Avoiding Vaccine Reactions in Dogs and Cats

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Veterinarians have become concerned with regard to over vaccinating and continual annual vaccination requirements for dogs and cats. Much of this concern stems from the recent awareness of post-vaccinal complications that can result with currently available biologicals. Knowledge of the various reactions and their predisposing causes helps to avoid their occurrence.

Immunologic Complications

Immunologic reactions that can develop following vaccination can be categorized as to the four classical types of hypersensitivity reactions. **Type I** reactions involve an interaction with cytophilic IgE and antigen with resultant degranulation of circulating basophils and tissue mast cells. In the dog, signs are facial edema, hypotensive shock, weakness, dyspnea and diarrhea. Cats show facial pruritus, salivation, dyspnea, collapse and respiratory distress from acute pulmonary edema Type **II** hypersensitivity reactions, resulting in cellular injury have been suspected or reported following the use of MLV vaccines in dogs. Autoimmune hemolytic anemia (AIHA) and autoimmune nonregenerative anemias (autoimmunity to erythrocyte precursors) have been associated with MLV parvoviral vaccines in some dogs. The dogs with this association had lower platelet counts, increased trend toward intravascular hemolysis and spontaneous microagglutination, and higher mortality than the other affected animals. Transient subclinical thrombocytopenia also has been reported following the use of MLV combination vaccines in dogs. **Type III** hypersensitivity reaction, associated with immune-complex formation and deposition, is responsible for the anterior uveitis that occurs in some dogs receiving the MLV--CAV-1 vaccine. This local type III, or Arthus reaction results from virus-antibody complex formation within the eye. The process resolves spontaneously unless secondary complications such as glaucoma develop. **Type IV,** or cell-mediated, hypersensitivity reactions can occur following the use of bacille-Calmette-Guérin (BCG) as an immunostimulator or some adjuvants. Large, exuding granulomas may develop at the site of injection. Polyradiculoneuritis has been observed in dogs following use of suckling mouse brain inactivated rabies virus vaccines and some other biologicals in dogs.

Nonimmunologic Complications

Local Reactions. Many complications have been associated with either local irritation or production of disease by canine and feline biologics. Local reactions following vaccination include pain, erythema, swelling, irritation, and abscess formation. These typically occur within minutes to days after inoculation. Pain can be caused by many components in the vaccine such as stabilizers, high or low pH, high osmolality, or preservatives. Swelling is most frequently noted with the use of inactivated products containing adjuvants or with bacterial vaccines containing large amounts of foreign protein derived from the culture media.

Adventitious Agents. Most viruses grown in cell culture must contain serum and this is usually

obtained from fetal calves. Fatal illness occurred in pregnant bitches vaccinated for DA2LPP in the last trimester of gestation from Bluetongue virus inadvertently contained in the vaccine. MEV vaccination is generally not advised during pregnancy but may be done under unusual circumstances. Signs were abortion 7 to 9 days after vaccination and death within 48 to 72 hours with cardiac failure and respiratory distress.

Focal cutaneous granulomatous lesions. These reactions are to adjuvants, which potentiate the immune response by creating a depot effect. A nodule, which forms typically, regresses in 2-6 weeks. These were histologically characterized by a local nonsuppurative vasculitis. Similar reactions have been observed in cats and contain foreign material representing residual adjuvant. An association of these inflammatory nodules to the development of sarcomas has been made.

Sarcomas. Neoplastic complications have been reported with increasing frequency following the use of inactivated adjuvanted vaccines in cats with much lower frequency in dogs. Rabies and FeLV vaccines have been most commonly incriminated on an epidemiologic basis in cats although combination inactivated products have also been associated. The component thought to be associated with postvaccinal inflammation is the vaccine's adjuvant. The inflammatory reactions to aluminum and other proprietary adjuvants may predispose cats to a connective tissue reaction and eventually neoplastic transformation. The estimated time course ranges from 3 months to 3.5 years postvaccination. Multiple vaccines at the same site and repeated yearly boosters may increase the risk. Vaccination sites should be monitored owners and veterinarians and any enlargement be examined. Local, very wide excision should be done for any enlargement that occurs after 3 months. Incomplete excision of a sarcoma usually results in more aggressive regrowth at the surgical site.

Various recommendations have been made to reduce the frequency of sarcoma development. Manufacturers can assist in determining the substances that are responsible for oncogenesis and making modifications. Veterinarians need to educate clients and alter their vaccination schedules to minimize the use of unnecessary vaccines. Better recording and tracking of reactions is needed. Clients need to observe vaccine sites and continue to bring their pet in for annual examinations.

Systemic Illness. Systemic illness characterized by fever and malaise may also occur as a result of self-limiting infection caused by MLV vaccines, usually caused by replication of the vaccine virus within local lymphoid tissues without viremic spread. This commonly does not last longer than 1 to 2 days following vaccination and often explains the transient anorexia and depression noted in recently vaccinated animals.

Prenatal and Neonatal Infections. If MLV vaccines are given during pregnancy, vaccine infections can result in fetal malformation or death or infertility and abortion in the dam. Neonatal infection can also occur following the use of MLV canine or feline parvoviral vaccines in puppies or kittens less than 4 to 5 weeks of age. The general recommendation is to never use MLV vaccines in pregnant females.

Vaccine-Induced Diseases. Clinical illness can develop as an expected postvaccinal event

when intranasal vaccines are used. The mild clinical syndrome is usually self-limiting, but the organisms may spread to other susceptible animals. The immunity to such vaccines is superior to that of parenteral vaccines; however, the clinical disease that these vaccines can produce has limited their use by many veterinarians.

Febrile, limping syndrome has been noted in kittens after use of products containing caliciviral or *Chlamydophila* antigens. Kittens less than 6 months old are usually affected for up to 1 week after vaccination. Related Akita dogs have developed immune-mediated polyarthritis within 3 weeks after vaccination. The dogs usually developed signs by 16 weeks of age consisting of cyclical fever and joint pain with associated laboratory abnormalities. The joint aspirates reveal nonseptic, purulent polyarthritis. Treatment with glucocorticoids helps alleviate the clinical signs but relapses are frequent. Young Weimaraners can develop radiographic changes typical of HOD. These are probably systemic manifestations of the disease syndromes.

Neurologic disease has been a commonly documented postvaccinal reaction described in dogs and cats. This may relate to the overt nature of neurologic illness and decreased immunocompetence of the CNS against MLV agents. Historically, complications following rabies virus vaccination have received the most attention. MLV vaccines are no longer used in the US for this reason. Vaccine-induced rabies in dogs and cats following MLV vaccination begins with paralysis in the inoculated limb within 7 to 21 days and progresses bilaterally and in an ascending fashion.

Encephalomyelitis has been reported after combined distemper virus vaccination in the dog especially in very young pups. Postvaccinal distemper has also been reported following immunosuppression of dogs with cytotoxic chemotherapy and virulent parvoviral infection. Hypertrophic osteodystrophy has also been associated with modified live distemper vaccines. A number of other immunosuppressive influences can facilitate vaccine-induced infections. MLV feline panleukopenia vaccines and canine parvoviral vaccines should not be used in kittens or puppies less than 4 to 5 weeks of age. Cerebellar degeneration and myocarditis may develop in kittens and puppies, respectively, from virulent parvovirus or MLV vaccine virus infection. Immunosuppressed cats can become ill following MLV parvoviral virus vaccines. Parenteral vaccination with one previously licensed MLV canine coronaviral vaccine has been associated with illness. This problem was related to the particular strain that was used in the vaccine. Currently available MLV coronaviral vaccine does no cause problems of this type.

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