The joy of poultry

Dr Robyn Alders (BSc (Vet) ’83, BVetSc ’84) is Associate Professor at Tufts University’s International Veterinary Medicine Program. She has spent the greater part of her career overseas. Nevertheless, her work directly affects the health and welfare of Australians and the global implications of her research are far reaching. From Boston, Massachusetts she answered questions put to her by Diana Simmonds

Q How did you start on the path you’ve taken? (Where do you come from and how did it all happen?)

A I was born and raised on a beef cattle and sheep farm just outside Taralga, on the Southern Tablelands of NSW. Much of my childhood was spent on the back of a horse and I entered the Faculty of Veterinary Science at Sydney University with the intention of becoming a specialist in equine medicine. Somewhere along the way, I became interested in international development (my time at Wesley College probably had something to do with this) and, after completing my PhD in veterinary immunology at the John Curtin School of Medicine at ANU, I made the unusual decision to work on a local contract at the new School of Veterinary Medicine within the University of Zambia. I worked there for three years and it’s one of the best decisions I have ever made.

As a consultant to the FAO (United Nations Food and Agricultural Organisation) your title is Senior Technical Advisor - Poultry Health and Production. You have more than 20 years experience and a PhD in immunology. Why poultry?

Why poultry? Well, I wish I could say that was because of the great lectures given to us by Dr Sinkovic in the final year of our vet course. Sadly, while I now understand that Dr Sinkovic did deliver excellent lectures, I was not really interested. However, when I arrived in Southern Africa, I came to understand that in their mixed farming systems 10-20 per cent own cattle, 30-40 per cent own goats and sheep, but almost everyone owns a few village chickens. These chickens are a living bank that can be sold or bartered to pay school fees, or buy medicine and clothes. Poor families rarely consume their birds as they consider this an absolute luxury. They never know what crisis tomorrow may bring. By preventing outbreaks of Newcastle disease in these village flocks through regular vaccination using thermo-tolerant vaccine (developed through research funded by the Australian Centre for International Agricultural Research), families can both increase their flock size and enjoy a chicken or egg dish. Almost everywhere you travel in the developing world, village poultry are part of the fabric of life. This is certainly the case in Indonesia where I now regularly make inputs into the Avian Influenza Control Program implemented by the Indonesian Ministry of Agriculture and the FAO.

Highly Pathogenic Avian Influenza (HPAI) is endemic in Indonesia. What does this mean for Australia (and the rest of the world) in terms of health, disease prevention and how it may spread?

The current HPAI crisis has an interesting history. Avian Influenza subtype H5N1 was identified in Indonesia in 2003 and a number of other Southeast Asian nations. Indonesia is not an exporter of poultry or poultry products and nations such as Papua New Guinea and Timor-Leste, that share a land border with Indonesia, currently remain free of HPAI. Veterinary services in Indonesia suffered significant cuts in funding following the Asian economic crisis and the introduction of decentralisation effectively removed the chain of command so important to animal disease control. It’s a little like the incursion of equine influenza (EI) into Australia. I believe that the investigation of the EI outbreak found that the reduction in support of and attention to animal quarantine regulations were significant. The Australian animal health network mounted an effective control response but the number of horses and geographical area involved was relatively small. Indonesia has 444 districts, 33 provinces, 17,000 islands and many, many tens of million poultry.

The HPAI control and eradication program in Indonesia is based on Participatory Disease Surveillance (PDS) techniques developed in the campaign against rinderpest (cattle plague). What does PDS actually mean in practical terms?

Participatory disease surveillance relies on the knowledge of farmers to identify disease in their animals and then share that information with animal health teams trained in participatory methodologies. This approach is very useful in situations were laboratory services are either not easily accessible or not functioning. This approach worked well with rinderpest as the clinical signs of disease are relatively distinctive. The Indonesian Ministry of Agriculture, FAO and Tufts University have devoted considerable attention to adapting these participatory methodologies to working with poultry (as chickens infected with HPAI can look just like birds infected with Newcastle disease or fowl cholera); and developing participatory responses that enable communities to be involved with outbreaks control measures. The program has moved on from PDS to participatory disease prevention and control that supports the strengthening of veterinary services and community empowerment.
The FAO estimates that rinderpest is now almost eliminated with the exception of a relatively small area of Africa encompassing northern Kenya, southern Somalia and parts of Ethiopia. As this area is the most remote and lawless region in the world is eradication realistic?

Dr Bryony Jones, a British veterinarian who has worked on the Rinderpest Eradication Campaign for many years, told me recently that structured African and Indonesian chooks with their keepers; Robyn Alders consults (above)
surveillance is being conducted in the areas that you mentioned right now and that if no trace of disease is found, then eradication will be proclaimed in early 2009.

And as Indonesia consists of 1.4 billion chooks and 230 million people who speak a number of languages across the islands, how does an eradication program work there?

The HPAI control program consists of surveillance, outbreak response, prevention activities and monitoring. In April of this year, a new disease prevention and control system was introduced that enables all villages in the program area to be classified as “Apparent Freely,” “Infected,” “Controlled” or “Suspect.” Each of these categories has a set of activities to be implemented in collaboration with communities and commercial producers that aim to either keep areas free of disease or to move infected areas towards freedom and then maintaining that status. So while eradication is clearly a long-term goal, in the short-term the aim is to work village by village, poultry farm by poultry farm and district by district to control disease and then to keep it out. The bio-security practices put in place will also help to improve farmers’ understanding of disease transmission and reduce the circulation of other poultry diseases. This should contribute to improved poultry production and this is important in an increasingly urbanised society.

Given that birds fly, poo and die, is eradication really possible?

As I mentioned before, eradication will not happen quickly, however, it must remain the long-term goal. Putting systems in place to control and eventually eradicate HPAI will also make us better prepared to deal with the next emerging infectious disease.

I’m puzzled. On the one hand green groups say that raising cattle for human consumption is harmful to the environment. On the other, huge efforts have been made to eradicate rinderpest in cattle that are basically status symbols. Can you explain?

I guess most things in life are contextual. Cutting down rainforests in the Amazon to raise cattle would not appear to be a great move from the point of view of ecological sustainability. However, there are ecosystems that have evolved over centuries where grazing and browsing wildlife and livestock are an integral part of the system. Cattle are important status symbols in many cultures. They also make crucial contributions to human nutrition (in terms of meat and milk) and traction (oxen power ploughs, wagons and power mills) to name the most obvious benefits. With increasing international trade, taking one killer disease out of the equation is a step in the right direction. It also reminds us that some key diseases can be contained and eventually eradicated if nations decide to work together towards that common goal.
The first documented outbreak of HPAI occurred in Italy in 1878. Outbreaks of the disease have been rare until the early 1990s when outbreaks became more frequent. In Australia, we’ve had two known outbreaks prior to 1990 and three subsequently but none have involved the H5N1 subtype. Wild waterfowl are considered the reservoir of HPAI virus and normally infection is asymptomatic. Most commentators associate the huge increase in commercial poultry production (more than doubled since the 1980s), increased international trade and increasing human population with the increase in HPAI outbreaks.

There was an item in the press recently citing a new study, which reveals that battery hens are healthier than free-range birds. What do you think of that?

I don’t know the press item that you mentioned, but once again, it would depend on the specific conditions concerned. Birds raised in cages may have fewer disease outbreaks if good bio-security is practiced but they also need to be fed a balanced diet and have adequate space. Free-range conditions vary considerably from commercial birds having access to a limited open range with feed being supplied entirely via feed troughs to village poultry that free-range over a wide area and scavenge for almost all their feed. As free-range birds may come into contact with wild birds, this may increase their likelihood of being exposed to some diseases, including HPAI. Once disease incursion occurs, it usually spreads more slowly in free-range poultry than in intensively raised poultry.

We worry about the HPAI virus mutating and becoming a fully human disease. Is this likely to happen? Is it preventable?

It is impossible to predict when a HPAI virus, and it may be a subtype other than H5N1 that shifts or re-assorts to become a strain that transmits between people. The assumption is that the more HPAI virus there is, the greater the probability of a new pandemic strain emerging. We are working to reduce the amount of HPAI virus in the environment but it is currently impossible to guarantee that another human influenza pandemic can be prevented. All it takes is one shift, one re-assortment event and it will be difficult to contain because of the speed with which people now move around the globe.

Is AI moving or likely to move into other bird populations - ratites (large flightless birds), for instance?

There have already been reports of emus, ostriches and rheas being infected with Low Pathogenicity AI viruses. In 2004, there was an outbreak of a different strain of HPAI known as H5N2 in ostriches in South Africa.

Can you tell us something about the immune system in poultry and how that affects the bird’s defence against pathogens?

Fundamentally, the immune system of birds is similar to that of mammals. In fact, the study of avian immunology has made significant contributions to the study of immunology in general. The first recorded attenuated vaccine was discovered by Pasteur and directed against fowl cholera. The “B” lymphocytes that are associated with the production of antibodies are “bursa-derived lymphocytes” named after the Bursa of Fabricius, a lymphoid organ of birds.

One aspect of poultry immunity that affects the bird’s defence against pathogens is the avian immune system. The immune response to the infection with HPAI can start with an initial immune response and then be followed by a secondary immune response. The secondary immune response is more effective and lasts longer than the initial immune response. The immune response to HPAI can be divided into innate and adaptive immune responses. Innate immune responses are the first line of defence against infection and are non-specific. Adaptive immune responses are specific and can be induced by exposure to antigens.

Can you explain in non-scientific terms aspects of poultry immunology, genomics and manipulation of host-pathogen interactions?

As mentioned before, we have been studying the immune system of birds for a very long time and it has helped us to understand the two arms of the immune response: humoral (antibody) immunity, and cell-mediated immunity. The recent revolution in biotechnology has greatly increased our knowledge of genes and how they are involved with the control of the immune response. Genomics refers to the study of all genes of an organism and inter-relations between genes. Host-pathogen interactions are important as they are directly associated with the consequences of infection. For example, there is increasing evidence in humans that individuals most severely affected by infection with the H5N1 virus mount an exaggerated immune response to the infection that increases the severity of disease. Looking for biotechnological means to develop disease resistance in animals, including poultry, is an active area of research. With the growing number of microorganisms resistant to pharmaceutical interventions, biotechnological solutions to disease control problems that are safe and affordable are becoming more important than ever.

In your opinion, what are the important lessons to learn from this avian influenza crisis?

The avian influenza crisis has reminded us that we live in an increasingly small world; what happens in one country can potentially impact on millions of people worldwide. It also reinforces the importance of the three pillars of a stable society: agriculture, education and health. For the first time in human history, more people now live in cities than in rural areas. Stable urban societies rely on safe and efficient agricultural production and so politicians can no longer continue to ignore farmers. When a poor formal education system results in a significant proportion of a society not understanding that infectious agents, rather than supernatural forces, are associated with disease, prevention and control activities will always be difficult. An important lesson learnt in many societies is the need for effective community public awareness. The crisis has also provided us with a long-overdue opportunity to build bridges between human and animal health services. It may just be that the combination of the AI crisis and concerns about global climate change will provide us with the impetus we need to embrace and benefit from the One World, One Health concept.