Australian Chicken Meat
Federation (ACMF) Inc

15 February 2013

Christine McDonald
Committee Secretary
Senate Finance and Public Administration Committees
PO Box 6100
Parliament House
Canberra
ACT 2600

By Email: fpa.sen@aph.gov.au

Dear Ms McDonald,

Inquiry into the progress in the implementation of the recommendations of the 1999 Joint Expert Technical Advisory Committee on Antibiotic Resistance (JETACAR)

The Australian Chicken Meat Federation (ACMF) is the peak coordinating body for participants in the chicken meat industries in Australia and recognized as the industry representative by the Australian Government.

Following an agreement in December 1997 of the then Australian Minister for Health and Family Services and the then Minister for Primary Industries and Energy the JETACAR was established to examine the issue of the use of antibiotics in food-producing animals, particularly as growth promotants, and the emergence of antibiotic-resistant bacteria in humans.

The potential impact of antibiotic use in the production of chickens on human health is a subject that the poultry industry and ACMF have taken and continue to take very seriously. As will be seen, bacteria isolated from Australian raw chicken meat have not been shown to have the most concerning resistances that are present in bacteria isolated from chicken meat in almost every other country in the world. This unique position arises from a combination of high levels of bird health associated with infection prevention programs (including continuous attention to biosecurity and the use of vaccination [refer to APPENDIX 2 for summary of available vaccines]), highly nutritious diets, cutting edge genetic selection and high standards of bird husbandry. In addition, and what is not widely recognised, the antibacterial agents approved for use in chickens are all older agents that were first described between 1941 and 1973. The following table presents a summary of all the antibacterial agents currently approved and available for use in chickens. It will be seen that there are only 17 antibacterial agents available. Despite the fact that there are 17 agents, most of these are rarely used. It will also be seen that most of these agents

are delivered by addition to water or to feed – this is because it is usually impractical and stressful to treat birds by injection.

TABLE 1: ANTIBACTERIAL AGENTS APPROVED FOR USE IN CHICKENS IN AUSTRALIA			
ANTIBACTERIAL AGENT	**PATENT**	**CLASS**	**ROUTE**
AMOXYCILLIN	1964	Penicillin	water
APRAMYCIN	1967	Aminoglycoside	water
AVILAMYCIN	1961	Orthosomycin	feed
BACITRACIN	1945	Polypeptide	feed
CHLORTETRACYCLINE	1948	Tetracycline	feed, water
ERYTHROMYCIN	1952	Macrolide	water
FLAVOPHOSPHOLIPOL	1965	Glycophospholipid	feed
LINCOMYCIN / SPECTINOMYCIN	1962, 1961	Lincosamide / aminocyclitol	water, injection
NEOMYCIN SULFATE	1949	Aminoglycoside	feed, water
OXYTETRACYCLINE	1950	Tetracycline	feed, water
SULFADIAZINE / TRIMETHOPRIM	1940, 1962	Sulfonamide / diaminopyrimidine	water
SULFADIMIDINE / TRIMETHOPRIM	1941, 1962	Sulfonamide / diaminopyrimidine	water
SULFADIMIDINE	1941	Sulfonamide	water
TIAMULIN	1973	Pleuromutilin	feed, water
TYLOSIN	1961	Macrolide	feed, water
VIRGINIAMYCIN	1955	Streptogramin	feed

The most recently discovered antibacterial agent available for use is tiamulin, a pleuromutilin that is rarely used, partly because of adverse interactions with a number of the anticoccidial polyether ionophores. It is particularly important to note the absence of cephalosporins and fluoroquinolones in the formulary of agents available to Australian poultry veterinarians. The cephalosporins and fluoroquinolones are used in most other countries and their use is associated with the presence of more concerning resistances from a public health perspective.

ACMF is committed to the use of high standards of health and welfare in the production of chickens. The poultry industry has had in place codes of practice for the appropriate use of antibiotics for more than 25 years. ACMF welcomed the JETACAR report and the recommendations it contained. ACMF continues to review and enhance its policies for antibiotic use.

ACMF is pleased to provide the following comments with reference to the recommendations of the JETACAR report.

RECOMMENDATION 1 (regulation of growth promotants)

The JETACAR selected the three criteria previously applied by the UK Swann committee to the assessment of antibiotics that were to be used as growth promotants. While ACMF supports the use of evidence in decision making, in recognition and appreciation of consumer concerns, the ACMF antibiotic policy does not support the use of antibiotics for growth promotion of chickens.

RECOMMENDATION 6 (scheduling of antibiotics)

ACMF supports the classification of all antibacterial agents as prescription only. The poultry industry depends on a small contingent of poultry veterinarians working closely with nutritionists and farmers to maintain the high standards of bird health and it is appropriate that their professional judgement and clinical assessment is applied to the selection and use of antibacterial agents.

RECOMMENDATION 10 (monitoring and surveillance)

ACMF supports the concept of monitoring and surveillance of antimicrobial resistance. ACMF believes that the frequency of monitoring and surveillance should be proportionate to the level of risk or the expected rate of change of resistance.

As mentioned above, Australian chicken meat has recently been shown to have very low levels of resistance in bacteria isolated at the retail level. A summary of the findings of the recent Food Science Australia survey and how it compares to similar survey in North American and Europe is presented below.

In 2007, Australia's peak advisory committee on food safety, The Food Regulation Standing Committee, commissioned Food Science Australia to conduct a pilot survey of foods to assess the presence of bacteria with AMR. In this survey, samples of raw whole poultry, beef mince, pork chops and iceberg lettuce were collected each month from shops in Melbourne, Sydney, Brisbane and Perth between February 2007 to January 2008. The food items selected were considered to be representative of an average consumer's shopping basket. Bacteria were isolated from food samples and then tested by Food Science Australia to see if they were resistant to a range of different antibiotics. All foods tested were of Australian origin. Results of isolates from poultry are summarised in the following sections and compared with similar surveys conducted in North America and Europe.

Antimicrobial resistance in *Campylobacter jejuni* isolates

The absence of quinolone (nalidixic acid) and fluoroquinolone (FQ) (ciprofloxacin) resistance in *C. jejuni* isolates in isolates from Australian poultry is consistent with other Australian surveys but in stark contrast to the results of surveys in Canada, USA, Denmark, Holland and seven other member states of the European Union where a prevalence of FQ resistance up to 83% has been observed.

TABLE 2: ANTIBACTERIAL RESISTANCE (%) IN *CAMPYLOBACTER JEJUNI* ISOLATES FROM BROILER MEAT

SPECIES ANTIMICROBIAL AGENT	**AUSTRALIA** **FSA** **2008**	**CANADA** **CIPARS** **2008**	**USA** **NARMS** **2011**	**DENMARK** **DANMAP** **2011**	**EUROPE** **EFSA** **2012**	**HOLLAND** **MARAN** **2012**
Campylobacter jejuni	Broiler meat at retail	4 Provinces (range)	Chicken Breast	Domestic broiler meat (imports)	Chicken meat 7 MS	Poultry meat
N	60	234	393	61 (70)	670	254
Azithromycin	-	**0-12.2**	**0.5**	-	-	-
Chloramphenicol			**0.0**[F]	**0 (1)**	-	**1.2**
Ciprofloxacin	**0**	**0-10.8**	**22.4**	**11 (57)**	**50 (17-83)**	**58.7**
Nalidixic acid	**0**	**0-10.8**	**20.9**	**11 (57)**	**48 (14-80)**	**58.7**
Cllindamycin	**1.7**	**0-2.9**	**0.3**	-	-	-
Erythromycin	**3.3**	**0-12.2**	**0.5**	**0 (6)**	**2**	**1.6**
Gentamicin	**0**	**0**	**0.0**	**0 (0)**	**0.7**	**0**
Streptomycin	-	-	-	**2 (1)**	-	**3.1**
Tetracycline	**1.7**	**31.8-59.2**	**48.3**	**10 (36)**	**22**	**47.6**

[F] florfenicol; MS – Member State

Antimicrobial Resistance in *E. coli* isolates

The comparative resistance prevalence of *E. coli* isolates reveals an absence of cephalosporin and FQ resistance in isolates from Australian poultry but significant cephalosporin resistance in Canada, USA and Holland, and high levels of FQ resistance in Holland and imported poultry meat in Denmark.

TABLE 3: ANTIBACTERIAL RESISTANCE (%) IN *ESCHERICHIA COLI* ISOLATES FROM BROILER MEAT

SPECIES ANTIMICROBIAL AGENT	**AUSTRALIA** **FSA** **2008**	**CANADA** **CIPARS** **2008**	**USA** **NARMS** **2011**	**DENMARK** **EFSA** **2012**	**DENMARK** **DANMAP** **2011**	**SWEDEN** **EFSA** **2012**	**HOLLAND** **MARAN** **2012**
E coli	Broiler meat at retail	5 Provinces (range)	Chicken Breast	Broiler meat	Domestic broiler meat (imports)	Broiler meat	Poultry meat
N	100	479	341	158	122 (140)	77	468
Amoxy-clav	**1**	**22.1-52.9**	**14.1**	-	-	-	-
Ampicillin, amoxicillin	**38**	**29.7-62.9**	**26.4**	**16**	**23 (57)**	**10**	**65.4**
Cefoxitin	**0**	**19.8-54.3**	**13.2**	-	-	-	-
Ceftiofur	**0**	**18.3-48.6**	**12.3**	**0.6**[C]	**2 (7)**	**0**[C]	**20.3**[C]
Ciprofloxacin	**0**	**0-0.8**	**0.0**	**4**	**6 (41)**	-	**48.1**
Nalidixic acid	**0**	**0-8.4**	**2.3**	**4**	**6 (39)**	**6**	**45.7**
Chloramphenicol	**0**	**3.3-8.1**	**1.2**	**0.6**	**2 (19)**	**1**	**17.7**
Gentamicin	**4**	**5.7-20.6**	**38.4**	**0**	**0 (3)**	**0**	**10.3**
Kanamycin	**8**	**6.1-12.1**	**5.6**	-	-	-	**14.7**
Streptomycin	**19**	**28.6-38.9**	**43.4**	**15**	**11 (46)**	**4**	**54.1**
Sulfonamide	-	**19.8-45.0**	**44.3**	**15**	**22 (56)**	**17**	**60.5**
Tetracycline	**47**	**40.0-48.4**	**79.9**	**13**	**19 (52)**	**8**	**54.9**
TMS	**22**	**3.3-16.2**	**2.3**	-	-	-	-
Trimethoprim	-	-	-	-	**12 (38)**	-	**44.2**

[C] cefotaxime; TMS trimethoprim + sulphonamide

Antimicrobial resistance in *Salmonella* isolates

While no cephalosporin or FQ resistance was identified in *Salmonella* isolates from Australian broiler meat, cephalosporin resistance was observed at high levels in the USA, Canada and Holland.

TABLE 4: ANTIBACTERIAL RESISTANCE (%) IN *SALMONELLA* ISOLATES FROM BROILER MEAT

SPECIES ANTIMICROBIAL AGENT	**AUSTRALIA** **FSA** **2008**	**CANADA** **CIPARS** **2008**	**USA** **NARMS** **2011**	**EUROPE** **EFSA** **2012**	**DENMARK** **DANMAP** **2011**	**HOLLAND** **MARAN** **2012**
Salmonella	Composite serovars	Composite 5 Provinces (range)	Composite serovars	Composite serovars 7 MS	Typhimurium	Poultry meat Java (other)
N	100	382	158	548	< 15 isolates	76 (79)
Amoxy-clav	**1**	**4.7-21.3**	**33.5**	**-**		**-**
Ampicillin, amoxicillin	**4**	**9.4-27.7**	**40.5**	**21**		**59.2 (32.9)**
Cefoxitin	**1**	**4.7-21.3**	**25.9**	**-**		**-**
Ceftiofur	**0**	**4.7-23.4**	**34.2**	**4[C]**		**18.4 (16.5)[C]**
Ciprofloxacin	**0**	**0**	**0.0**	**24 (4-82)**		**68.4 (26.6)**
Nalidixic acid	**1**	**0**	**0.0**	**24 (4-82)**		**65.8 (27.8)**
Chloramphenicol	**0**	**0-2.1**	**0.6**	**3**		**2.6 (8.9)**
Gentamicin	**0**	**0-8.3**	**3.8**	**2**		**5.3 (1.3)**
Kanamycin	**-**	**0-3.1**	**11.4**	**-**		**10.5 (15.2)**
Streptomycin	**5**	**16.7-35.9**	**38.6**	**-**		**38.2 (15.2)**
Sulfonamide	**-**	**2.2-6.4**	**44.9**	**27**		**64.5 (54.4)**
Tetracycline	**16**	**8.3-36**	**65.8**	**20**		**28.9 (49.4)**
TMS	**3**	**0-0.7**	**1.3**	**-**		**-**

[C] cefotaxime; TMS trimethoprim + sulphonamide; MS – Member State

In Australia, antimicrobial susceptibility testing of *Salmonella* isolates of both human and non-human origin submitted to the Australian Salmonella Reference Centre (ASRC) commenced in May 2000 and was first reported in the 2001 annual report.

Table 5 (APPENDIX 1) summarises the results of susceptibility testing to a panel of 11 antimicrobial agents of 11,723 *Salmonella* isolates from Australian broilers submitted to the ASRC and reported in annual reports for the period 2001 to 2009. Resistance to all agents other than streptomycin is currently low or absent and multiple resistance is also present at a low frequency. There is also a trend for progressively reduced levels of resistance in the time period from 2001 to 2009. Highest resistance levels are reported for the aminoglycoside, streptomycin. The high frequency is due to the high prevalence of this resistance in avirulent *Salmonella* Sofia, the dominant *Salmonella* serovar isolated from broilers.

Of 10,647 *Salmonella* isolates from broilers assessed for cefotaxime resistance between 2002 and 2009 inclusive, only one isolate (serovar Saintpaul isolated in 2007) displayed phenotypic resistance.

Of 11,723 *Salmonella* isolates from broilers assessed for ciprofloxacin resistance between 2001 and 2009 inclusive, no isolates have displayed resistance.

In view of the low resistance status of bacteria isolated from poultry and the judicious use of antimicrobial agents (which are selected from a small group with an average age in excess of 50 years) a surveillance frequency of once every 5+ years is probably sufficient to pick up any changes, especially considering there is an annual survey of resistance in *Salmonella* isolates that could act as a sentinel to identify any significant changes.

RECOMMENDATION 12 (infection prevention - HACCP)

The chicken meat industry has worked closely with FSANZ in the development and implementation of the Primary Production and Processing (PPP) Standard for Poultry Meat (Standard 4.2.2)

PPP Standards aim to strengthen food safety and traceability throughout the food supply chain from paddock to plate. The standard introduces new legal safeguards for growing live poultry and requires poultry growers to identify and control food safety hazards associated with poultry growing.

Poultry processors will continue to be required to identify and control food safety hazards associated with poultry processing (which includes the slaughtering process) and verify the effectiveness of the control measures. Campylobacter and Salmonella are the two main bacteria that can be present on raw poultry and cause illness if the poultry is not cooked or handled correctly. The Poultry Standard aims to lower both the prevalence and levels of these two pathogens in poultry meat, thereby reducing the likelihood of illness occurring. As the prevalence of these organisms is decreased so will the presence of organisms with antibacterial resistance.

As part of preparations for this standard, FSANZ, in association with federal and state government agencies, coordinated a baseline survey to obtain information on the likelihood of live chickens being contaminated on-farm with *Campylobacter* and *Salmonella*, and also the likelihood of their being contaminated after slaughter.

The Poultry Standard (P282) commenced on 20 May 2012, following a two year implementation period. In due course, FSANZ will conduct another poultry survey to determine whether the requirements have been successful in lowering the amount of *Campylobacter* and *Salmonella* in raw poultry.

RECOMMENDATION 13 and 18 (alternatives to antibiotics)

ACMF and the poultry industry are fully committed to disease prevention and high health. Currently the combination of enhanced genetics, biosecurity, nutrition, husbandry and environmental controls maintain the high health status of Australian flocks. However, this is an area of continuous innovation and improvement and a large investment in alternatives to antibiotics has been and continues to be made.

In the five years from 1998/99 to 2002/03, RIRDC (through its Chicken Meat Program) invested approximately $820,000 (or 10.5% of its total budget) on projects with the direct aim of developing alternative to antibiotics generally. These projects were largely targeted towards finding replacement for antibiotics for the control of necrotic enteritis. Investments in other projects related to improving disease recognition and control (including diagnostic tests development and vaccines for bacterial and viral agents) accounted for a further 41% of program expenditure over this period.

In the following six years 2003/4 to 2008/09 (and as the Australian Poultry CRC took over responsibility for funding research in the area of antibiotic alternatives), RIRDC expenditure in this area progressively decreased, but RIRDC still invested more than $720,000 (or more than 4.5% of its total budget) into the antibiotic replacement field, as well as a further ~37% of its total budget in other areas of enhanced disease recognition and control.

Since 2009/10 RIRDC has not invested in any generic 'antibiotic replacement' projects, with all such work being fully handed over to the Poultry CRCs. However, it has continued to fund a significant body of research directed towards enhanced means of diagnosing poultry disease and managing flock health (bacterial, viral and parasitic). Between 2009/10 and 2012/13 it will have invested more than $2,280,000 (or approximately 19% of its total R&D budget) in such areas.

Additionally, the industry continues to try to find new and better ways of enhancing bird performance (and efficiency) through nutritional means which do not rely on antibiotics. As an example, between 2009/10 and 2012/13 the Chicken Meat Program of RIRDC will have invested approximately $2,300,000 (or 19.6% of its total budget) in such areas.

The Australian Poultry CRC which operated from 1 July 2003 to 31 December 2009 spent a total in excess of $15 million (approximately 50% of the total expenditure) on alternatives to antibiotics and improved diagnostics. Investment in this area continues with the Poultry CRC which commenced on 1 January 2010. To the 30 June 2013, actual and forecast expenditure on alternatives to antibiotics will total more than $5 million or approximately 28% of the total budget. In addition to these costs could be added expenditure on scholarships and education.

It is not generally appreciated that a diversity of vaccines are available to protect birds from a large number of bacterial, viral, protozoal and mycoplasma diseases. APPENDIX 2 summarises details of vaccines currently approved by APVMA for use in Australia. A number of the vaccines in this table arose from the investments by RIRDC and the CRC in alternatives.

<u>From the above, it is clear that the poultry industry has a massive commitment to finding the so far elusive alternatives to antibiotics</u>.

RECOMMENDATION 21 (coordination of the resistance management program -EAGAR)

ACMF believes that coordination of antimicrobial resistance management is pivotal to the successful mitigation of the impact of resistance. ACMF encourages the Australian Government to fund the continuation of EAGAR which should include regular external review of its operation to ensure that its procedures and decision making processes remain at the forefront of best practice.

ACMF would welcome the opportunity to respond to any questions that the Standing Committee may have.

Yours sincerely

Andreas Dubs
Executive Director

APPENDIX 1

Table 5: Antimicrobial susceptibility testing of Salmonella isolates from broilers submitted to the Australian Salmonella Reference Centre

Year	Strains tested	Gen 4µg/ml	Kan 16µg/ml	Nal 16µg/ml	Chl 8µg/ml	Amp 8µg/ml	Tet 8µg/ml	Str[1] 16µg/ml	Sul 256µg/ml	Tmp 4µg/ml	Cip 1&4µg/ml	Cef 1µg/ml	Multiple Resistance[2]
2009	1,475	0.3	1.4	0	0.4	6.0	10.4	31.4	6.6	4.3	0	0	3.1
2008	1,408	0	2.2	0	0.2	5.8	12.4	37.9	7.7	6.0	0	0	3.7
2007	1,364	0	1.8	0.1	0.1	5.1	11.1	32.6	7.4	6.2	0	0.1	2.6
2006	1,618	0.1	2.1	0.2	0.4	5.0	13.0	32.9	6.2	5.9	0	0	3.5
2005	1,925	0	3.0	0.2	0.9	6.2	10.3	47.0	7.6	7.3	0	0	4.5
2004	1,008	0.3	3.6	0	1.5	6.5	9.3	45.0	5.8	6.7	0	0	2.9
2003	963	0	1.3	0.1	0.7	9.6	22.5	31.8	4.8	5.1	0	0	2.7
2002	886	0	1.1	0	1.4	6.8	16.8	46.8	6.9	8.0	0	0	3.2
2001	1,076	0	1.1	0.5[3]	1.0	9.9	18.2[3]	74.3[3]	16.4	15.2	0	NR	NR

Gen gentamicin [4][4]; Kan kanamycin [16]; Nal nalidixic acid [16]; Chl chloramphenicol [8]; Amp ampicillin [8]; Tet tetracycline [8]; Str streptomycin [16]; Sul sulfadiazine [256]; Tmp trimethoprim [4]; Cip ciprofloxacin [0.125, 1, & 4]; Cef cefotaxime (3GC) [1]

[1] Most streptomycin resistance was detected in the non-pathogenic serovar subsp II Sofia. For example, in 2006 87.3% of 534 Sofia isolates tested were resistant to streptomycin, while only 6.2% of 1084 non-Sofia broiler chicken isolates were resistant. In 2008, S II Sofia constituted 45.9% of the broiler isolates. Streptomycin resistance was 91.6% and 3.9% amongst Sofia other serovars respectively.

[2] Multiple resistance is defined by the ASRC as Salmonella resistant to 4 or more antibiotics [2009 comparison of salmonella isolates from broiler 3.1%; bovine 1.5%; porcine 68.1%]

[3] Antibiotic concentration in agar lower than other years. Nal 8µg/ml; Tet 4µg/ml and Str 4µg/ml

[4] Breakpoint in µg/ml used in NCCLS single break-point agar method

APPENDIX 2

AUSTRALIAN POULTRY VACCINES (2013)

65 products approved by APVMA, 26 disease agents

Bacteria 5 disease agents

Mycoplasma 2 disease agents

Protozoa 8 disease agent (8 species)

Virus 11 disease agents

#	NAME	IMMUNOGEN	TARGET SPECIES			
VACCINES AGAINST BACTERIAL PATHOGENS [5 bacterial disease agents, 15 vaccines] *Pasteurella multocida, Haemophilus paragallinarum* Types A & C, *Salmonella* spp, *Escherichia coli*, *Riemerella anatipestifer*						
PER 13740	Coryza vaccine containing inactivated *Haemophilus paragallinarum* types A-4 & C-2	*Haemophilus paragallinarum* types A and C inactivated		L	Bre	
PER 12737	HAEMOPHILUS PARAGALLINARUM TYPES A & C	*Haemophilus paragallinarum* types A and C inactivated		L	Bre	
PER12829	E coli vaccine, Custom inactivated / Pigs, Poultry including Chickens and Turkeys	E. coli	B	L	Bre	T
60278	POULVAC I PABAC IV	PASTEURELLA MULTOCIDA (inactivated)	B	L	Bre	T
PER12580	Inactivated *Pasteurella multocida*	*Pasteurella multocida* Inactivated			Bre	T
PER13743	Custom inactivated *Pasteurella multocida* vaccine	*Pasteurella multocida* inactivated			Bre	

#	NAME	IMMUNOGEN	TARGET SPECIES			
PER12740	Inactivated *PASTEURELLA SPP*.	*PASTEURELLA SPP*. Inactivated			Bre	T
PER12856	Pasteurella vaccines / Various livestock / Pasteurella infections	*Pasteurella multocida* inactivated		L	Bre	T,D
PER13099	Custom inactivated *Salmonella spp* vaccine	*Salmonella spp* inactivated	B	L	Bre	T
40728	VAXSAFE ST VACCINE (LIVING)	SALMONELLA TYPHIMURIUM				T
PER13692	Custom duck Salmonella Vaccine	*SALMONELLA* (AUTOGENOUS) (inactivated)				D
PER13246	Salmonella Vaccine for Poultry, Autogenous	*Salmonella spp* inactivated		L	Bre	
PER12576	Salmonella Vaccine, Inactivated / Poultry, Pigs and Cattle	*Salmonella spp* inactivated	B	L	Bre	T
PER12966	*Reimerella Vaccine / Septicaemia*	*Riemerella anatipestifer* inactivated				D
PER13061	*Riemerella and Pasteurella Vaccine / Duck Septicemia and localised infections*	*Riemerella anatipestifer and Pasteurella multocida* inactivated				D
VACCINES AGAINST MYCOPLASMA PATHOGENS [2 mycoplasma species, 2 vaccines] Mycoplasma gallisepticum, M synoviae						
35907	VAXSAFE MG VACCINE (LIVING)	MYCOPLASMA GALLISEPTICUM STRAIN TS-11		L		
47985	VAXSAFE MS VACCINE (LIVING)	MYCOPLASMA SYNOVIAE STRAIN MS-H VACCINE	B	L		
VACCINES AGAINST PROTOZOAL PATHOGENS [7 protozoal (Eimeria) species, 4 vaccines] Eimeria acervulina, E brunetti, E maxima, E mitis, E necatrix, E praecox, E tenella						

#	NAME	IMMUNOGEN	TARGET SPECIES			
54495	EIMERIAVAX 4M (LIVING)	EIMERIA ACERVULINA / EIMERIA MAXIMA / EIMERIA NECATRIX / EIMERIA TENELLA	B	L	Bre	
63631	EIMERIAVAX 3M (LIVING)	EIMERIA ACERVULINA / EIMERIA MAXIMA / EIMERIA TENELLA	B	L	Bre	
61990	PARACOX 8 ANTICOCCIDIAL VACCINE FOR CHICKENS (LIVING)	EIMERIA ACERVULINA HP / EIMERIA BRUNETTI HP / EIMERIA MAXIMA CP / EIMERIA MAXIMA MFP / EIMERIA MITIS HP / EIMERIA NECATRIX HP / EIMERIA PRAECOX HP / EIMERIA TENELLA HP	B	L	Bre	
62055	PARACOX-5 ANTICOCCIDIAL VACCINE FOR CHICKENS (LIVING)	EIMERIA ACERVULINA HP / EIMERIA MAXIMA CP / EIMERIA MAXIMA MFP / EIMERIA MITIS HP / EIMERIA TENELLA HP	B			
VACCINES AGAINST VIRAL PATHOGENS [11 viral disease agents, 44 vaccines] [34 living, 10 inactivated] Avian Encephalomyelitis Virus, Avian Influenza H5N2, Chicken Anaemia Virus, Egg Drop Syndrome 76 Virus, Fowl Adenovirus, Fowl Pox Virus, Infectious Bronchitis Virus, Infectious Bursal Disease Virus, Infectious Laryngotracheitis Virus, Marek's Disease Virus / Herpes Virus Of Turkeys, Newcastle Disease Virus						
38994	POULVAC AEI	AVIAN ENCEPHALOMYELITIS VIRUS (I STRAIN) (LIVE)		L	Bre	
51877	INTERVET NOBILIS AEV VACCINE	AVIAN ENCEPHALOMYELITIS VIRUS (LIVE)	B	L	Bre	
61777	NOBILIS INFLUENZA H5N2	AVIAN INFLUENZA VIRUS TYPE A, H5N2 , INACTIVATED	B	L		
48988	CAV VACCINE	CHICKEN ANAEMIA VIRUS (LIVE) STRAIN 3711			Bre (pre-lay)	
58408	INTERVET NOBILIS CAV P4 VACCINE	CHICKEN ANAEMIA VIRUS (LIVING, ATTENUATED) STRAIN 26P4				

#	NAME	IMMUNOGEN	TARGET SPECIES			
39915	EGG DROP SYNDROME VACCINE	AVIAN HAEMAGLUTINATING VIRUS - KILLED / FORMALDEHYDE	B	L	Bre	
50008	NOBILIS EDS INACTIVATED VACCINE FOR LAYING HENS	EGG DROP SYDROME 76 VIRUS STRAIN BC 14 / OIL ADJUVANT		L		
58494	NOBILIS EDS + ND COMBINED INACTIVATED VACCINE AGAINST EDS'76 AND NEWCASTLE DISEASE	EGG DROP SYDROME 76 VIRUS STRAIN BC 14 / NEWCASTLE DISEASE VIRUS CLONE 30	B	L	Bre	
52390	INTERVET NOBILIS FAV VACCINE	LIVE FOWL ADENOVIRUS (inclusion body hepatitis)			Bre (pre-lay)	
38988	WEBSTERS FOWL POX VACCINE (M STRAIN, LIVE VIRUS, SPF)	FOWL POX VIRUS STRAIN M (LIVING)	B		Bre	T
40542	INTERVET NOBILIS FOWL POX VACCINE	FOWL POX VACCINE (LIVING)	B	L	Bre	T
60345	FOWL POX VACCINE #2	FOWL POX VIRUS (LIVING) GROWN IN SPF CHICKEN CELL CULTURE				
35759	INTERVET NOBILIS IB VACCINE	INFECTIOUS BRONCHITIS VIRUS (POULTRY) (LIVE)	B	L	Bre	
39006	WEBSTERS INFECTIOUS BRONCHITIS VACCINE (VIC S STRAIN, LIVE VIRUS, SPF)	INFECTIOUS BRONCHITIS VIRUS STRAI VIC S	B	L	Bre	
39007	WEBSTERS INFECTIOUS BRONCHITIS VACCINE-ARMIDALE A3 STRAIN-LIVE VIRUS	INFECTIOUS BRONCHITIS VIRUS STRAIN ARMIDALE A3	B	L	Bre	
39008	WEBSTERS INGHAM STRAIN INFECTIOUS BRONCHITIS VACCINE (LIVE VIRUS, S.P.F.)	INFECTIOUS BRONCHITIS VIRUS (POULTRY)	B	L	Bre	
49236	RCI OZ IB VACCINE INFECTIOUS BRONCHITIS VACCINE	INFECTIOUS BRONCHITIS VIRUS (POULTRY) [LIVE]				

#	NAME	IMMUNOGEN	TARGET SPECIES			
55222	VAXSAFE IB VACCINE (LIVING)	INFECTIOUS BRONCHITIS VIRUS (INGHAM STRAIN) - LIVE	B	L	Bre	
59674	INFECTIOUS BRONCHITIS VACCINE (INGHAM STRAIN, FD)	INFECTIOUS BRONCHITIS VIRUS (INGHAM STRAIN) - LIVE	B	L	Bre	
46011	POULVAC BURSA F	INFECTIOUS BURSAL DISEASE VIRUS STRAIN V877 (LIVE)	B		Bre	
38975	WEBSTERS BURSAVAC K INFECTIOUS BURSAL DISEASE VACCINE (OIL ADJUVANTED INACTIVATED V877 STRAIN VIRUS)	INFECTIOUS BURSAL DISEASE VIRUS (IBD) STRAIN V877				
49421	NOBILIS GUMBORO INACTIVATED VACCINE	INFECTIOUS BURSAL DISEASE VIRUS (STRAIN D78) (INACTIVATED)	B	L	Bre	
54684	POULVAC I IBD	INFECTIOUS BURSAL DISEASE VIRUS (IBD) STRAIN V877 INACTIVATED		L		
56537	VAXSAFE IBD VACCINE (LIVING)	INFECTIOUS BURSAL DISEASE VIRUS STRAIN V877 (LIVE)	B	L	Bre	
58353	NOBILIS GUMBORO + ND COMBINED INACTIVATED VACCINE AGAINST GUMBORO AND NEWCASTLE DISEASE	INACTIVATED GUMBORO VIRUS / INACTIVATED NEWCASTLE DISEASE VIRUS ANTIGEN	B	L	Bre	
39890	POULVAC LARYNGO A20	INFECTIOUS LARYNGOTRACHEITIS VIRUS STRAIN A20 (LIVE)	B	L	Bre	
50573	POULVAC LARYNGO SA2	INFECTIOUS LARYNGOTRACHEITIS VIRUS STRAIN S.A.2 (LIVE)	B	L	Bre	
59802	INTERVET NOBILIS ILT VACCINE	INFECTIOUS LARYNGOTRACHEITIS VIRUS (ILT) SERVA STRAIN (L)		L	Bre	

#	NAME	IMMUNOGEN	TARGET SPECIES			
50538	VAXSAFE HVT VACCINE (LIVING)	HERPES VIRUS OF TURKEYS (HVT) STRAIN FC 126				
53591	HVT-CA VACCINE	HERPES VIRUS OF TURKEYS LIVING	B	L	Bre	
55741	MAREXINE CA (LIVE)	HERPES VIRUS OF TURKEYS (HVT) STRAIN FC 126	B	L	Bre	
63411	VAXSAFE SBH VACCINE (LIVING)	HERPES VIRUS OF TURKEYS STRAIN FC126 (SEROTYPE 3) / MAREK'S DISEASE VIRUS STRAIN SB-1 (SEROTYPE 2)		L	Bre	
50485	VAXSAFE RIS VACCINE (LIVING)	MAREKS DISEASE	B	L	Bre	
52379	MDV-1 LIVING VACCINE	MAREKS DISEASE				
53143	NOBILIS RISMAVAC	MAREK'S DISEASE LIVE VIRUS STRAIN CVI988				
53224	POULVAC HVT CA VACCINE (SEROTYPE 3, LIVE MAREK'S DISEASE VIRUS)	LIVE MAREK'S DISEASE VIRUS SEROTYPE 3				
56670	POULVAC CVI VACCINE (SEROTYPE 1, LIVE MAREK'S DISEASE VIRUS)	MAREK'S DISEASE LIVE VIRUS STRAIN CVI988				
53259	POULVAC CVI/HVT VACCINE (SEROTYPES 1 AND 3, LIVE MAREK'S DISEASE VIRUSES)	HERPES VIRUS OF TURKEYS (HVT) STRAIN FC 126 / MAREK'S DISEASE LIVE VIRUS STRAIN CVI988				
53275	POULVAC HVT CF VACCINE (SEROTYPE 3, LIVE MAREK'S DISEASE VIRUS)	MAREK'S DISEASE VIRUS, SEROTYPE 3, HVT STRAIN FC 126				
42019	WEBSTERS NEWCASTLE DISEASE VACCINE "V4 STRAIN" SPF (LIVING)	NEWCASTLE DISEASE STRAIN V-4 VIRUS	B	L	Bre	
53811	NOBILIS NEWCAVAC VACCINE AGAINST NEWCASTLE DISEASE IN POULTRY	NEWCASTLE DISEASE VIRUS ANTIGEN INACTIVATED	B	L	Bre	

#	NAME	IMMUNOGEN	TARGET SPECIES			
59138	POULVAC NEWCASTLE IK VACCINE (INACTIVATED)	NEWCASTLE DISEASE VIRUS ANTIGEN INACTIVATED				
59142	VAXSAFE ND VACCINE (LIVING)	NEWCASTLE DISEASE STRAIN V-4 VIRUS	B			
63275	INTERVET NOBILIS LIVE NEWCASTLE VACCINE V4	NEWCASTLE DISEASE STRAIN V-4 VIRUS				

B Broiler Bre Breeder D Duck L Layer T Turkey

REFERENCES

CIPARS 2008 Government of Canada (2011). Canadian Integrated Program for Antimicrobial Resistance Surveillance (CIPARS) 2008. Guelph, ON, Public Health Agency of Canada.

DANMAP 2011 Danish Integrated Antimicrobial Resistance Monitoring and Research Programme (DANMAP) (2012). Use of antimicrobial agents and occurrence of antimicrobial resistance in bacteria from food animals, food and humans in Denmark. ISSN 1600-2032. Copenhagen, National Food Institute, Statens Serum Institut.

EFSA 2012 European Food Safety Authority and European Centre for Disease Prevention and Control (2012). "The European Union Summary Report on antimicrobial resistance in zoonotic and indicator bacteria from humans, animals and food in 2010." EFSA J 10(3)(2598): [233 pp.].

FSA 2008 Barlow, R. and K. Gobius (2008). Pilot survey for antimicrobial resistant (AMR) bacteria in Australian food. Cannon Hill, Queensland, Food Science Australia.

MARAN 2012 Monitoring of Antimicrobial Resistance and Antibiotic Usage in Animals (MARAN) (2012). Monitoring of Antimicrobial Resistance and Antibiotic Usage in Animals in the Netherlands in 2010/11

NARMS 2011 NARMS (2012). Retail Meat Annual Report 2011. National Antimicrobial Resistance Monitoring System**:** 1-82