

Parainfluenza in dogs: What is it?

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Before we delve into parainfluenza, we need to clear up confusion. The canine parainfluenza virus is separate from the canine influenza viruses. Therefore, the parainfluenza vaccine will not provide protection against the canine influenza viruses H3N2 and H3N8, nor will canine influenza vaccines protect against canine parainfluenza. However, for clarification, canine influenza virus infection often resembles canine infectious tracheobronchitis ("kennel cough"), which is caused by one or more bacterial or viral infections, including *Bordetella bronchiseptica*, adenovirus-2 and canine parainfluenza virus.

DHPP or DA2PP are the common acronyms for the combination multivalent canine vaccine for canine distemper, infectious canine hepatitis (adenovirus -2), canine parvovirus and canine parainfluenza. We notice that the last "P" – parainfluenza – is often an afterthought. Indeed, Dr. John Ellis calls it "the forgotten virus". Discovered in the 1960's, the vaccine against the canine parainfluenza virus was developed in the 1970's. Since then, research on the virus and vaccine efficacy have mostly petered out over the last 25 years.

Parainfluenza Virus

Parainfluenza affects many mammals such as pigs, dogs, monkeys, and even humans. In humans, it could lead to the commonly known condition called "croup". According to the Centers for Disease Control, a human parainfluenza vaccine does not exist. [Note: no data supports parainfluenza transmission from dogs to humans. Cats can shed canine parainfluenza and do not develop signs of the disease.]

In and of itself, canine parainfluenza produces mild to moderate upper respiratory disease or no discernable clinical disease. We know this because of research conducted in the late 1960's, early 1970's, and early 1990's. However, these studies used parainfluenza isolates that had been passaged *in vitro* through the tissue culture cells of other species, which can lead to attenuation of virulence. In normal terms: the scientists relied on petri dishes and test tubes to replicate the cells with other animal cells as a harvesting ground. Thus, the parainfluenza samples used to infect the dogs may not have had the same *in vivo* effect or even have survived in a more natural, realistic environment. Regardless, it is safe to say that natural infection of parainfluenza alone is self-limiting and fairly restricted to the upper respiratory tract.

But, when parainfluenza virus is combined with a bacterium such as *Bordetella* and several other potential viral pathogens, kennel cough could result. So, the attempt to pin down canine parainfluenza to specific respiratory lesions is difficult within the kennel cough complex. To do so, scientists would need to examine dogs that died of the disease. Since most dogs recover from kennel cough, the availability of appropriate specimens is basically nil. Based on what we know, canine tracheobronchitis lesions were similar to those found in other species with parainfluenza infections. Kennel cough is a quagmire. So, the conclusion "parainfluenza lesions were resultant" would be a misnomer without proper testing. In conclusion, we do not know its exact impact upon the complex.

Active and Passive Immunity of Parainfluenza

One of the things I and others often talk about is the timing of vaccines. I recommend giving parvovirus and distemper to puppies at 9-10 weeks and 14-16 weeks of age. Then, just a single monovalent

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parvovirus vaccination at 18 weeks. The reason why is that as maternal antibodies – passed to puppies in colostrum – have become depleted, we need to bolster the system against these two virulent canine viral diseases. Here is the interesting item though about parainfluenza: no published data exists on parainfluenza passive immunity in mothers or puppies. Many veterinarians give a blanket DHPP/DA2PP vaccination without full knowledge if the mother-to-puppy exchange even occurred. If it does occur, we certainly do not know how long the maternal parainfluenza antibodies last.

Active immunity is imparted by vaccine natural exposure or both. Vaccinated active immunity to parainfluenza has been shown to be between two-three years. A study conducted in the mid-2000's examined dogs over the age of two that had been vaccinated 1-4 years prior. 98% had virus neutralizing titers or responded greatly to a revaccination. The administration and frequency of vaccinations prior to the titer test study are unknown.

Vaccine Efficacy

As mentioned above, the canine parainfluenza vaccine was developed in the late 1970's. The first form of the parainfluenza vaccine was modified live and was to be administered parenterally (injected). The results of the efficacy study demonstrated 20 vaccinated dogs had no clinical disease after challenge (virus passaged in dog kidney cells). Contrarily, three of the five unvaccinated control dogs presented with mild kennel cough.

During the early 1980's, the canine parainfluenza vaccine was combined with the Bordetella vaccine. This newer vaccine was administered intranasally. The efficacy study was performed on 8 to 16 week-old mixed breed puppies given one vaccination. 18 days after vaccination, the group was challenged with parainfluenza (virus passaged in green monkey kidney cells) via aerosol. All vaccinated dogs demonstrated resistance to the virus. On day 21, they were challenged again via aerosol with Bordetella bacteria. None of the dogs presented signs of kennel cough. However, nine out of ten control unvaccinated dogs developed clinical symptoms.

The results sound perfectly fine, right? Again, one problem lies with how the researchers are developing the canine parainfluenza virus challenge solution or aerosol because of potential attenuation of virulence.

Field trials have also been conducted.

In 1979, Packard *et al.* published a study in which 52 dogs were given the parenteral parainfluenza vaccine approximately two weeks but no longer than one year prior to kenneling. 144 dogs – that were also placed in the kennel – were not vaccinated. 33 of the 144 unvaccinated dogs developed coughs whereas one 2 out of the 52 vaccinates presented with coughs.

A field study conducted a little bit later evaluated the intranasal parainfluenza/Bordetella vaccine. 5,300 “puppy mill” puppies were brought to a central facility before being sent to pet stores. The incidence of kennel cough went from 40% based on historical findings to 8%. Of course, this study's flaw was not having a control group, and complete reliance on historical and possibly misleading or even inaccurate findings.

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In another trial involving a large breeding facility, 1,873 puppies were used. 929 received the combination of parainfluenza/Bordetella and the remaining 944 received the placebo. 174 of the vaccinated puppies presented symptoms of kennel cough and 205 of the unvaccinated puppies did too. The limitation of this trial was that the puppies were then immediately placed together. The results were skewed because of presumed shedding of the vaccine components and cross-immunization.

A trial was finally conducted during the 2000's at an animal shelter. Incoming dogs were evaluated and deemed free of respiratory disease. On a rotating daily basis, the dogs would receive a placebo, a parainfluenza/Bordetella combination, or an adenovirus-2/parainfluenza/Bordetella combination. After a month-long post-vaccination period, the incidence of kennel cough was reduced by 20-24% compared to the placebo group. One positive attribute was that the facility was clean and no circulating respiratory disease was present at the time of the study.

While we can say definitively that the incidence of kennel cough was reduced across canine populations, we can also say definitively that *we do not know how much of an influence canine parainfluenza virus has on the kennel cough complex.* We can also say that these findings coupled with extensive clinical experience indicates that kennel cough complex vaccines are not 100% efficacious.

It is definitely time for a reevaluation of the efficacy and need for canine parainfluenza vaccine.

It is important to emphasize that boarding facilities, shelters, and doggie daycares should not rely on vaccination alone as an indication of protection from the kennel cough complex (or the other clinically important infectious diseases). They must be vigilant in maintaining proper cleanliness, ventilation, humidity levels and an isolation area for any dog who might be at risk to develop kennel cough.

Reference: Ellis, John A., and G. Steven Krakowka. "A Review of Canine Parainfluenza Virus Infection in Dogs." *Journal of the American Veterinary Medical Association* 240.3 (2012): 273-84.