

Poultry Health Seminar, continued

Vaccination & Importance of monitoring

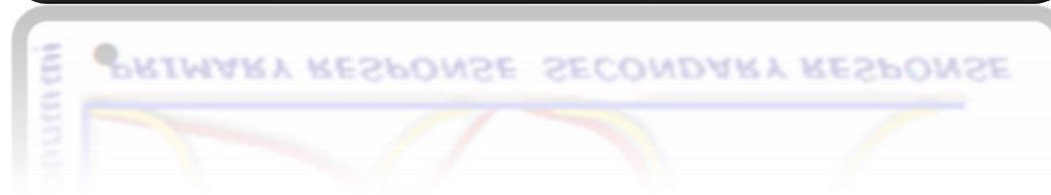
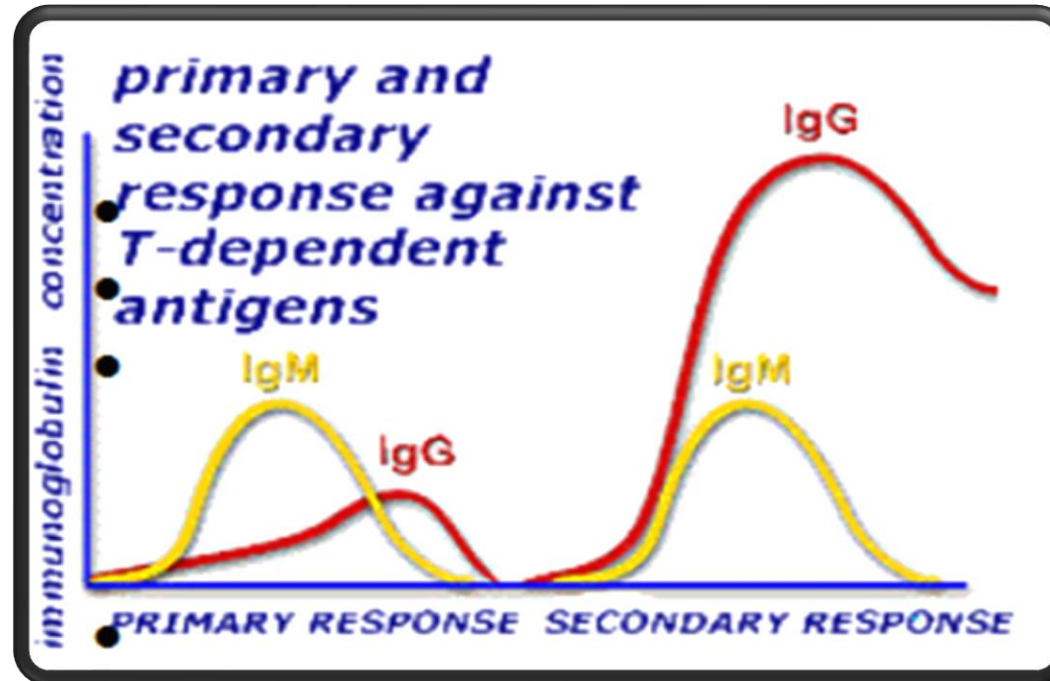
Robert Jan Molenaar, DVM, FRCPath



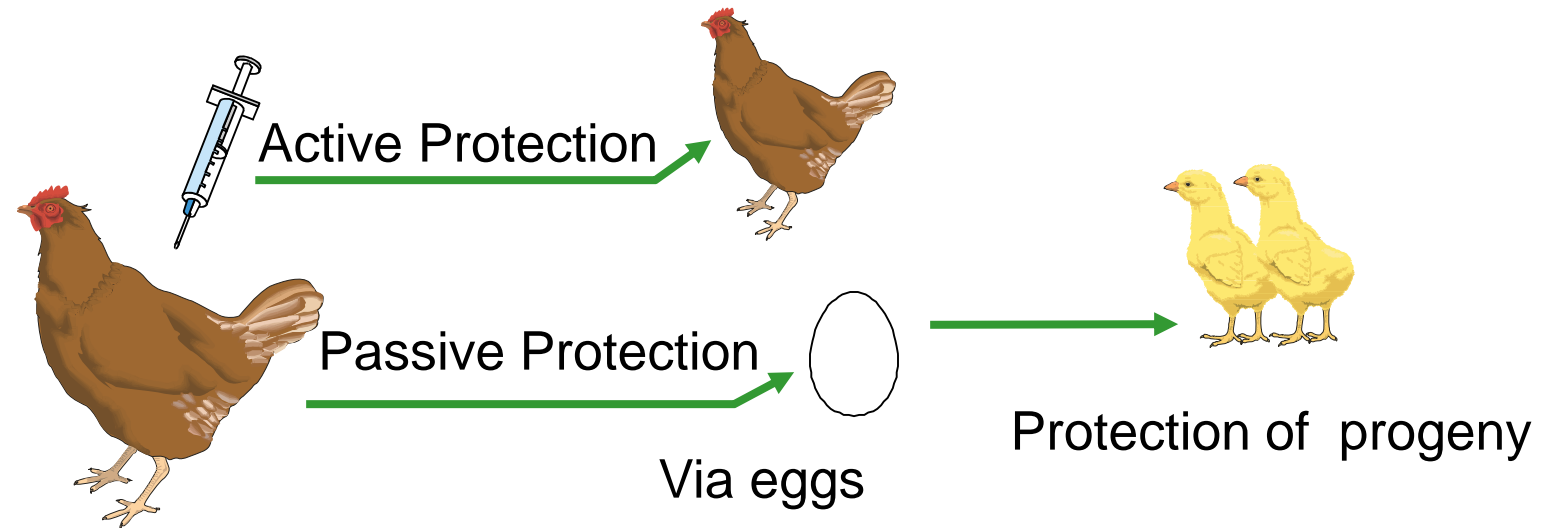
Aims of vaccination



- Formation of memory cells
 - Without the bird getting seriously ill (minimum of harm to the bird)
 - Inducing antibodies so that during a second contact the bird is protected.



Aims of vaccination



Live versus inactivated



- **Inactivated**
 - Application by injection
- **Live (attenuated)**
 - Application by coarse spray
 - Application by fine spray
 - Application by eye drop
 - Application by drinking water
 - Application by wing-web
 - Application by injection
- **Which one can cause a vaccine reaction?**



Live versus inactivated



All of them!

A vaccine reaction is required for an immune response



Inactivated vaccines contain formalin or oil to cause tissue irritation

Contains no live components, no risk of mutation or spreading

Safe and stable for storage

Immune response to certain antigens of the pathogen (only 'exogenic')

Often more expensive

Best after priming with live vaccine

Systemic immunity (humeral response is high)

Less local immunity (cellular response is limited)

High protection after 2-4 weeks

No inactivation by local immunity

A lot of antigen: low risk of neutralisation by Ig

WHOLE-INACTIVATED



Live (attenuated) vaccines cause tissue damage by replication

Early protection (1-2 weeks)

Protection does not last very long (depends on disease!)

Replication and infection of host cell simulate original pathogen

Better immune response due to simulation of natural infection

Local and systemic protection

Directed against different parts of the (total) virus: 'endogenous & exogenous antigens'

Mutations to original form might occur

Spreading and mass application possible

Often cheap per dose (compared to inactivated)

Fragile to warmth and to detergents

High level of MDA / Antibodies lower humeral response



Live (attenuated) vaccines cause tissue damage by replication

Replication stimulates the immune response of all kind of cells (cytotoxic T cells, all T helper cells, B cells)

Systemic immunity

Local immunity (low, variable)

High protection after 3-5 weeks

Against the inserted gene (protein)

HVT-vector: continuous replication, long lasting protection

MDA has very little influence

Low spreading, individual application required

Sensitive for inactivation (cell bound)

Provides also protection against vector

RECOMBINANT
VIRAL VECTOR



- Revaccination with live vaccine (first also live):
 - Use secondary response for production of better immunity
 - Reactivate mucosal immunity (IgA)
 - Too soon after first vaccination often not effective as the protection of the previous vaccination can prevent the replication of the vaccine
- Revaccination with inactivated vaccine
 - No interference of the protection

General information for vaccination



- Use vaccines prior to their expiry date
- Follow vaccine manufacturers' instructions
- Vaccines are very sensitive to incorrect temperatures during delivery, in storage and on transport to farms
- Know what temperatures must be maintained; keep the cold chain.

Vaccination preparation



- Check vaccines immediately on arrival to ensure correct vaccines have been delivered, that vaccine vials or containers are intact and that the correct temperature conditions exist
- Store live vaccines in a fridge at 4-8C
- Have max-min. thermometers in fridges. Don't open the fridge during power cut!

Transport of Vaccines to poultry house



- Take the vaccine out of the fridge just prior to vaccination
- Transport in insulated containers. **Always!**

Preparation for Vaccination



- Double-check that you have the correct vaccine
- Note the number of doses in the vaccine vial
- Check manufacturer's label advice
- Calculate the number of vials of vaccine required for the house. Overestimate a little.
- Set up
- Maintain vaccine at recommended temperature and other conditions

Application

- Injection
- Drinking water
- Coarse spray
- Fine spray



Live vaccination: the gold standard



Live Vaccines

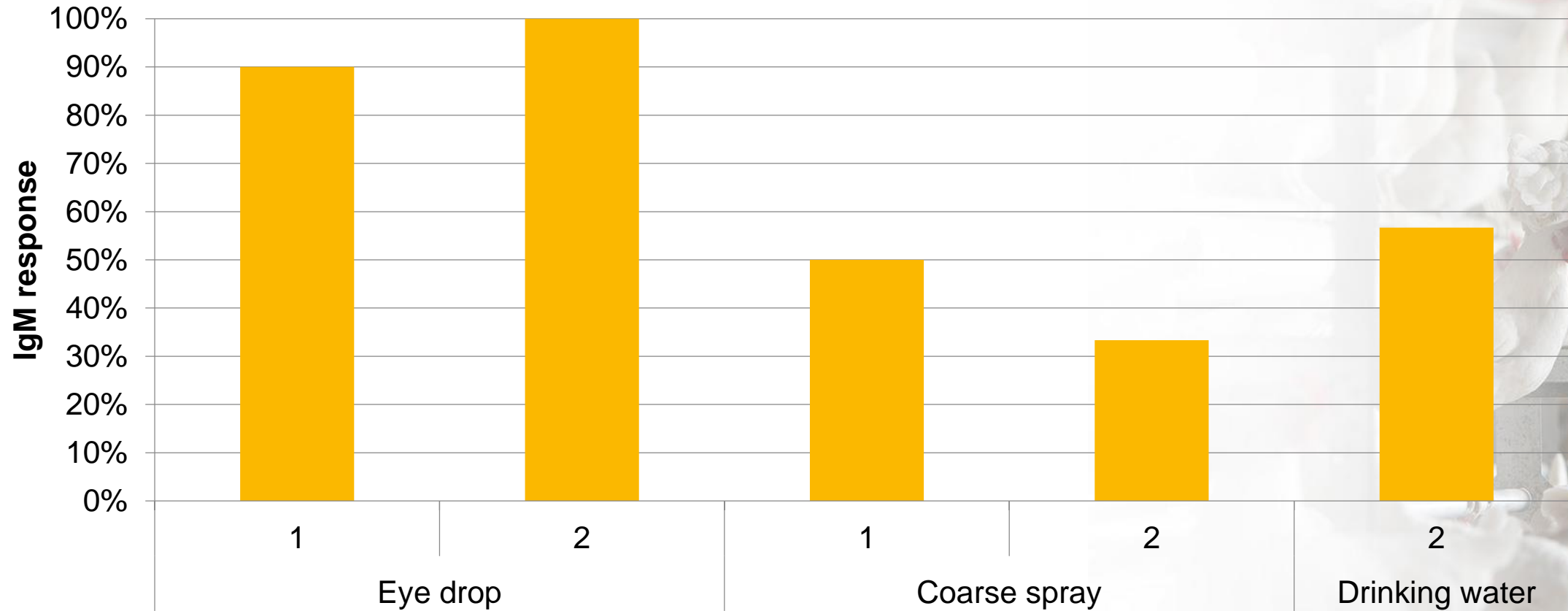
- Cold chain!!
- Freeze dried
 - Stored at 4 – 8 °C
 - Out of the cooler: < 2 hours
 - Standard refrigerator



VETERINARY COLD CHAIN MANUAL

Ensuring effective vaccines

Application methods



IBV H120 vaccination, IgM response SPF Broilers

Experiment 1: 7 d.p.v. 10 birds

Experiment 2: 10 d.p.v. 30 birds

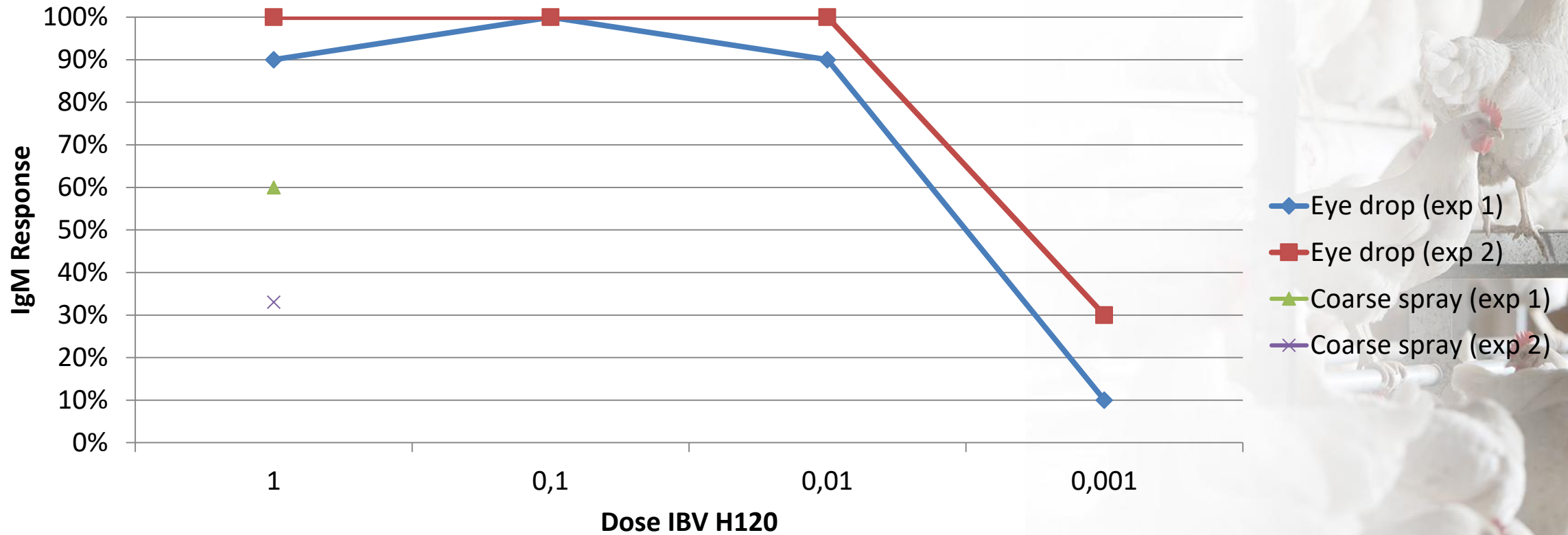
Spray vaccination



1. Preparation of the vaccine
2. Preparation of the flock
3. Application
4. Check



Spray vs eye drop



1. Preparation of the vaccine: coarse spray



- Use cold water
 - Hatchery 25 ml/1000 chicks
 - Farm house >500 ml / 1000 chicks
- Use gloves
- Add skimmed milk (10 ml/l) or peptone (0,1 gr/l)
- Take required amount of vaccine out of the cool box
- Open the vial under water / use tablets
- Dissolved vaccine should be used within 2 hours



Water temperature & spray



3.2% improvement per degree Celcius lower

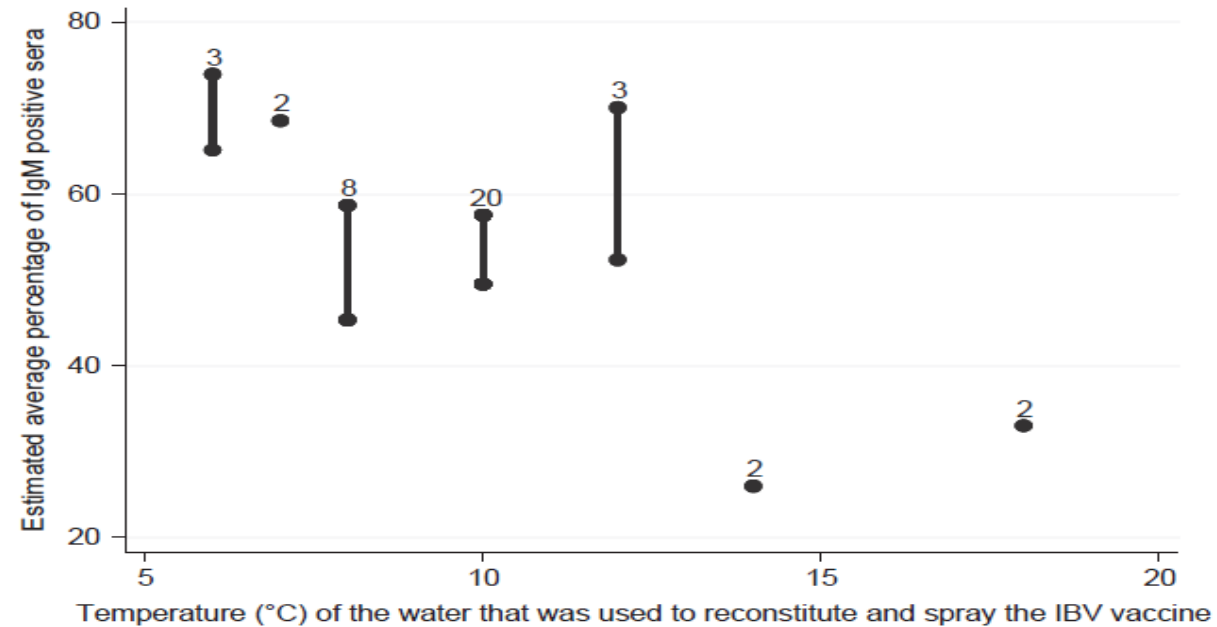


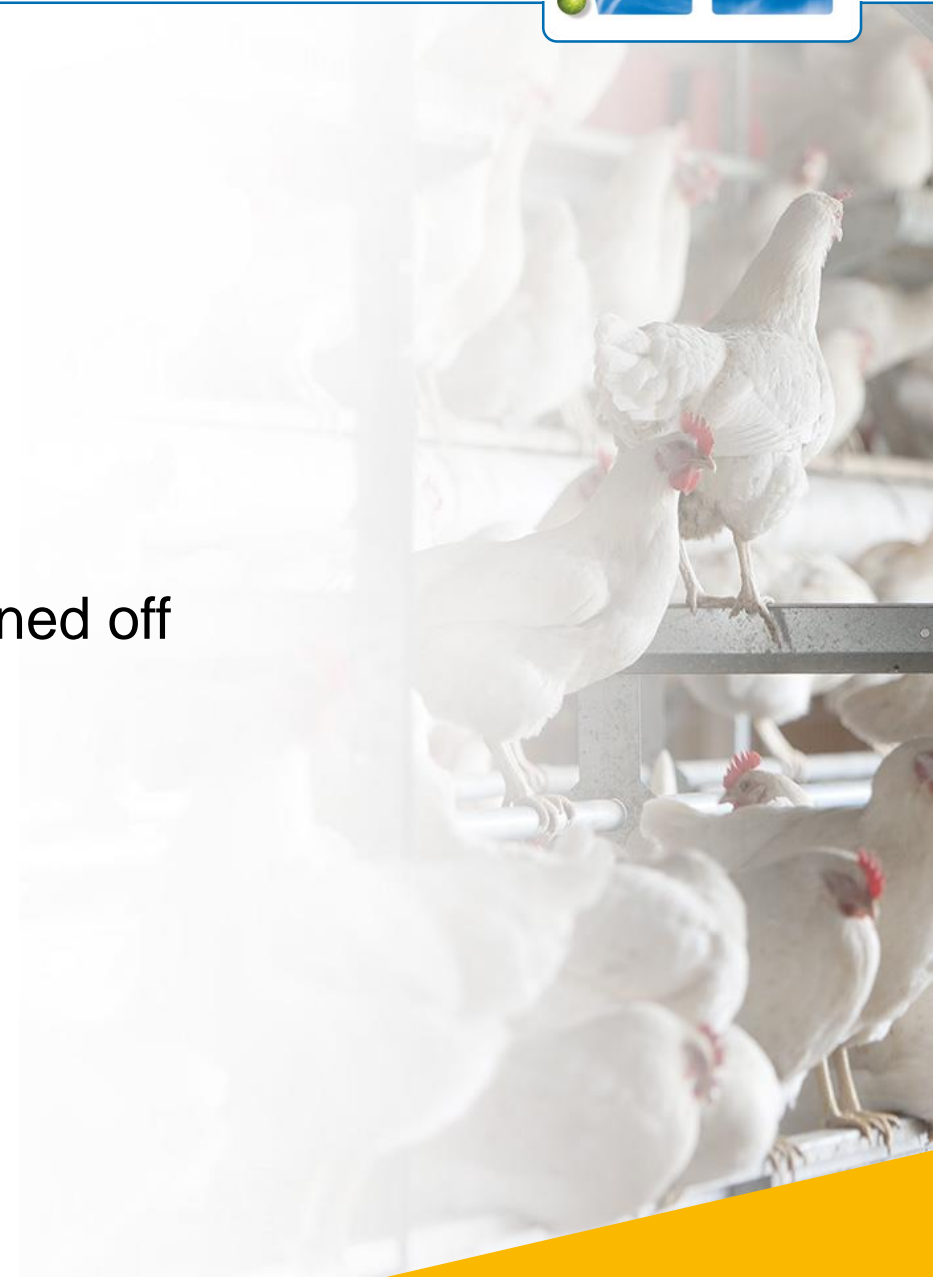
Figure 6. Association between the temperature of the water that was used to reconstitute and spray the vaccine and the average IgM response per broiler breeder flock after IBV spray vaccination at approximately 2 weeks of age. Bar: 95% confidence interval of the estimated average percentage of IgM-positive sera for each temperature of the water. Number on top of bar: number of flocks with that temperature of the water that was used to reconstitute and spray the vaccine.



2. Preparation of the flock



- Herding / rounding up
- Dimming lights
 - Less activity, eyes still open
 - 41,1% higher IgM response when light turned on
- Preparation vaccine
- Ventilation off
 - 15.5% higher IgM response when ventilation was turned off
- Heater off



3. Application of the vaccine



- Coarse spray or aerosol
- Distance to birds
- Walking speed → hit each bird evenly
- Ventilation on



Coarse spray

- Large particles
 - 250 – 350 μm
- Short distances
- Contact conjunctiva
- Inhalation
- Ingestion

Aerosol

- Small particles
 - 20 – 100 μm
- Large distances
- Primarily inhalation



4. Check



- Manually check whether birds are wet
 - 100 birds per quarter
 - 90% wet
- Serology



IBV field trial (360 spray vaccinated flocks), practical

translation *De Wit et al, Avian Pathology, 2010, pp 123-132*



- Better results when:
 - Ventilation off during spray (15.5%, $P=0,037$)
 - (sufficient) Light on during spray (41%, $P=0,009$)
 - Second IBV vaccination not within 2 weeks (2,5% per extra day, $P=0,005$)
 - cold water was used (3,2% per °C, $P=0,021$)
- Flock size/housing type: unclear
 - Cages significantly lower responses than floor housing (31% vs 53%, $P=0,01$)
 - Bigger flocks significantly lower results (1% per 1000 extra birds, $P=0,04$)

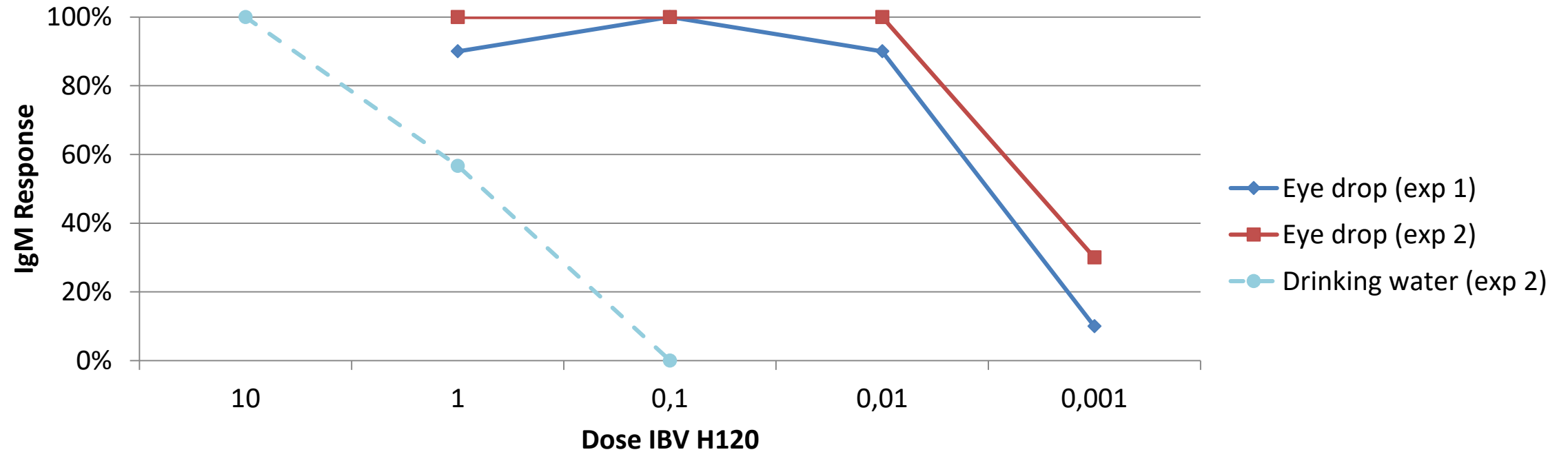
Water vaccination



1. Preparation of water lines
2. Preparation of the flock
3. Preparation of the vaccine
4. Supply vaccine
5. Check



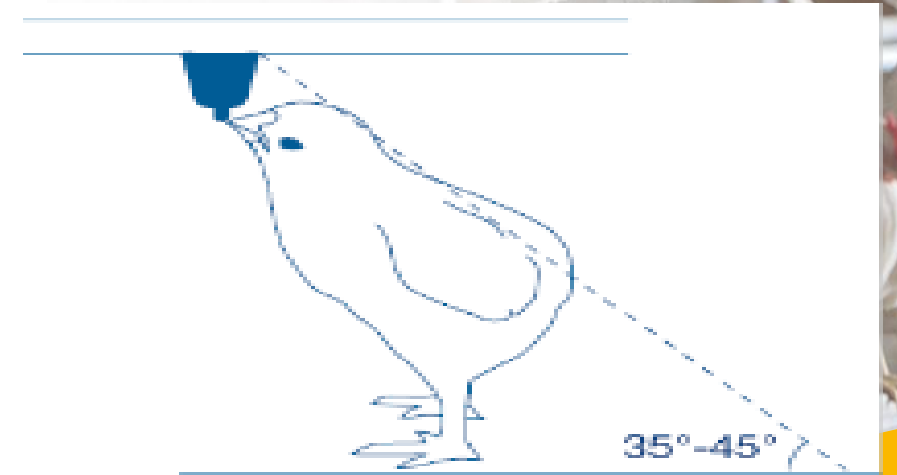
Drinking water vs eye drop



1. Prepare water lines



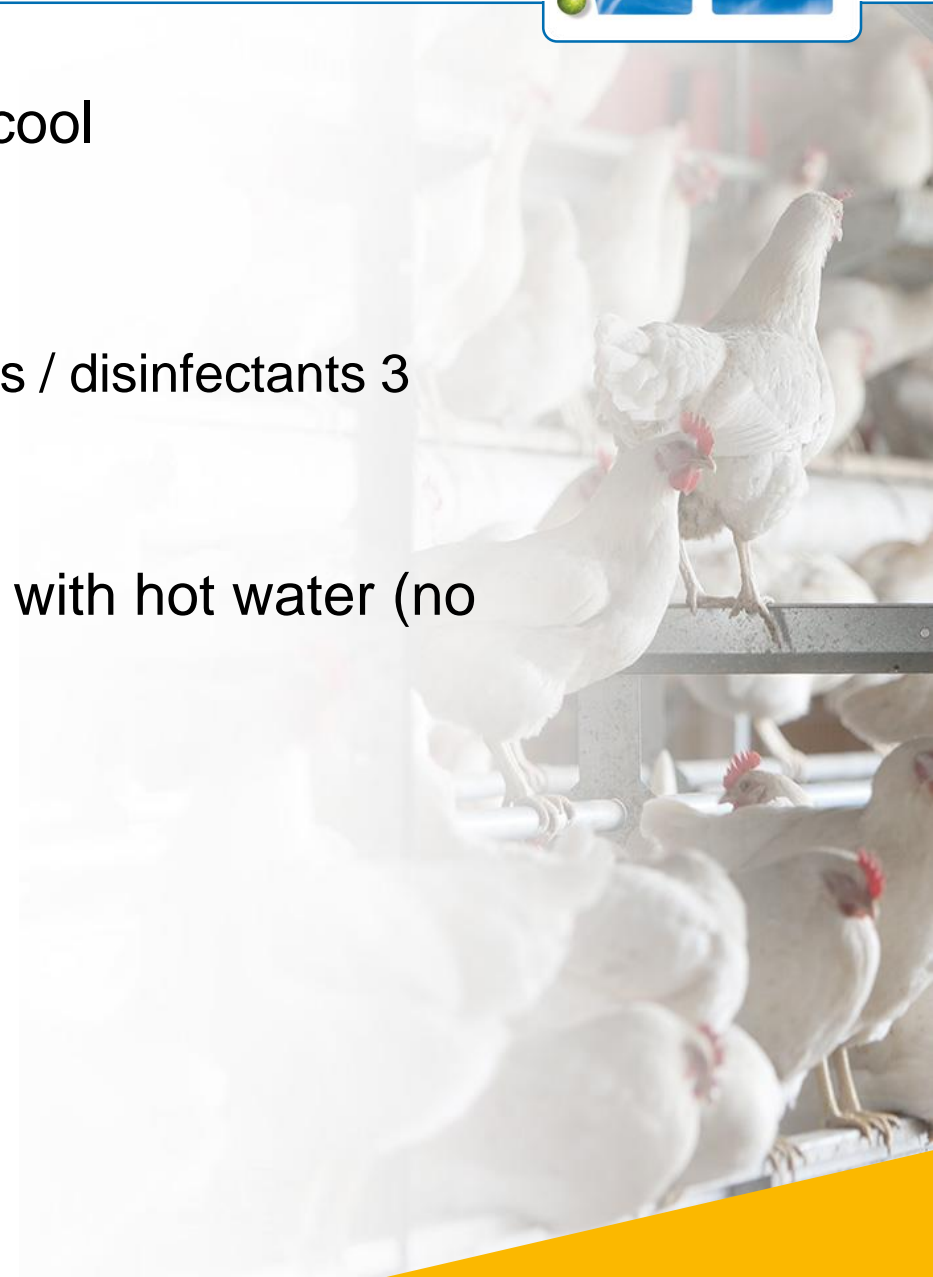
- Amount
 - drinkers (1 for 100)
 - nipples (1 for 10 to 12)
 - cups (1 for 12 to 15)
- Correct height
- Correct pressure (bell 0,4 – 0,8 bar)
- Correct flow (cup; 80-90 ml/min., nipple; 50-60 ml/min.)



1. Prepare water lines



- Best to vaccinate in early morning, when temperature is cool
- Stop treatments 24 hours before vaccination
 - Incl. necessary cleaning & disinfection
 - In less intense operated farms: stop treatments / detergents / disinfectants 3 days prior
- Flush
- Clean the bell drinker, medicator bucket and header tank with hot water (no detergent).
- Bleed & retract 1,5 – 2 hours
- Remove filter prior to vaccination
- Prepare vaccine
 - Add stabilizer?
 - Add coloring agent
- Provide in 2 stages of 1 hour each



1. Prepare water lines



Provide in 2 stages of 1 hour each

- **The titer of reconstituted vaccines generally starts to decline after two hours**

Alternative (only if 2x 1hr is not feasible):

- Vaccinate in 2 periods of 2 hours with $\frac{2}{3}$ and $\frac{1}{3}$ of the vaccine amount.
- Calculate the amount of water that will be drunk by the birds to be vaccinated using water consumption tables **or prior morning consumption** over 2 x 1 or 2 x 2 hours.
- General rule: age is the total liters of water per 1000 birds.



water consumption tables



- Tables based on feed intake x 1.85
- Ratio depends on temperature, feed, birds, etc.
- Always check the weight – not the age

- Preferably use REAL data (if available) instead of general tables

Age in days	Weight	Feed intake	Water intake/ day
7	182	33	61
8	212	38	70
9	246	42	78
10	281	47	87
11	320	51	94
12	362	57	105
13	407	61	113
14	455	66	122

Age in days	Weight	Feed intake	Water intake/ day
15	506	73	135
16	561	78	144
17	618	83	154
18	678	89	165
19	741	95	176
20	806	101	187
21	874	107	198
22	944	114	211

Example flock 6000 birds



- Vaccination at 10 days
- Weight 240 gram
- Waterintake per day: 75 cc
- Waterintake 2 hours:
$$75 / 24 \times 2 \times 6000 = 37500 \text{ cc} = 37,5 \text{ liter}$$
- Vaccination 2 periods of 2 hours of 35 liter
- Age: $10 \times 6(000) = 60 \text{ liter} (2 \times 30)$

Stabilizers



- Stability higher by addition of sterilized defatted or skimmed milk (1:50) or
 - Skimmed milk powder (0.2%) or
 - Coloring stabilizer (AviBlue, High Light or BlueDye)
 - Visibility
-
- Add with high temperature
 - Stabilizers are no compensation for inadequate water quality control



Milk proteins in the water bind chlorine and metallic ions, helping the survival of the vaccine virus in the water.



2. Preparation of flock



- Calculate expected water uptake 2 hours
 - Depends on age, breed, feed, temperature, length of water withdrawal
- Withdraw water for 1,5 – 2 hours
 - Synchronized drinking
- Do not adapt lighting scheme



3. Preparation of the vaccine



- Tank or dosator?
- Use cold water
- Use gloves
- Take required amount of vaccine out of the coolbox
- Add the stabilizer, wait 15 minutes (the chlorine has to be neutralized)
- Stir well
- Open the vial under water / use tablets
- Stir well
- Dissolved vaccine should be used within 2 hours



When using skimmed powder or skimmed milk:

Add skim milk powder at the rate of 2 grams to each liter of total water or 1 liter of skimmed milk per 50 liters of total water to be used.

- Pour the diluted vaccine into the header tank or a larger bucket only used for vaccination = stock.

Oh and....

Stir well



Example



- 35 liter of water
 - = $\frac{3}{4}$ liter skimmed milk
 - = 70 gram skimmed milk powder
- Bucket: 5 liter of water + milk(powder)
- Divide the stock in the 30 liters of water to be used. (30 water + 5 stock)

Ingredients (source: Lohmann AH)



Protection: add skimmed milk



- Skimmed milk:
 - protein protects the virus.
 - Fat has a negative effect on the virus
- Pure skimmed milk or milkpowder.
 - Take care dissolving (T)





Source: Lohmann AH





4. Supply vaccine (pipe lines)



Before preparation of the vaccine:

- Clean the lines by flushing clean water. Collect the water at the end of the line.
- Remove any water filters to the lines



4. Supply vaccine (pipe lines)



- Open valve
 - Check water flow + presence vaccine at the end of the line
 - Check flock activity
- Walk through the flock to chase away the birds from the drinker to allow other birds to drink.



- Check that all watering points are working regularly.
- Replace the cleaned filters and turn on the water to the shed immediately after all the water containing vaccine has been drunk. Lines may need to be flushed to remove any air locks or blockages.



Water vaccination: bell drinkers

- Turn off the main water supply.
- Period of water restriction
- Dim the lights and clean the drinkers. No detergent.
- Prepare the vaccine and mix the stock in the total liters of drinking water.



Water vaccination: bell drinkers



- Dim the lights
- Bring the vaccine water to birds quickly with a watering can.
- Manpower !
- Increase light intensity and activate feeders.
- Walk around to house to stimulate the birds



Water vaccination 2: bell drinkers



- Repeat the vaccination procedure with the second batch of the vaccine
- When the water is finished turn on the main water supply.
- Check the water supply for any leakage or blockage.



Also possible: automatic bell drinkers

5. Check



- Check color stabilizer uptake
 - Check 100 birds per quarter of the house
 - 90% positive
- Serology



Problems during vaccination



- Birds are too thirsty
 - Over and under consumption of vaccine
 - Spilling of vaccine
 - Bad uniformity titers: protection level ↓
- Birds are not thirsty
 - Water intake more than 2 hours
 - Under consumption
 - Low titers: protection level ↓



Alternative Individual Vaccination



Alternative in areas with low labour costs

- Oculo-nasal (eye drop) vaccination
 - Droplet in the eye and on the nostrils
- Oral vaccination
 - Dip the beak in vaccine water

Environmental temperature



- Correct body temperature: 41,0 – 41,5 °C
 - Set environmental temperature from this
- Cold: huddling, low activity
- Hot: panting, wings wide, low activity
 - Stress on respiratory tract
 - Particles deep in airways
- Temperature stress
 - Reduced immune response



Hot weather vaccination



- Vaccinate at coldest part of the day?
- Postpone vaccination a few days?
- Add stabilizer?
- Drinking water vaccination:
 - Water restriction: how long? (Dutch circumstances: 2 hours)
 - Per period: No more vaccine water than intake for 2.0 hours.



Thank you for your attention!

