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Anti Microbial Resistance (AMR)

1.1 Introduction

Antimicrobial agents are specific drugs used to treat infections caused by bacteria in particular. It is an essential medicine for both animal and human health. Therapeutic use of Antibiotics in infected animals can make the difference between cure and death. They are invaluable, but some bacteria have demonstrated full or partial resistance to different microbial agents to which it originally was sensitive. This phenomenon is called Anti Microbial Resistance (AMR). Under such situation the standard anti microbial treatments become ineffective and infections may persist increasing risk of spread.

The evolution of resistant strains is a natural phenomenon that happens when micro-organisms are exposed to antimicrobial agents, and resistant traits can be exchanged between certain types of bacteria. Misuse of antimicrobial medicines accelerates this natural phenomenon and poor infection control practices encourages the spread of AMR. Potential AMR public health risk can be associated with the use of Antibiotics in food producing animals. Furthermore many emerging infectious diseases are due to circulation of novel clones of drug resistant bacteria.

Human and animal share the same micro-organisms and 60% of the recently emerging diseases are of animal origin. It is a key component in concern in both animal and public health today. Appropriate use of anti microbial agents is a critical issue in animal welfare, food safety and food security policies too. Therefore it is important to control the use of Antimicrobial agents in animal population; strictly restricting the use through Veterinarians whose ethics is guarantied by a Veterinary statutory body as laid down by law.

1.2 Mechanism of AMR

Therapeutic use of antibiotics in human medicine started as far as year 1940 and the first resistance was noted in late 1950s. Antibiotics have been reported to be used routinely in Veterinary medicine and Agriculture since 1950s. By 1960s the strains of *Salmonella enterica* emerged in Europe and USA, resistant to commonly used antibiotics causing clinical diseases in calves and it was considered as a public health risk. Micro-organisms are present everywhere and can adapt to survive in extreme conditions like heat, cold, radioactivity etc... In contact with antibiotics, sensitive bacteria will get destroyed and the resistant will survive and develop.

Therefore any use of antimicrobial will lead to the selection of resistant bacteria. Bacteria have an ability to exchange genetic material and an ability to multiply. The higher the capacity of these characters the higher the adaptability. The protection mechanisms have developed in bacteria via genetic alterations to be able to survive to antibiotics in the ecosystem. Genetic alterations occur either due to spontaneous mutation within the bacterial chromosome or by acquisition of entire resistance genes from other sources such as horizontal gene transfer which can occur through number of ways such as conjugation, transformation, transduction etc. Plasmids are extra chromosomal genetic elements which carry genes that encode for antimicrobial resistance. Some carry multiple resistance genes making it possible for a bacteria to acquire multi drug resistance, following a single gene transfer event.

Genetic alterations can result in resisting the action of antibiotics by four different mechanisms identified; decreased uptake of drugs, enzymatic inactivation or modification of the drug, structural modification of the target molecule and production of an alternative target.

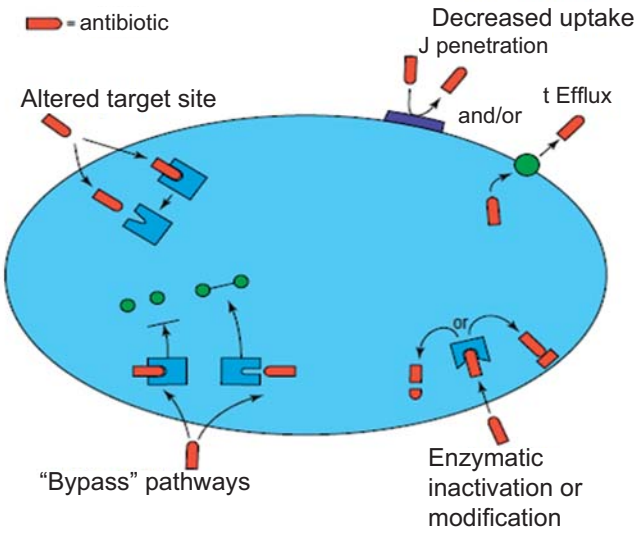


Figure 01 : Four major biochemical mechanisms of antibiotic resistance.

Antimicrobial resistance in animal population has been recorded in several occasions in the past; Penicillin in 1974; Trertacycline in 1997; Avoparacin in 1999; Bacitracin, Spiromycine, Tylosin, Viginiamycine, in 2000. Strain of Salmonella enteric Typhimurium DT204b was found resistant to nine microbial drugs causing clinical disease, traced to pre-shredded important lettuce: 2012. Denmark surveillance study also reports that the monophasic Salmonella Typhimurium isolates from pigs had high resistance to Ampicillin (65%), Streptomycine (67%) and Sulphonamide (67%), Tetracycline (65%).

Multi-drug resistant clones of *Strptococcus pnuemoniae* in circulation around the world that cause pneumonia, ear infection and meningitis and multi-drug resistant uropathogenic *Eschrchia coli* are becoming common in human and animal health.

Problems arise with AMR

- AMR leads to the limitation of treatment options for infections and diseases caused by resistant bacteria resulting in
  -Extended period of treatment
  -Usage of more than one drug to control the diseases
  -Usage of second-line agents (modern and expensive drugs)
  -Not possible to treat with available drugs

- AMR which develops in zoonotic pathogen can enter human food chain..

- Most of the resistant determinants are located in mobile genetic elements and they may use commensal bacteria such as Escherichia coli, Enterococci as vehicles to transport in the population and transferred to pathogenic organisms.

- Livestock professionals are at risk of acquiring exposure to AMR bacteria from the animals they work with. Eg : spread of Multi-Resistance *Staphylococcus aureus* in livestock professionals.

The most common reason for drug resistance is inappropriate use of antimicrobials. In developing countries socio-economic and behavioural factors also contribute largely where anti microbial resistance surveillance programs are in rudimentary stage or not existing.

Pharmaceutical industry is reluctant to develop new antimicrobial drugs. Their painful experience is that the costs of development are not recovered before the drugs are rendered inefficient.

How to overcome AMR

Use of responsible and prudent use of antimicrobials in human and Veterinary medicine is a critical component. Early and exact diagnosis of infection, using appropriate drug at the correct dosage, and knowledge on resistance of bacteria are important concepts to be kept in mind, in order to prevent AMR.

The OIE Global Conference on "Responsible and Prudent use of antimicrobs in animals" held in 2013 concluded with following recommendations,

- Develop/ update a national system collecting data on the monitoring of AMR in relevant animal pathogens and quantities of antimicrobial agents used in food producing animals,
- Develop / update appropriate legislation and regulation on import, marketing and use of quality Veterinary medicinal products in interaction with competent authorities and ensure efficient implementation.
- Strengthen Veterinary Statutory Bodies capacity and authority to institute continuing professional development and continuing education programs directed towards prudent use of antimicrobial agents and those that including diagnostic tests in animal health.
- Strengthen Veterinary services, to implement good governance and legislation related to antimicrobial agents in compliance with OIE and Codex Alimentarius standards; and to help them to fight against the use of unlicensed/ counterfeit products.
- Research to improve the understanding of the efficacy of current antimicrobial agents while minimizing the development of resistance and find alternatives that could be used in animal production for antimicrobial agent substitutions.
- To develop risk assessment and to carefully evaluate practices of use of antimicrobial agents that are not intended to combat animal diseases.

The World Animal Health Organization (OIE) together with the World Health Organization (WHO) and the Food and Agriculture Organization of United Nation (FAO) work closely under the "Tripartite Alliance" to address the AMR as a major critical issue inaddtion to the control of zoonosis.

References

1. Danish Integrated Antimicrobial Resistant Monitoring and Research Program (DANMAP), 2012. National Veterinary Institute, National Food Institute, Technical University of Denmark.
2. World Animal Health Organization (OIE) Antimicrobial Resistant Portal(AMR) http://www.oie.int/for-the-media/amr

2. Status of Livestock Diseases

2.1 Bovine Diseases

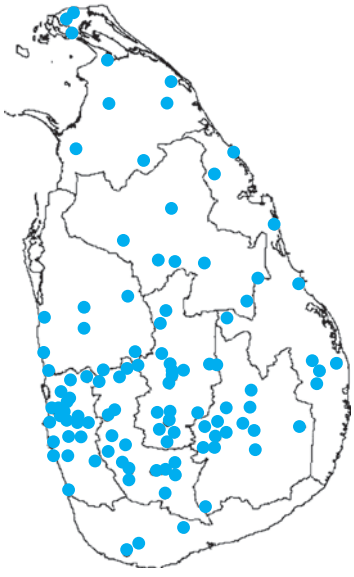
2.1.1 Bovine Babesiosis

A total of 800 cases of Bovine Babesiosis have been reported during the third quarter of 2013. The pre-immunization program continued with immunizing 1000 calves in this period. The animals were immunized against *B. bovis* and *B. bigemina* strains .

Pre-immunization
July-Sept 2013

District	No. of Animals pre-immunized
Gampaha	40
Colombo	100
Kegalle	40
Ratnapura	60
Badulla	660
Jaffna	100
Total	1000

Spatial Distribution of Bovine Babesiosis



2.1.2 Bovine Brucellosis :

In the third Quarter 2013, there were 58 suspected cases of Bovine Brucellosis; recorded at Padiyatalawa, Lankapura, Mannar, Musali, Vavuniya, Oddusuddan, Balangoda, Ambalantota, Siyambalanduwa, Mahara, Kalutara, and Marandagahamula Veterinary ranges. RBPT is carried out at Veterinary Investigation Center level as the screening test in suspected herds and as further confirmatory testing, CFT is carried out at Veterinary Research Institute. Vacnication programme is implemented through the respective Veterinary Investigation Centres at locations identified to be at risk.

Bovine Brucellosis cases July-Sept 2013

Province	Cases
Eastern	1
North Central	2
Northern	20
Sabaragamuwa	1
Southern	20
Uva	4
Western	10
Total	**58**

2.1.3. Black Quarter

A total of 19 Black Quarter cases were reported with a Case Fatality Rate at 100%. The extensive outbreak was observed at Vavunia in which 15 cattle succumbed to death. Sporadic cases were detected in 3 separate localities at Kurunegala, Puttlam and Trincomalee. The Cattle population at risk were vaccinated to contain the disease, resulting in vaccination of 33,699 cattle in Anuradhapura, Polonnaruwa, Puttlam, Mannar, Mullaitivu, Vavuniya, Ampara, Batticaloa, Trincomalee and Badulla districts.

Black Quarter Cases July- Sept 2013

District	Cases	Deaths
Vavuniya	15	15
Kurunegala	2	2
Puttlam	1	1
Trincomalee	1	1
Total	**19**	**19**

2.1.4 Foot and Mouth Disease

Foot and Mouth Disease was not reported from any part of the country. Similarly there were no cases reported in the same period of 2012.The only outbreak during this year was detected at Uhana Veterinry range in Eastern Province during the month of June. Prophylactic vaccination program continued in the country with 12,8921 number of cattle, buffalo and goats being vaccinated during this period.

Bovine Brucellosis cases July-Sept 2013

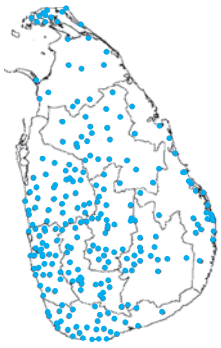
Province	July	Aug	Sep
Western	5219	3414	1875
Central	360	-	-
North Central	16540	4722	10388
North Western	17221	18456	9810
Northern	2204	947	3608
Eastern	5091	11656	17410
Total	46635	39195	43091

2.1.5 Mastitis :

In the third quarter, 2013 a total of 3303 clinical cases of mastitis were reported. This is in comparison to the 2935 cases reported in the same period in 2012. Locally prepared udder infusion lactating cow therapy, containing Ampicillin and Cloxacllin are issued at field level and it contributes to reduce te cost involved in treating mastitis cases in cows.

Monthly distribution of cases of Mastitis :July-Sept 2013

Month	Cases
July	1117
August	1130
September	1073
Total	**3320**



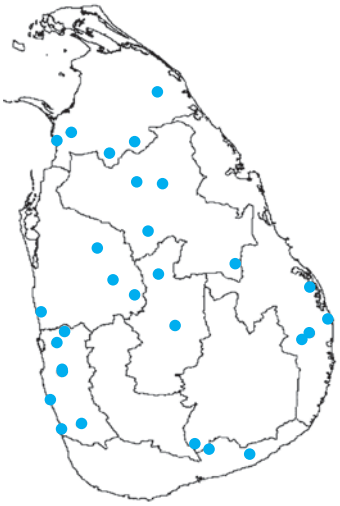
2.2 Caprine Diseases

2.2.1 Contagious Pustular Dermatitis :

During the 3rd quarter of 2013, 441 cases of Contagious Pustular Dermatitis has been reported with death of 6 goats. More than 80% of the cases have been confined to three provinces namely Northern, Eastern & North Central with few cases in other provinces.The same period in year 2012 reported 208 cases and 9 deaths.An auto vaccine is locally produced at District Veterinary Investigation Centre level, based on the demand by relevant Veterinary Surgeon and also with the farmer cooperation.

Distribution of CPD Cases July-Sept 2013

Month	Cases	Deaths
July	111	1
August	122	2
September	208	3
Total	**441**	**6**



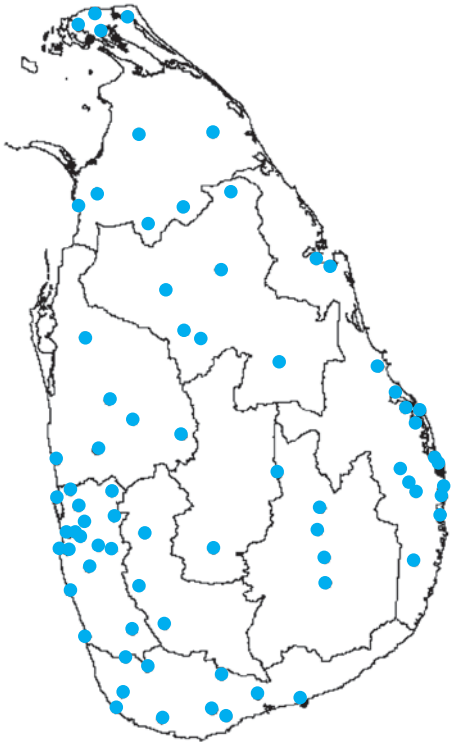
2.3 Poultry Diseases

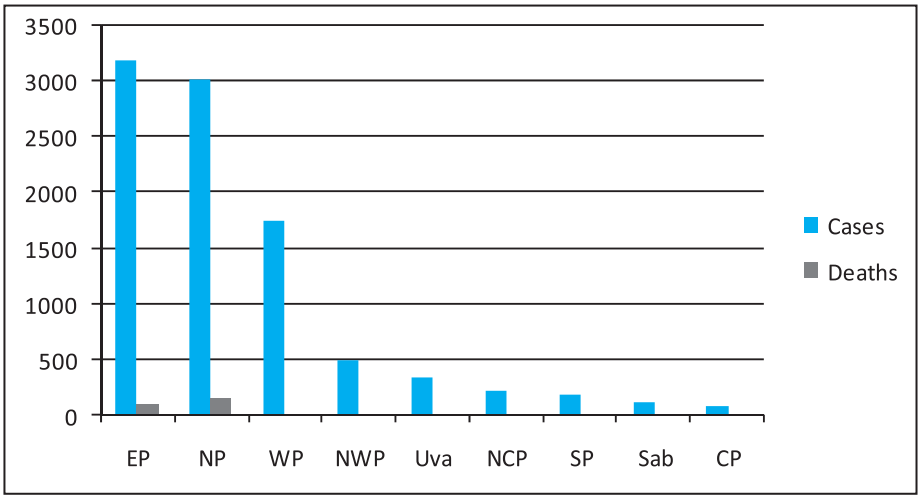
2.3.1 Fowl Pox :

Fowl Pox is reported from all over the island with a total of 9412 cases. Ampara, Jaffna, Batticaloa, Colombo districts reports higher incidences. Fowl pox is a disease that can be easily prevented by vaccination. However, vaccination coverage appears to be very low and clinical cases are found very often witnessing the endemic status in the country.

Month	Cases	Deaths
July	2639	77
August	2887	101
September	3886	128
Total	**9412**	**306**

Occurrence of Fowl Pox July-Sept 2013

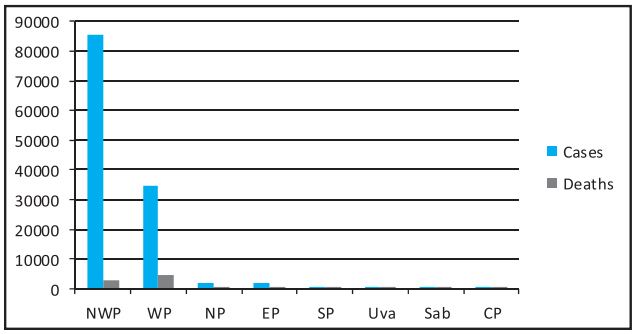




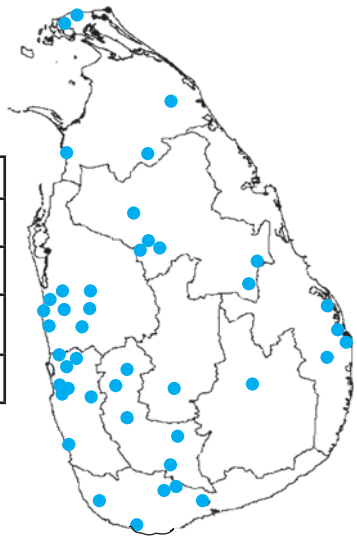
2.3.2 Gumboro Disease :

Gumboro remains as the major poultry disease prevail in the country. Almost 8,000 birds succumbed to death during this three months period (July, Aug, Sept) due to this disease. In spite of large number of vaccines registered and used in the country, the disease is found in endemic status especially in poultry-belt area.

Distribution of Gumboro Cases : July-Sept 2013



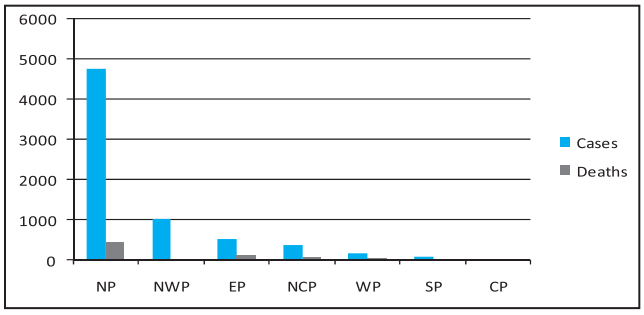
Month	Cases	Deaths
July	30953	812
August	56824	4519
September	37164	2523
Total	**124941**	**7854**



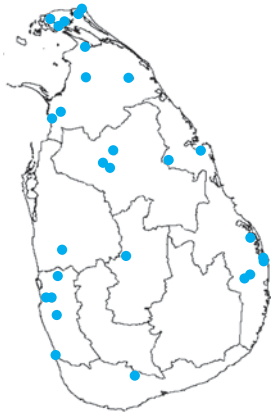
2.3.3 Newcastle disease :

A total of 6830 cases of NCD was reported with a 1% CFR during the period under review. Mullaitivu, Jaffna and Kurunegala Districts report higher incidence of the disease. NCD Vaccine is locally produced at VRI. A total of 1,817,600 vaccine doses were issued to the field during this period. Apart from the hundred doses ampoules which are used free of charge in small scale operation, five hundred doses ampoules are also available at VRI for Rs. 100.00 to support the medium scale and large scale operation.

Occurrence of NCD : July-Sept 2013



Month	Cases	Deaths
July	3031	271
August	1766	138
September	2033	339
Total	**6830**	**748**



2.3.4 Salmonellosis :

A total of 9097 Salmonellsis cases with a Case-Fatality Rate (CFR) at 2% has been reported in the third quarter 2013. This is in comparison to the 9122 cases and a same CFR in the July-Sept 2012. Preventive vaccination against Salmonellosis including Pulloram disease and Fowl typhoid is carried out extensively in commercial poultry operation and also in limited number of Poultry Breeder Farms.

Distribution of Salmonella Cases and Deaths : July-Sept 2013

Province	Cases	Deaths
Central	102	20
Eastern	10	10
North Western	8106	87
Northern	473	5
Sabaragamuwa	21	13
Western	372	42
Total	**9097**	**167**

3. 1 Highly Pathogenic Avian Influenza Surveillance Program : July-Sept 2013

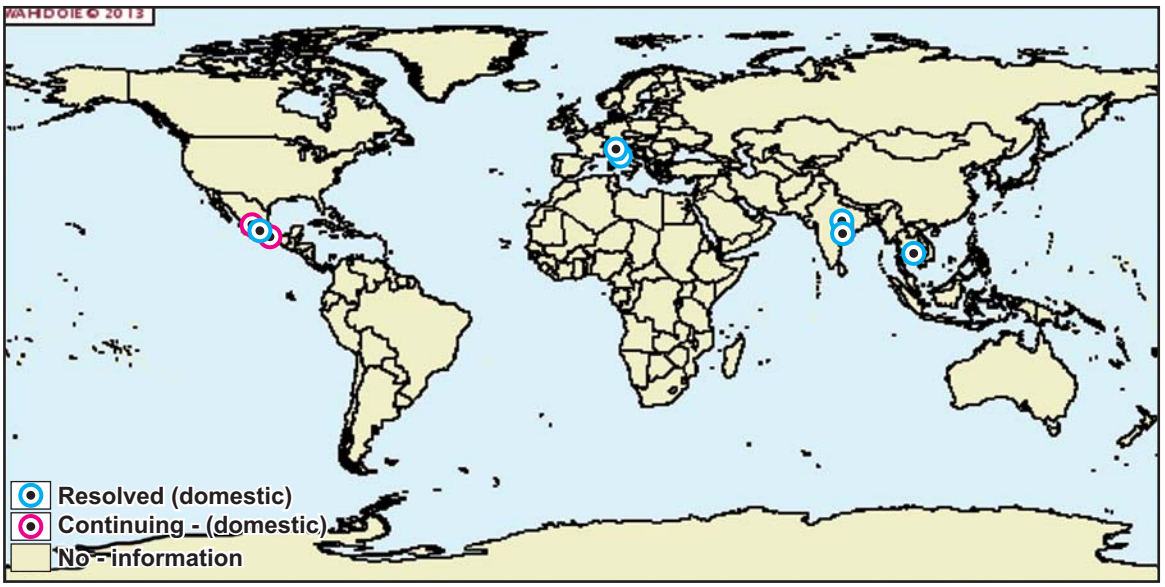
Se. No.	District	Commercial Poultry Serum Samples		Pooled dropping and cloacal swabs	
		No. Tested	Results	No. tested for AIV *	Results
1	Anuradhapura	90	(-) ve	-	-
2	Badulla	45	(-) ve	-	-
3	Chilaw	30	(-) ve	-	-
4	Homagama	230	(-) ve	180	(-) ve
5	Jaffna	15	(-) ve	45	(-) ve
6	Kandy	60	(-) ve	-	-
7	Matara	30	(-) ve	-	-
8	N- Eliya	60	(-) ve	-	-
9	Trincomalee	30	(-) ve	-	-
10	Vavuniya	90	(-) ve	33	(-) ve
11	Kurunegala	45	(-) ve	-	-
12	Gampaha	135	(-) ve	-	-
	Total	860		258	

*** Avian Influenza Virus**

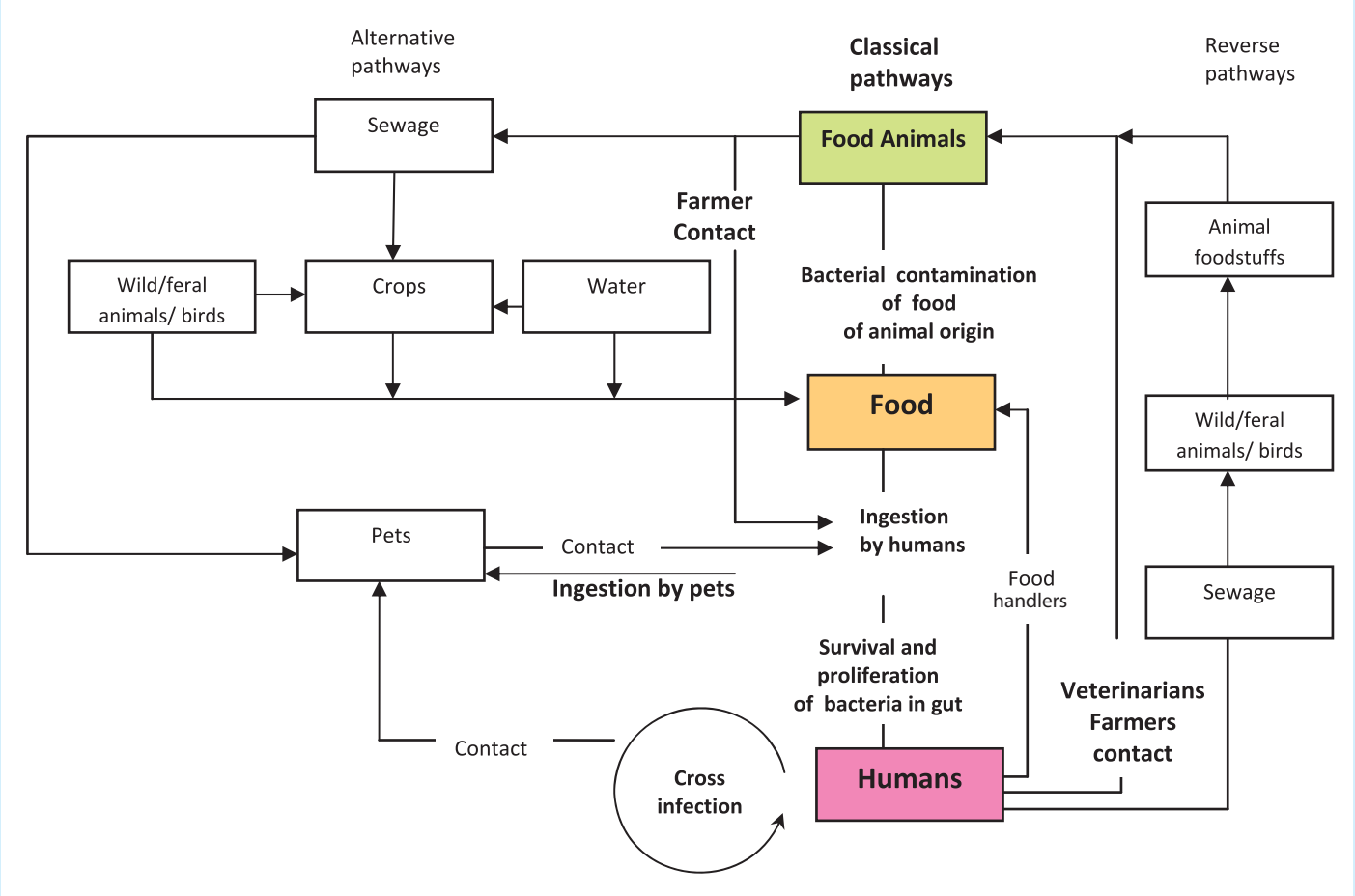
3.2 Global Distribution of Notifiable Avian Influenza: July-Sept 2013

Virus Type	Country
H5N1	Cambodia, Nepal, India
H7N3	Mexico
H7N7	Italy

3.3 Global situation of HPAI outbreaks



Gastro Intestinal micro-organisms with different response to Antibiotics in animals and human



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