

Titer Testing in Horses

An interview by Lisa Ross-Williams with
W. Jean Dodds, DVM

Dr. Dodds, one of the foremost authorities on animal vaccination, has done some amazing work using titers to show the immunologic status of animals against various diseases. Her work has been instrumental in some states changing to a three-year rabies vaccination protocol. She shares here her knowledge of titers - what they are, what they can show, and how they can be used to limit over-vaccination of our pets and horses.

Q: Titer testing is done on a blood sample. What exactly is a titer? Is it an antibody for a specific disease?

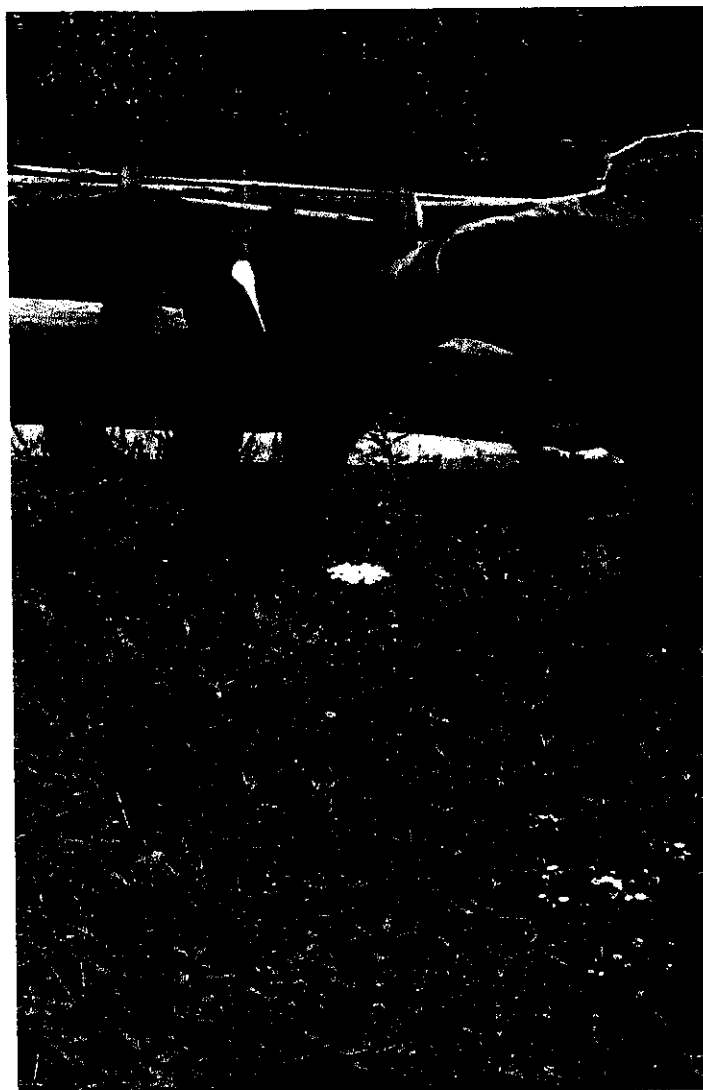
A: A titer is the quantitative measurement of the amount of a specific antibody present in a bodily fluid, typically the blood. This antibody would be specific for a particular antigen (disease causing agent) that the individual had been exposed to previously and/or had received a vaccine to protect against.

Q: So depending on the results' levels, or in some instances presence, of antibodies, it can tell us what?

A: Some titers must reach a certain level to indicate immunity (e.g. rabies virus, leptospirosis), but for other infectious disease agents that produce sterilizing immunity (e.g. canine distemper, adenovirus, and parvovirus, and feline panleukopenia virus), the presence of any measurable antibody shows protection. The positive titer test result is fairly straightforward, but a negative titer test result is more difficult to interpret, because a negative titer is not the same thing as a zero titer and it doesn't necessarily mean that animal is unprotected. A negative result usually means the titer has failed to reach the threshold of providing complete protection.

Q: Titer testing is most often used to determine the immunologic status of an animal in relation to post-vaccination. Does it also show antibodies produced from natural exposure as well?

A: Yes, the titer level reflects a combination of both the animal's natural disease exposure and vaccination against this same disease.



Titer level reflects a combination of both the animal's natural disease exposure and vaccination against a disease.

Q: Is a titer difference noted on route of entry? For instance, if the normal route of a disease is a puncture such as with rabies or tetanus and the vaccine is given that same route, does the body recognize that more naturally and therefore create a stronger immunological response? Same for bordetella that is normally acquired through respiratory avenues?

A: Not really; the route or portal of entry of a disease agent and the vaccine against it do not have to be the same. It all depends upon when the disease or vaccine arrives at the body's immune-responsive cells to start generating antibodies. For example, injecting a vaccine into the body gets it to the antigen-presenting immune cells faster than giving a vaccine orally or intranasally. For some disease agents like coronavirus, protection lies within the cells lining the gastrointestinal tract; so measuring serum antibody titers against coronavirus are *not* predictive of protection against this disease.

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what has been called the "fallacy of titer testing", because research has shown that once an animal's titer stabilizes it is likely to remain constant for many years. Properly immunized animals have immunity that not only prevents clinical disease but also prevents infection or keeps the infection from progressing to severe clinical disease.

As stated by eminent expert Dr. Ronald Schultz in discussing the value of vaccine titer testing, "It is often said that the antibody level detected is only a snapshot in time. That's simply not true; it is more a motion picture that plays for years." Furthermore, protection as indicated by a positive titer result is not likely to suddenly drop-off unless an animal develops a medical problem such as cancer or receives high or prolonged doses of immunosuppressive drugs. Viral vaccines prompt an immune response that lasts much longer than that elicited by classic (natural, environmental) virus exposure. Lack of distinction between the two kinds of responses may be why practitioners think titers can suddenly disappear.

Finally, what does more than a decade of experience with vaccine titer testing reveal? Published studies in refereed journals show that 90-98% of dogs and cats that have been properly vaccinated develop good measurable antibody titers to the infectious agent measured. Similar data have not yet been accumulated for horses, although it would be expected that these would reveal parallel findings. In contrast to the concerns of some practitioners, using vaccine titer testing as a means to assess vaccine-induced protection will likely result in the animal avoiding needless and unwise booster vaccinations.

Q: Regarding Table 1, Equine Vaccine Titer Levels for Immunity, to help our readers understand, can you please explain the following?

Column 1 - What do you mean by *method*?

A: The test method used to measure immunity [i.e. SN = serum neutralization; HI = hemagglutination inhibition; IFA = immunofluorescent antibody; RFFIT = rapid fluorescent focus inhibition test; ELISA = enzyme-linked immunosorbent assay]

Q: Column 2 - Titer level for immunity - Is this the desired or required level for immunity?

A: Both

Q: What do the ratios stand for or represent exactly?

A: They represent the highest dilution of patient serum or other bodily fluid in which inhibition or immunoreactivity is still detected.

Q: Column 3 - By interpretation, does this mean that if the levels in column 2 are met or exceeded, that the animal then has that level of protection as labeled?

A: Yes, it's a listing of the degree of immunity found based on the titer level obtained [meet or exceed the middle column].

Q: What are the common reasons for vaccine titer testing?

Q: Over-vaccination is a huge issue in both the small animal and equine world. Holistic experts have linked a number of health issues to this. Ideally, we want to find a balance of protecting our animal from a serious, life-threatening disease, but by doing it responsibly so as not to cause other issues. What would happen to an animal who did have sufficient protection but was vaccinated anyway?

A: If these animals were re-vaccinated, they would respond with a temporary (2-3 months) increase in antibody titer, which is not sustained, but instead may develop a hypersensitivity to vaccine components (e.g. fetal calf serum). Whenever possible, we should avoid vaccinating animals that are already well protected.

Q: Combo vaccinations are very popular, although I personally don't support them as I feel they can overwhelm the body. Have you done any research on whether animals develop a stronger immunity when single vaccines, spaced apart, are used?

A: This is a controversial topic as the body has a very large potential to respond to multiple antigens simultaneously. That said, there is documented research showing that the degree and number of adverse reactions to vaccines goes up when more antigens are given at the same time. So, monovalent (single) or bivalent (two) vaccines given together are safer than giving a multiple polyvalent combination vaccine.

Q: I've seen an increase in some vets using titer testing, but others continue to subscribe to the outdated practice of annual or semi-annual boosters. What is the most common reason you hear from vets who challenge the validity of using titer testing?

A: Some veterinarians have challenged the validity of using vaccine titer testing to assess the immunologic status of animals against the common, clinically important infectious diseases.

With all due respect, this represents a misunderstanding of

Table 1. Equine Vaccine Titer Levels for Immunity

VIRUS / METHOD	TITER LEVEL for IMMUNITY	INTERPRETATION
Equine Arteritis Virus	Unknown	Unknown
Equine Herpes Virus - I, SN	1:32	Good
Equine Herpes Virus - III, SN	1:32	Good
Equine Encephalitis Virus, HI EEE, VEE, WEE	1:100	Good
Potomac Horse Fever Virus, IFA	1:40 1:80	Good Very good
Rabies Virus, RFFIT	1:5	Adequate for humans per CDC
West Nile Virus, Capture Ab, ELISA	1:100	Good
West Nile Virus, SN	1:32	Good

Table 2. Equine Duration of Vaccinal Immunity

VIRUS	DURATION of VACCINAL IMMUNITY
Equine Arteritis Virus	Unknown
Equine Herpes Virus - I, SN	6-12 months
Equine Herpes Virus - III, SN	6-12 months
Equine Influenza Virus, HI	Intranasal MLV, 6months; recombinant MLV, 1 year, if given 3 rd booster
Equine Encephalitis Virus, HI EEE; VEE; WEE	1-2 years
Potomac Horse Fever Virus, IFA	Unknown
Rabies Virus, RFFIT	At least 1 year; likely 3-5 years
West Nile Virus, Capture Ab, ELISA	1 year; 6 months, in endemic areas
West Nile Virus, SN	1 year, 6 months, in endemic areas

Available Vaccine Titrers for Horses:

- Equine Herpes I and III (Rhino)
- Potomac Horse Fever
- Equine Encephalitis (EEE, WEE, VEE)
- Equine Viral Arteritis
- Equine Influenza
- Rabies Titer (RFFIT: non export)
- West Nile Virus Antibody Titer

Equine Herpes I and III (Rhino)

While serum titers for EHV I and III are available, the short-lived duration of immunity from vaccination or natural disease makes their measurement of little use.

Equine Encephalitis Virus Vaccine Titrers

Vaccine titers for all three types of equine encephalitis are available and offer a good indication of the immune status of the animal.

Equine Arteritis Virus Vaccine Titrers

Vaccine titers can be measured against EAV but are of questionable value in predicting protection against infection and disease.

Equine Influenza Virus Vaccine Titrers

While serum titers for EIV are available, the short-lived duration of immunity from vaccination or natural disease makes their measurement of little use.

Rabies Virus Vaccine Titrers

An RFFIT rabies antibody titer is available for horses not destined for export. Serum samples are sent to Kansas State University, the federally recognized rabies serology laboratory. Testing takes 2-3 weeks to complete and results come with the statement that protective rabies titers have not been determined for this species. Nevertheless, the federal Centers for Disease Control in Atlanta have determined that a rabies antibody titer of 1:5 or greater (0.05 IU/mL) is protective of humans against rabies. This titer level has been extrapolated to other mammals to be a protective level.

West Nile Virus Vaccine Titrers

WNV capture and serum neutralizing antibody titers are available and can be used to determine the existing immune status of a horse following vaccination or disease exposure.

A: from: Schultz RD, Ford RB, Olsen J, Scott F. Titer testing and vaccination: a new look at traditional practices. *Vet Med*, 97: 1-13, 2002 (insert):

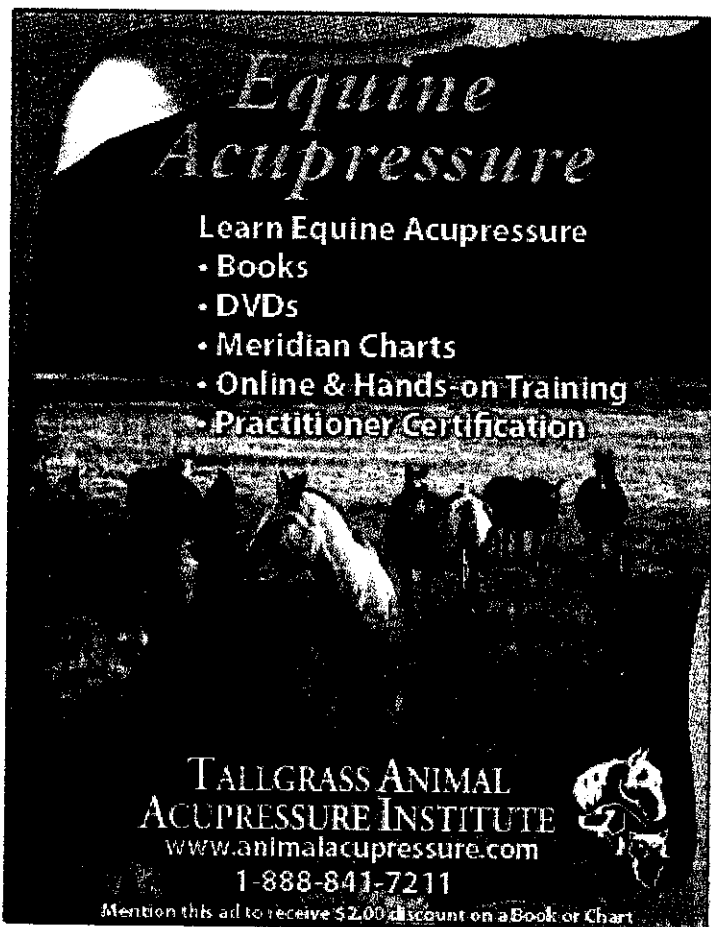
1. To determine that animal is protected (suggested by a positive test result).
2. To identify a susceptible animal (suggested by a negative test result).
3. To determine whether an individual animal has responded to a vaccine.
4. To determine whether an individual vaccine is effectively immunizing animals.

Q: How often would you suggest an animal guardian check titers, and what do these tests normally cost?

A: It depends upon the virus involved, as shown by the duration of immunity in Table 2, **Equine Duration of Vaccinal Immunity**. So for some viruses that produce short-lived immunity, titering should be done every 6-12 months. For others like rabies, if titers were an acceptable alternative to the required rabies boosters – currently they're not – every 3-5 years. ☺

About the author:

Dr. W. Jean Dodds received her DVM degree with honors in 1964 from the Ontario Veterinary College, University of Toronto. In 1986 she established Hemopet, the first nonprofit national blood bank program for animals which has saved many animals' lives, www.hemopet.com. Dr. Dodds has received many awards throughout her career and is considered one of the foremost authorities on animal vaccination.



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