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Reply to Questions on Notice.

Inquiry into the Food Standards Amendment (Truth in Labelling – Genetically Modified Material) Bill 2010

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Introduction

I gave evidence to the Inquiry into the Food Standards Amendment (Truth in Labelling – Genetically Modified Material) Bill 2010 on Tuesday 19 April by phone. I was given some questions on notice. This is my reply to those questions. When putting these questions into this document, I have sometimes summarised long or detailed questions into fewer words.

Questions on Notice

Comment on some of the assertions made by CropLife equating natural selection with GM.

On page CA 3 of the Hansard record, CropLife essentially stated that traditional crop breeding has provided benefits to agriculture and health for over 10,000 years. They then stated that GM plant breeding techniques were simply an improvement on traditional plant breeding that allowed breeders to develop new varieties with more precision and fewer side effects.

I covered their assertions at length in my verbal submission. I would like to add these additional comments.

Traditional plant breeding involves taking two plants with characteristics you want and "mating" them to get off-spring with characteristics you want. For example, if you want to make a new variety of wheat that had a high yield and was also resistant to a certain disease, you could take a variety that has a high yield and another that had resistance to that disease and "mate" them to get plants that had both characteristics. Essentially, you can do this sort of thing in your own backyard, and some people do, if they grow their own vegetables and gather seeds from their best growing, best tasting, most disease-resistant plants to plant them next year. But you are limited to things that can cross-pollinate with each other and produce viable off-spring. You cannot hope to get a tomato plant to take-up genes from a fish by "mating" them in this way.

You cannot do GM plant breeding in your own backyard. You need expensive, high-tech laboratories to overcome the natural boundaries of gene flow. The industry first makes a "gene cassette" containing the bits of DNA that they want to insert into the plant. The gene cassette usually begins with a "start" section, telling the plant to make whatever follows, then the gene(s) for the protein(s) that the genetic engineer wants the plant to make, plus often a gene that makes the plant resistant to an antibiotic, and finishes with a "stop" section, telling the plant to stop making proteins from that section of DNA. The pieces of DNA can, and do, come from anywhere. FSANZ has allowed into the Australian food supply, GM crops containing genes from plants, bacteria, viruses and deep-sea organisms. Genes can also come from animals and humans. So essentially, the industry can get a tomato to "mate" (ie exchange genes with) a fish using GM techniques. And because the GM crops made this way are so novel, the GM industry can, and does, put patents on their crops that you could not put on a crop made using traditional plant breeding.

The GM industry can make gene cassettes fairly accurately, but the process of inserting the cassette into the plant is not accurate. One technique is to coat tiny gold or tungsten balls with copies of the cassette and use a modified shotgun to shoot it at the plant and hope that some of the cassette sticks to the plant's DNA when the plant tries to repair the damage done to it and its DNA. I have seen in

FSANZ GM crop safety assessments; multiple copies of the cassette when only one was desired, partial copies when whole copies were needed, and reversed copies when "normal direction" copies were needed. So clearly, the process is not accurate.

And that is one reason why making a GM crop is so expensive. It takes a lot of people, time (years) and effort and therefore money (often millions of dollars) to go through making lots of dud versions of the GM crop you are trying to make before you can get a version of that GM crop that does what the gene engineer wants it to do AND actually grows properly without deformities and also yields well.

But there are also other problems. Besides the proteins that the GM plant has been engineered to produce, there is another possible hazard – unforeseen substances that the plant has NOT been engineered to produce, but have been made by the plant as a result of the "collateral damage" done to it from making it GM. For example, the insertion process can result in lots of tiny bits of GM DNA being "peppered" into the plant's genes. This "peppering"can alter the plant's genes and therefore alter the plants' normal metabolic processes so that the plant may now make a protein that it has not made before. Such unforeseen proteins may cause allergic, toxic or reproductive problems in the animals and people who eat them and this possibility is largely unassessed by the current safety assessments.

So there are likely to be more side effects to people from eating GM crops compared to crops produced through traditional plant breeding.

For more information, please see the attached document "Is GM food safe to eat" that I wrote a few years ago.

Elaborate on your statement that FSANZ wrongly interprets the Code by not requiring the labelling of highly refined products that contain GM.

Essentially, FSANZ states that highly refined material from GM crops do not need to be labelled because they contain no GM DNA or GM protein. However, there is a considerable amount of scientific evidence that FSANZ is wrong and that highly refined products do contain GM DNA or GM protein and hence should be labelled.

In my submission to this Inquiry, I provided a document as an Appendix. That appendix was my submission on GM foods to the recent Review of Food Labelling Law and Policy. In section 5 of that document, I provided detailed evidence from the peer-reviewed literature of how FSANZ is wrongly interpreting the Code by not requiring the labelling of highly refined products that contain GM material. I have reproduced the relevant section here for your convenience. Please refer to the full appendix document for more information about the references cited below.

5.2 Highly refined foods from GM crops

The Food Standards Code states that highly refined food, other than that with altered characteristics, where the effect of the refining process is to remove novel DNA and/or novel protein, does not need to be labelled. FSANZ has interpreted this to repeatedly state in other documents and in the media that highly refined products such as cooking oil, sugars and starches from GM crops contain no DNA or protein and therefore do not need to be labelled, with very few exceptions. One exemption is if a GM plant is designed to produce a different type of oil than normal for that plant (for example if a canola plant was engineered to produce fish oils) then the oil would still need to be labelled. So, how

accurate is this view?

Determining if a food ingredient has come from a GM crop generally uses one of two approaches – looking for the DNA that has been inserted to make the plant genetically modified, or looking for the protein that the plant has been designed to make as a result. Finding DNA or protein in refined foods depends very much on how refined the product is, the methods used to refine it and the food being tested (Gryson, 2010). Refining generally involves purification steps that denature proteins and fragment DNA, while food processing may involve mechanical stress, heating, pH variations and fermentation that may degrade or remove DNA from the sample (Gryson, 2010). Generally, DNA is more robust at surviving such processing conditions than protein.

5.2.1 Oil from GM crops

Even though protein can denature more easily than DNA and is therefore more difficult to pick up, it has been known for decades that there is a small amount of protein in vegetable oils. For example, numerous editions of the "bible" of food composition, McCance and Widdowson, have stated that oils contain a small amount of protein, including a recent supplement listing 18 different vegetable oils (Chan et al, 1994). Others have confirmed that this specifically includes oils on supermarket shelves (Moneret-Vaurtrin et al, 1998). Even FSANZ's own safety assessment of a GM canola variety shows there to be a small amount of protein in the oil (FSANZ, 2000). Yet, FSANZ has still concluded that there is no protein in the oil from that crop (FSANZ, 2000), and that oils do not contain protein, particularly novel protein. Since both the GM crop industry and FSANZ have long argued that GM protein behaves the same as "ordinary" protein, they have also argued, *ipso facto,* that oil from GM canola contains GM protein and must be labelled.

Moreover, FSANZ has also concluded, by referring to documents given to it by Monsanto that even if there were some protein in oil, there is not enough to cause any health effects, such as allergic reactions. In doing so, FSANZ has managed to miss a significant body of scientific literature and clinical knowledge. For example, in one published oral provocation test, 22% of patients allergic to peanuts reacted to peanut oil (Moneret-Vautrin et al, 1998). In another peer-reviewed study, various manufacturer's brands of refined, bleached and deoderised oils from almonds, peanuts and walnuts had enough of the allergenic proteins left in them to show immunoreactivity with sera from patients with significant nut or peanut allergies (Teuber et al, 1997). There are also published, clear cases of infants aged two weeks to three months showing allergic reactions from consuming peanut oil in milk formulae (Moneret-Vautrin et al 1994). Finally, a number of neonatal units recommend not even putting products containing peanut oil in the skin of babies in order to prevent a possible allergic reaction.

DNA is more robust at being able to survive food processing conditions than protein, so it provides for a better method of determining whether oil has come from a GM crop (Costa et al, 2010; Bogani et al 2009).

There is a significant body of literature describing the relative ease of finding DNA in virgin olive oil, largely because the oil is mechanically processed and often doesn't undergo further refining (see Costa et al 2010 for review). Indeed, DNA tests on olive oil have been used to determine whether oil marketed as olive oil is in fact olive oil or an alternative, cheaper, mis-labelled oil (Costa et al 2010). However, oil from the main genetically engineered crops (cotton, canola, soy and corn) tends to be more highly refined. The GM industry and FSANZ have long argued that this precessing removes all DNA from the oil.

However, it has been known for a decade that there is a small amount of DNA in canola oil (Hellebrand et al, 1998). More recently, Costa et al (2010) investigated whether DNA in general, and

GM DNA more specifically, could be found during and after commercially refining soy bean oil. Oil from soybeans constitutes a high proportion of oil in the human food supply, being 30% of all oil consumed in 2007 (Costa et al 2010).

Commercial methods of chemically refining soybean oil involve a number of steps using methods that can significantly affect the quality and quantity of DNA remaining. First, the seeds are cleaned, cracked, laminated, extruded and the oil extracted with hexane. The oil is then degummed using phosphoric acid, neutralised using concentrated sodium hydroxide, washed to remove the formed soaps, bleached using activated carbon or clays, and then deoderised using steam at reduced pressure. Even so, DNA could be detected after every step of the process, while GM DNA that identified the oil as coming from a particular type of GM soy bean was found at all steps of the process except for some intermediate steps during oil refining, possibly due to sample instability during those stages. Significantly, GM DNA could be detected in the final product destined for supermarket shelves (Costa et al, 2010).

Using a different GM DNA detecting technique, Bogani et al (2009) also found GM DNA from GM soy beans at every stage of the industrial soybean processing chain, including crude and degummed oil.

The methods used to find GM DNA are important in order to prevent false negative results in oils and other foods. First, the food matrix generally includes inhibitors of the testing process such as proteins, fats, polysaccharides, polyphenols and phenols (see Bogani et al 2009 or Gryson, 2010 for reviews). For example, polyphenols can irreversibly bind to DNA and reduce the yield and purity of extracted DNA (Gryson et al 2007) while other compounds may inhibit the polymerase enzyme often used for GM DNA testing (Margarit et al, 2006). Dealing with them can be crucially important in being able to detect DNA that is present in the foodstuff (Gryson, 2010). Methods are available to deal with some of these, such as the Wizard® method (Bogani et al, 2009; Costa et al, 2010; Smith and Maxwell, 2007), that, if not used, may cause a false-negative result. Moreover, some extraction methods are better suited to some processed foods than others, so that a particular methods should be chosen on a case-by-case basis (Gryson, 2010).

Second, refining generally causes some degradation of DNA, resulting in shorter fragments of DNA. Not only are shorter fragments more stable than longer fragments (Gryson, 2010), but primers are required that can pick-up and amplify these shorter sections. Using primers that only look for longer fragments may produce a false-negative result. Bogani et al (2009) recommend looking for fragments of 188, 195 and 470 base pairs (bp) when looking for GM soy in processed products, while Gryson (2010), in a substantial review of methods for detecting GM DNA in a variety of processed foods, recommends looking for a maximum of only 150 bp.

Third, the quantity of material tested may be quite important. DNA is a contaminant of the oil that remains after the oil is refined. If only a tiny oil sample is taken for testing, there may be too little DNA present to be picked-up. While Bogani et al (2009) required only ½ ml to be able to find GM DNA in crude and degummed oils, Costa et al (2010) used 200ml to find GM DNA in more refined oil samples. Costa et al (2010) also first spun the oil at high speed to isolate the impurities (including DNA) from the oil and then using the Nucleospin® method, which separated contaminants from nucleic acids by spinning them through a membrane that trapped the nucleic acids (Nucleospin User Manual, 2002). The volume of oil used by Zhang et al (2007) was not given and may have been too small to find GM DNA in refined soybean oil and soybean salad oil. However, the volume used was enough to find GM DNA in crude soybean oil.

When these are not done, authors that report GM DNA in less refined foodstuffs tend not to find it in oil from GM crops (Margarit et al, 2006).

Note that commercial GM DNA laboratories offer a service for finding GM DNA in oils including from canola, corn and soy. Genetic ID, a US-based company is one that does so (http://www.ifoam.org/about_ifoam/membership/pdfs/Client_Ordering_Instructions.pd).

5.2.2 Highly processed flour

Corbisier et al (2005) took soy flour with a 1% GM content (which would trigger a GM label in many countries) and processed it by mixing it with water to turn it into a slurry and then mixing it at varying velocities and heating it at varying temperatures to mimic food production processes. They not only found GM DNA at the end of the process in all samples, but determined that the end products contained 1% GM material, even though the DNA was quite highly degraded in some samples. In fact, rather than finding it difficult to find GM DNA, they found that care was needed with more highly degraded samples to prevent more than 1% GM material being recorded at the end.

Corn flour is produced using a dry milling process in which the whole kernel (often without the germ) is finely ground using a mechanical process (Smith and Maxwell, 2007). After this process, DNA can be found in as little as 200mg of corn flour (Smith and Maxwell, 2007).

5.2.3 Starch from GM crops

Cornstarch is produced from the corn kernel using a wet milling process in which the kernels are soaked in a weakly acidic solution and then ground to a slurry before the starch granules are separated from the other components. Even after this process, which is designed to separate the starch granules from the other cellular material, quantifiable DNA can be found using the Wizard® method in only 200mg of cornstarch (Smith and Maxwell, 2007).

Meanwhile, Bogani et al (2009) found GM DNA from GM soy in crude flour and proteic flour, even though the DNA from proteic flour was highly degraded with an average fragment size below 500bp.

5.2.4 Sugars from GM crops

Similar to oil, there is a small amount of protein in sugars. McCance and Widdowson (Chan et al, 1994), the "bible" of food composition, shows that the amount of protein in sugar reduces as it is more highly refined, from 1.2% protein in black treacle, to 0.5% in Demerara sugar to 0.1% in brown sugar to a trace in white sugar. Of the 11 different types of sugars recorded in this reference book, only three contained no measurable protein. Since both the GM crop industry and FSANZ have long argued that GM protein behaves the same as "ordinary" protein, they have also argued, *ipso facto,* that sugars from GM crops contain GM protein and must be labelled.

DNA has also been found in sugar destined for chocolate (Gryson et al, 2007) and in corn syrup (Margarit et al, 2006). Since both the GM crop industry and FSANZ have long argued that GM DNA behaves the same as "ordinary" DNA, they have also argued, *ipso facto,* that sugars from GM crops contain GM DNA and must be labelled. Note that GM DNA laboratories offer a service for finding GM DNA in corn syrup. Genetic ID, a US-based company is one that does so (http://www.ifoam.org/about_ifoam/membership/pdfs/Client_Ordering_Instructions.pd).

5.2.5 Lecithin from GM crops

Lecithin is commonly used in food as an emulsifier and lubricant and soybeans are a major source of

food-grade lecithin. It is usually obtained from degummed soy oil (Bogani et al 2009).

Gryson et al (2007) found DNA in lecithin while Bogani et al (2009) found GM DNA in lecithin from GM soybeans. The latter authors also found that DNA was degraded in the process to about that present in soy oil due to repeated thermal and chemical treatments.

Zhang et al (2007) also found GM DNA in lecithin from soy using a different GM DNA detection method (triplex nested PCR).

Lecithin is commonly used in chocolate, where the presence of polyphenols from the cocoa component of the chocolate can seriously impede the test for GM DNA in the lecithin by reducing the yield and purity of the DNA (Gryson et al 2007). The low levels of lecithin in the chocolate, at around 0.5%, can also be problematic (Gryson et al 2007). Together, they can make it difficult to find GM DNA from the lecithin in chocolate when it is present. Again, the method of extraction, sample size and PCR method are important in being able to find GM DNA (Gryson et al 2007).

Note that GM DNA laboratories offer a service for finding GM DNA in lecithin. Genetic ID, a US-based company is one that does so (http://www.ifoam.org/about_ifoam/membership/pdfs/Client_Ordering_Instructions.pd).

5.2.6 Other processed foodstuffs

GM DNA has been found in soy protein powder, chocolate beverage (probably from lecithin from GM soy) and infant rice cereal (Zhang et al, 2007) as well as soymilk, corn chips, tortillas, taco shells, tofu, miso, irradiated foods and sonicated foods (Gryson, 2010).

5.2.7 Honey from bees browsing on GM crops

Honey contains 0.4% protein (Chan et al, 1994). As the protein in honey is generally obtained from pollen from foraged plants, this protein is likely to contain GM protein and GM DNA. This was confirmed in 2009 when Greenpeace took three samples of honey from beehives placed near a GM canola crop in Australia. DNA testing showed that two of the samples contained GM DNA (ABC, 2009; Morton, 2009). Therefore, according to the Food Standards Code, honey from bees that have foraged on GM crops should be labelled.

Recommendation 2 – Highly refined food

All foods containing ingredients that have come from a GM crop should be labelled as they are in the European Union. This includes oil, starches, sugars and lecithin from GM crops. Honey from bees that have foraged in GM crops should also be labelled. The Food Standards Code currently requires all foods containing DNA and protein from a GM organism to be labelled as being GM. Labelling these foods therefore requires little change to the Food Standards Code. It mostly requires the Review Panel to inform FSANZ not to wrongly interpret the Code and for the Review Panel and FSANZ to inform the food industry that the Food Standards Code requires all foods from GM crops such as oil, starches, sugars and lecithin to be labelled.

The Bill requires FSANZ to develop due diligence guidelines. Is there anything that you would like to specifically see included in the guidelines?

First, I would like to clearly support the need for due diligence as described in the Bill.

There are essentially two types of due diligence required here. One is by producers, manufacturers and distributors of food, as discussed in Section 16D of the Bill. I believe that this section of the Bill is adequate to ensure due diligence by these sectors of the food industry. The other type of due diligence required is by the food regulator, FSANZ, as discussed by Section 16E of the Bill. I wish to make comments about this latter section, which I believe needs strengthening.

At present, there is essentially no monitoring of the current GM food laws. Essentially, FSANZ states that it is the States' responsibility to conduct any sampling of GM foods on supermarket shelves. However, I have not seen anything in writing that this is legally the case. I am also aware that some States then argue that it is not their responsibility either, and suggest that it is the role of local government authorities to conduct such testing. The effect of this apparent "buck-passing" is that there is essentially no monitoring of the GM labelling laws in this country. This allows unscrupulous or uncaring food manufacturers to get away with not labelling GM ingredients in their foods without fear of being prosecuted.

Furthermore, there is essentially no monitoring of imported crops or foods. It is my understanding that Australia's quarantine inspection service (AQIS) has never inspected any imported foods or crops for GM ingredients, that AQIS says that it requires FSANZ to instruct it to do such an inspection, and that FSANZ has never instructed AQIS to do any such inspection. This situation has persisted even during times when experimental GM crops (eg Liberty Link rice) or GM crops designated for animal use only (eg Starlink corn) were found to have entered the human food supply. When other countries tested their imported food for these illegal GM crops, Australia did not, simply because FSANZ did not ask AQIS to test imported food.

FSANZ needs to be the body that conducts GM food monitoring for many reasons, including the following:

- Much of Australia's food is imported. A national authority is best to deal with an imported food, as that food may enter one port on one occasion and another port in another State on another occasion.
- Foods manufactured in one State often uses ingredients from other States and the food thus produced is often exported to other States. It is for these reasons that we have a national food regulator.
- Australia has a national body (FSANZ) to regulate food labels. The same body should also enforce those labels.
- If individual States undertook their own sampling, some foods may be over-sampled while other foods may be under-sampled or not sampled at all, leading to inefficiencies, duplication and waste. One authority should do the sampling on a national basis.
- GM food testing is expensive and beyond a small State or Territory to do in any comprehensive manner.
- It is my understanding that FSANZ and the States have been negotiating for years to do GM food surveys, but little has happened. Apparently, a significant factor has been determining who will pay for it. Instructing FSANZ to do this work in this Bill may be the only way to actually get the work done.

However, I and others have lost faith in FSANZ to be impartial or to do an adequate job of GM food testing. To my knowledge, they have only ever done one GM food survey and that was years ago, and had an inadequate sample size and sampling methodology. I therefore recommend that the testing and monitoring methodology be reviewed and approved by group of academics with skills in the area before the survey is enacted. I further recommend that the actual testing then be overseen by an independent entity such as the Auditor General.

I therefore recommend that Section 16E of the Bill be changed to reflect the following:

- FSANZ should be instructed to be the agency that does an annual survey for GM ingredients in foods in Australia.
- The annual survey should have a specific start date, say June 2012, so that there is no more dithering.
- FSANZ has a history of conferring much more with the food industry than with independent experts (eg academics) and the community. The sampling methodology needs be determined in conjunction with people in academia who know how to do this sort of sampling properly and not by just conferring with the food industry. After all, it is in the latter's interests to have a poor-quality testing regime that is unlikely to find GM contamination, so as to protect its members from prosecution. In particular, in order to ensure a representative sample of foods on supermarket shelves, at least 50 commercially-available manufactured foodstuffs that are at high risk of containing ingredients from GM crops should be tested each year.
- The raw data of the results should be posted on the FSANZ website so that other researchers can also analyse the data.
- AQIS should be instructed to regularly test importations of GM crops and foods into Australia, particularly for GM materials that have not been approved. Again, the sampling methodology needs be determined in conjunction with people in academia who know how to do this sort of sampling properly and not by just conferring with the food industry.
- Whenever an illegal GM organism is found to have escaped into the human food supply in Australia or in other countries, AQIS and/or FSANZ should be required to adequately test for it immediately in food where it is most likely to occur, and any foods containing that GMO should be recalled.
- The Auditor General or a parliamentary committee or similar independent entity should oversee the testing process.
- The schedule of testing should be revised on a regular basis to reflect risks that may be identified from specific GM ingredients, including any evidence that may emerge in scientific and medical journals.

Would you support a three-part labelling scheme that would say: 'contains GM', 'may contain GM' and 'GM-free'. If not, why not?

Because foods that are “unintentionally” contaminated by up to 1 percent per ingredient can escape a GM label, many food manufacturers believe that they do not need to label a GM ingredient if it is present at less than 1%. However, FSANZ has been clear that this exemption only applies “where the manufacturer has actively sought to avoid GM ingredients but GM material is inadvertently present” and that “the food manufacturer needs to be able to demonstrate that they have sought to source non-GM food for their product. Such measures include document verification, identity preservation systems or batch testing. However if testing shows a GM ingredient is present, labelling is required regardless of whether the level is below 1 percent.” For more information, please see the attached

published paper on the legal aspects of GM food labelling, written by me, titled "How GM food is regulated in Australia and New Zealand: A story of standards, oil and sausages".

On this basis, food should have a "contains GM" label if:

- GM material is present at a level of 1% or more in any ingredient in that food, regardless of whether the material is there by accident or not.
- GM material is present at a level of less than 1% in any ingredient in that food, if the manufacturer knows that that GM material is there or knows that it is very likely to be there.

Food should be able to have a "GM-free" label if the manufacturer has done good-quality due diligence to ensure that, as far as is practicable, all ingredients in that food contain no GM material. This means that the manufacturer has done due diligence as described in section 16D of the Bill. If, despite all the good-quality due diligence the manufacturer has done, some contamination has crept-in, then this should not prevent the manufacturer from still being able to put a GM-free label on the food, as long as it is below 1%. Otherwise Australian manufacturers could be faced with repeats of the "Bean Supreme" example described in the attached paper on the legal aspects of labelling, titled "How GM food is regulated in Australia and New Zealand: A story of standards, oil and sausages."

However, if the manufacturer continues to use the same supplier and the supplier continues to provide GM-contaminated ingredients, then the manufacturer must know that the food being produced contains GM materials. Hence the manufacturer cannot claim that the food is GM-free and if the manufacturer continues to use the GM-free label, then the manufacturer should be prosecuted.

Under these conditions, there is currently no real reason to have a "may contain GM" label. Food manufacturers should have done due diligence as to whether GM material is in their food or not and should have labelled their products accordingly. However, there may be a case for a "may contain" label if:

- A manufacturer is using ingredients that may contain GM material (such as ingredients that have come from corn, soy, cotton and canola plants from countries that plant GM varieties of these crops) and has not done any due diligence as described in Section 16D of the Bill as to whether these ingredients contain GM material or not.
- A manufacturer has repeatedly found occasional contamination in an ingredient and has not changed the supplier of that ingredient. Therefore, the manufacturer knows that any given package of that manufacturer's food may (or may not, depending on chance) contain GM material on that occasion.

Can you address issues around what literature is available around health impacts of GM materials? Could you give us the references where independent researchers have obtained and re-analysed GM company raw data and found adverse health effects in those data?

While GM crop developers may provide food regulators with safety data, these data are rarely published. Moreover, FSANZ has a policy of not re-analysing the raw data given to it, they just read the document from the GM company that summarises what the company wants FSANZ to know about the data. FSANZ does not do its own due diligence on the raw data to ensure that the company is making full and accurate disclosure of any problems with the crop. Some researchers have obtained GM company raw data, sometimes under court order, and have re-analysed those data and found significant problems in the way the data were collected or analysed. Such researchers have found

significant adverse effects in experimental animals that have eaten the GM crop. I have attached some examples of that to this document.

Furthermore, the nature of the tests conducted by the GM companies are inadequate. For example, GM companies do not appear to have done any reproductive or long-term term toxicological studies. If a GM crop company does any animal feeding studies, it often uses farm-type animals that are not physiologically comparable to humans. And then, it often does not actually measure health-related matters. They are usually animal production studies, suitable to work out if farm animals will put on weight, live long enough and be in a sufficient condition to get a good price at market when eating GM crops for a few weeks. A common example is to feed chickens a GM crop for a few weeks and only measure their body weight, death rate and breast meat yield, when none of these are suitable measures of human health, particularly as chickens are very different animals compared to people. For example, they have feathers, lay eggs, have two stomachs and their kidneys do not produce urine. Note that there has not been a single human health study done on GM crops. More information can be found in my verbal submission and the attached document titled: "Is GM food safe to eat?"

In addition, independent studies are rare. GM companies usually forbid independent research on GM seeds purchased from them and prohibit farmers from giving GM seeds to researchers.

Even rarer are studies using diets that simultaneously contain a number of GM crop varieties or varieties containing "stacked" GM genes, even though these are commonly eaten. For example, in the US, Monsanto's triple stack corn (maize), containing three GM genes is widely planted and approval to plant an eight-stacked corn variety has recently been given. Most food regulators, including FSANZ, do not require separate health studies for these stacked crops.