

MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE  
STATE BIOTECHNOLOGICAL UNIVERSITY  
Institute of Veterinary Medicine and Animal Husbandry  
Faculty of Veterinary Medicine  
Department of Epizootology and Microbiology

**Vaccinology in veterinary medicine**  
Guidelines for laboratory classes

Methodological recommendations for students of 2-3 courses of specialty 211- Veterinary medicine of the second (master's) level

Kharkiv – 2022

UDC 619:616.98:615.371:578/579

Methodological recommendations for students of the 2nd-3rd year of the FVM specialty 211- "Veterinary Medicine" of the second (master's) level - Mala Danylivka, 2022 - 101 slides.

The outlined recommendations are intended for mastering practical skills during the study of the course "Vaccinology in veterinary medicine". The scope of the discipline according to the curriculum is 90 hours, of which 14 hours are lectures, 16 hours of laboratory classes and 60 hours of independent classes. The recommendations contain the main provisions of laboratory and practical classes .

Compilers: Haragulya H.I., Basko S.O.

Approved by the Scientific and Methodological Commission of the Faculty of Veterinary Medicine of the State Biotechnological University "22" on December 22, 2022. (protocol No. 61)

Responsible for graduation,  
head of the department,  
associate professor

R.V. Severin

## Safety rules. Types of bacterial antigens.



2022

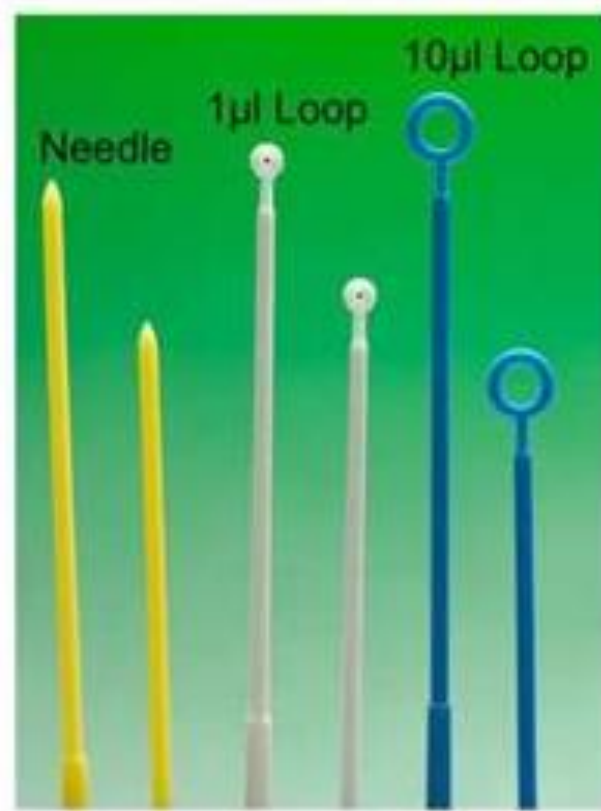


## Safe Practices for the Microbiology Laboratory

- Treat all microorganisms as potential pathogens.
- Sterilize equipment and materials.
- Disinfect work areas before and after use.
- Disinfect work areas before and after use.
- Never pipette by mouth.
- Do not eat or drink in the lab, nor store food in areas where microorganisms are stored.
- Label everything clearly. All cultures, chemicals, disinfectant, and media should be clearly and securely labeled with their names and dates.
- Autoclave or disinfect all waste material.

# Inoculating loops and needles

- **Inoculating loops** are used to transfer microorganisms to growth media or for staining slides.
- The wire forms a small loop with a diameter of about 5 mm.
- The loop of wire at the tip may be made of platinum or nichrome.



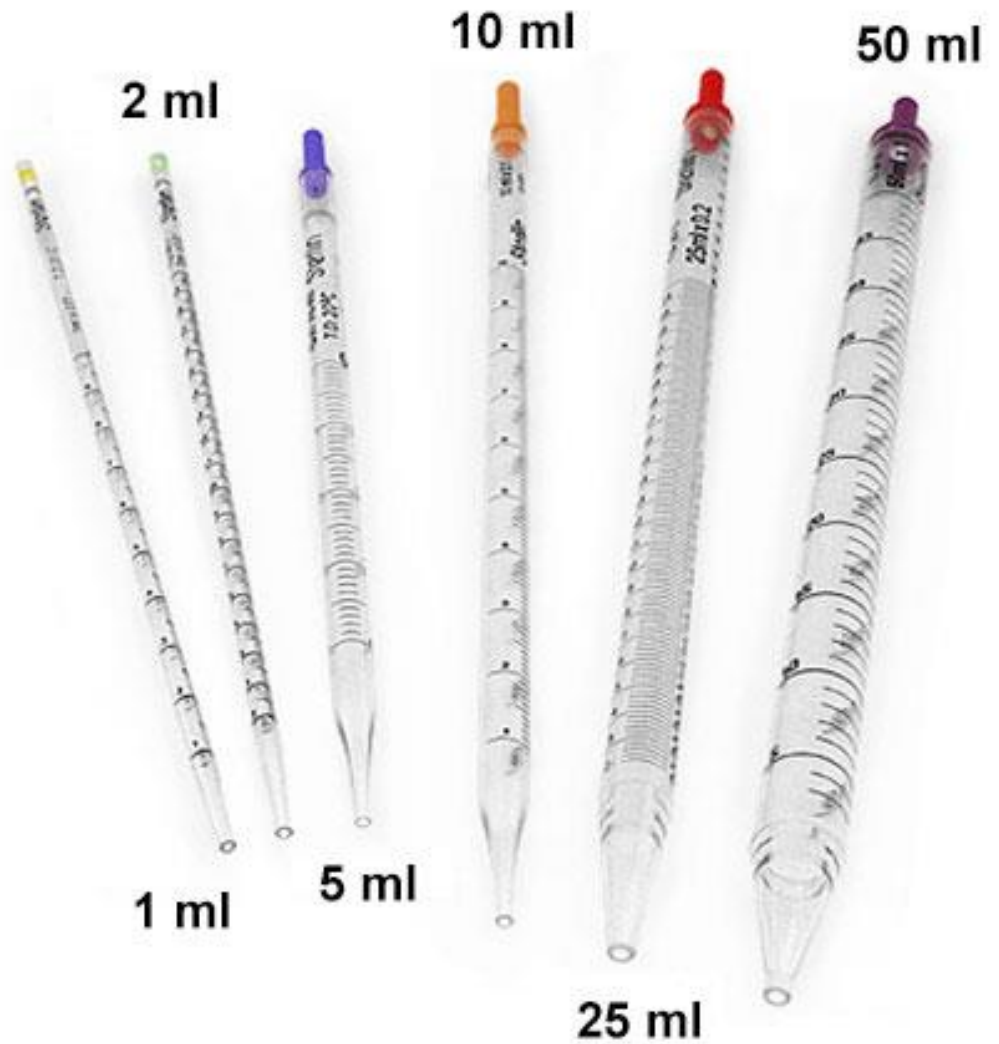
**Glassware: glass test tubes, a rack, cleaning brush, stoppers, and clamp**



# Glassware



Pipet



2 ml

10 ml

50 ml

1 ml

5 ml

25 ml



## Glassware:

### Petri dishes

- often used to make **agar plates** for microbiology studies.
- The dish is partially filled with warm liquid containing agar and a mixture of specific ingredients that may include:
  - **nutrients**
  - **blood**
  - **salts**
  - **Carbohydrates**
  - **dyes**
  - **indicators**
  - **amino acids**
  - **or**
  - **antibiotics**





# Glassware



Used in  
filtration  
and in  
transferring  
liquid

**FUNNEL**

**Funnel**

aids in pouring liquids into small openings without  
spilling them.




# BEAKER

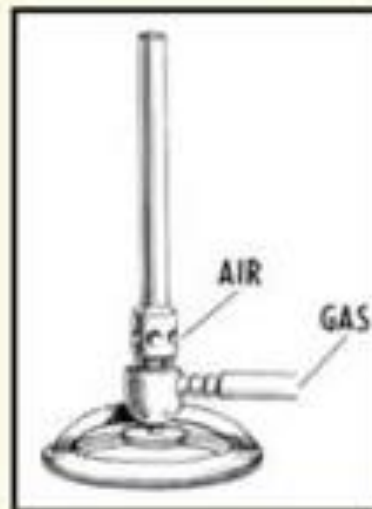
A wide-mouthed container used to transport, heat or store substances



# Glassware

## **BUNSEN BURNER/ ALCOHOL LAMP**

 Sources of heat



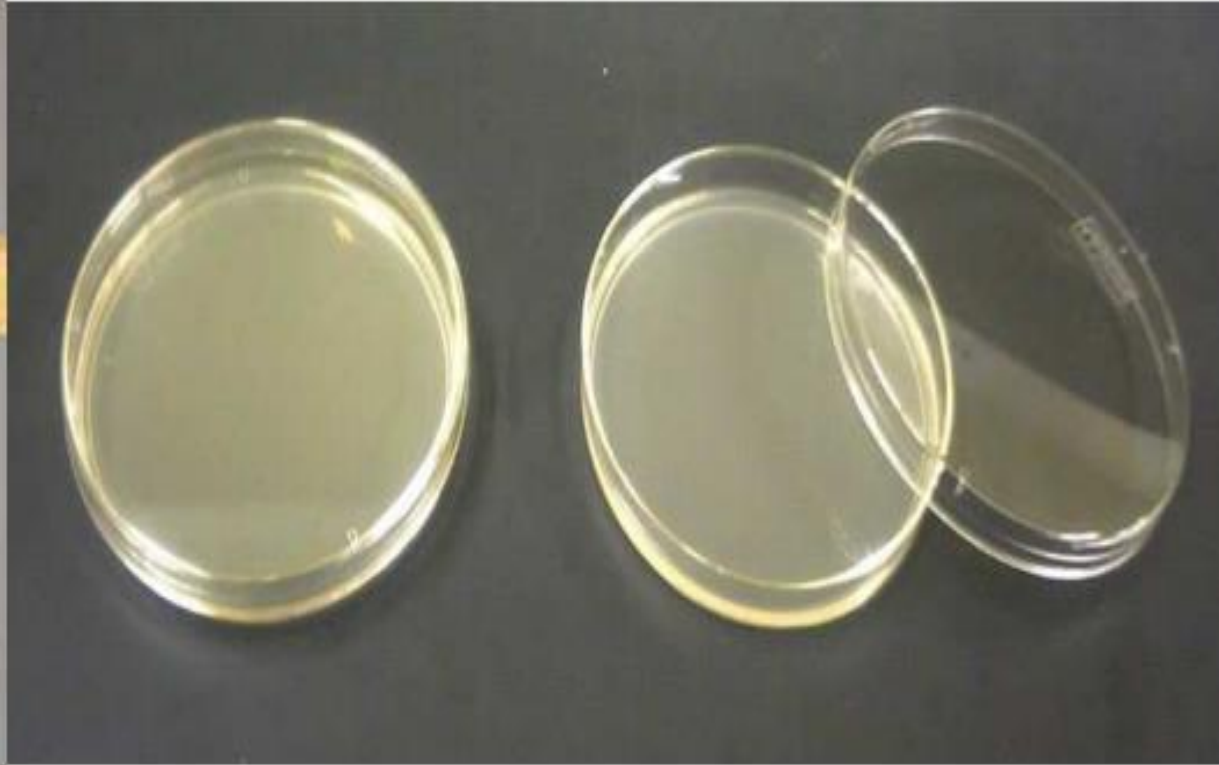
# Solid culture media



**deep**



**Slant**



**Plate  
(Petri dish)**

# 1-3: Aseptic Technique



- Types of media:
  1. **Broth** (liquid)
    - Inoculated with a **loop**
  2. **Slant** (solid)
    - Inoculated with a **loop** usually (except when you need to transfer only a small amount, like for a citrate slant)
  3. **Agar deep** (semi-solid)
    - Stab inoculate with a **needle**



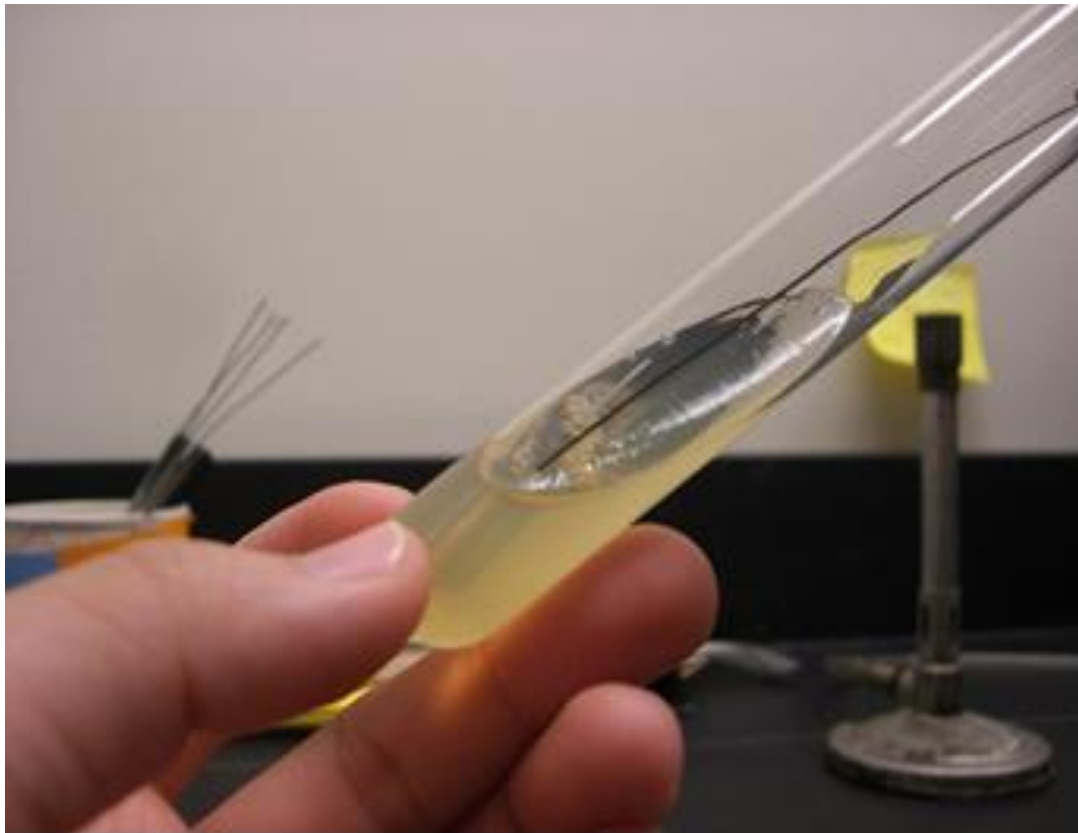
# Biosafety Cabinets



**Purifier Logic Class II  
Biosafety Cabinets**

## Inoculation of culture into agar slant

- An agar slant is a test tube containing agar, in which the solid agar forms a slant in the test tube. When inoculating an agar slant, draw the loop containing the inoculum very lightly over the surface in a zigzag formation while being careful not to break the surface.



# Methods of Streak Plate



- There are many different types of methods used to streak a plate. There are two most commonly used streak patterns, a three sector “T streak” and four-quadrant streak methods.
- Picking a technique is a matter of individual preference and can also depend on how large the number of microbes the sample contains.





**Incubator**

# Centrifuge

- is an apparatus that rotates at high speed and separates substances of different densities.



After centrifugation: **bacteria** will settle to the bottom of the tube, and **toxins** will be in the liquid.

# Tetanus Toxoid Vaccine (Inactivated)

Tetanus Toxoid Vaccine (Inactivated)  
Prevention of tetanus



## Directions/Dosages

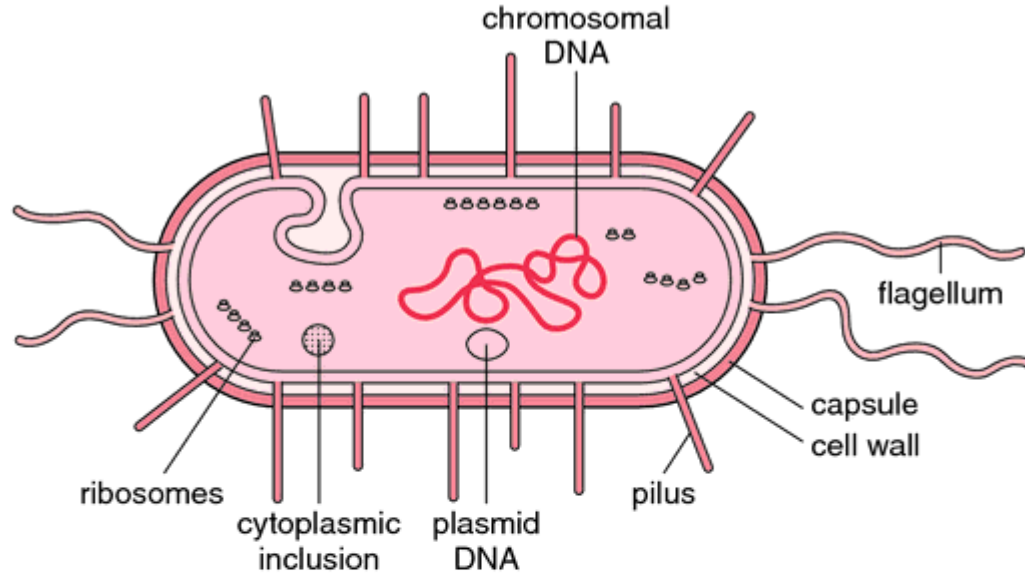
Administer the following quantity of the vaccine twice at an interval of 2 weeks by subcutaneous injection in the neck. Duration of vaccine efficacy is approximately 1 year.

Animals	First	Second
Large sized animals	5 ml	5 ml
Medium sized animals	2 ml	2 ml
Small sized animals	0.5 ml	0.5 ml

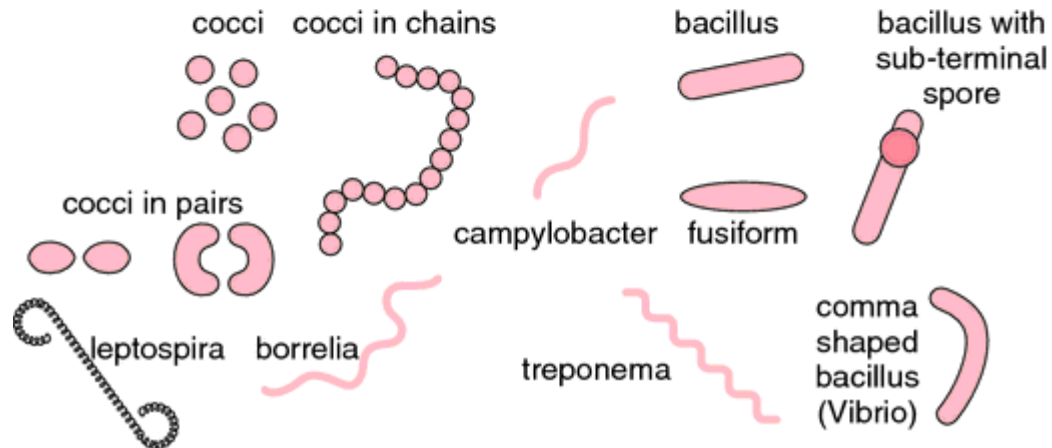
What is the antigen in this vaccine?

# Types of bacterial antigens.

## GENERALIZED STRUCTURE OF BACTERIUM



## EXAMPLES OF BACTERIAL MORPHOLOGY



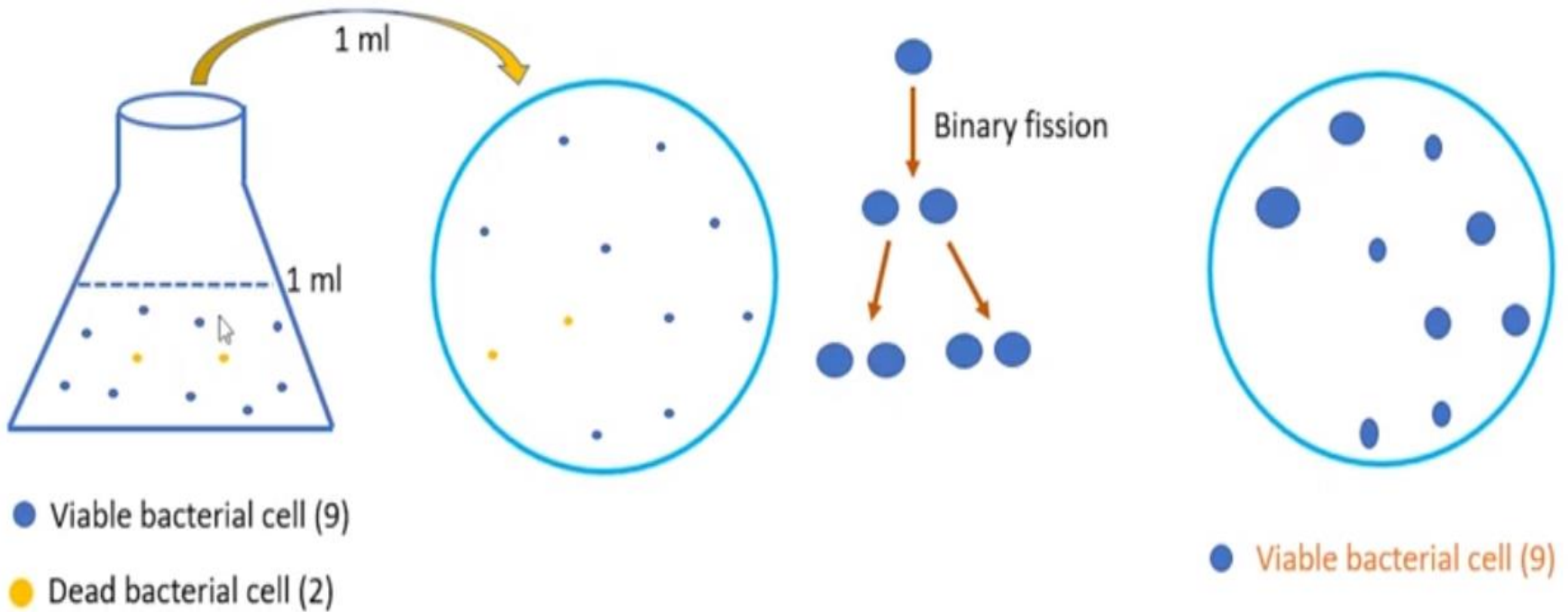
# CFU

**Colony-forming unit (CFU, cfu or Cfu)** is a unit which estimates the number of microbial cells (bacteria, fungi) in a sample that are viable, able to multiply via binary fission under the controlled conditions.

- Counting with colony-forming units requires culturing the microbes and counts only viable cells, in contrast with microscopic examination which counts all cells, living or dead.
- The visual appearance of a colony in a cell culture requires significant growth, and when counting colonies, it is uncertain if the colony arose from one cell or a group of cells.

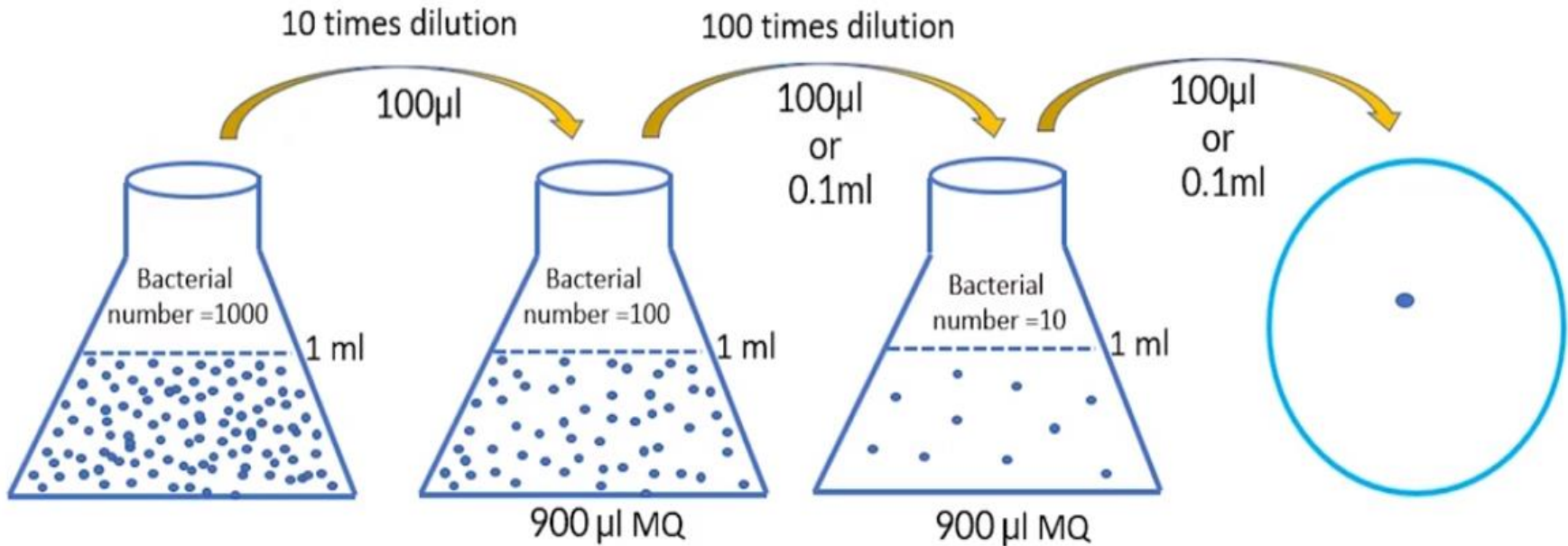
# Colony-forming unit (CFU)

➤ Colony-forming unit (cfu) is a unit of viable bacterial or fungal cells





# Calculation of CFU



No. of colonies = 1

Volume of original culture = 1ml

Dilution factor = 100

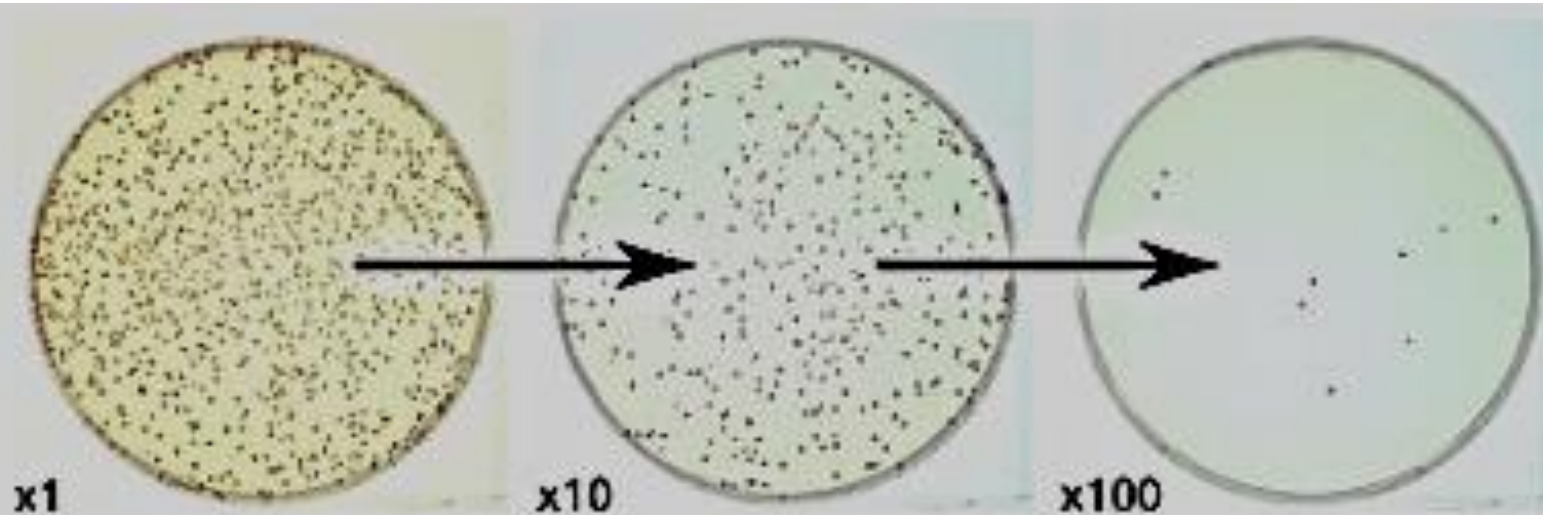
Volume plated = 0.1ml or 100 µl

$$\text{cfu/ml} = \frac{1 \times 100}{0.1} = 1000 \quad (\text{or})$$

$$\text{cfu/ml} = \frac{1 \times 1000 \times 100}{100} = 1000$$

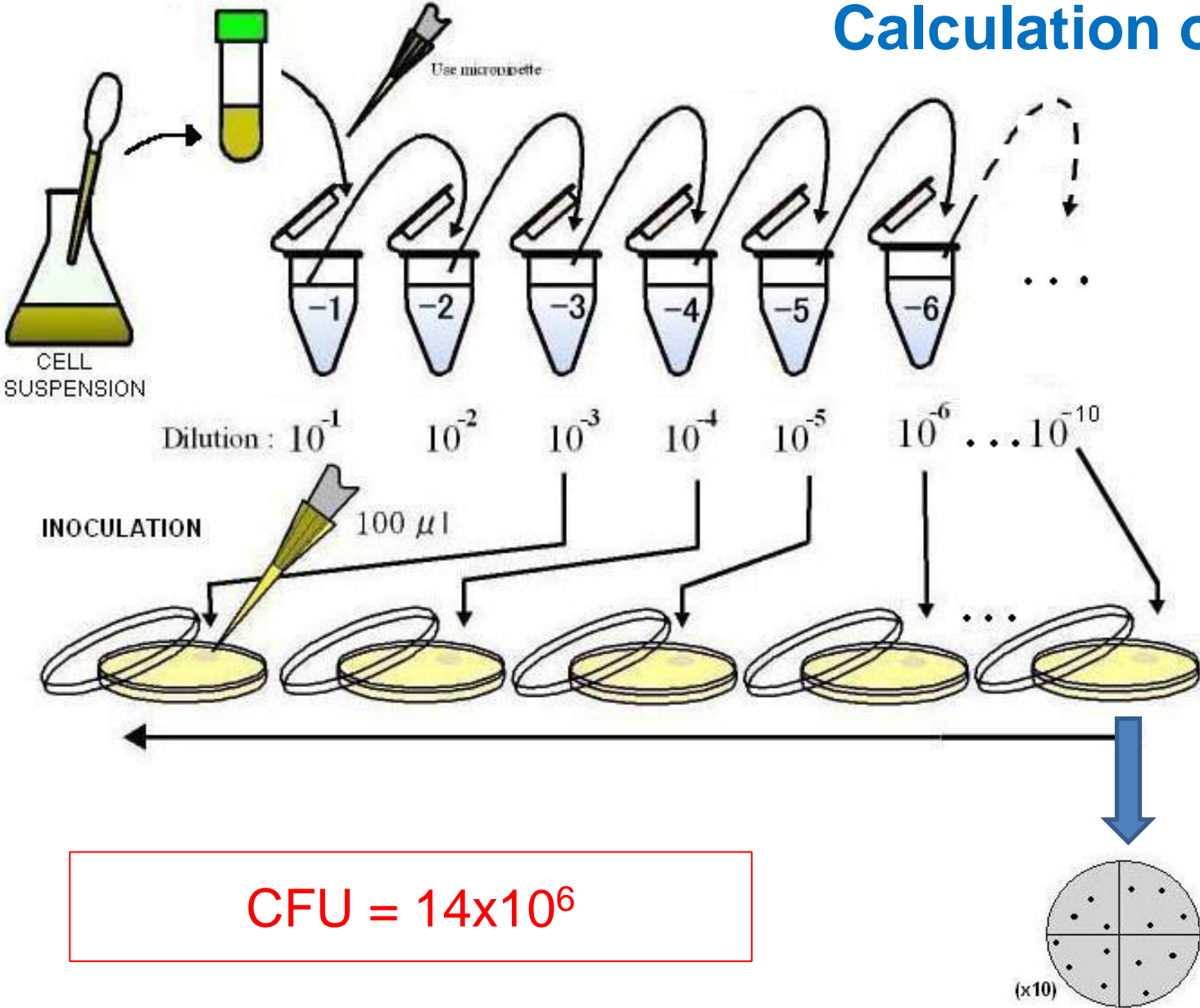


# Calculation of CFU

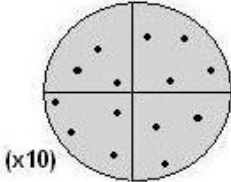


A solution of bacteria at an unknown concentration is often serially diluted in order to obtain at least one plate with a countable number of bacteria. In this figure, the "x10" plate is suitable for counting.

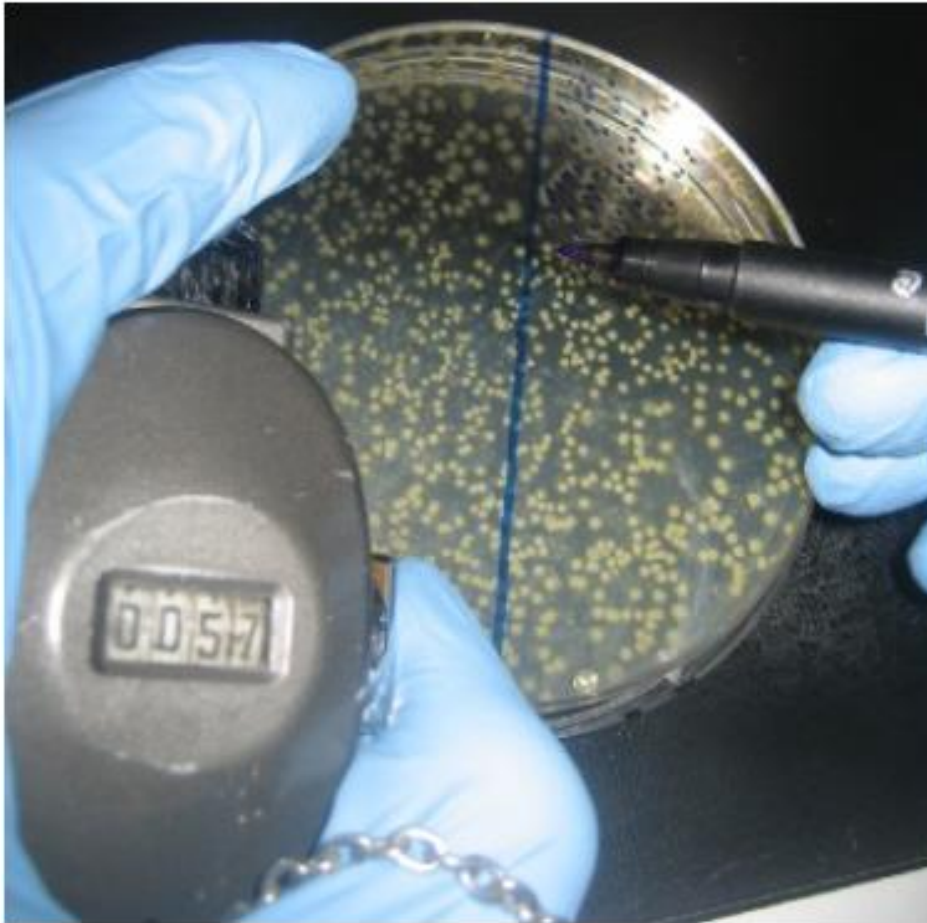
# Calculation of CFU



$CFU = 14 \times 10^6$



## Calculation of CFU



The traditional way of enumerating CFUs with a “click-counter” and a pen. When the colonies are too numerous, it is common practice to count CFUs only on a fraction of the dish.



# Calculation of CFU

An automated colony  
counter using image  
processing

[https://www.wikiwand.com/en/Colony-forming\\_unit](https://www.wikiwand.com/en/Colony-forming_unit)



# Nisseiken Swine Erysipelas Vaccine ME

Generic name: Swine Erysipelothrix rhusiopathiae inactivated vaccine (with oil adjuvant)

Composition/ Information on Ingredients

Ingredients and Contents: Per 25 mL (for 50 pigs) of the vaccine

Component Name	Contents
(1) Inactivated <i>Erysipelothrix rhusiopathiae</i> (Tama 96 strain) (seed) (total bacterial count before inactivation)	$5 \times 10^9$ CFU or more
(2) Formalin	Not more than 0.15%
(3) Micro-emulsion (contains 0.01% of thimerosal)	25% (0.0025% of thimerosal)

What is the antigen in this vaccine?

# Nisseiken Swine AP Vaccine 125RX

Ingredients and Contents: Per 100mL (for 100 pigs) of the vaccine

Component Name	Contents
(1) Inactivated <i>Actinobacillus pleuropneumoniae</i> strain 41-1 (serotype 1) (total bacterial count)	$1 \times 10^{11} - 5 \times 10^{11}$
(2) Inactivated <i>Actinobacillus pleuropneumoniae</i> strain SHP-1 (serotype 2) (total bacterial count)	$1 \times 10^{11} - 5 \times 10^{11}$
(3) Inactivated <i>Actinobacillus pleuropneumoniae</i> strain Ng-2 (serotype 5) (total bacterial count)	$1 \times 10^{11} - 5 \times 10^{11}$
(4) Non-toxicogenic cytotoxins of <i>A. pleuropneumoniae</i> (derived from <i>Escherichia Coli</i> ) rApx I protein (protein content)	8 - 12 mg
(5) Non-toxicogenic cytotoxins of <i>A. pleuropneumoniae</i> (derived from <i>Escherichia Coli</i> ) rApx II protein (protein content)	8 - 12 mg
(6) Non-toxicogenic cytotoxins of <i>A. pleuropneumoniae</i> (derived from <i>Escherichia Coli</i> ) rApx III protein (protein content)	8 - 12 mg
(7) Formalin	Not more than 0.25%
(8) Thimerosal	Not more than 0.010%
(9) Aluminum hydroxide gel (as aluminum content)	Not more than 0.36%
(10) Phosphate-buffered saline	Residual quantity

Generic name:  
Swine  
*Actinobacillus pleuropneumoniae* (serotypes 1, 2 and 5, and non-toxic recombinant toxins) inactivated vaccine (with adjuvant).

What are the antigens in this vaccine?

# Blanthax Blackquarter & Anthrax Vaccines



Blanthax is a vaccine for the active immunisation of animals against anthrax and black quarter.

## COMPOSITION

Blanthax vaccine is a colourless liquid that contains a suspension of living spores of unencapsulated avirulent strain of *Bacillus anthracis* in alum precipitated *Clostridium chauvoie*.

What are the antigens in this vaccine?





## BCG vaccine (Freeze-dried)

- Bacillus Calmette- Guérin (BCG) is the only licensed tuberculosis vaccine.
- The first human subject trial took place in early 1920 on a 3-day-old infant at Hôpital de la Charité in Paris.
- In 1973, the WHO Expert Committee on Tuberculosis recommended that BCG be used as widely as possible; today, 90% of all children are vaccinated with BCG making it the most administered vaccine in the world

# Nisseiken Avian Colibacillosis Vaccine

Generic name: Avian *Escherichia coli* live vaccine

Composition/ Information on Ingredients

Ingredients and Contents: Per 1,000 doses of the vaccine

Component Name	Contents
(1) Avian <i>Escherichia coli</i> serotype O78, AESN1331 strain	$1 \times 10^{10}$ - $1 \times 10^{12}$ CFU
(2) Skim milk	100 mg
(3) Yeast extract	1.3%
(4) D-Sorbitol	2.5%



## Poulvac E. coli (avian colibacillosis vaccine (live))

- Poulvac E. coli is a vaccine that is used in chickens and turkeys for active immunisation against an infection caused by Escherichia coli serotype O78, called colibacillosis.
- It contains the live bacteria Escherichia coli, type O78, strain EC34195 with a gene (aroA) deleted.
- The bacterium is alive, but it has been weakened by removal of a gene (aroA) so that it does not cause disease, which makes it suitable for use in a vaccine.

# COLIDEX -C

Inactivated vaccine against neonatal and post-weaning diarrhea in piglets caused by *Escherichia coli* and *Clostridium perfringens* type C.



## Composition:

Each dose contains inactivated *E. coli* strains and *Cl. perfringens* type C toxoid. *E. coli* strains assure protection against K88, K99, F41 and P987 fimbrial antigens, toxoids of (LT) thermolabile toxin, (STa) thermostable toxin, (VT) verotoxin and (Hly) haemolysin. This vaccine contains mineral oil as adjuvant.



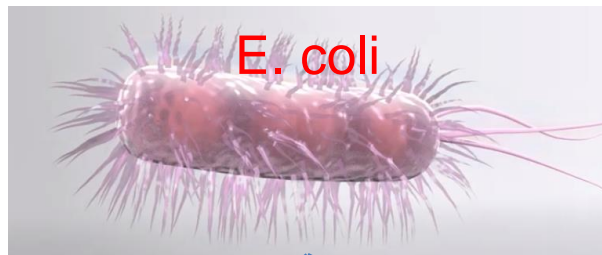
## Nobilis *E.coli inac*

- MSD's *E. coli* vaccine (Nobilis® *E.coli inac*) is a sub-unit vaccine containing the F11-type fimbrial antigen and the flagellar antigen FT.
- Either one or both of these antigens are expressed by 93 per cent of the 203 *E. coli* strains collected from all over the world, therefore, this vaccine can offer a broader spectrum of activity than the vaccines based on one or two serotypes.



# SUISENG

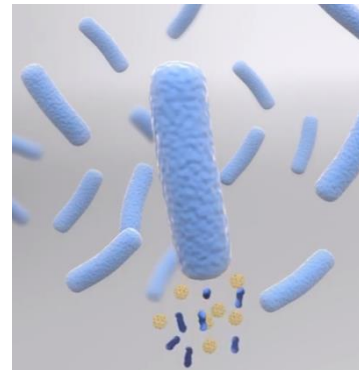
Inactivated vaccine against neonatal colibacillosis and *Clostridium* infections in swine, in injectable suspension.



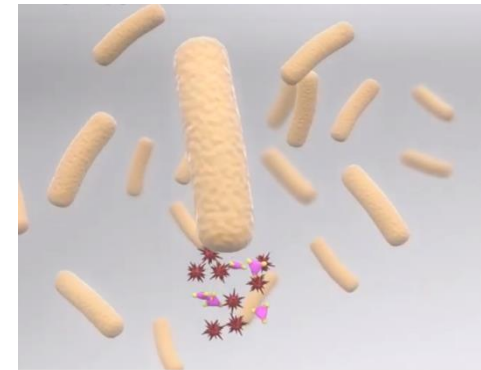
Fimbrial adhesins:  
F4ab, F4ac, F5, F6



Heat-labile  
Toxoid (LT)



*Clostridium*  
*perfringens*  
type C  
Toxoid



*Clostridium novyi*  
type B  
Toxoid

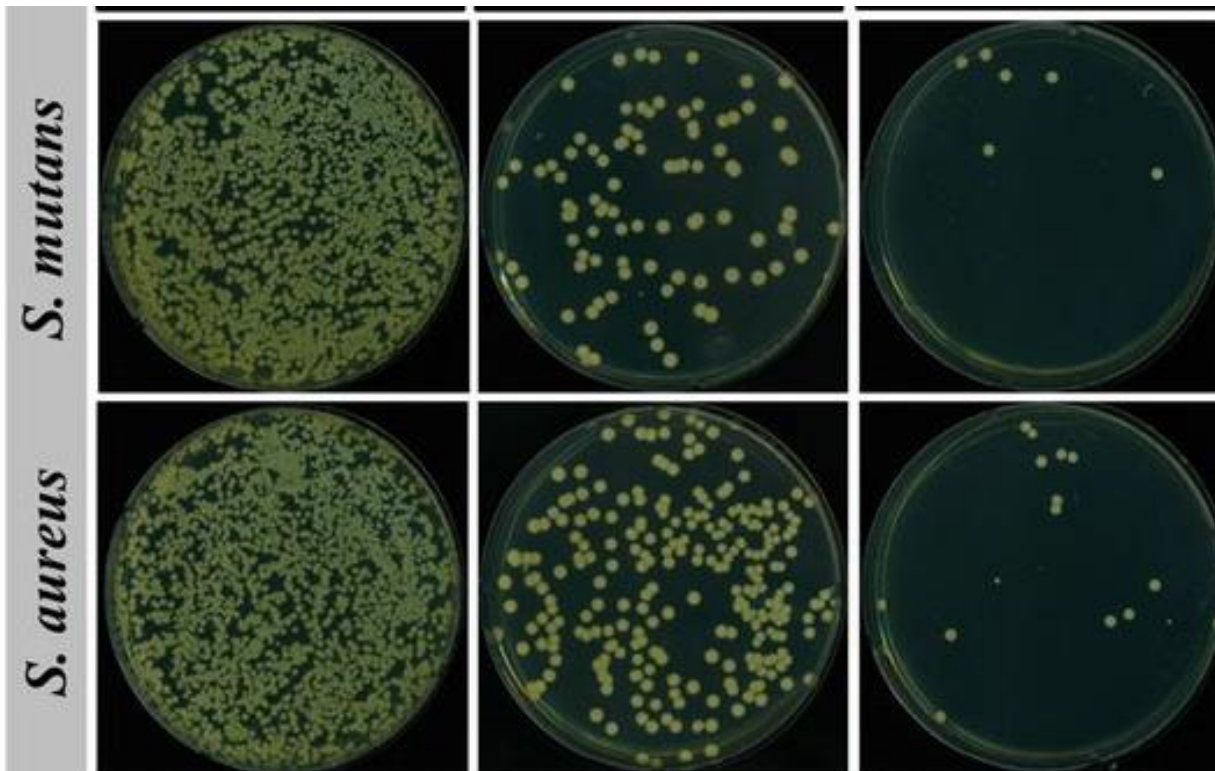
Antigens in this vaccine



## Exercise 1: calculation of CFU;

which bacteria is more: streptococci or staphylococci?

Dilution		
$10^{-3}$	$10^{-4}$	$10^{-5}$



Calculation  
of CFU of  
*Streptococcus  
mutans*  
and  
*Staphylococcus  
aureus*  
(the result is  
shown in the  
photo)



## Exercise 2:

How are the two vaccines different?

	Anthrax spore vaccine	Anthravax®
Differences		
Similarities		



## Anthravax®

For the active immunisation of cattle, sheep and goats against Anthrax.

### COMPOSITION

Contains a suspension of living spores of uncapsulated avirulent strain (Sterne 34F2) of *Bacillus anthracis*.



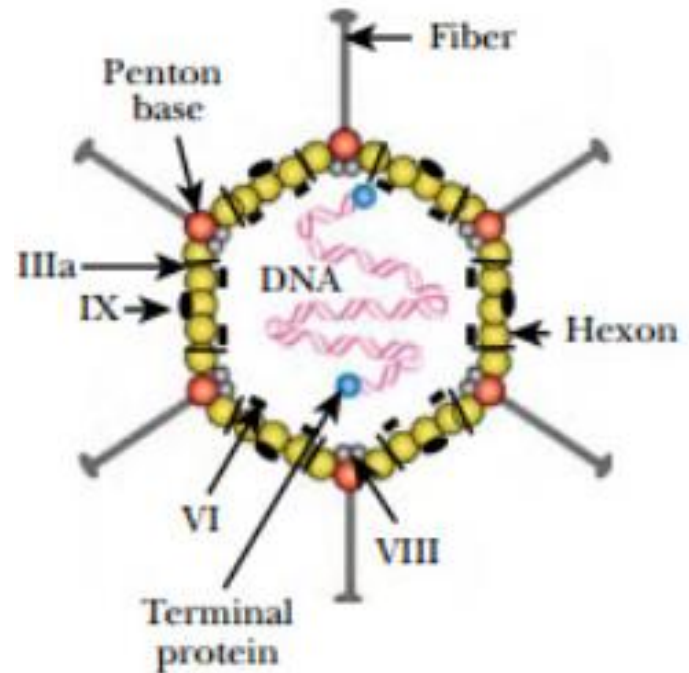
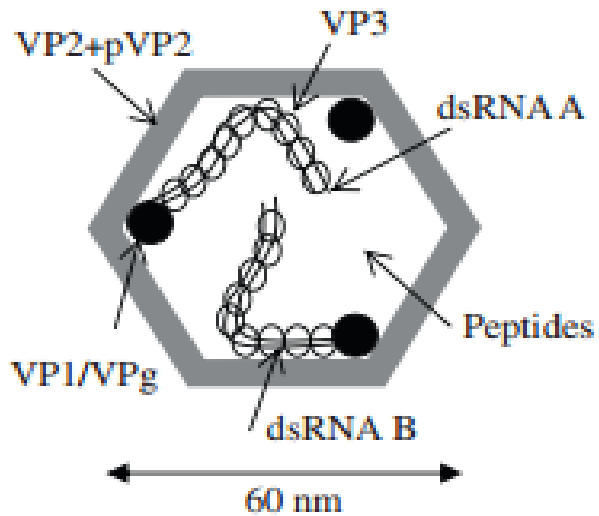
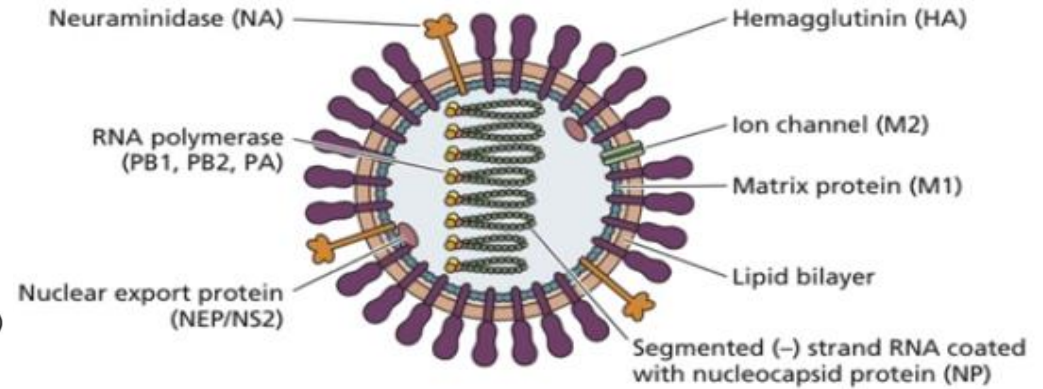
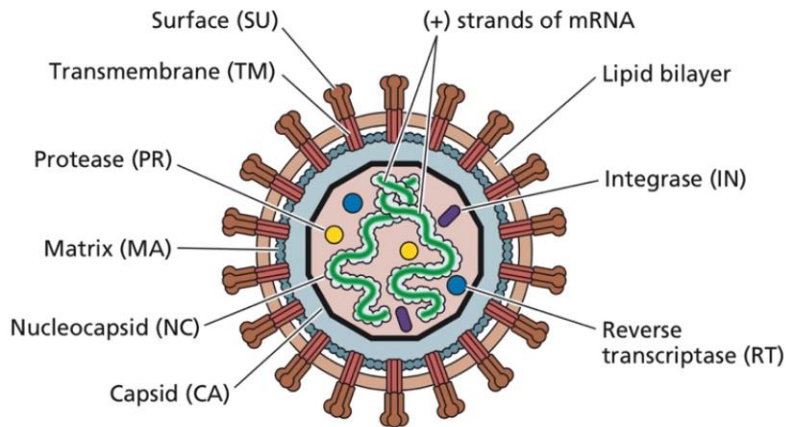
# ANTHRAX SPORE VACCINE

This product has been shown to be effective for the vaccination of healthy cattle, sheep, goats, swine, and horses against Anthrax.

**Ingredients:** Anthrax Spore Vaccine contains a suspension of viable *Bacillus anthracis* spores in saponin.

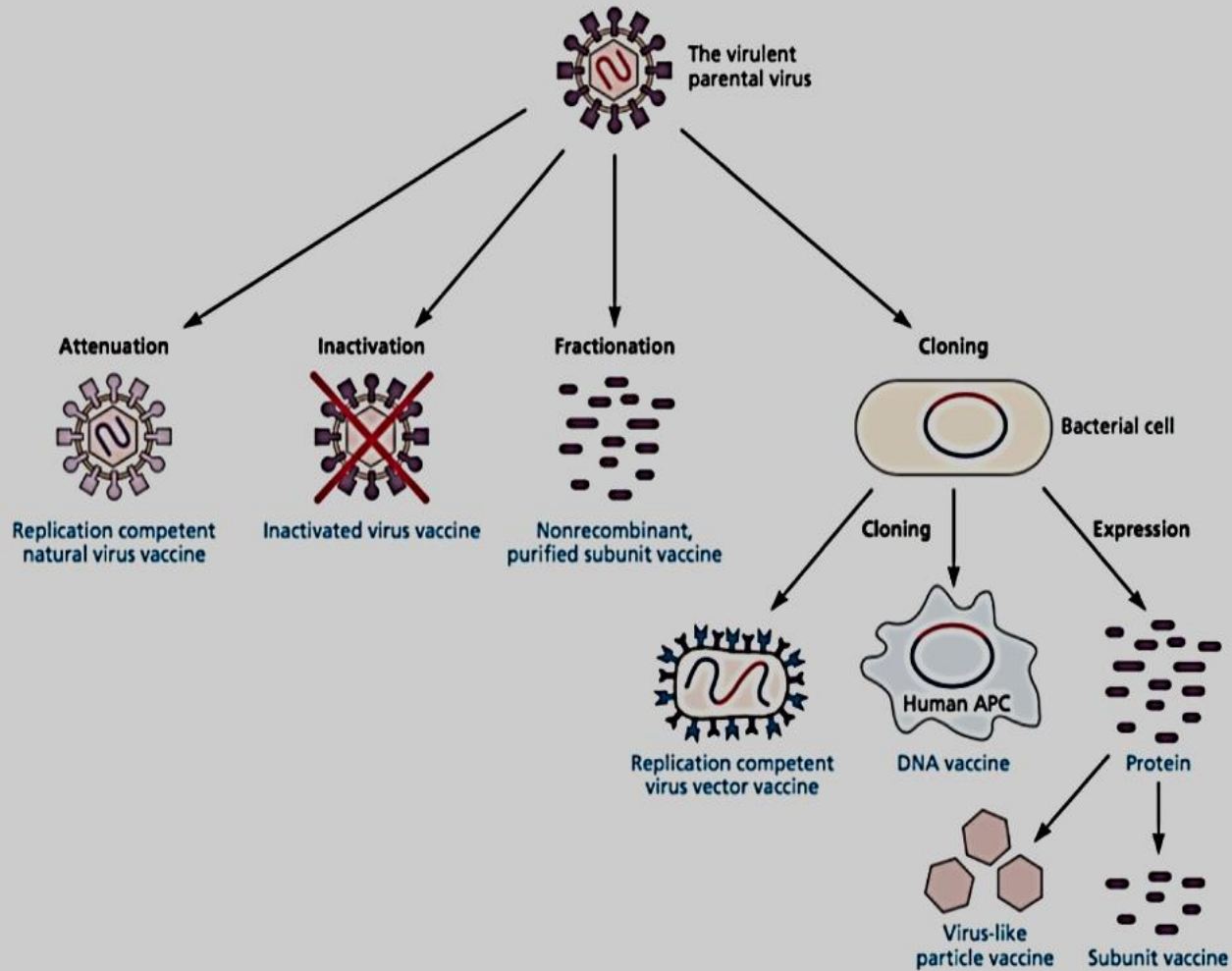
### Types of viral antigens.

# Viral antigens.





# Viral antigens.



# NOBIVAC® 1-RABIES PROVIDES PROTECTION AGAINST RABIES



Each dose contains Rabies strain Pasteur RIVM with potency  $\geq 2$  I.U.



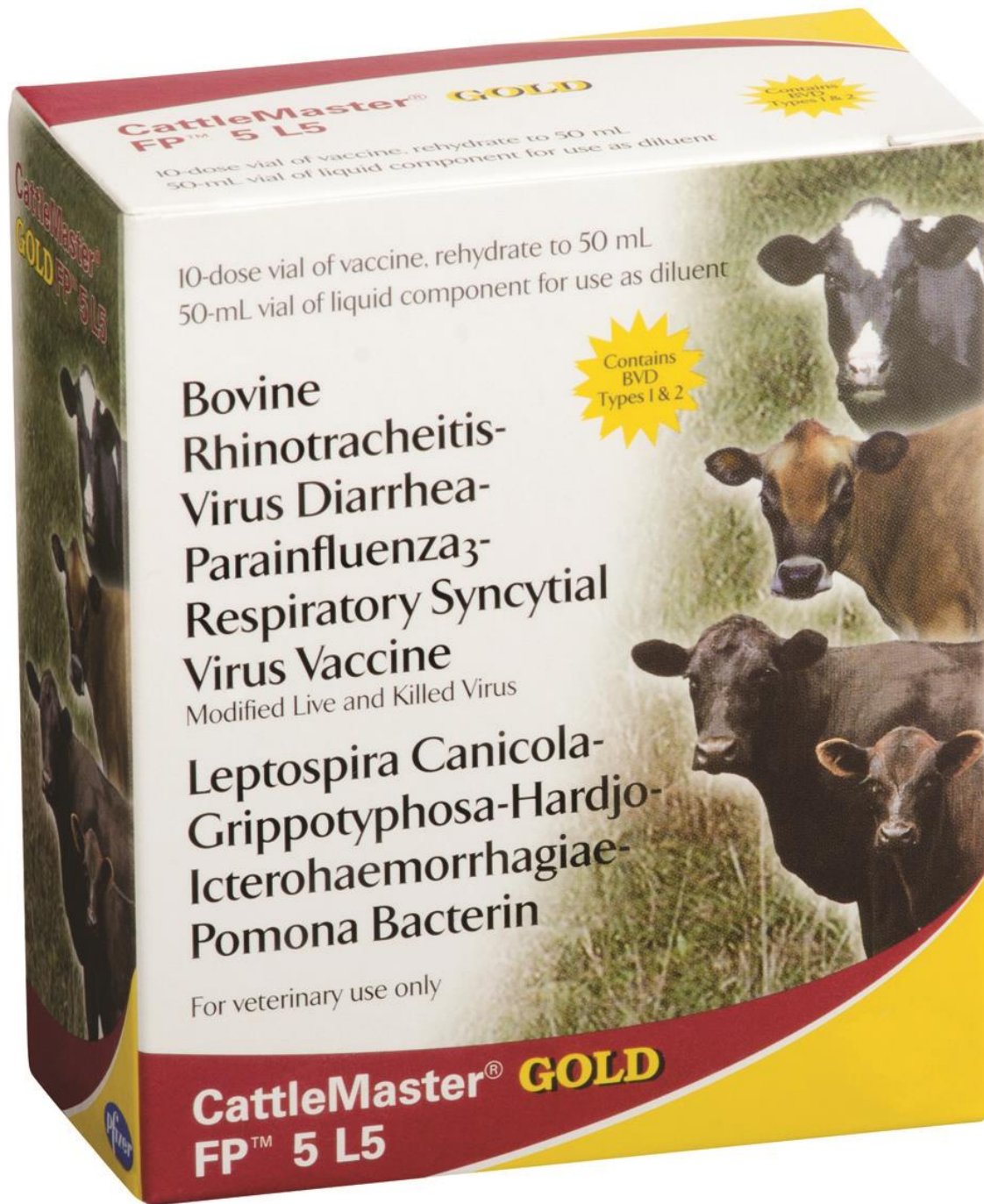
## Rabvac 3 - 10 dose



- Killed virus
- Provides three year immunity for dogs and cats and one year immunity for horses
- Injectable vaccination

# Beef and Dairy Cattle Vaccination

- IBR (infectious bovine rhino-tracheitis)
- BVD (bovine virus diarrhea)
- PI-3 (parainfluenza-3)
- BRSV (bovine respiratory syncytial virus)



## INFECTIOUS BOVINE RHINOTRACHEITIS



# Bovine parainfluenza virus 3 (vaccines)



# Infectious bovine rhinotracheitis (IBR) marker vaccines available in European countries.

<b>Name of Vaccine (Company)</b>	<b>Active Substance</b>	<b>Vaccine Strain</b>	<b>Dose</b>	<b>Route</b>
Hiprabovis IBR Marker Live (Hipra)	Live gE-, tk-, double-gene deleted BoHV-1 virus	Ceddel $10^{6.3}$ – $10^{7.30}$ CCID <sub>50</sub> <sup>a</sup>	Single 2 mL	i.m.
Cattlemarker IBR Inactivated (Zoetis)	gE-, inactivated virus	Difivac gE-, $\geq 5.5 \log_2$ <sup>b</sup>	Single 2 mL	s.c.
Bayovac IBR Marker Vivum (Bayer)	gE -, modified live (attenuated) virus	Divifac $10^5$ TCID <sub>50</sub> (min)– $10^7$ TCID <sub>50</sub> (max) <sup>c</sup>	Single 2 mL	i.n., i.m.
Bovalto Ibraxion Inactivated IBR virus (Merial)	gE-, inactivated IBR virus	0.75 VN.U <sup>d</sup>	Single 2 mL	s.c.

<sup>a</sup> CCID<sub>50</sub>, cell culture infectious dose 50% endpoint; <sup>b</sup> log<sub>2</sub>, logarithm in base 2; <sup>c</sup> TCID<sub>50</sub>, tissue culture infectious dose 50% endpoint; <sup>d</sup> VN.U., virus neutralizing antibody titer after vaccination in guinea pigs; i.m., intramuscular route; s.c., subcutaneous route; i.n., intranasal route.

[https://www.researchgate.net/figure/Infectious-bovine-rhinotracheitis-IBR-marker-vaccines-available-in-European-countries\\_tbl1\\_330109546](https://www.researchgate.net/figure/Infectious-bovine-rhinotracheitis-IBR-marker-vaccines-available-in-European-countries_tbl1_330109546)

# BOVI-SHIELD® IBR

## bovine rhinotracheitis (modified-live virus)



- BOVI-SHIELD® IBR provides protection for dairy cattle from respiratory disease caused by infectious bovine rhinotracheitis (IBR) virus.

# Biobos IBR Marker Vaccine



- Contains inactivated bovine herpesvirus type-1 (BoHV-1) for cattle
- Monovalent IBR marker vaccine for cattle

# Bovi-Shield Gold IBR-BVD Cattle Vaccine



- Bovi-Shield Gold IBR-BVD is for the vaccination of healthy cattle to prevent respiratory disease caused by infectious bovine rhinotracheitis (IBR) and as an aid in preventing respiratory disease caused by bovine virus diarrhea (BVD) Types 1 and 2.
- Modified live, requires mixing.



# Inforce 3 Vaccine, Modified Live Virus, 20mL-10 dose



- bovine respiratory syncytial virus (BRSV)
- infectious bovine rhinotracheitis (IBR) virus
- parainfluenza type 3 (PI-3) virus

# Bovilis Nasalgen 3 Cattle Vaccine



- Bovilis **Nasalgen 3** Cattle Vaccine is an intranasal vaccine for the vaccination of healthy cattle 1 week of age or older against **IBR**, **BRSV**, and **PI-3**.
- Give a single 2 ml dose intranasally in one nostril.
- Unique **blue shadow dye** clearly indicates which animals have been vaccinated.

# RESPINET



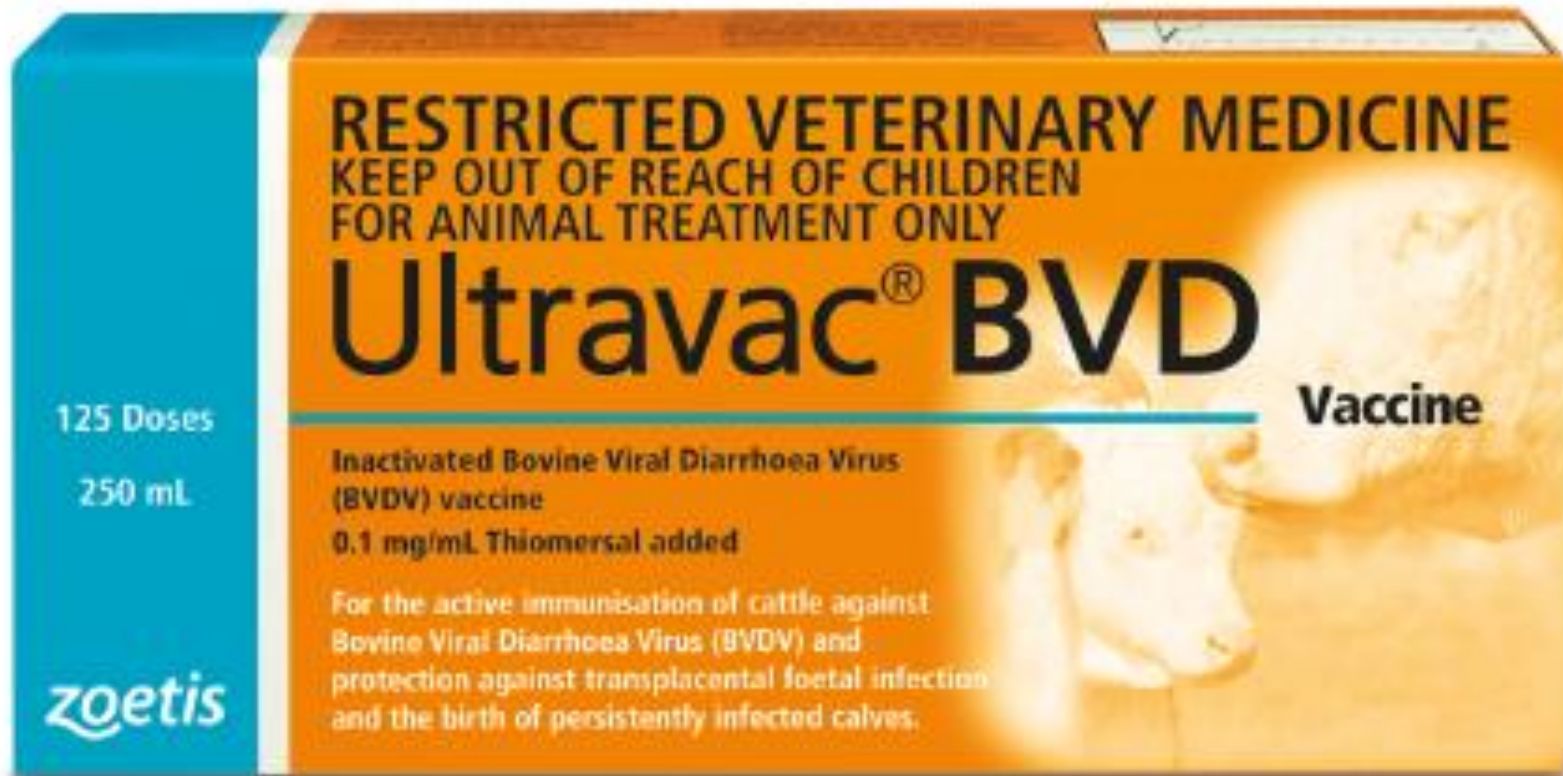
- Vaccine for the prevention of diseases caused by Infectious Bovine Rhinotracheitis virus, Parainfluenza Virus 3, Pasteurella multocida and Pasteurella haemolytica
- Bottles of 100 ml and 250 ml

## Composition:

- Bovine Infectious Rhinotracheitis Virus (IBR),
- Parainfluenza Virus 3 (PI<sub>3</sub>),
- *Pasteurella haemolytica*,  
*Pasteurella multocida*.

## Ultravac<sup>®</sup> BVD

- The most devastating impacts of BVD are on pregnant cattle and their unborn calves, so protecting heifers and cows from infection during mating and gestation is critical.



# Biobos IBR Marker Vaccine

Contains inactivated bovine herpesvirus type-1 (BoHV-1) for cattle

## Features

- ✓ Monovalent IBR marker vaccine for cattle
- ✓ Innovative technology allowing DIVA (Differentiating Infected from Vaccinated Animals) principle

## Benefits

- ✓ Excellent efficacy against new infections, resulting in substantially reduced viral shedding
- ✓ Latency of bovine herpesvirus maintained in previously infected cattle





# Horse Vaccination

- Equine Herpesvirus (Rhinopneumonitis)
- Equine Influenza
- Equine Viral Arteritis

Equine arteritis. Modified live (1) and inactivated (2) vaccines

1



2



# Pneumequine x10

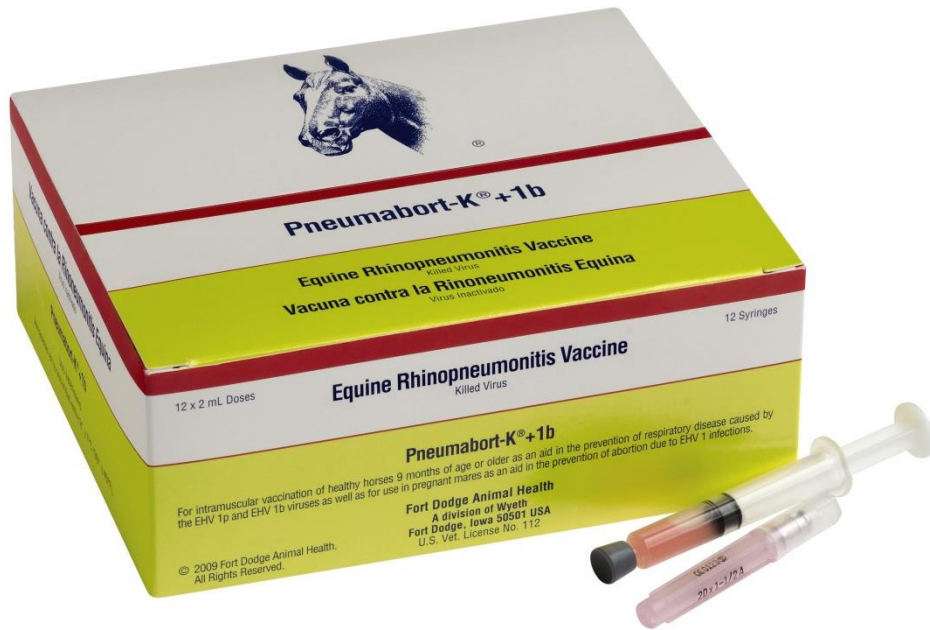
## Pneumequine is an inactivated Equine Rhinopneumonitis vaccine (EHV-1).



- Glycoproteins of inactivated Equine herpesvirus type 1 (Kentucky)

# PNEUMABORT-K® + 1B

## EQUINE RHINOPNEUMONITIS VACCINE KILLED VIRUS



- PNEUMABORT-K® + 1b is the only equine vaccine labeled for use in pregnant mares to aid in the prevention of abortion due to equine herpesvirus type 1 (EHV-1) infections, as well as to help prevent respiratory infections caused by EHV-1p and EHV-1b.

## Calvenza<sup>®</sup>-03 EIV/EHV



- For the vaccination of healthy, susceptible horses 6 months of age or older, including pregnant mares, as an aid in reduction of respiratory diseases caused by equine herpesvirus type 1 (EHV-1) and type 4 (EHV-4), and by equine influenza virus types A2.
- Killed virus vaccine, no reconstitution necessary

# FLUVAC INNOVATOR®



- The FLUVAC INNOVATOR line of vaccines helps keep your horse healthy and provides him with broad protection against newly emerging and conventional equine influenza virus (EIV) strains as well as equine herpesvirus (EHV-1 and EHV-4).



# Poultry birds vaccination

- Newcastle disease (Ranikhet disease)
- Infectious bronchitis
- Infectious bursal disease
- Marek's disease

# Ranikhet Disease Vaccine, Inactivated - Killed



- Ranikhet Disease Vaccine,
- Inactivated (Lentogenic Strain, Lasota) (IP)  
(Killed Vaccine) – 500 ml (1000 Doses)



## GlobiVac ND UNIQUE

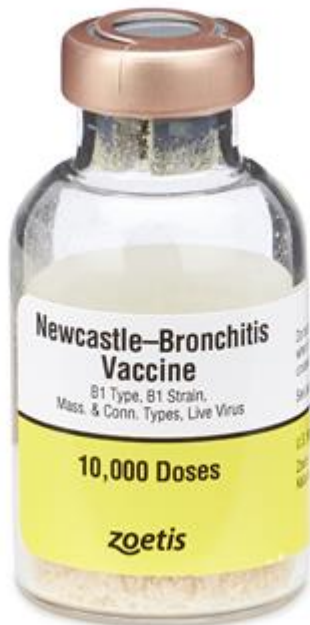
contains freeze dried, Ranikhet (Newcastle) Disease vaccine, Live, Lentogenic, TANUVAS D 58 strain, propagated in fertile chicken embryos of specific pathogen free flocks.

- **Composition:** Each dose contains  $10^{6.0}$  EID<sub>50</sub> ND Virus, TANUVAS D58 strain.

# NEWCASTLE B1 + BRONCHITIS MASS-CONN MODIFIED-LIVE FREEZE-DRIED VACCINE

Live Newcastle disease virus, B1 type, B1 strain and live IB virus, Massachusetts and Connecticut serotypes

## Indications



- Newcastle-Bronchitis Vaccine, B1 Type, B1 Strain, Mass. and Conn. Types, has shown to be effective for the vaccination of healthy chickens 2 weeks of age or older to help protect against Newcastle disease and IB, Massachusetts and Connecticut serotypes.



Live vaccine against infectious bronchitis  
H120 strain, in oral freeze-dried tablet.

# ORNIVAC ND+GO+IB+EDS EMULSION FOR INJECTION FOR DOMESTIC FOWL



## Inactivated vaccine against

- Newcastle disease,
- avian infectious bursitis,
- avian infectious bronchitis and
- Egg-laying decrease syndrome

## COMPOSITION

- Each dose of the vaccine contains:
- *Paramyxovirus pseudopestis avium*, NDV strain SL-93 min.  $10^{8.6}$  EID<sub>50</sub>
- *Virus bursitidis infectiosae avium ante inactivatum*, IBDV strain OP-23 strain min.  $10^{6.6}$  TCID<sub>50</sub>
- *Virus bronchitidis infectiosae avium ante inactivatum*, IBV strain M-41 strain min.  $10^{6.8}$  EID<sub>50</sub>
- *Adenovirus EDS 76 ante inactivatum* min. 1000 HAU.



# Marek's Disease Vaccine, Live, Frozen HVT FC 126 & Rispens Strains



- **Description**

The vaccine contains HVT and Rispens CVI 988 strain of chicken herpes virus adopted in cell culture and frozen in a programmable freezer to preserve stability. It is supplied with diluents. The product meets rigid 'Quality Control' standards of Purity, Safety and Potency as per monographs of viral vaccines of I.P.

- **Composition**

Each dose contains not less than 10<sup>3</sup> PFU of HVT- FC 126 and 10<sup>3</sup> PFU of Rispens CVI 988 strain of chicken herpes virus.

# MD-Vac CFL, (for Marek's Disease) 200 mL



- MD-Vac® CFL is a monovalent live virus vaccine for the immunization of one-day-old chicks to aid in the prevention of the signs and lesions of Marek's disease.
- Live Marek's disease virus, serotype 3

# BURSINE<sup>®</sup>-2

Modified-live infectious bursal disease virus,  
Lukert strain



- Bursine<sup>®</sup>-2 is a monovalent modified-live virus vaccine for the immunization of chickens against infectious bursal disease (IBDV) or Gumboro disease.
- Bursine-2 is particularly suited for use in flocks where maternal antibodies have interfered in active immunization using milder live virus vaccines.

# TRANSMUNE<sup>®</sup> IBD

Live Immune Complex vaccine

For the active immunization of chickens  
against Infectious Bursal Disease.



## COMPOSITION

- CEVAC<sup>®</sup> TRANSMUNE IBD vaccine contains the Winterfield 2512 strain of Infectious Bursal Disease live virus in complex with IBD immunoglobulins in freeze-dried form.
- The embryonated hen eggs and chickens used in the production of the vaccine are obtained from specified-pathogen-free (SPF) flocks.
- The vaccine can be administered via in ovo or subcutaneous injection.

## Nobilis® Gumboro 228E

The Gumboro live vaccine that gives unrivalled protection without immunosuppression. A live intermediate plus vaccine against Infectious Bursal Disease in chickens.



### COMPOSITION

- **Active ingredients** - Live IBD strain 228E
- The vaccine virus strain 228E is a less attenuated intermediate IBDV strain. As a result of this, the virus is capable of breaking through the maternal immunity at an earlier stage and will spread better through the vaccinated flock.
- The age at which chickens can be successfully vaccinated depends on the level of maternally derived antibodies (MDA) and therefore on the type of birds and on the way the parent breeding flock is vaccinated.

# AVIVAC®

Deltamune range of registered vaccines

Vaccine range for the protection of poultry against Avian Influenza, Infectious Coryza, Egg Drop syndrome and Newcastle disease.





# BIOCAN NOVEL DHPPI/L4R, lyophilisate and diluent for preparation of injection solution



Live attenuated vaccine against canine distemper, canine, infectious hepatitis, laryngotracheitis, parvovirus, parainfluenza, leptospirosis and rabies.

## Composition - 1 ml

- Canine Distemper virus, strain CDV Bio 11/A - min.  $10^{3.1}$  TCID<sub>50</sub><sup>\*</sup>, max.  $10^{5.1}$  TCID<sub>50</sub><sup>\*</sup>
- Canine Adenovirus Type 2, strain CAV-2 Bio 13 - min.  $10^{3.6}$  TCID<sub>50</sub><sup>\*\*</sup>, max.  $10^{5.3}$  TCID<sub>50</sub><sup>\*</sup>
- Canine Parvovirus Type 2b, strain CPV-2b Bio 12/B - min.  $10^{4.3}$  TCID<sub>50</sub><sup>\*</sup>, mix.  $10^{6.6}$  TCID<sub>50</sub><sup>\*</sup>
- Canine Parainfluenza Type 2 virus, strain CPiV-2 Bio 15 - min.  $10^{3.1}$  TCID<sub>50</sub><sup>\*</sup>, max.  $10^{5.1}$  TCID<sub>50</sub><sup>\*</sup>

## Diluent (suspension of inactivated vaccine against leptospirosis and rabies)

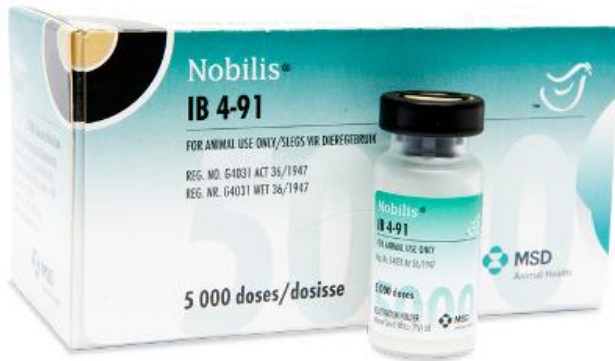
- *Leptospira icterohaemorrhagiae*, strain MSLB 1089 GMT\*\*  $\geq$  1:51 ALR\*\*\*
- *Leptospira canicola*, strain MSLB 1090 GMT\*\*  $\geq$  1:51 ALR\*\*\*
- *Leptospira grippotyphosa*, strain MSLB 1091 GMT\*\*  $\geq$  1:40 ALR\*\*\*
- *Leptospira bratislava*, strain MSLB 1088 GMT\*\*  $\geq$  1:51 ALR\*\*\*
- Inactivated rabies virus, strain SAD Vnukovo-32 > 2.0 IU\*\*\*\*
- Adjuvant: aluminium hydroxide Al (OH)<sub>3</sub> 1.8-2.2 mg

## Exercise 2:

How are the two vaccines different?

	<b>Nobilis® IB 4-91</b>	<b>Nobilis IB Ma5</b>
Differences		
Similarities		

# Nobilis® IB 4-91



## INDICATIONS

Nobilis® IB 4-91 is a live attenuated, freeze-dried vaccine against Infectious Bronchitis virus serotype 4-91 or serologically related types for administration to 1-day-old chicks and older chickens (broilers, breeders, layers).

## COMPOSITION

Each dose contains at least  $\log_{10} 3,6 \text{ EID}_{50}$  of live attenuated avian Infectious Bronchitis Virus (IBV) strain 4-91 in stabiliser.

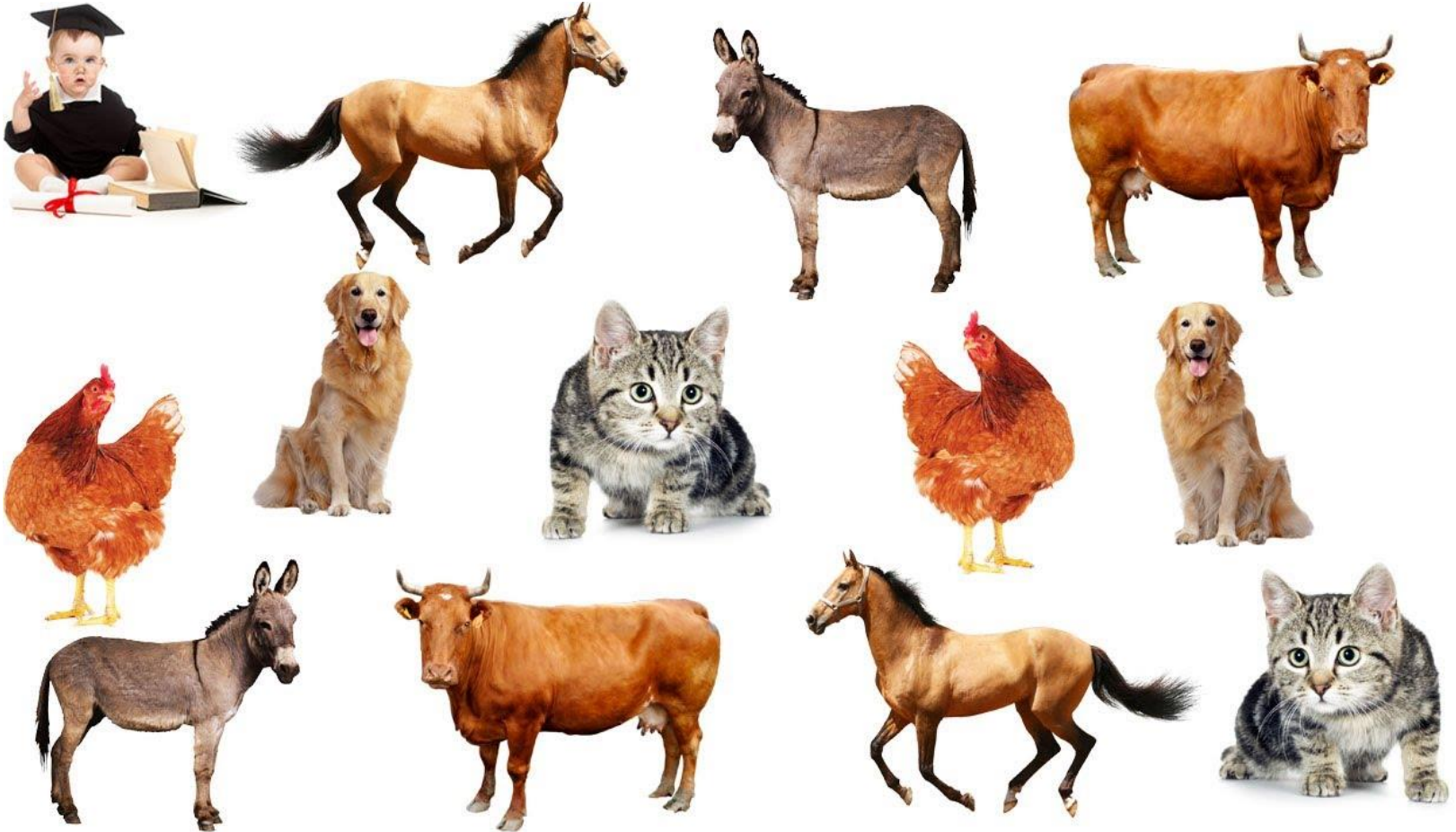
# Nobilis IB Ma5



- Nobilis IB Ma5 is a live vaccine containing  $> 3.5 \log_{10} \text{EID}_{50}$  Avian Infectious Bronchitis virus strain IB Ma5 per dose.

## Topic 5-6.

# Types of vaccines for different animals



2022

# OIE-Listed diseases, infections and infestations in force in 2018

## Multiple species diseases, infections and infestations

- Anthrax
- Bluetongue
- Crimean Congo haemorrhagic fever
- Epizootic haemorrhagic disease
- Equine encephalomyelitis (Eastern)
- Heartwater
- Infection with Aujeszky's disease virus
- Infection with *Brucella abortus*, *Brucella melitensis* and *Brucella suis*
- Infection with *Echinococcus granulosus*
- Infection with *Echinococcus multilocularis*
- Infection with foot and mouth disease virus
- **Infection with rabies virus**
- Infection with Rift Valley fever virus
- Infection with rinderpest virus
- Infection with *Trichinella* spp.
- Japanese encephalitis
- New world screwworm (*Cochliomyia hominivorax*)
- Old world screwworm (*Chrysomya bezziana*)
- Paratuberculosis
- Q fever
- Surra (*Trypanosoma evansi*)
- Tularemia
- West Nile fever



## Rabies vaccines (oral rabies vaccine - ORV)

Vaccine name	Vaccine composition. Properties	Notes
<b>ONRAB®</b>	ORV. A human <u>adenovirus</u> rabies glycoprotein <u>recombinant vaccine</u> . oral rabies vaccine.	To control rabies in wildlife.
<b>RABORAL V-RG®</b>	An oral rabies vaccine bait that contains an attenuated (“modified-live”) <u>recombinant vaccinia virus vector vaccine</u> expressing the rabies virus glycoprotein gene (V-RG). The liquid vaccine is packaged inside edible baits	To control rabies in wildlife.
<b>Nobivac® Rabies</b>	Inactivated vaccine against Rabies. Rabies strain Pasteur RIVM. Provides protection for up to 3 years (dogs, cats), 2 years (cattle, sheep, goats, horses )	For dogs, cats, cattle, sheep, goats, horses
<b>Nobivac 3-Rabies</b>	Killed virus. Injectable vaccine. Provides protection for up to 3 years	For use in dogs and cats
<b>Imrab Rabies Cattle, Horse &amp; Sheep Vaccine</b>	Killed virus. Injectable vaccine. Provides protection for up to 3 years	For use in cattle, horses and sheep.

# Bluetongue vaccines used in Europe

There are 24 serotypes of bluetongue virus, 7 of which have been present in Europe during the past 10 years

	Bulgaria	France	Italy	Portugal	Spain
<i>Modified live virus</i>					
BTV-1	Not used	Not used	2007	Not used	Not used
BTV-3, -8, -10 and -11	1999–2000	Not used	Not used	Not used	Not used
BTV-2	Not used	2000–2002	2002–2006	Not used	2000–2001 <sup>†</sup>
BTV-4	Not used	Not used	Not used	2005–2006	2004–2006
BTV-2 and -4	Not used	2003–2004	2004–2006	Not used	2003 <sup>§</sup>
BTV-2 and -9	Not used	Not used	2002–2006	Not used	Not used
BTV-16	Not used	2004 <sup>  </sup>	Not used	Not used	Not used
BTV-2, -4 and -16	Not used	Not used	2004 <sup>  </sup>	Not used	Not used
BTV-2, -4, -9 and -16	Not used	Not used	2004 <sup>  </sup>	Not used	Not used
BTV-2, -4 and -9	Not used	Not used	2005–2006	Not used	Not used
BTV-9	Not used	Not used	Not used	Not used	Not used

# OIE-Listed diseases, infections and infestations in force in 2018

## Cattle diseases and infections

- Bovine anaplasmosis
- Bovine babesiosis
- Bovine genital campylobacteriosis
- Bovine spongiform encephalopathy
- Bovine tuberculosis
- Bovine viral diarrhoea
- Enzootic bovine leukosis
- Haemorrhagic septicaemia
- **Infectious bovine rhinotracheitis/infectious pustular vulvovaginitis**
- Infection with *Mycoplasma mycoides* subsp. *mycoides* SC (contagious bovine pleuropneumonia)
- Lumpy skin disease
- Theileriosis
- Trichomonosis
- Trypanosomosis (tsetse-transmitted)

# Vaccines against Bovine rhinotracheitis

Vaccine name	Vaccine composition. Properties	Notes
BOVI-SHIELD® IBR	Bovine Rhinotracheitis Virus Vaccine	Modified-live virus
INFORCE 3® RESPIRATORY VACCINE	Bovine Rhinotracheitis-Parainfluenza 3-Respiratory Syncytial Virus Vaccine	Modified-Live Virus
RISPOVAL™ IBR-MARKER INACTIVATED	Inactivated marker for active immunization against Infectious bovine Rhinotracheitis	To reduce clinical signs
Biobos IBR Marker Vaccine	Contains inactivated bovine herpesvirus type-1 (BoHV-1) for cattle. Innovative technology allowing <b>DIVA</b> (Differentiating Infected from Vaccinated Animals)	ELISA test can be used to differentiate field infected from vaccinated animals
BIOBOS IBR MARKER LIVE, LYOPHILISATE AND SOLVENT FOR SUSPENSION	Intranasal and intramuscular live attenuated marker vaccine against BHV-1 (infectious bovine rhinotracheitis). Live attenuated Bovine herpesvirus type 1 (BHV-1), strain Bio-27	To reduce the severity and duration of clinical symptoms

# OIE-Listed diseases, infections and infestations in force in 2018

## Sheep and goat diseases and infections

- Caprine arthritis/encephalitis
- Contagious agalactia
- Contagious caprine pleuropneumonia
- Infection with *Chlamydophila abortus* (Enzootic abortion of ewes, ovine chlamydiosis)
- Infection with peste des petits ruminants virus
- Maedi-visna
- Nairobi sheep disease
- Ovine epididymitis (*Brucella ovis*)
- Salmonellosis (*S. abortusovis*)
- Scrapie
- Sheep pox and goat pox

# Vaccines against Peste des Petits Ruminants

<b>Product name</b>	<b>Vaccine type</b>	<b>Vaccine strain</b>	<b>Licensed country</b>
PPR-VAC®	Live	Nigeria 75/1	Botswana
PPR Vaccine-Sungri 96 strain	Live	Sungri 96	India
Peste des Petits Ruminants Vaccine	Live	Nigeria 75/1 homologous	Nepal
Peste des Petits Ruminants Vaccine	Live	Nigeria 75/1	China, Nigeria



# OIE-Listed diseases, infections and infestations in force in 2018

## Equine diseases and infections

- Contagious equine metritis
- Dourine
- Equine encephalomyelitis (Western)
- Equine infectious anaemia
- Equine influenza
- Equine piroplasmosis
- Glanders
- Infection with African horse sickness virus
- Infection with equid herpesvirus-1 (EHV-1)
- Infection with equine arteritis virus
- Venezuelan equine encephalomyelitis

# Vaccines against African Horse Sickness

Vaccine name	Vaccine composition. Properties	Notes
African Horse Sickness	Freeze-dried, polyvalent, live attenuated horse sickness virus strains	for the prophylactic immunisation of horses, mules and donkeys against horse sickness.
The laboratory's inactivated vaccines	two vaccine combinations, termed <u>vaccine 1</u> (covering serotypes 1, 4, 7, 8, and 9) and <u>vaccine 2</u> (serotypes 2, 3, 5, and 6)	Inactivated vaccines are considered safe

# Vaccines against Influenza

Vaccine name	Vaccine composition. Properties	Notes
<b>Fluvac Innovator (Flu) Equine Vaccine</b>	Protects against influenza strains A1 and A2, Prague 56 and Kentucky 92.	Metastim adjuvant enhances immune response for rapid immunity and disease protection
<b>Flu Avert I.N. (Flu) Equine Vaccine</b>	Flu Avert vaccine is a proprietary “modified live” virus given intranasally. Unlike traditional killed vaccines that are given I.M., Flu	Avert is administered without a needle and causes no swelling or muscle soreness.

# OIE-Listed diseases, infections and infestations in force in 2018

## Swine diseases and infections

- African swine fever
- Infection with classical swine fever virus
- Infection *with Taenia solium* (Porcine cysticercosis)
- Nipah virus encephalitis
- Porcine reproductive and respiratory syndrome
- Transmissible gastroenteritis

# Vaccines against classical swine fever

<b>Vaccine and Vaccine Candidates</b>	<b>Type of Vaccine</b>	<b>Essentials Characteristics</b>
LOM vaccine	Live attenuated vaccine	Potential reversion to a virulent strain.
C-strain	Live attenuated vaccine	Safe and effective against the disease. Protective immune response against all CSFV genotypes. Early protection in the absence of neutralizing antibodies.
GPE-strain	Live attenuated vaccine	Safe in pregnant sows, newborns, and adult pigs. Early protective immunity. Potential reversion to a virulent strain.
Thiverval strain	Live attenuated vaccine	Safe and genetically stable. Prevent vertical transmission.

# Vaccines against classical swine fever

Vaccine and Vaccine Candidates	Type of Vaccine	Essentials Characteristics
PAV-250	Live attenuated vaccine	<p>Safe in pregnant sows and genetic stable.</p> <p>Elicit a strong immunogenic response.</p> <p>Protect against different virulent strains of CSFV.</p>
INF $\alpha$ -E2-CSFV	Subunit vaccine	<p>Recombinant human alpha interferon has an immune-stimulatory effect. Clinical protection 7 days after single vaccination.</p> <p>Double vaccination with a 3-week interval/challenge six weeks after booster vaccination with highly virulent CSFV.</p> <p>Duration of immunity is of at least 9 months after double vaccination.</p>
KNB-E2	Subunit vaccine	<p>Sterilizing protection after a single vaccination dose.</p>



# Vaccines against Porcine reproductive and respiratory syndrome (PRRS)

Current name	Type	Virus strain	Manufacturer	Market <sup>1</sup>
Amervac-PRRS	Attenuated	European	Hipra Laboratorios	Asia, Europe
Suvaxyn <sup>®</sup> -PRRS <sup>2</sup>	Inactivated	European	Fort Dodge Veterinaria SA	Europe
Ingelvac <sup>®</sup> PRRS ATP	Attenuated	North American	Boehringer Ingelheim	North America
Ingelvac <sup>®</sup> PRRS MLV <sup>3</sup>	Attenuated	North American	Boehringer Ingelheim	Asia, Europe, North America, South America
Porcillis <sup>®</sup> PRRS	Attenuated	European	Intervet	Europe
Progressis <sup>®</sup>	Inactivated	European	Merial <sup>4</sup>	Europe
PRRomiSe <sup>®</sup>	Inactivated	North American	Intervet	North America
Pyrsvac-183 <sup>®</sup>	Attenuated	European	Laboratorios Syva	Europe
Sulpravac <sup>®</sup> -PRRS	Inactivated	European	Hipra Laboratorios	Asia, Europe

# OIE-Listed diseases, infections and infestations in force in 2018

## Avian diseases and infections

- Avian chlamydiosis
- Avian infectious bronchitis
- Avian infectious laryngotracheitis
- Avian mycoplasmosis (*Mycoplasma gallisepticum*)
- Avian mycoplasmosis (*Mycoplasma synoviae*)
- Duck virus hepatitis
- Fowl typhoid
- Infection with avian influenza viruses
- infection with influenza A viruses of high pathogenicity in birds other than poultry including wild birds
- Infection with Newcastle disease virus
- Infectious bursal disease (Gumboro disease)
- Pullorum disease
- Turkey rhinotracheitis

# Vaccines against Newcastle disease

S/N	Vaccine Name	Type of Vaccine	Formulation	Parent Strain	Challenge Strain	Observed Response
1	NDRL0901 [148]	Live attenuated vaccine	Passaged six (6) times in specific pathogen-free (SPF) chickens	DK1307 strain of duck origin	Kr005 strain	Showed >80% protection from mortality irrespective of administration route.
2	ND I <sub>2</sub> [149]	Thermostable Live vaccine	Passaged two (2) times in the allantoic cavity of embryonated chicken egg.	NDV I <sub>2</sub> strain	Local NDV strain	Induces antibody response and protective immunity against challenge strain
3	VG/GA [150]	Live attenuated vaccine	Passaged three times in embryonated chicken egg.	VG/GA strain	NDV GB strain	Provided 95–100% protection against challenge strain
4	LaSota and PT3 [151]	Live vaccine	Lentogenic live strains	LaSota strain and PT3 strain	NDV SD strain, NDV DY strain	Provided full protection against challenge strains

[https://www.researchgate.net/figure/Available-vaccines-against-Newcastle-disease-in-poultry\\_tbl1\\_348191194](https://www.researchgate.net/figure/Available-vaccines-against-Newcastle-disease-in-poultry_tbl1_348191194)

# Vaccines against Newcastle disease

S/N	Vaccine Name	Type of Vaccine	Formulation	Parent Strain	Challenge Strain	Observed Response
4	LaSota and PT3 [151]	Live vaccine	Lentogenic live strains	LaSota strain and PT3 strain	NDV SD strain, NDV DY strain	Provided full protection against challenge strains
5	NDV/A14 [152]	Inactivated vaccine	Amino-acid sequence of the cleavage site of the F0 protein was changed by reverse genetics, passaged 10 times in chicken embryo and inactivated with 0.7% formaldehyde	NDV genotype VII JS3/05 strain	NDV genotype VII JS3/05 strain	Reduced viral shedding and protected the birds against clinical disease
6	Ban/AF [153]	Live attenuated vaccine	Virulent F protein motif was modified to avirulent motif by reverse genetics and passed 10 times in chicken	NDV strain Ban/010	NDV strain Ban/010	Provided full protection against the challenge virus and prevented viral shedding

[https://www.researchgate.net/figure/Available-vaccines-against-Newcastle-disease-in-poultry\\_tbl1\\_348191194](https://www.researchgate.net/figure/Available-vaccines-against-Newcastle-disease-in-poultry_tbl1_348191194)

# Vaccines against Newcastle disease

S/N	Vaccine Name	Type of Vaccine	Formulation	Parent Strain	Challenge Strain	Observed Response
7	NDV O/A14 [154]	Inactivated vaccine	HN gene of NDV/A14 vaccine strain replaced with that of JS-14-12-Ch bearing E347K and G362A co-mutation	JS-14-12-Ch HN gene in NDV/A14	JS-14-12-Ch NDV strain	Provided full protection, reduced viral shedding and viral loads.
8	aSG10 [155,156]	Live attenuated vaccine	Reverse genetics and the protease cleavage site of the virulent F0 protein was altered to avirulent strain	SG10 strain	SG10 strain	Provided full protection and reduced viral shedding
9	G7M [95]	Live attenuated vaccine	Reverse genetics and the replacement of F cleavage site sequence typical of velogenic strains with that of LaSota vaccine	G7 strain	Genotype VII NDV (G7 strain)	Provided full protection against the challenged virus strain, induced both humoral and cell-mediated immunity, reduced virus replication and shedding

[https://www.researchgate.net/figure/Available-vaccines-against-Newcastle-disease-in-poultry\\_tbl1\\_348191194](https://www.researchgate.net/figure/Available-vaccines-against-Newcastle-disease-in-poultry_tbl1_348191194)

# Vaccines against Newcastle disease

S/N	Vaccine Name	Type of Vaccine	Formulation	Parent Strain	Challenge Strain	Observed Response
10	rLS1-XII-2 [157]	Live attenuated vaccine	membrane domains of the F and HN protein in the rLS1 backbone were replaced with those of PP2011	Genotype XII (PP2011) strain	Genotype XII (PP2011) strain	Provided full protection against the challenged strain and reduced virus shedding
11	rGM-VIIIm [146]	Live attenuated vaccine	Reverse genetics, rGM attenuated by changing the F0 polybasic cleavage site to monobasic	Genotype VII GM strain	GM NDV strain	Both inactivated and live rGM-VIIIm provided full protection against the challenge strain. However, the live vaccines reduced viral shedding more than the inactivated vaccine.
12	mIBS025 [158]	Live attenuated vaccine	Reverse genetics, in silico modification of F cleavage site from virulent polybasic to avirulent monobasic motif, modified sequence chemically synthesized and inserted into pOLTV5 transcription vector	Complete genome sequence of NDV IBS025/13 strain	NDV strain IBS002/11	Induced strong antibody-mediated immunity and reduced viral shedding
13	rNDV-R2B-FPCS [159]	Live attenuated vaccine	Reverse genetics, changing the F protein cleavage site from polybasic amino acid to dibasic amino acid	rNDV-R2B	Virulent NDV strain (Accession No. KJ769262.1)	Stimulated both humoral and cellular immunity, reduced viral shedding

[https://www.researchgate.net/figure/Available-vaccines-against-Newcastle-disease-in-poultry\\_tbl1\\_348191194](https://www.researchgate.net/figure/Available-vaccines-against-Newcastle-disease-in-poultry_tbl1_348191194)



# Vaccines for dogs

Vaccine name	Vaccine composition. Properties
<b>Eurican DHPPi Vaccine for dogs</b>	Against distemper to reduce mortality and clinical signs against infectious canine hepatitis, parvovirus and parainfluenza type 2 infections
<b>Eurican DHPPi2-LR Dog Vaccine</b>	Provides immunity against Canine Parvovirus, Canine Distemper, Infectious Canine Hepatitis, Canine Parainfluenza Virus, Leptospirosis, Infectious Laryngotracheitis) and Rabies
<b>Nobivac Canine 1-DAPPv+Cv</b>	Prevention of disease caused by canine distemper virus, adenovirus type 1 (hepatitis), adenovirus type 2 (respiratory disease), canine parainfluenza virus, canine parvovirus, and coronavirus
<b>VANGUARD® DAPP</b>	Against canine distemper virus (CDV), canine adenovirus type 1 (CAV1), canine adenovirus type 2 (CAV2), canine parainfluenza virus (CPiV), canine parvovirus (CPV), and canine parvovirus type 2c (CPV2c).

# OIE-Listed diseases, infections and infestations in force in 2018

## Lagomorph diseases and infections

- Myxomatosis
- Rabbit haemorrhagic disease

## Other diseases and infections

- Camelpox
- Leishmaniosis

# Vaccines against Rabbit haemorrhagic disease

Vaccine name	Vaccine composition. Properties	Notes
<b>Rabbit haemorrhagic disease type 2 (RHDV-2)</b>	<u>Inactivated</u> vaccine	Injectable emulsion
<b>Nobivac Myxo-RHD Plus</b>	Against the three main infectious diseases in rabbits - Myxomatosis, Rabbit Haemorrhagic Disease (RHD) classic and variant strains (RHDV-1 and 2) Active substance: <u>Live</u> myxoma vectored RHD virus strain 009: <u>Live</u> myxoma vectored RHD virus strain MK1899:	Lyophilisate and solvent for suspension for injection for rabbits