Introduction to Vaccination

Principles of Rabies Vaccine Administration for Dogs, Cats & Ferrets

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Objectives

• Describe the key elements of the principles of vaccination
• List general recommendations on immunization
• Explain animal vaccine safety / licensure requirements
• Discuss appropriate methods of vaccine administration
• Summarize important aspects of vaccine storage and handling
• Describe rules pertaining to medical waste management

Principles of Vaccination

• Immunity
  — Self vs non-self
  — Innate vs adaptive (naturally or artificially acquired)
  — Antigen and antibody
• Vaccines (killed, live attenuated, recombinant)

Definitions from www.vaccines.gov

• A vaccine is a product that produces immunity from a disease and can be administered through needle injections, by mouth, or by aerosol.
• A vaccination is the injection of a killed or weakened organism that produces immunity in the body against that organism.
• Immunization is the process by which a person or animal becomes protected from a disease. Vaccines cause immunization, and there are also some diseases that cause immunization after an individual recovers from the disease.

Principles of Vaccination

• Antigen
  — A substance (protein, polysaccharide, glycolipid, etc.) capable of inducing a specific adaptive immune response.
  — Introduction of an antigen may be through invasion of infectious organisms, immunization, inhalation, ingestion, etc.

Principles of Vaccination

• Antibody
  — Protein molecules produced in response to exposure to a “foreign” or extraneous substance (invading microorganisms responsible for infection or active immunization).
  — Antibody has capacity to bind specifically to a foreign substance (antigen) that elicited its production, supplying a mechanism against infectious disease.
Immunity

Innate

Epithelial barriers, phagocytes, NK cells

Adaptive or Artificially Acquired

Naturally Acquired

Artificially Acquired

Acquired Immunity

Naturally Acquired

Active: Antigens enter the body; the body produces antibodies and specialized lymphocytes

Passive: Antibodies pass from mother to fetus via placenta or to infant in mother’s milk

Artificially Acquired

Active: Antigens are introduced in vaccines; the body produces antibodies and specialized lymphocytes

Passive: Preformed antibodies in immune serum introduced into body by injection

Active Immunity

• Either way, if an immune person or animal comes into contact with that disease in the future, their immune system will recognize it and immediately produce the antibodies needed to fight it.

• Anamnestic Response = Memory

• Active immunity is long-lasting, and sometimes life-long.

Can I booster a dog, cat or ferret if they are overdue?

Yes, Because of Anamnestic Response (immune system memory), a previously vaccinated animal that is overdue for a vaccine can be boostered and will be considered currently vaccinated immediately after the booster vaccination.

Classification of Rabies Vaccines

I. Noninfectious – Inactivated (dogs, cats, ferrets, livestock)
   – Cannot revert to virulence
   – More likely to produce adverse reactions – antigen, adjuvant, serum or cellular proteins, or combinations.
   – Adjuvants – maintain or depot the antigen and stimulate an inflammatory response
   – Cats – fibrosarcoma?
     • Multiple products – see Rabies Compendium

II. Infectious
   – Viral: Recombinant (infected cells) – more likely to revert to virulence

http://www.cdc.gov/vaccines/vac-gen/default.htm
Classification of Rabies Vaccines

II. Recombinant Viral Vectored - cats

- Recombinant DNA technology (genetically engineered)
- Non-infectious – cannot revert to virulent form; cannot replicate in lymphocytes

- Example: Purevax Feline Rabies, Merial Inc.
  - Advantage: No adjuvant, no Fibrosarcoma?

Minimum Age for Administration

- Generally rabies vaccines can be administered as early as 3 months of age
- Always consult package insert
- List of USDA licensed vaccines – NASPHV Rabies Compendium
  - Product name, Manufacturer
  - Species
  - Age – initial, booster timing (duration of immunity)
  - Route of Administration

Vaccine Adverse Events (AE)

- Any undesirable side effect or unintended effect.
- Serious AEs are uncommon
- AEs involve the health of the treated animal
- Any injury, toxicity or sensitivity reaction associated with the vaccine.

Vaccine Adverse Events (AE)

- Within hours to 2-3 days after vaccination
- Local and/or Systemic
  - Injection site reactions
  - Transient post-vaccine nonspecific illness
  - Allergic hypersensitivity, Immune-mediated
  - Vaccine failure
  - Tumorigenesis - Fibrosarcoma

- Advise clients to seek Veterinary Care
- Report to the manufacturer and USDA APHIS CVB
  ent.shtml

Contraindications

- Condition or history in a recipient that greatly increases the chance of a serious adverse reaction

- Example: known severe acute hypersensitivity to a vaccine component or severe reaction following a prior dose.
- Refer those animals to a DVM
### Pregnancy

- AAHA 2011 guidelines recommends caution regarding vaccination during pregnancy
  - Avoid Infectious or MLV vaccines (distemper, parvovirus) to reduce potential fetal injury
  - [https://www.aahanet.org/PublicDocumentsCanineVaccineGuidelines.pdf](https://www.aahanet.org/PublicDocumentsCanineVaccineGuidelines.pdf)
- Insufficient data concerning vaccine safety to fetuses and efficacy
- NCGS 130A-185, 130A-197; no legal waivers in NC

### Illness

- Most package inserts advise to only vaccinate healthy animals
  - Suboptimal protection (?)
- NCGS 130A-185 requires owners to have their dogs, cats and ferrets current (>4 mos.)
- NCGS 130A-197 – risk/benefit
- No legal waivers in NC

### Can a rabies antibody titer be used in place of a rabies vaccination to assess immunity?

- No. A titer cannot be used in place of rabies vaccination.
- NCGS 130A-185 requires that owners of dogs, cats and ferrets (4 months and older) keep their animals currently vaccinated against rabies.

### Know what you are Administering

- Animal vaccines are licensed by the USDA APHIS Center for Veterinary Biologics (CVB)
  - Purity
  - Safety
  - Potency
  - Efficacy
  - Manufacturers are required to demonstrate these qualities prior to licensure
- 9 CFR 113.209 Rabies Vaccine, Killed Virus
- Specific requirements for rabies vaccine
- Challenge studies required based on claimed duration of immunity
- Read the product label and package insert
### Think Before you Vaccinate
#### The 5 “Rights”
1. The right vaccine (rabies vaccine ONLY)
2. The right species (dog, cat, ferret ONLY)
3. The right age or time (>=3 mo old, consult PI)
4. The right dose (1 ml, see insert)
5. The right route (SQ, consult PI)

### Protect the Animals
- Question owners about contraindications
- Answer owner questions about vaccine you are administering
- Appropriately and SAFELY restrain animals
- DO NOT re-use needles
- DO NOT pre-fill syringes

### Protect Yourself
- Properly restrain the animal (assistant)
- Ideally gloves should be worn
- DO NOT recap needles
- DO NOT pre-fill syringes
- Properly dispose of needles and syringes after use
- Wash hands thoroughly after handling animals and vaccine

### Administration:
Aseptically inject 1 mL (1 dose) subcutaneously or intramuscularly into healthy cats or dogs

### Aspiration:
The process of pulling back the plunger of the syringe prior to injection to ensure that the medication is not injected into a blood vessel.

### Vaccine Storage and Handling
- Store at the appropriate temperature. Do not freeze. See package insert.
- How was the vaccine handled during shipment?
- What is the shelf life?
  - multi-dose vials should be used the same day
- Do you have a checklist for safe vaccine storage and handling?
  - [http://www.immunize.org/catg.d/p3035.pdf](http://www.immunize.org/catg.d/p3035.pdf)
Waste Management
Veterinary / Animal Control
NC Rules

Source: http://portal.ncdenr.org/web/wm/sw/medicalwaste

Are Animal Shelters covered by Waste Management Rules in NC?

• SECTION .1200 - MEDICAL WASTE MANAGEMENT (15A NCAC 13B)
  – (2) "Generating facility" means any facility where medical waste first becomes a waste, including but not limited to any medical or dental facility, funeral home, laboratory, veterinary hospital and blood bank

Medical Waste

• Medical waste means any solid waste which is generated in the diagnosis, treatment, or immunization of human beings or animals, in research pertaining thereto, or in the production or testing of biologicals,
  – but does not include any hazardous waste identified or listed pursuant to this Article, radioactive waste, household waste as defined in 40 Code of Federal Regulations § 261.4(b)(1) in effect on 1 July 1989, or those substances excluded from the definition of solid waste in this section. (NCGS 130A-290(a)(18)

Regulated Medical Waste

• "Regulated Medical Waste" means blood and body fluids in individual containers in volumes greater than 20 ml, microbiological waste, and pathological waste that have not been treated pursuant to Rule .1207 of this Section.

Medical or Regulated Medical Waste?

• Regulated medical waste must be treated prior to disposal
• After treatment these wastes may be handled as general solid waste
• Treatment required due to potential to cause human illness

Sharps...
How are these classified

• "Sharps" means and includes needles, syringes with attached needles, capillary tubes, slides and cover slips, and scalpel blades.
Handling Sharps

- At the generating facility, sharps shall be placed in a container which is rigid, leak-proof when in an upright position and puncture-resistant
  - Contained sharps shall not be compacted prior to off-site transportation. After leaving the generating facility, the container and its contents shall be handled in a manner that avoids human contact with the sharps
- The container may then be disposed of with general solid waste

What other Waste Management Rules Apply?

- Regulated Medical Waste includes...
  - blood and body fluids in individual containers in volumes greater than 20 ml
  - microbiological waste
  - pathological waste
- that have not been treated pursuant to Rule .1207 of this Section

Blood and Body Fluids

- In general this refers to human product
- Acceptable method of treatment is
  - Incineration or sanitary sewage systems
  - DENR recommends the drain as the most cost efficient and effective means of treatment
- No special requirement for veterinary clinics

Microbiological Waste

- "Microbiological waste" means cultures and stocks of infectious agents, including but not limited to specimens from medical, pathological, pharmaceutical, research, commercial, and industrial laboratories
- Acceptable method of treatment is:
  - Incineration, steam sterilization, microwave treatment, or chemical treatment
  - If the generating facility treats the waste on site, it can be disposed of with general solid waste

Pathological Wastes

- "Pathological waste" means human tissues, organs and body parts; and the carcasses and body parts of all animals that were known to have been exposed to pathogens that are potentially dangerous to humans during research, were used in the production of biologicals or in vivo testing of pharmaceuticals, or that died with a known or suspected disease transmissible to humans.
Pathological Wastes

- Do veterinarians and CRVs ever work with animals that may have died from a disease that is communicable to humans?

- [CDC MMWR](http://www.cdc.gov/mmwr/)

Veterinary Public Health Contact Information

- [http://portal.ncdenr.org/web/wm/sw/medicalwaste/providers](http://portal.ncdenr.org/web/wm/sw/medicalwaste/providers)