Avian tumor diseases are divided into two main categories, depending on whether the etiologic agent is known. In addition to causing economic losses from tumor mortality as well as poor performance, some of these tumor diseases have served as highly suitable models for studying various phenomena of neoplasia.

Virus-induced neoplastic diseases of poultry are the most common naturally occurring, and economically significant avian tumor diseases. These diseases are caused by either a herpesvirus, Marek’s disease, or by a retrovirus, leukosis/sarcoma group, reticuloendotheliosis and lymphoproliferative disease of turkeys. This review is primarily aimed at addressing current status and future challenges regarding control of these three important virus-induced tumor diseases of poultry, namely avian leukosis, reticuloendotheliosis, and Marek’s disease (5, 18, 20, 21).

**Avian leukosis**

The leukosis/sarcoma (L/S) group of diseases designates a variety of transmissible tumors of chickens caused by L/S group of avian retrovirus. Under natural conditions, avian leukosis, caused by a virus termed avian leukosis virus (ALV), is the most common form of L/S group of diseases seen in field flocks (5, 18). Although ALV is capable of inducing a variety of neoplastic conditions in chickens, lymphoid leukosis (LL), a B-cell lymphoma affecting primarily the bursa of Fabricius and visceral organs is the most common form of leukosis that arise from infection with ALV. However, with the recognition of subgroup J ALV (ALV-J) infection in the early 1990’s, myelocytomatosis, has emerged as a tumor condition that is frequently detected in ALV-J-infected meat-type chickens (5, 18). Like other retroviruses, ALV mutates at a high rate and can recombine with endogenous (subgroup E ALV) elements resulting in new recombinant ALVs (5, 18). These endogenous subgroup E ALV elements not only contribute to recombination, but also can interfere with diagnosis and control of ALV infection. Recombination can also occur between members of two different subgroups of exogenous ALV. Recent laboratory observations provided evidence for recombination between subgroup A and J ALV (ALV-A/J), a recombinant ALV with the envelope of subgroup A and long terminal repeat (LTR) of subgroup J; this recombinant ALV resulted from passing ALV-J in cells expressing subgroup A envelope (16). Recombination between members of two subgroups of ALV can also occur under field conditions, resulting in the emergence of a natural recombinant virus. Recently, an ALV-B/J, a recombinant ALV with envelope of subgroup B and LTR of subgroup J was isolated from commercial layers affected with myelocytomatosis (9).
Natural infection with ALV has been known to cause significant economic losses in commercial layers and breeder flocks due to mortality and lower productivity. As a potential contaminant of live-virus vaccines of poultry, ALV can also cause significant losses if contaminated vaccines were used in susceptible flocks. Most recently, a subgroup A ALV was isolated from commercial Marek’s disease vaccines; however source of such contamination has not been determined yet (6, 7).

To date, because no commercial vaccines are available for control of ALV infection, eradication of virus infection at the primary breeder level remains to be the principal method for controlling ALV infection in chickens. The new advancements in knowledge regarding molecular characteristics of ALV genome, development of highly specific reagents such as monoclonal antibodies and other technologies such as cloning of viral genes have contributed significantly to improved diagnosis and control of ALV. Clearly, diagnosis and control of re-emerging recombinant ALV and the tumors they induce in chickens represent new challenges that must be addressed in order to reduce losses from future outbreaks with previously unrecognized subgroups of ALV.

**Reticuloendotheliosis**

Reticuloendotheliosis (RE) comprises a group of disease syndromes in several avian species and is caused by a retrovirus unrelated to the L/S group of viruses termed RE virus (REV). REV infects chickens, turkeys, ducks, geese, pheasants, quail, and probably many other avian species (18, 20). The most common clinical diseases induced by REV are tumors and an immunosuppressive runting disease. Although REV is widespread, REV-induced clinical disease is infrequently diagnosed in commercial flocks (18, 20). All isolates of REV are remarkably uniform in antigenicity and have similar structural and chemical characteristics (20). Although REVs are known to belong to a single serotype, three subtypes were identified on the basis of neutralization tests and differential reactivity with monoclonal antibodies (20). Also, unlike the case with ALV, no endogenous REV elements have been identified.

Although losses in REV affected flocks can be significant due to tumor mortality and or immunosuppression (1, 18, 20), the principal economic concerns of REV infection are: a) as contaminants of live-virus vaccines of poultry, and b) as a barrier to export of breeding stock to certain countries. To date, no commercial vaccines are available for control of REV infection and unlike the case with ALV, no method has been routinely used by industry to control REV infection in commercial turkey and chicken flocks. Current information on partial or complete REV genome insertion in large DNA avian viruses such as Marek’s and fowlpox viruses (4, 8, 12, 13, 14, 15, 17) have indicated the need for further studies to determine the role of such insertion in the epidemiology of REV as well as the pathogenicity of these large DNA viruses. Contamination of vaccines, partial or complete insertion of REV genome in other viruses and developing new control methods represent important challenges that must be addressed in order to develop effective strategies for control of REV infection in poultry.
Marek’s disease

Marek’s disease (MD), a T-cell lymphoma of primarily chickens is caused by a highly cell-associated alphaherpesvirus termed MD virus (MDV) (21). The disease is and has been controlled since early 1970s by use of conventional vaccines. During the last three decades, research on MD has resulted not only in improved conventional vaccines, but also in improved methods of vaccination, namely in-ovo vaccination (19). Good biosecurity practices and host genetic resistance are also recognized as important factors in implementing any strategy for control of MD. However, despite widespread use of vaccines and development of new methods of vaccination, economic losses from mortality of layers and breeders and condemnation of broilers continue to occur (18, 21). In recent years, MD has been diagnosed in commercial turkey flocks in Germany, France, Israel and Ukraine (2, 3, 10, 11, 18, 21), suggesting that the host range of MDV has apparently expanded to include turkeys. More studies are needed to understand factors that lead to MD outbreaks in commercial turkeys.

The fact that MDV continues to mutate to greater virulence, reducing the effectiveness of many existing vaccines (21) is a major concern to the poultry industry. Obviously, an important challenge regarding control of MD in the future is developing new strategies to control losses caused by new emerging MDV pathotypes. Development of vaccines that can interfere with replication and shedding of MDV, and understanding role of host genes involved in resistant to MD will undoubtedly improve our ability to implement a better strategy for control of MD in the future.

References:


