep was cloned—and he, of course, led that group. He was asked about human cloning and he said, 'Why would anybody want to clone human beings?' He is now the second person in the UK who has applied for a licence to do therapeutic cloning. Views change; science changes. Once one can see the potential, people will change their views.

CHAIR—We will have to leave it there, gentlemen. Thank you very much for your evidence today and for the submissions you have prepared for the committee.

Proceedings suspended from 3.53 pm to 4.08 pm

KHACHIGIAN, Professor Levon, President, Australian Society for Medical Research

TUCH, Professor Bernard, Director, Diabetes Transplant Unit, Prince of Wales Hospital

WAITE, Professor Phil, Private capacity

CHAIR—Welcome to all of you. Do you have any comment to make on the capacity in which you appear?

Prof. Waite—I am appearing as a scientist on my own behalf.

Prof. Tuch—I am appearing as the Director of the Diabetes Transplant Unit, and I am also the Director of the New South Wales Stem Cell Network.

CHAIR—Thank you very much for your appearance today and for the submissions which you or your respective organisations have put in. I think you have all received information about parliamentary privilege and the protection of witnesses. I remind you that, if you want to give evidence to the committee of a confidential nature, we can consider receiving that in camera. We now invite you to make opening submissions and we will then proceed to questions.

Prof. Khachigian—The Australian Society for Medical Research is the peak body representing health and medical researchers in this country. Our mission is to foster excellence in Australian health and medical research and to promote community understanding and support for it through public, political and scientific advocacy. We represent the health and medical research sector through direct membership of 42 affiliated professional societies and medical colleges representing some 15,000 people actively involved in health and medical research. Our corporate and disease related foundation memberships bring a further 100,000 Australians with an interest in health and medical research into association with ASMR.

We support both adult stem cell and embryonic stem cell research and training consistent with the society's overall mission. Stem cell research provides great promise for the development of new medical treatments in areas of unmet need, like heart disease, diabetes, spinal cord injury and Parkinson's disease. The field of stem cell research is very much in its infancy and its full potential is not yet known. It is only through more research that we will know whether stem cell technology can provide a robust and viable new therapeutic frontier in the clinic.

It seems that adult stem cell therapy may not be the panacea that we all hoped it would be, at least for some diseases. I draw the panel's attention to a 21 September issue of the widely read and prestigious *New England Journal of Medicine*, which reported the results of three studies of a combined total of 376 patients and revealed the failure of intracoronary autologous bone marrow—that is, adult stem cell—infusion to improve ventricular function after a heart attack, or MI. This suggested there may be truth to the adage: 'You can't teach an old dog new tricks.'

In contrast, ES cells by their very nature have greater pluripotency and may offer greater versatility and promise. I refer the committee to the document of September 2006 written by Nick Gough for the Victorian government's Department of Innovation, Industry and Regional

Development, which reviews key advances in human ES cell research, including the correction of the sickle-cell mutation in murine ES cells reported by Chang in PNAS in January of this year.

We believe that embryonic human stem cell research along the lines of the Lockhart review should be allowed as long as it falls within a strict ethical and scientific framework and is approved, of course, by a government body such as the NHMRC Licensing Committee. This includes the use of excess assisted reproductive technology derived embryos, the creation of human embryos by SCNT technology for research and training purposes, and the creation of hybrid embryos by introducing the nucleus of a human cell into an animal egg for the purposes of research and training. We think that existing restrictions on activities should continue to apply, and these are listed under point 2, including a ban on reproductive cloning.

Not supporting the recommendations of the Lockhart review would stall Australian advances in stem cell research and deny Australia potential benefits in knowledge, health and wealth creation. I again emphasise that we need to perform research in the area in order to realise the potential of stem cell technology. This would allow us to then have an evidence based, factual discussion.

Prof. Tuch—I wanted to move on, without stating specifically that we support the Lockhart report and its findings, and talk about implementing what you have just heard from our president. My unit is concerned with developing cell therapies for the treatment of the 130,000 Australians with type 1 diabetes, one of whom sits at your table at the moment.

To do this we are developing a number of strategies. Stem cells are one component of those strategies. Earlier this year we started a clinical trial with insulin-producing cells derived from people who die, but as you will be aware few people donate organs. There were 204, to be precise, in Australia last year. The number of suitable pancreases available is less than 100. It does not go into the equation. Alternative sources are needed; stem cells are a possibility, whether they are embryonic or adult, and our group, together with others, is exploring the potential of both of those particular possibilities. We already have collaborations, for example, with the group in Queensland of Alan Mackay-Sim, to see whether his cells will do what is claimed or what some claim they might do.

The issue, basically, is that progress is being made. We have detailed that, and I will not bore you, but nine points are made in our submission which will give you an indication of the progress that has been made since 2002 in our laboratory on the use of human embryonic stem cells. Nuclear transfer is a step forward to being able to develop a cell therapy which is patient specific and also will allow a disease-specific cell line to be established for the purposes of investigating more about how diabetes occurs.

For those who would argue that no progress has been made, if you do not accept the nine points we have made in our submission then I draw to your attention the issue of *Nature Biotechnology*, which comes from North America, of last Friday. The title of the article is 'Production of pancreatic hormone-expressing endocrine cells from human embryonic stem cells'. It is the most advanced form of therapy in that sort of science that has been forthcoming, and it tells you that if you give them opportunities people can use their initiative, can use their abilities and will be able to create cells that can potentially in the future be of therapeutic value.

Are we there yet? We are not. Are we getting closer? We are. 'Within my lifetime' is the way I like to put it, and what we are asking the Senate as well as the House of Representatives is to allow us that possibility and to back Australia's ability to achieve what is being done in other countries where permission has been given.

CHAIR—Thank you, Professor Tuch. The document you referred to: can we have that tabled, please?

Prof. Tuch—I have got the first page here. I have not got all nine pages, but it contains the essence of what I said. I am happy to send that to you if you wish.

CHAIR—That would be fine; yes, please.

Prof. Waite—Good afternoon. I would like to turn from diabetes to nervous system problems. I am a professor of medical science at New South Wales University and Head of the Neural Injury Research Unit. My area of expertise is in neuroscience, in brain and spinal cord problems. I have spent my whole career—some 40 years now—looking at neural injury, and in the last 10 years I have focused on spinal cord injury. I hold a program grant from the New South Wales government to look at the use of cellular therapies in spinal cord injury, as well as international funding.

The thrust of our research is to look at ways to repair the damaged spinal cord. As you probably know, spinal cord damage kills the cells and breaks the processes of the nerves so that you are unable to control the lower part of the body. This does not repair itself spontaneously, so the person is left with a lifetime of disabilities. Our group is doing something which is unique in Australia, and I think internationally, in actually comparing different sorts of cells. We are comparing embryonic stem cells which we obtained from Professor Tuch's unit, adult nasal stem cells which we obtained from Alan Mackay-Sim's unit and haematologic adult stem cells which we obtained from St Vincent's haematology department.

So it is important to say, I think, that most labs have an interest in a particular sort of cell. Their expertise is in that cell type, and their success with that cell is important to them for their continued funding. In our case, our funding does not depend on the outcome of the therapies. We simply want to know which cell is going to be best for repairing the cord and for the different problems that this faces.

The second issue I would like to address is the myth that embryonic stem cell research has made no progress in the last few years. You have just heard from Professor Tuch about the area of endocrinology; in the area of the nervous system, given that the field is so young, the progress has really been impressive.

In my submission I gave you an example from Hans Keirstead's lab in California, where they have developed embryonic stem cells to a point where they can repair a loss of myelin, which is a component which surrounds the nerve cells to insulate them. If that is lost, as it is in conditions like multiple sclerosis, the signalling is broken. It is the same, in a way, as just breaking a conduct wire between the cells. They have been able to culture embryonic stem cells in sufficient purity, numbers and reliability to go to clinical trial, and that is now being planned. In the animal experiments and in the proof-of-concept experiments, they have shown that those

cells can help with the animals'—they are rodents—locomotion. They remyelinate the axons; that is, they produce the myelin again. I have those publications here if anyone would like to see them or would like them tabled. I would be pleased to answer any questions on that.

CHAIR—If you would table them, that would be great.

Senator FIERRAVANTI-WELLS—My question is to Professor Tuch. In the background section of your submission, you make reference to 'a cutting-edge research group in Sydney' and the work that you are doing with both embryonic and non-embryonic stem cells. Could you outline the range of research that you have conducted under the current regulatory regime? You appear to have done quite substantial research under the current regulatory regime. Could you comment further on the advances that you believe that you have made?

Prof. Tuch—Thank you for the question. Can I clarify the nature of it? The regulations currently relate to embryonic stem cells; there is no specific regulation for non-embryonic stem cells. Are you asking me to comment on both of those or just on the embryonic outcomes?

Senator FIERRAVANTI-WELLS—I am asking you in particular about the embryonic cells but you do make a comment about non-embryonic cells.

Prof. Tuch—I think it is relevant and important to bear in mind that, just because much of the discussion occurs in relation to embryonic cells, it does not mean we are not looking. In fact, we are. We have a contract at the moment with a company in North America called BioE to use their cord blood stem cells and try to convert them.

Senator FIERRAVANTI-WELLS—In your answer, could you deal with what you are doing and the advances that you are making in both of those areas?

Prof. Tuch—On the embryonic stem cell side of things, since the legislation, as is detailed in the submission, effectively we have made our own embryonic stem cell line. We call it Endeavour-1, for logical reasons. It is an Australian research and discovery line. As you may have heard this morning from Dr Kuldip Sidhu, we have made clones—in other words, taken individual cells from that line and produced other lines from them. In other words, rather than having a motley collection of cells, each of those cells has now been so-called purified into a clone. That is novel; that has been patented. In addition to that, we have developed the ability to turn these cells into insulin-producing cells, but we have not optimised that particular process and we are certainly not as developed as the group in California that I referred to, which published last Friday.

We have learnt how to attach those cells onto what we call biodegradable scaffolds. To put it simply, they are called smart surfaces. Those surfaces are made by engineers and the design behind this is that a pancreas is a three-dimensional structure. In order for a cell to differentiate properly, the argument is that it needs to be in an environment where it is likely to want to be able to do that. We have learnt how to attach those cells. This is not a static situation; it is ongoing, and we are now trying to optimise that particular protocol to further differentiate the cells into becoming insulin producing. We have learnt how to prevent tumour formation, basically, when embryonic stem cells are transplanted.

In relation to the non-embryonic stem cells, we have used cord blood. We have taken stem cells from that and have begun the process of trying to differentiate them into insulin producing cells but have not yet succeeded. I think that is a reasonable summary, although there are some additions which will appear under the various nine points which I have already detailed.

Senator FIERRAVANTI-WELLS—Would you agree that there is still a lot that you could do within the parameters of the current regulatory regime?

Prof. Tuch—The answer to that question is: absolutely yes, of course; under the current situation, yes.

Senator FIERRAVANTI-WELLS—What is therapeutic about therapeutic cloning? Can you tell the committee what therapeutic treatments have been procured from human stem cell research?

Prof. Tuch—None that I know of, but you would have been aware of that equally as well before you asked the question, I would expect. The Koreans were certainly the first to claim that they could produce human embryonic stem cell lines, and that certainly has not been done in relation to humans. I would like to go back a step, if I may, because this is leading in a direction in which the facts seem to point in a slightly different way. In other words, the issue basically is not what can be achieved today. If we knew what could be achieved today, Australia would be well behind the line in terms of items that have been developed in other countries, and we certainly would be paying top dollar to be able to bring those into this country.

What we are looking at, with all due respect, is: where do we want to be in five to 10 years time? For me, as a leader—and I only have a limited amount of time left to be able to contribute to the research—where do I want to be in 10 years time when I am 65 years of age? The answer is: I would like to be one of the leaders in the world, not basically following on from others. I would like that opportunity, and at the moment that opportunity is limited. It is basically limited because effectively we think we can do more with the concept of utilising nuclear transfer. What we would like to do is to be able to combine that with the particular research strategies that we are currently using.

If you were to say, 'Yes, but you can achieve much with what is currently available,' I would agree entirely with you in relation to that. However, by putting blocks effectively in the way of people being able to use their imagination it will in fact move things in a different direction from the one which you might anticipate.

Senator FIERRAVANTI-WELLS—Can you explain to me the therapeutic component? In other words, what is therapeutic about therapeutic cloning?

Prof. Tuch—The principle behind it is that what you are doing effectively is trying to create cells which are patient specific, for someone who might have diabetes, which could then be used as a therapy. At present we have very few therapies available for such people. For those people who do not have type 1 diabetes, that might sound inane, but it is not—or if you have to inject insulin four, five or six times a day, as our lab manager does, the quality of life is such that you can't predict many things. You want something better than what is currently available. Cell therapy is the way of the future. The question is: where will it come from? Embryonic stem cells

represent a particular way of trying to achieve that goal and making them patient specific seems to me to be a fair and reasonable thing to do for the patients that I see.

Senator FIERRAVANTI-WELLS—I am sure Senator Barnett will ask you this question later, but I would like to refer to committee evidence received last Friday from Professor Silburn, a clinical neurologist and researcher in Queensland, to the effect that there were a very significant number of clinical trials around the world involving adult stem cells. The committee heard evidence last Friday from Professor Williamson from the Australian Academy of Science that the likelihood of treatments will most likely be from adult stem cells. Do you agree with both these statements? Can you advise the committee what clinical trials are underway in relation to human stem cells?

Prof. Tuch—I have to confess some ignorance here. I don't know Professor Silburn so I can't comment on him. I don't know whether he is an endocrinologist; perhaps you could help me on that one. I have never met the gentleman. If he is a clinician, I am not aware of it. I don't think he is an endocrinologist but if I am wrong, please correct me.

Senator FIERRAVANTI-WELLS—Professor, if you do have the opportunity to look at the evidence that was given by both Professor Silburn and Professor Williamson, please feel free to comment on their evidence.

Prof. Tuch—Thank you for that opportunity. Could I ask a question? With respect to Bob Williamson, he and I have teamed up together on a number of occasions.

Senator FIERRAVANTI-WELLS—I am sure you have, Professor. I am simply asking if you would care to have a look at that evidence. We can provide you with a copy of it. If you do have any comments in relation to it, please feel free to provide those comments.

Prof. Tuch—Could I make a general statement about adult stem cell trials in diabetes?

Senator FIERRAVANTI-WELLS—Sure.

Prof. Tuch—Without knowing or having seen what either of these gentlemen have said, I cannot comment on that. Quite simply, the trials which are currently occurring in the treatment of type 1 diabetes are utilising human islets, not stem cells. I do not know of any adult stem cell trials which are currently occurring in the area of diabetes type 1. The human islets come from patients who have died, but they are not stem cells.

Senator FIERRAVANTI-WELLS—I think the comment was generally about adult stem cells. Perhaps it is preferable if you have a look at it. If you wish to make any comments, please do so; if you do not, that is fine.

CHAIR—It is on the website at the moment if you want to go there to see it.

Senator FIERRAVANTI-WELLS—I ask all witnesses: do you support interspecies fertilisation?

CHAIR—This is hybridisation of animals and human genetic material.

Prof. Tuch—I understand the question.

Prof. Waite—To clarify, is this for its scientific curiosity? What is the purpose?

CHAIR—The purpose of research into this area of science.

Prof. Waite—As a scientific question—

CHAIR—Yes.

Prof. Waite—it could be an interesting one, of course.

CHAIR—That is not the question, though. The question is: do you support it happening? There is some controversy about it. Some people, such as the Chief Scientist, have suggested that it is not ethical and should not occur and others have argued before our committee that it should. What is your position on that?

Prof. Waite—I think it depends on why you are asking those questions and why you would be testing it. If this is for finding out information of scientific interest then I do not think there would be an ethical issue.

CHAIR—I will leave it at that.

Senator BARNETT—My question is to any of the witnesses here. I want to take you back to 2002 and a debate in and around that time. Some views were certainly put by those in favour of liberalising the regime that hope would be delivered to people with, say, type 1 diabetes, motor neurone disease, Alzheimer's et cetera. There have not been any cures or therapies delivered to date through embryo stem cell research. Professor Skene on Friday put to our committee that it would be in the lifetime of our grandchildren when cures might be delivered under embryo stem cell research. Professor Williamson on Friday put the view to our committee that the adult stem cell research would continue and most of the cures and therapies would flow through from that type of research. Professor Silburn asked the rhetorical question: why do we need the new type of research that is recommended under this bill? He answered that by saying that we do not need it. I wonder whether you could respond to those comments.

Prof. Khachigian—In general terms, I think we have to be very careful about expecting too much from research of this type, especially when embryonic stem cell research has been relatively muted as a pursuit for various reasons. Also, our expectation of research needs to be tempered by the fact that new developments and breakthroughs do not happen overnight. I draw the committee's attention to a story. In the 19th century a politician visited the laboratory in London of the inventor of electricity and asked him, 'What are these sparks that are going up and down the bar here?' The scientist said, 'That is electricity.' He asked, 'What is this thing, electricity?' He answered, 'One day you will tax this thing called electricity.' The point I am making is that we do not come to breakthroughs overnight. The field of embryonic and indeed adult stem cell research is very much in its infancy. I think the argument needs to be driven by the unmet health needs for this technology to be given a chance—

Senator BARNETT—Isn't the adult aspect still in its infancy as well?

Prof. Khachigian—I think adult and embryonic stem cell research is very much in its infancy. Under strict guidelines, I think this technology ought to be given a chance to demonstrate whether or not we have a potential therapeutic approach that might be a new frontier in our approach to health care.

Prof. Tuch—The only thing I would like to add to that is a general statement in the area of diabetes. I will state once again that I know of no adult stem cell therapy for treatment of type 1 diabetes in humans, and if there is one, I would ask anyone here, either around the table or previous witnesses, to state what that is.

Senator BARNETT—Thank you, Professor Tuch. I am aware of your earlier comments about islet cell transplantation and the merit of that. I was at the Blakey lecture a year or two ago when he came out to Australia to discuss the merits of islet cell transplantation. But that is a different matter.

Senator FIERRAVANTI-WELLS—Professor, picking up on your previous point, your comment seemed to imply that medical research and the need for medical research overrides other issues, including ethical issues. Is that the intent of what you were saying?

Prof. Khachigian—The point I was making was that as scientists we are driven by curiosity. We ask questions, and our job is to answer those questions. We are also mindful of the fact that there are strict ethical issues that we need to abide by, especially in matters of stem cell research, which transcend the question of curiosity driven research into other areas that you are inferring—religion and personal conscience. So I was making a general statement that we, by our very fabric, are in it to try and answer questions that affect suffering, or try to alleviate suffering, under strict ethical and scientific guidelines. There is no question that we would want to perform research that is beyond that brief.

Prof. Waite—Could I comment on the question about why we need embryonic research. In the area of demyelinating diseases, it is clear that differentiation of embryonic cells and their effectiveness is leading the field. Adult cells have been tried. Adult cells taken directly from the adult are not effective. Adult cells de-differentiated to become progenitor cells are much less effective than the embryonic cells and to be effective have to be put in with other trophic factors.

CHAIR—We have heard some quite widely varying evidence about this. The other day Professor Williamson, although an advocate of embryonic stem cells, was arguing that the adult stem cells were more likely to get there first in terms of producing these answers. You are saying that is not the case?

Prof. Waite—That is not the case in this particular situation of producing a cell that will produce myelin where you have lost that insulating layer. That is clearly being led by embryonic cells at the moment, and I have given you the papers.

CHAIR—Could I clarify what you said before, Professor Tuch, about your research having led to solving the problem of tumour formation. Do I understand you to be saying that your research has led to the point where you believe that the use of embryonic stem cells is likely to prevent the formation of tumours, which is one of the problems theoretically associated with this technique?

Prof. Tuch—I did mention that in item 4 of the submission. I did re-emphasise that; that is true. There is a publication coming out in the journal called *Transplantation* in three weeks time. I am having a little bit of difficulty in giving you the exact details because of the embargo which the journal places on anything more specific than what I have already said. However, in confidence I am happy to pass on the particular manuscript, provided it stays out of the public until 14 November, at which time the embargo is off.

CHAIR—We have to report long before that point. Indeed, I think we will be looking at the legislation before that point.

Prof. Tuch—I have sought clarification from the journal as to whether it could be released at an earlier stage. They say the publication date is it. I have asked whether, bearing in mind the circumstances in Australia, we could release the mechanics at an earlier point, and I have yet to hear back from the company in North America. The statement is there and the answer—that, in fact, yes—is under item 4.

CHAIR—We may have to let that one go through to the wicketkeeper. Professor Khachigian, as a person working in the area of medical research you presumably know a bit about the way in which scientists move around to be able to take advantage of particular projects happening around Australia or around the world. To what extent do scientists move to pursue those opportunities? Would you be able to give us an estimate, for example, of how many scientists in any given year leave where they are and move somewhere else, either in Australia or overseas, to pursue an opportunity to conduct research in a particular environment?

Prof. Khachigian—There are a couple of levels to your question. By virtue of the peer reviewed grant system that we enjoy in this and other Western countries, we do not have every research grant that is submitted for funding being funded. In fact, the success rate, as Senator Patterson would know very well, is of the order of 20 per cent. That means only one out of every five is funded and that projects that are put up are essentially shelved or improved upon for the next round. Consequently, people who are named on those grants as investigators or as pairs of hands to carry out that research need to find alternative positions of employment, and that can mean a transposition, if you like, across the corridor, to a different floor in the building, to a different address within the city or, indeed, to another state.

CHAIR—Or overseas.

Prof. Khachigian—Or overseas, indeed.

CHAIR—That is my question. How many of those sorts of movements occur in any given year?

Prof. Khachigian—The Australian Society for Medical Research has commissioned a third party to put numbers on that ‘brain drain, brain gain, brain exchange’ question that you are asking. In fact, some discussions we had with the minister for health have precipitated this kind of questioning. To what extent that movement in landscape is a consequence or otherwise of regulations on stem cell research, I cannot give you a number.

CHAIR—I am not asking that question. I am simply asking you: can you give us an estimate? Would it be fair to say the movement of people is such that 200 scientists in any given year would leave Australia, come back to Australia or come to Australia from somewhere else?

Prof. Khachigian—As much as I would like to give you numbers, it would be irresponsible of me to give you an estimate when we do not actually have those numbers. But we will have those numbers in December of this year when the report comes back. As far as how many stem cell researchers have—

CHAIR—I was not asking that question. We are short of time, so, with respect, I do not want to ask a question that I do not need an answer to.

Senator FIERRAVANTI-WELLS—Professor Waite, in evidence to the committee last Friday members of the Lockhart committee advised that limitations on its time prevented it from doing a thorough review of relevant literature. This meant, for example, that it referenced the Indian Council of Medical Research draft guidelines for stem cell research but not three important reports—2002, 2004 and 2005—from the United States President's Council on Bioethics. You state in your submission:

The Lockhart Review comprehensively, and with great clarity, addressed the many and complex issues involved in stem cell research.

Do you maintain that position?

Prof. Waite—I think it did a splendid job, yes. It was not perhaps a perfect job; one could always find faults with any submission. But I think, yes—

Senator FIERRAVANTI-WELLS—So, in your opinion, relying on Indian research is probably a lot more cogent than relying on the US—

Prof. Waite—I think you have tried to pick the effect of a particular point. Yes, there would have been other things it could have read, there would have been other people it could have talked to. I think it was a pretty good report.

Senator FIERRAVANTI-WELLS—Do you support the Lockhart recommendations regarding the promotion of the development of biotechnology and pharmaceutical products arising from the stem cell research?

Prof. Tuch—Absolutely.

Senator FIERRAVANTI-WELLS—Is that the same for all of you?

Prof. Khachigian—The question is an appropriate one. Indeed, it would be entirely consistent with the objective of health and medical research in Australia as being a driver of knowledge, health and wealth creation, where Australia is the beneficiary of this effort.

Senator FIERRAVANTI-WELLS—One of the issues that has been raised is about the extraction of eggs. Indeed, the Lockhart review suggests ways eggs could be obtained, such as extraction from and use of eggs from cadavers. Do you support this?

Prof. Tuch—I will comment on that since I have given some thought to it, because if we are going to do nuclear transfer we are going to need a source of eggs, and they are hard to come by. I would have thought perhaps a better source than taking them from cadavers, because we do not know how viable eggs will be after death, is to take them from those women who are having their ovaries removed for other purposes. I have taken the liberty of doing a little bit of homework in relation to this. There are in Australia, I understand, something in the order of 240 women a year who have their ovaries removed because they have the breast cancer gene. There are roughly, I am told, 90 such people in New South Wales and another 90 in Victoria, and the other 60 are around the rest of Australia. We do not know what their views are as yet; that is a separate issue. But let us assume that they are having their ovaries removed for their own purposes and, as a separate issue, they are then asked whether they would be prepared to donate their eggs. If the answer to that is yes then you have a source of eggs which would not be from cadavers; it would be from consenting adults who are having their ovaries removed for other reasons.

Senator FIERRAVANTI-WELLS—And, of course—

CHAIR—You are out of time, I am sorry.

Senator FERRIS—Professor Waite, I would like to ask you a question. It has been put to me that stem cell research has the capacity to be as significant for science in the future as the mapping of the human genome has been. I wonder if you would like to comment on that. Most of all, I would like you to take me through how you see the landscape in your particular area of medical science over the next five to 10 years if Lockhart was able to be passed into legislation.

Prof. Waite—I think that the potential for stem cells is tremendous. We really do not know its limitations yet. One of the things that I guess we are asking for is the chance to be able to explore that. Whether it is as good as the example you gave about the genetic—

Senator FERRIS—Mapping the human genome.

Prof. Waite—Yes—well, maybe. We do not know. I think one of the issues is that we do not have the basic data that we so desperately need on adult and on embryonic cells. We have not had the chance to do all the experiments that are needed. And there are such nasty disorders out there—as I know you have been hearing about—all needing different tailored approaches, that certainly that potential is just huge.

How do I see my own field going? We understand quite a lot now about what happens when you traumatise the nervous system, such as when you break the spinal cord. We understand to a certain extent the ongoing cell death—that the initial insult causes cells to die, which makes bystander cells die down the line. That is so-called secondary degeneration. We understand some, not all, of the mechanisms of that. We understand the breaking of the axons and some of the things that inhibit the process of repair that so many other tissues can do. We understand a bit about the scar tissue that forms and its inhibition and the loss of myelin that I was mentioning.

Potentially stem cells could provide guidance for processes to grow along, to reconnect; could provide trophic factors to support the cells that are dying so that less cells die; and could change the scar tissue so that, instead of becoming an inhibitory environment that nothing can grow through, it can grow. Those are the sorts of things that might be possible in five years time. That, of course, might mean that you could have someone who, instead of being a paraplegic for the rest of their lives, could gain bladder and bowel control. Paraplegia is devastating for young people.

Senator FERRIS—Professor Tuch, did you want to add to it at all?

Prof. Tuch—Are you asking where we will be in five years time?

Senator FERRIS—No, I said five to 10 years.

Prof. Tuch—Looking at the history of diabetes—and I have been in the area now for some two decades—in fact we have made major progresses. The first reversal of diabetes in a human was in 1990, which was 16 years ago. We have improved upon that. I could foreshadow that within the next 10 years there will be other cell therapies, probably not in stem cells in the first instance. Pig cells are a possibility. The Japanese made cell lines last year. That is nothing to do with stem cells. Maybe five or 10 years from now we will start to realise what stem cells are potentially capable of doing. We have a fair bit of work yet to be done.

The concept of nuclear transfer is simply one part of that exercise; it is not the be all and end all. It is a process. It is a tool to help us to get down to where we can see basically what would be available and to maximise the gains, certainly in the area of embryonic stem cells. After all, we do not want to take anti-rejection drugs if we do not have to.

Senator FERRIS—What would you say to people who say that there is no need to do this work?

Prof. Tuch—I guess I would say to go back and look at history. Edward Jenner, in the 1860s, was asked, 'Why are you working on this idea of giving these cowpox injections?' Smallpox was devastating the world. He said, 'I don't care; I'm interested in doing this.' He basically went ahead, and today we do not have smallpox anymore because of that. There are other examples. Andreas Vesalius, back in the 17th century, said: 'I don't believe what the Greeks said, the Romans said and the Bible says'—this is not an attack on the Bible—'It says in the Bible that man has 11 ribs because one was taken out and Eve was made from it. I'd like to look myself.' They basically told him: 'We're excommunicating you. We're doing this to you.' He said, 'I don't care; I'm going to do it.' As a result of that, we now know precisely that men, like women, have 12 ribs. We have been able to study anatomy because these things have been allowed to progress. So for those who would say, 'There's a limit; you should not cross this bridge,' I would suggest that there have been so many illustrations of where people have made those comments, like Copernicus and Galileo, going back several hundreds of years—

Senator FERRIS—Lord Florey, perhaps.

Prof. Tuch—Yes, equally. If you want to close your eyes, close them. If it is not being done, let it be because you are saying, 'I'm closing my eyes,' not because we do not have the opportunity and we do not want to explore and develop for the benefit of humanity.

Senator WEBBER—We heard earlier from Professor Mackay-Sim. I will paraphrase what he said. He said that there was still a lot of work to be done with animals—and internationally—on this research before there would be any need for Australia to legislate to allow it, because it is unproved, and that we should wait until the potential is proven before we legislate to allow it to happen. Would that be your view?

Prof. Tuch—Alan Mackay-Sim is a scientist. He is certainly a person who has a particular point of view, and you could argue he has got 22 million reasons as to why he would want to maintain that point of view. I am not trying to be facetious; we do work with him through Professor Waite. We have a collaboration set up to explore precisely what the nasal stem cells will or will not do. But if he is wrong, what are you going to tell the people with type 1 diabetes in five years time when it does not pan out? Are you going to say, 'Sorry, I picked the wrong horse'? You would be doing a disservice to the community if you did that, in which case I would suggest to you that we take as many options as we can and explore them to come up with what is the most beneficial.

Senator NETTLE—My particular interest in this area is in ensuring that any therapies that do come from embryonic stem cell research are available in the public domain and, ideally, through the public health system. Of course it is always a very difficult thing to do, and especially at this point in the development of the research. One proposal that has been put to me is about requiring people when they made applications to the licensing committee to address in their application, and then for the licensing committee to look at, what contribution their research would make to reducing the global health burden, or some similar phraseology to allow that public interest and public health component to be in it. I wondered if you have a view about the feasibility of that or how that would work, and if you have any other suggestions for ways to inject that public health component into—

Prof. Tuch—Sure, it is called money. I work in a public hospital, as part of a university. We put our hands up some time ago and said, 'Thank you very much, we'd like to be able to create some embryonic stem cells lines and we'd like a good manufacturing practice facility to be able to produce them for the public good.' Basically government—let us leave out who—said 'That's nice,' but never supported it. In the end we had to do it privately to push the thing along. To create our embryonic stem cell line we took an initiative not from the public but from private foundations who had enough vision to be able to say, 'Let's move it; let's not sit around waiting.' To be able to do that, a relationship was built up with the hospital involved, the private foundation and the IVF foundation so that all parties would gain from it. So there was a benefit.

But if you do not put money behind it you expect people to sit. They are not going to do nothing, in which case the only other options, I guess, are private organisations or foundations. You cannot expect, in five or 10 years time when things are developed, that things are going to be easy for the public situation unless you are prepared to put funding up-front to support it. In other words, once legislation gets passed—as it was passed four years ago—you have got to have the funding available generally to allow it to be implemented, otherwise you will not reap the benefits so easily.

Prof. Waite—I am in the public domain; it is all public. I publish our results and they are available to anyone.

Prof. Khachigian—In many ways we are putting the cart before the horse. I think there is a void—a black box—about the potential of this kind of technology, so we need to invest in order to see whether or not we have something that is malleable, realistic and robust and that can be tested. Upon that we can build a skyscraper, not necessarily out of matchsticks but actually out of steel. But we are not yet there, and it is only by investment and curiosity-driven research by colleagues such as those on my right that we will be able to make a substantive decision about whether or not this kind of technology has any feasibility for the clinic.

Senator NETTLE—Do you have a view on the idea for part of the licence application process including looking at this issue of public health benefit to come from the research in the public domain?

Prof. Tuch—I would just make a quick comment about the review process at the moment. I think the committee does an excellent job in terms of the checks and balances which are required in Australia and in basically giving people confidence that in fact we are not going to go off the rails; we are not going to create those sorts of things that are outlawed, and which no-one is suggesting be made possible. In terms of the public domain, I do not how you would do that, perfectly honestly. It is an issue of: if you want it, you invest the funds in development organisations and you say what is produced is public. It is simple; I do not know that you need a committee for that purpose, though. We have already got the NHMRC, and we have got an ARC. I would have thought the particular committee involved has enough on its plate without wishing to address that thorny issue, and it does not have the funds at its disposal anyway.

Senator PATTERSON—Professor Waite and Professor Tuch, there have been comments from those people who are opposed to human somatic cell nuclear transfer research that one of the reasons it should not go ahead is that it is quite dangerous, that it can produce teratomas and that it can have outcomes that do not happen in adult stem cell research. Although, I did ask a question about cancers and some of the evidence from some of the research said there are cancers associated with adult stem cell research. Do you have a concern about that in the research you are doing, either with embryonic stem cell research or with somatic cell nuclear transfer? What would your comments be on that as an argument not to use somatic cell nuclear transfer or embryonic stem cell research?

Prof. Waite—I can speak for embryonic stem cells. They do not use them directly; they differentiate them up to the cell that they want. That having been done, teratomas have not been seen. We are not seeing them after injecting them into the spinal cords at all, but you do not use the multipotent and pluripotent embryonic cell as such.

Senator PATTERSON—I understand that, but that is the argument that has been put against using embryonic stem cells for therapy.

Prof. Waite—But you do not need to. You can differentiate it to the cell you know you want, and then you do not have those problems. And it differentiates very easily, obviously. It is very keen to differentiate.

Prof. Tuch—I support those comments of Professor Waite. Senator Humphries, at the start of this inquiry you said that, if there was information that you did not wish to be made public, you could give it in camera. I have highlighted already that we have evidence of ways to overcome that particular problem. I have suggested that I cannot talk about it at the moment because there is an embargo on it, but there is no reason why it cannot be done in confidence. I am happy to pass that information on to the committee in confidence.

CHAIR—The committee has the capacity to receive evidence in camera if it wishes. Is it the wish of the committee to take evidence in camera from these witnesses?

Senator PATTERSON—Before we do, is it because it is commercial-in-confidence? When we do take things in camera, it does not always necessarily mean that it does not end up in the public arena, and I have been around long enough to know that.

Prof. Tuch—There is nothing commercial-in-confidence in relation to this; this is simply an embargo by a journal in relation to a publication.

Senator PATTERSON—We should take it in camera then.

Senator HOGG—If you do not want to take it as evidence in camera, is there any reason why you should not receive it as a supplementary submission and treat it as a confidential submission to the inquiry? Would that help, Senator Patterson?

Senator PATTERSON—No, I am happy. I was just alerting Professor Tuch to the fact that sometimes things do—

Senator HOGG—That is why I am suggesting—

Senator PATTERSON—I am happy for it to be in camera.

Senator WEBBER—Yes, I am too.

CHAIR—It might be easiest if we do that, given the limitations of our time. We will proceed to hear evidence in camera, which means we need to ask people who are not members of the committee or its officers to leave the room. We probably will not be long in that process, but I ask you to please step outside.

Evidence was then taken in camera but later resumed in public—

Proceedings suspended from 5.03 pm to 5.08 pm

Senator ADAMS—Professor Waite, I would like to ask you some more about the work of Dr Keirstead in relation to adult stem cells and their migration.

Prof. Waite—Embryonic stem cells?

Senator ADAMS—Yes. There is a comment here that the adult stem cells migrated less well in the spinal cord and that the mature glial cells would not remyelinate.

Prof. Waite—That is correct. The cell that you need is called an oligodendrocyte. If you try and use mature oligodendrocytes they are unable to repair and make the myelin. If you take neural stem cells from adults—adult neural stem cells—and you make them into an oligodendrocyte precursor, you can get some myelination. It is more limited than with the embryonic precursors, and they do not migrate as well in the cord, as I have said there. It is not zero, but it is not as good.

Senator ADAMS—Why is that?

Prof. Waite—They are a different sort of cell. The whole reason why I am funded to compare the cells is for exactly that reason, that we do not know all the differences between the embryonic and the adult stem cells. We do not know their potentials. They very clearly, from my own work, have a different survivability in the spinal cord and a different migratory ability. We do not yet know about their outcome. That is exactly the reason why we want these sorts of experiments: to be able to give us results, to continue and give us some answers. It seems to me if you have got something that has a potential you should at least try and find out what it can do.

Senator ADAMS—Thank you.

Senator MOORE—My question is one I have been putting to a few of the scientists, and I do apologise if it is going over ground you have already covered. I am interested in the degree of contest to Lockhart that there seems to have been through the evidence and through this process. Scientists are taking distinctly different positions and, in their attempt to promote their own research, are not only promoting the qualities of their own research but almost throwing doubt on the skills basis of their opponents. I am not sure whether that is a standard scientific process or whether that goes on all the time. I am interested in whether the three of you, who have been working in the field for an extensive period of time, are aware of why this is such a black-and-white debate. In fact, in the evidence we have had up until now, there have only been a couple of people who have been prepared to say, 'Yes, these things are both valuable; they are working towards an end result.' Rather, people who had come before us have said, 'You have got to concentrate on either this research or that research.' I would like to get some comment on that from the three of you.

Prof. Khachigian—Let me start our collective response. I have no personal involvement in the conduct of embryonic or adult stem cell research. I have not done any experiments and I do not plan to in the foreseeable future. However, I do think that the nature, the fabric, of peer review is one of self- and cross-criticism, and I think that is very healthy.

Prof. Tuch—I would like to make the general comment that if the message I am giving and I am sure Professor Waite is giving—though, obviously, I will let her speak for herself as well—is that we would say, 'This is the way it must be done,' then I want to make it clear that that is not the message I am giving. The message was clear at the very beginning—I said: we are dealing with embryonic and nonembryonic. It is just that people concentrate on the embryonic because in the eyes of certain people this is a problem; whereas in the area of nonembryonic, if it is not of interest then why would you take notice until we have produced a therapy to reverse diabetes—in which case, then people will take notice. That is understandable.

But let us go back to the reason why, basically, people are taking that particular point of view. I would suggest to you it is not a scientific one; it is a religious one. I am sure you have discussed and debated it, and it has been discussed all over the place: when does life begin? If you went around the room, I would be surprised if you all agreed upon that. The great religions disagree on it. The Catholic Church disagrees: basically, St Thomas Aquinas, back 700 or 800 years ago, had a different position to what the Catholic Church has today. The Jewish religion has a very different point of view to the Catholic religion. Moslems, Hindus and Buddhists would more agree, I guess, from the Jewish side of things, in terms of pushing life back beyond the embryo—in other words, life does not begin until a later time point. But there is no one absolute answer to that. And I suspect, with all due respect, that in fact that is what is driving this exercise completely.

If you declare your interest up-front in terms of where you believe life begins, almost everything else will flow from that. So why don't we just declare it and make a public decision that we are going to go one direction or the other? Then much of the rest of this will disappear until we develop therapies—in which case, then you will be interested again.

Senator MOORE—Professor Waite, do you want to add to that?

Prof. Waite—I have no vested interest. I use both adult and embryonic cells; in fact, the whole thrust of the program grant is to find out which is best. I do not make the cells; they come in from other places. I do not have a vested interest in either. I do have an interest in finding out which is best. I think it is really sad to shut the door on one or the other. In addition to the religious thing, I would add, in relation to different groups, that if your funding and your whole lab depend on the success of the particular cell type that you are making then that is a big factor in trying to promote that. So, as well as the religious thing, I would add: where does the funding come from and what is supporting your lab? If you are going to lose staff and kudos and credibility by your cell not working or not being possible, that is obviously an issue.

CHAIR—Professors, we have run out of time. I thank you for the evidence you have given to us today and for the submissions you have supplied to the committee.

Committee adjourned at 5.15 pm