Jane K.A. Cook

1939 -

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Reflections on a career as an avian Microbiologist

Early years.

I was born in Derby in central England, but we moved to rural Lincolnshire when I was 7 years old. Most of my schooling was in the delightful Lincolnshire town of Louth, whose charms I sadly did not really appreciate until I had left home. I always enjoyed sciences at school and from a very

early age I had an interest in biology rather than the physical sciences. I think this was probably because of the particularly good Biology teacher we were fortunate enough to have. However I was keen to find a University course that was different from just Zoology or Botany, probably because by then I was enjoying reading books about microbes – one I remember in particular was called "*Man, microbes and malady",* by John Drew and published by Penguin Books – interestingly I see it is still available today on Ebay! I discovered that Bristol University offered an undergraduate course in Microbiology, so this sounded good to me. An added attraction of Bristol was that it is built on and is surrounded by hills; coming from a very flat part of England, this was a major attraction.

At University in Bristol.

Having got the necessary grades in my A levels, I set off to Bristol in 1957 to read Microbiology, with Physiology as the subsidiary subject. It was a good choice and I thoroughly enjoyed my time there. In those days virology was a relatively new discipline and our studies focused mainly on bacteria and fungi. It was also very medically orientated and I felt I had a leaning towards a career in Medical Microbiology. However, when it came to looking for a job on graduating in 1960, I could not find any suitable openings in the medical field, but was attracted by a job advertisement from a Pharmaceutical Company called May & Baker, situated in Essex, just outside London.

My time with May & Baker.

This company was once well known for developing the sulfanilamide, sulphapyridine (commonly known as M&B 693), which was widely and successfully used to treat bacterial pneumonia. They were looking for someone to work in their veterinary laboratory studying ways to control avian mycoplasmas. I moved there in 1960 and stayed for 3 years, during which time I became increasingly interested in avian respiratory diseases generally, and the effect that management practices had on disease and welfare in an increasingly commercialised poultry industry. In 1963, I saw an advertisement for someone to work on infectious bronchitis virus (IBV) at Houghton Poultry Research Station (HPRS) near Huntingdon in Cambridgeshire. This sounded attractive and I moved there in late 1963.

Houghton Poultry Research Station.

Like almost everything that has happened to me work wise, none of my job moves have been planned, rather they have just happened and this was the case here. When Herbert Williams-Smith (Willie) was appointed Head of the Microbiology Department at HPRS, a strong IBV team was soon built up under his leadership. Mike Boursnell, Matthew Binns and Fiona Tomley were early pioneers in genetic sequencing and indeed sequenced the entire IBV genome. Dave Cavanagh was interested in viral proteins, whilst my interest was in the disease the virus caused. I think we made a good team and these were highly productive years. Led by the drive and enthusiasm of the molecular biologists we made a lot of progress in studying all aspects of the IBV coronavirus and the disease it caused.

Infectious bronchitis becomes increasingly important.

It had been know for many years, mainly from work by groups in USA, that IBV existed in the form of different antigenic types. Work by Frans Davelaar and Ben Kouwenhoven at Doorn in the Netherlands showed that different antigenic types of IBV were becoming an important issue in that country and elsewhere in Europe. With the continuing commercialisation of the poultry

industry in the UK, meaning that chickens were being reared in increasing numbers but with less and less space, it became clear that IBV was emerging as one of the major respiratory diseases of poultry in the UK and that improved methods of control were needed. One of the main difficulties in studying IBV in the laboratory was that the virus could only be grown in cell culture after adaptation by serial passage, risking alteration to the virus in the process. The conventional way to grow the virus was by passage via the allantoic cavity of embryonated eggs; an expensive and time-consuming procedure. At HPRS we succeeded in developing the use of tracheal organ cultures to grow IBV. This made it much easier not only to isolate the virus from field material, but also to study it *in vitro*, whilst minimising the risk of altering the antigenic type of the virus or attenuating its virulence by repeated passage in embryonated eggs. This was a big step forward, enabling us to begin to study these new IBV variants affecting the poultry population in UK and elsewhere. I was soon isolating increasing numbers of variants, showing some of them to be major causes of disease in commercial flocks in many parts of the world and with Dave Cavanagh, looking in more detail at the differences between antigenically different IBVs. In due course, molecular techniques, including PCR came on stream and IBV variants are now being analysed using highly sophisticated techniques and detailed epidemiological studies are being undertaken using molecular methods, but this was something for the future, after I had retired!

Turkey rhinotracheitis and avian pneumovirus.

When a new disease of turkeys, known then as turkey rhinotracheitis (TRT), first emerged in the UK in the mid 1980s I was able to make use of our work with tracheal organ cultures to isolate the causal agent (the first avian pneumovirus to be described) and to do the initial characterisation. In collaboration with a Pharmaceutical Company, I developed the first successful live-attenuated vaccine against it. At HPRS we also looked at the different types of TRT virus and did some preliminary studies on the newly emerging C type in USA.

Some years later, it became clear that this virus, by now called avian metapneumovirus (aMPV) rather than TRTV, was also potentially pathogenic in chickens. It was one of several pathogens involved in the complex respiratory disease being seen in broilers. The pathogen was also of economic importance in breeder flocks, where it was affecting egg laying performance. Importantly, we were able to isolate aMPV from a flock of breeding hens experiencing quite high mortality; an unusual and very surprising finding. This strain was subsequently developed into a live-attenuated vaccine for use against aMPV infections in chickens. We also did a lot of interesting epidemiological work comparing aMPV isolates from the two species and looking at their pathogenicity in both turkeys and chickens. We found that whilst aMPV isolated from each species induced an antibody response in both turkeys and chickens, the isolate from turkeys caused marked infection only in turkeys, but that from chickens appeared to infect both species similarly. This may suggest that the chicken is not the natural host for aMPV and that a period of adaptation is necessary for the virus to become pathogenic.

Move to Intervet.

It is said that all good things eventually come to an end. In 1986, the UK Institute for Animal Health was created by merging HPRS with two other animal disease Research Institutes, those at Compton (diseases of farm animals) and Pirbright (exotic diseases) and in 1992 the decision was made to close HPRS and transfer the work to Compton in Berkshire. My husband was settled in his legal practice in Huntingdon and we did not wish to move to the other side of England. Once more in my career, fate played its part. The Pharmaceutical Company, Intervet had a UK

Laboratory just 1 mile away from HPRS, headed by Bill Baxendale and I was fortunate to be invited to move there and continue my work on both IBV in chickens and aMPV infections in turkeys and chickens.

In the last few years at HPRS, I had been acting Head of the Microbiology Department, pending the relocation to Compton. This involved me in more and more administrative duties, leaving less time for hands on research. The move to Intervet relieved me of this administration, meaning I could concentrate on bench work; something which pleased me greatly. Obviously there was a shift in emphasis in a Pharmaceutical Company so I became more interested in controlling the diseases IBV and aMPV caused and in developing vaccines against them. Before leaving HPRS I had become very interested in one new IBV variant in particular. This we called IBV 4/91 and we had already begun to try attenuating its virulence. Because of the widespread nature of this variant and because of the severe disease it caused in chicken of all types, not only in UK but in an increasing number of countries worldwide, it was decided to continue studying this attenuated strain at Intervet. After some years work, a new live-attenuated vaccine against IBV 4/91 was approved for use in the field. It has continued to prove beneficial in IBV vaccination programmes in many parts of the world. Because of the cost involved and the number of years it takes, it is probably largely a matter of luck in deciding which IBV variant is of sufficient, long lasting importance to be the one against which a new live-attenuated vaccine should be developed; fortunately IBV 4/91 proved to be the right choice at this time.

As techniques to detect and type IBV improved, more and more variants were being detected worldwide and the problem of how to control them became a major issue. It is unrealistic to try to develop a new live-attenuated IBV vaccine against each new IBV variant and the cost would certainly be prohibitive. We therefore considered how improved protection might be achieved using the IBV vaccines that were already licensed. We discovered that by using a vaccination programme in which live-attenuated IBV vaccines developed against both IBV 4/91 and Massachusetts (Mass) were included it was possible to greatly improve protection against not only the two IBV types in the vaccines, but also against very many of the IBV variants of economic importance in many countries worldwide. I think we were lucky in that the IBV 4/91 variant seems to have particularly strong antigenicity and also to be very different antigenically and at a molecular level from Mass strains of IBV. Clearly these two IBV variants are not the only ones which when used together will be effective in controlling a range of different IBV variants; but they certainly did (and still do) a good job. Maybe this was luck, or possibly serendipity!

Inactivated IBV vaccines have always been crucial for protection against IBV infections in laying and breeding flocks, and we were subsequently able to show enhanced protection for these types of chickens against different variant IBV challenges by using both Mass and 4/91 IBV vaccines in the priming programme prior to administration of inactivated IBV vaccine.

Development of aMPV vaccines was also part of my remit at Intervet and we developed both an inactivated vaccine and live-attenuated vaccines against aMPV isolates from both turkeys and chickens enabling enhanced protection against aMPV infections in the two species.

Although I had studied IBV and aMPV for many years prior to joining Intervet, I found it very interesting to study these agents from a different perspective and during my time with Intervet, I was involved in the development of several vaccines against these two viruses for use in both chickens and turkeys. It enabled me to develop a much more global view of avian respiratory diseases since the company had very much a worldwide focus.

Retirement.

I retired from Intervet in 2000 but was fortunate to be able to continue my interest in IBV by doing consultancy work. This involved me in writing reports to aid registration of vaccines and in travelling to different countries worldwide to discuss the disease situation in these countries and how IBV might better be controlled as well as to present the work I had done at Congresses. In this, I was perhaps fortunate in that IBV variants were continuing to be a major issue affecting the poultry Industry in most parts of the world, so my experience was still relevant. I found this time both interesting and rewarding and it gave me the opportunity to visit new countries, something which I greatly enjoyed.

I had become an Associate Editor for the Journal *Avian Pathology* in 1993 and I continued in this role in retirement, which made it easier for me to keep abreast of new developments in the IBV field. I have been involved with the Houghton Trust since 1987, as its Secretary for many years, as a Trustee and now just as a Member. This has proved to be a good way to keep in touch with colleagues all over the world, as well as being a way to encourage young scientists by providing travel and other grants to help them attend Congresses and to visit other Laboratories for training.

Once I retired, obviously I no longer had facilities to do bench work, so I was very fortunate to be asked by my good friend and fellow IB researcher, Dr J. J. (Sjaak) de Wit of Deventer, the Netherlands to collaborate with him. Sjaak has a keen interest in IBV and in the many variants that continue to emerge and is doing a lot of interesting epidemiological work with IBV, using the molecular techniques now increasingly available. We had already been collaborating, so it was good to be able to continue this cooperation. This is something which I have valued greatly; it has helped me to keep in touch with the IBV field and has provided an interest in retirement.

Additional biographical materials may be available from the AAAP Historical Archives located at Iowa State University. Contact information is as follows:

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