

Medical FAQs

Vaccine Reactions

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What are the different types of vaccine reactions?

Vaccine reactions can be divided into non-immunological and immune-mediated. Additionally, they can be localized or systemic (Moore 2003, Datz 2010).

Non-allergic (non-immunological) reactions in both humans and some pets include pain, mild transient fever, transient lethargy and swelling at the injection site.

Pain at the time of the injection is unassociated with the vaccinal antigen, but is related to the injection itself. Often, warming the vaccine just prior to injection can reduce the pain, as can exchanging the needle on the syringe between extracting the vaccine and injection.

Local inflammation can occur for up to a week after injection. Abscessation is rare. Any mass that persists for more than 1 month at the injection site should be evaluated further, especially in cats.

Localized vasculitis has been reported in small or toy breed dogs, resulting in focal alopecia. Rabies vaccines have been implicated.

Immune-mediated reactions are less common. These include Types I-IV hypersensitivity reactions.

Type I reactions include urticaria (hives), rashes, angioedema, and anaphylaxis. They can occur within minutes of administration, but can occur up to 24-48 hours after the vaccination. Antibodies to bovine serum albumin and fibronectin have been detected in dogs, presumably due to residues of

fetal calf serum used in vaccine production. In dogs, the most common clinical signs are urticaria and angioedema ("hives" or swelling) involving the face, head, and ears. Vomiting and diarrhea may be seen, and respiratory distress is rare but serious. Cats more often have GI signs (acute onset vomiting and diarrhea), and less commonly respiratory distress or urticaria (Datz 2010).

Type II and Type III reactions are due to antigen-antibody complexes, resulting in immune-mediated diseases. Immune-mediated diseases have been associated with vaccines in dogs. However, the mechanisms have not been elucidated and cause-and-effect is not proven. A small retrospective study of 55 dogs suggested recent vaccination as a possible precipitating factor (Jackson & Kruth 1985). A retrospective study published in 1996 concluded that a temporal relationship existed between vaccination and immune-mediated hemolytic anemia (IMHA) (Duval et al 1996). 15 of 58 dogs (26%) with idiopathic IMHA were found to have onset of clinical signs within 1 month of vaccination. (Duval 1996). Other studies failed to identify an association between vaccination and immune-mediated thrombocytopenia or IMHA (Huang AA 2012, Reimer et al 1999). In the United Kingdom, a retrospective study of 41 cases of IMHA or immune-mediated thrombocytopenia (ITP) showed that 12% had been vaccinated within the past month (Warman et al 2007).

A case series in a veterinary orthopedic journal described 27 dogs with immune-mediated arthritis, of which 4 (15%) were recently vaccinated (3-15 days, mean 11 days) (Kohn et al 2003). Clinical signs included stiff gaits, a reluctance to move, and difficulty rising. All received diagnostic workups and were treated with doxycycline and carprofen. Signs resolved quickly (1-2 days after treatment). One dog was revaccinated and developed arthritic signs 12 days later, while another dog was revaccinated with no signs.

Hypothyroidism resulting from autoimmune thyroiditis has been identified in dogs, and antibodies (Ab) produced against canine thyroglobulin are diagnostic of this condition. A study in research Beagles and pet dogs attempted to discover if vaccination could cause this disorder. Results were mixed – Ab were found to canine and bovine thyroglobulin (probably because of bovine protein contaminants in the vaccines) but no cases of hypothyroidism were observed (Scott-Moncrief et al 2002).

Vaccine-associated sarcomas are a well-recognized vaccine-related reaction in cats given rabies vaccinations, although other vaccines have been implicated.

Are any vaccines more or less likely to cause a reaction?

Anecdotal reports suggest that rabies vaccines, killed products such as leptospirosis, and adjuvanted vaccines are more likely to result in adverse reactions compared to modified live vaccines. Evidence is limited, and many animals are vaccinated with multiple antigens at one time which makes identifying a causative product difficult. The more vaccines given at the same time, the more likely an adverse reaction will occur.

Should I continue to vaccinate after a vaccine reaction?

If the reaction is life threatening future vaccinations should be avoided. If mild then consider premedicating.

Are particular breeds of dogs and cats more or less likely to have a vaccine reaction?

One author suggests that Old English Sheepdogs, Akitas, and Weimaraners have higher rates of vaccine-associated immune-mediated diseases than other breeds, but evidence is lacking (Day 2005). Another study suggested that Dachshunds, Pugs, Boston Terriers, Miniature Pinschers and Chihuahuas had higher incidence of vaccine-associated reactions (Moore et al 2005). Hypertrophic osteodystrophy (HOD) has been linked with modified-live distemper vaccines in Weimaraners, with average age of onset 13.5 weeks and 10.5 days post-vaccination (Harrus et al 2002). However, no control group was included in this small study, and this breed has been identified as developing HOD without prior vaccination. Therefore, the role of vaccination in Weimaraner HOD is unclear (Moore & HogenEsch 2010).

In a retrospective study of over one million dogs, the reaction rate (all types) was 38.2/10,000 (Moore et al 2005). Young adult dogs (1-3 years) and small-breed dogs were at higher risk. Boxers were the only large breed with more reactions than average.

Another study of 57,000 dogs found a low incidence of anaphylaxis following vaccination and a relatively low incidence of any type of "vaccine-associated adverse events" (approximately 5 per 1000 dogs) (Miyaji et al 2012).

In one study of 500,000 cats, the reported rate of vaccine-associated adverse events was 51.6 per 10,000 cats (Moore et al 2007).

Should I premedicate and what should be used?

For pets with a history of urticaria, swelling, or GI signs, at all future vaccine visits they are pretreated with an antihistamine and possibly corticosteroids and then monitored in the hospital for at least 8 hours. In cases of life-threatening reactions, future vaccination should be avoided if possible. If absolutely necessary, vaccines should be split into multiple visits (3 or more weeks apart) along with pretreating and careful monitoring.

How should I treat a vaccine reaction?

Treatment is often reserved for type-I hypersensitivity reactions, but can be administered whenever clinical signs warrant. As soon as signs appear, injectable drugs such as corticosteroids, antihistamines, and/or epinephrine are given depending on severity. Other therapies such as IV fluids and oxygen are occasionally needed, and facilities for endotracheal intubation and ventilation should be available. A typical approach for mild cases is to give dexamethasone 0.2 mg/kg IV or IM and diphenhydramine 2 mg/kg IM. To treat late-phase reactions, oral corticosteroids and antihistamines are dispensed for 2-3 days. Epinephrine doses for 1:1000 concentration are approximately 0.1-0.2 ml per 10 kg body weight. [The VIN ER drug calculator](#) can help determine the exact volume required.

Will a half dose of vaccine prevent a reaction?

A smaller vaccine dose will not prevent or reduce the risk of a type I hypersensitivity reaction. Additionally, with vaccines such as rabies vaccines, administering a smaller dose could be illegal in some states, as it could leave the patient unprotected.

How can I prevent a vaccine reaction?

Pre-treatment with antihistamines and corticosteroids in dogs or cats that have experienced mild vaccine reactions can reduce the likelihood of a reaction, or the severity of a reaction. The only true “prevention” is avoiding vaccinating the patient.

Is there any genetic predisposition for vaccine reactions?

One study (Moore et al 2005) suggested a higher rate of vaccine reactions in certain breeds than others, which could argue for a genetic predisposition. As stated above, the top 5 breeds for reactions were Dachshund, Pug, Boston Terrier, Miniature Pinscher, and Chihuahua. Boxers were the only large breed with more reactions than average.

Can I skin-test to determine susceptibility to vaccine reactions?

Yes, for type I hypersensitivity reactions. A positive and negative control need to be co-administered, and the dermal response monitored for the next several hours. Micro-doses of vaccines for intradermal testing can usually be purchased from companies that manufacture reagents for intradermal testing. However, interpretation of intradermal antigen testing can be complicated. The tests are considered specific (if the patient reacts to the skin test, they will likely react to a regular dose of vaccine), but not sensitive (lack of a reaction does not rule out the possibility of reacting to a regular vaccine dose).

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This FAQ was reviewed by Craig Datz for the VIN community

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