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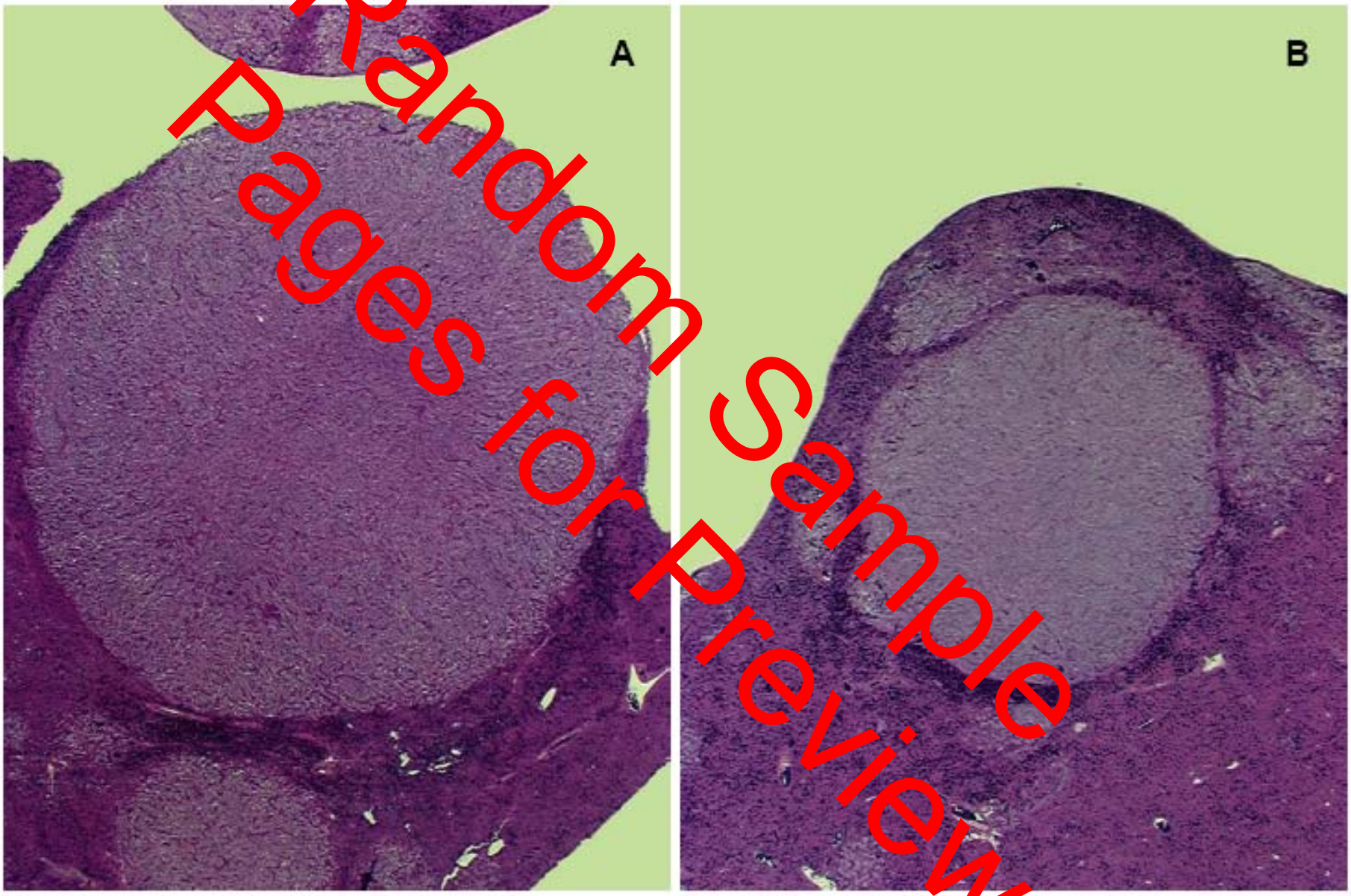

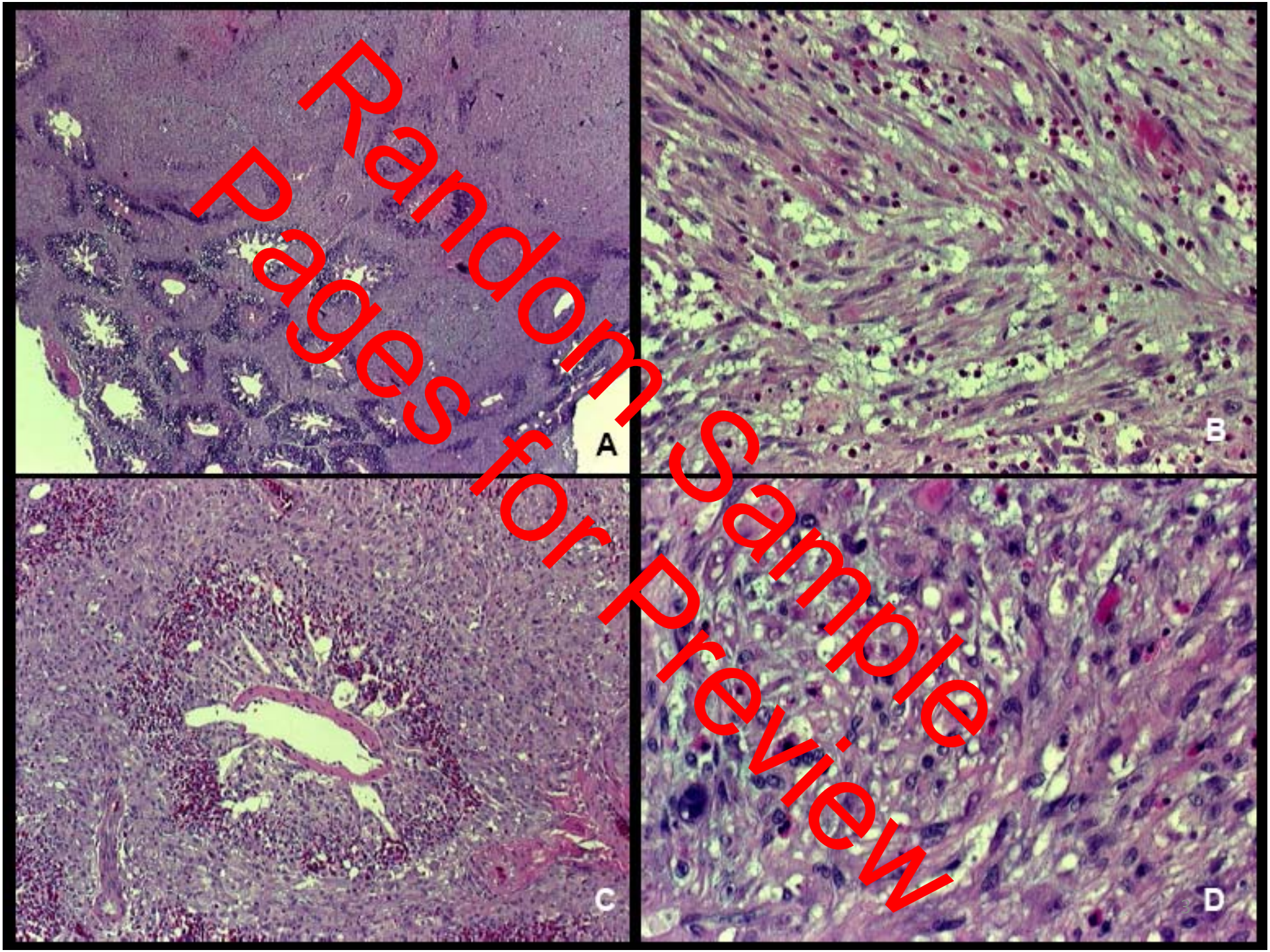

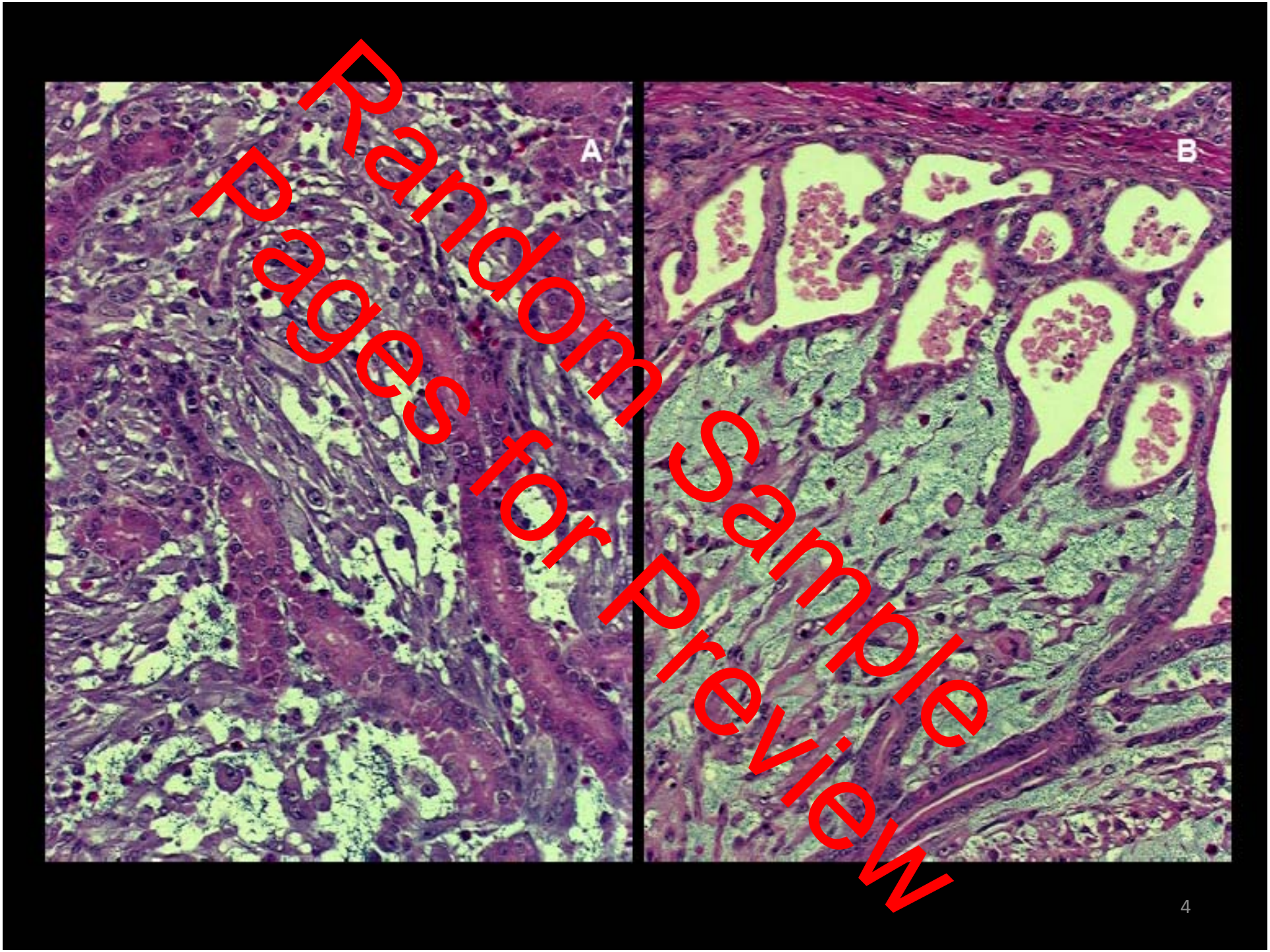

RNA Tumor Viruses
AAAP Slide Study Set
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Submitted: July of 2006

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Introduction

Avian tumor viruses include Marek's disease virus (MDV), reticuloendotheliosis virus (REV) and the avian leukosis sarcoma group of retroviruses (ALSV) (13). MDV is a herpesvirus, and REV and ALSV are retroviruses unrelated to each other. All avian retroviruses of economic significance are classified within the family Retroviridae, subfamily Orthoretrovirinae (13). Avian leukosis virus (ALV) is the representative virus of the genus Alpharetrovirus, which in turn is classified within the subfamily Orthoretrovirinae. REV is a Gammaretrovirus also classified within the subfamily Orthoretrovirinae but is not related phylogenetically or antigenically to the ALSV, including ALV. Unclassified avian oncogenic retroviruses include avian myeloblastosis associated virus (MAV) (21).

Members of the ALSV group are pluripotential in that each has the ability to induce a variety of neoplasms (16, 29, 34). The most common neoplastic responses to ALV infection comprise a variety of leukoses, connective tissue tumors, epithelial tumors, endothelial tumors and other related tumors (Table 1) (13). While many of these neoplasms involve tissues stemming form the embryonic mesodermal layer and some

ALSV members tend to induce specific types of tumors, it is highly imprecise to attempt an etiological diagnosis based on gross and/or microscopic lesions. Members of the ALSV are classified in six subgroups infecting chickens based on interactions between their envelope proteins and cell receptors (2, 3). Subgroups A (ALV-A), B (ALV-B), C (ALV-C), D (ALV-D) and J (ALV-J) are exogenous viruses. Subgroup E comprises a group of endogenous viruses that are mostly innocuous, are permanently inserted into the germ cell genome of all commercial chickens and are inherited in a Mendelian fashion [13].

REV infection during embryonic development or early in life may result in tolerance and oncogenesis is characterized by B cell or T cell lymphomas (10, 12, 36). REV-induced lymphomas are often indistinguishable morphologically from lymphomas caused by members of ALSV. In addition, mixed infections with combinations of MDV, ALV and REV are possible, making etiological diagnosis highly imprecise just on the basis of tumor distribution and morphology. Furthermore, spontaneous tumors are also found in the field, which increases the difficulty of identifying possible etiologies. Recombinant ALVs consisting of genetic material from more than one subgroup have been reported (7, 18, 22, 27, 28). The pathology involved in infection with recombinant viruses may differ from the pathology observed in typical cases of infection with known ALSV. Therefore, it is important to provide a detailed morphological description of neoplastic changes as part of the quest of resolving the etiology of outbreaks of neoplastic disease, but the etiological diagnosis should rely on isolation and identification of the virus (es) involved.

Epizootiology

Avian leukosis virus. Members of the ALSV infect only chickens amongst the avian species raised commercially (13). The ALSV may be transmitted congenitally or horizontally. Congenital infection occurs during the embryonic development as a result of active viremic infection in the dam and may result in tolerance and oncogenesis. Horizontal infection may occur upon close contact between shedder chickens and susceptible chickens and may or may not result in tolerance and oncogenic responses (13). Vaccine contamination with ALV has also been reported and may constitute an additional source of infection in the field (42, 43). Before the advent of ALV-J, ALV subgroups A and B were considered the most commonly found ALVs of economic significance in the field (13). Although ALV-A and ALV-B have the potential of inducing a variety of tumors, lymphoid leukosis has been one the most common neoplastic conditions found in commercial chickens, particularly in commercial egg layers (13). ALV-J infects primarily meat type chickens and acquired a worldwide distribution during the 1990s (31). Occasional outbreaks of ALV-J in commercial layers have been reported (18). Other subgroups of ALV are not commonly found in commercially raised poultry (13).

Unclassified avian retroviruses are also known to circulate in the field. One example is avian myeloblastosis associated virus type 1 (MAV-1), which has been reported in commercial layers, in which it frequently induces subcutaneous sarcomas

(44). Inoculation of MAV-1 into susceptible chickens may induce other types of tumors, including myelocytomas. Myelocytomas induced by ALV-J, MAV-1, ALV-C or other ALSVs are usually indistinguishable from each other on the basis of microscopic morphology.

Reticuloendotheliosis. Outbreaks of clinical reticuloendotheliosis (RE) are sporadic in commercial poultry (36). Unlike ALV, REV is capable of infecting multiple avian species, including chickens, turkeys, quail, pheasants and wild birds of various species (4-6, 8, 11, 15, 20, 24-26, 30, 35-37, 39). REV may be transmitted congenitally via the egg (36), horizontally upon close contact with infected birds (36), mechanically by insects (9), or as a result of the use of contaminated vaccines (14, 15, 23, 32, 33, 41). REV is known to be capable of inserting its proviral DNA into viruses of high molecular weight such as MDV (40) and fowlpoxvirus (17). Early infection may result in tolerance and oncogenesis, where the most common type of neoplasm is either a B cell or a T cell lymphoma (36). Although the vast majority of the tumors involved in oncogenic REV infection are represented by lymphomas, other unclassified tumors have been observed. REV is known to circulate in the field based on serological evidence albeit few cases result in clinical disease or poor economic performance (1, 19, 37, 39). REV may occur in mixed infections with MDV and ALV.