

PCV2 and PRRS in relation to PMWS, secondary infections and management factors

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Porcine

regarding the pig

Circo-

Circular (type of genome)

Virus

Typ 2

Porcine Circovirus Typ 2 (PCV2)

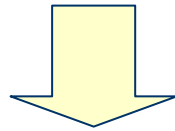
- Clinical symptoms first described in Canada (1991) and France (1996)
- Wasting of pigs especially 1-2 weeks post weaning (often without any other symptoms like coughing or diarrhoeas ...)
- Sometimes already symptoms in suckling pigs (sneezing, wasting)
- Sometimes abortions in sows in all stages of pregnancy (West et al., 1999; Allan et al., AASP 2000)

Theories, why PCV2 Symptoms did occur so „late“ (since about 1998) although the virus is already circulating in pig populations since decades

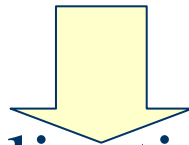
- Also pcv2 virus in healthy herds (SPF), virus has become endemic (Antibodies in all herds)
- Mutation of the virus from symptomless to pathogene.
- Suspension of mammalian proteins from pig diets (due to BSE)
- Increase of mycotoxins in pig diets (multifactorial)
- Higher production (30 piglets/sow/year) and concentration of pig production
- „Mistake for PRRS symptoms“
- Genetic change (pietrain strains??)

Pathogenesis (PCV2) experimental

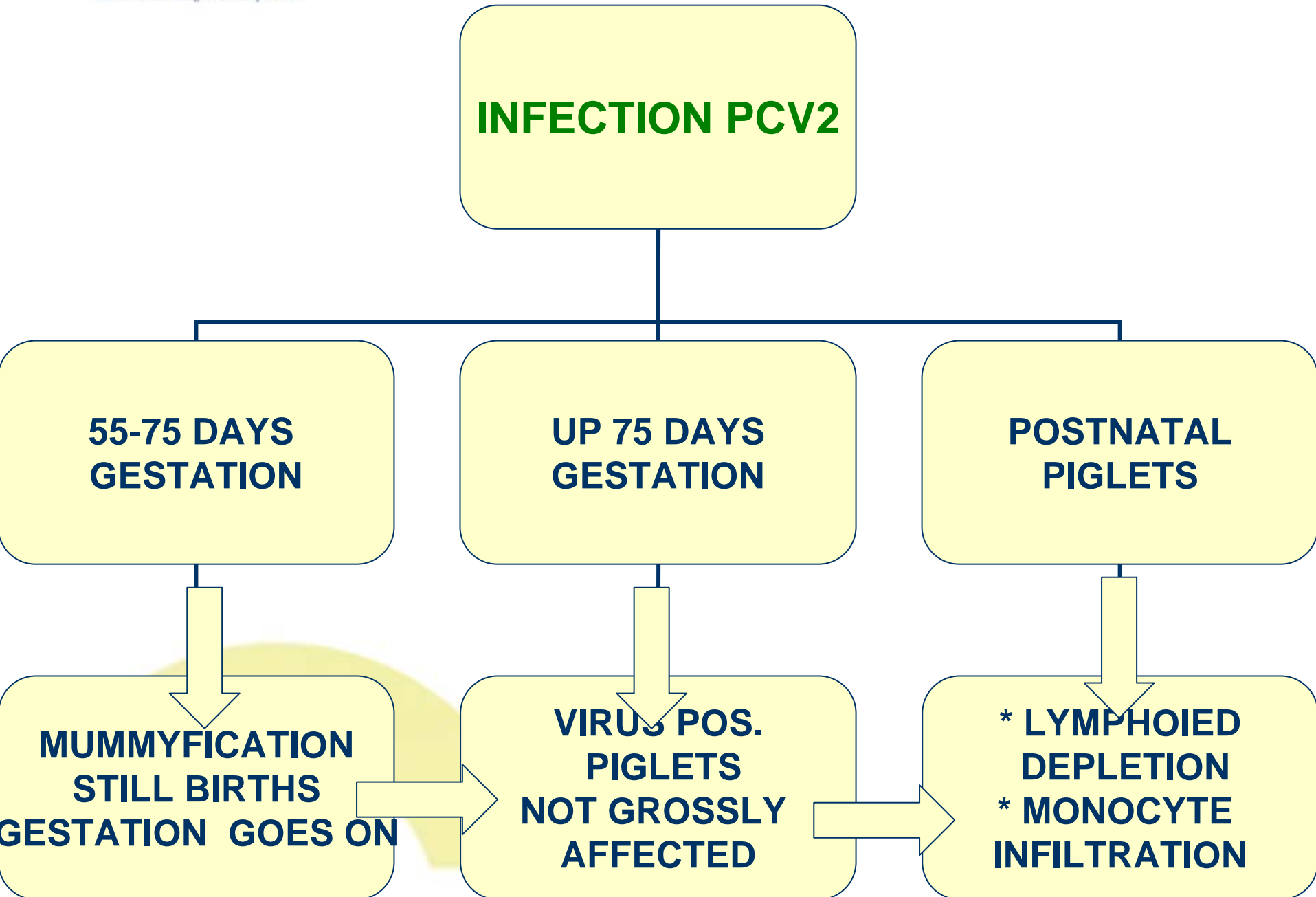
- Oronasaal infection seronegative SPF gilt
(DURING GESTATION)



viraemia



virusreplication in embryo



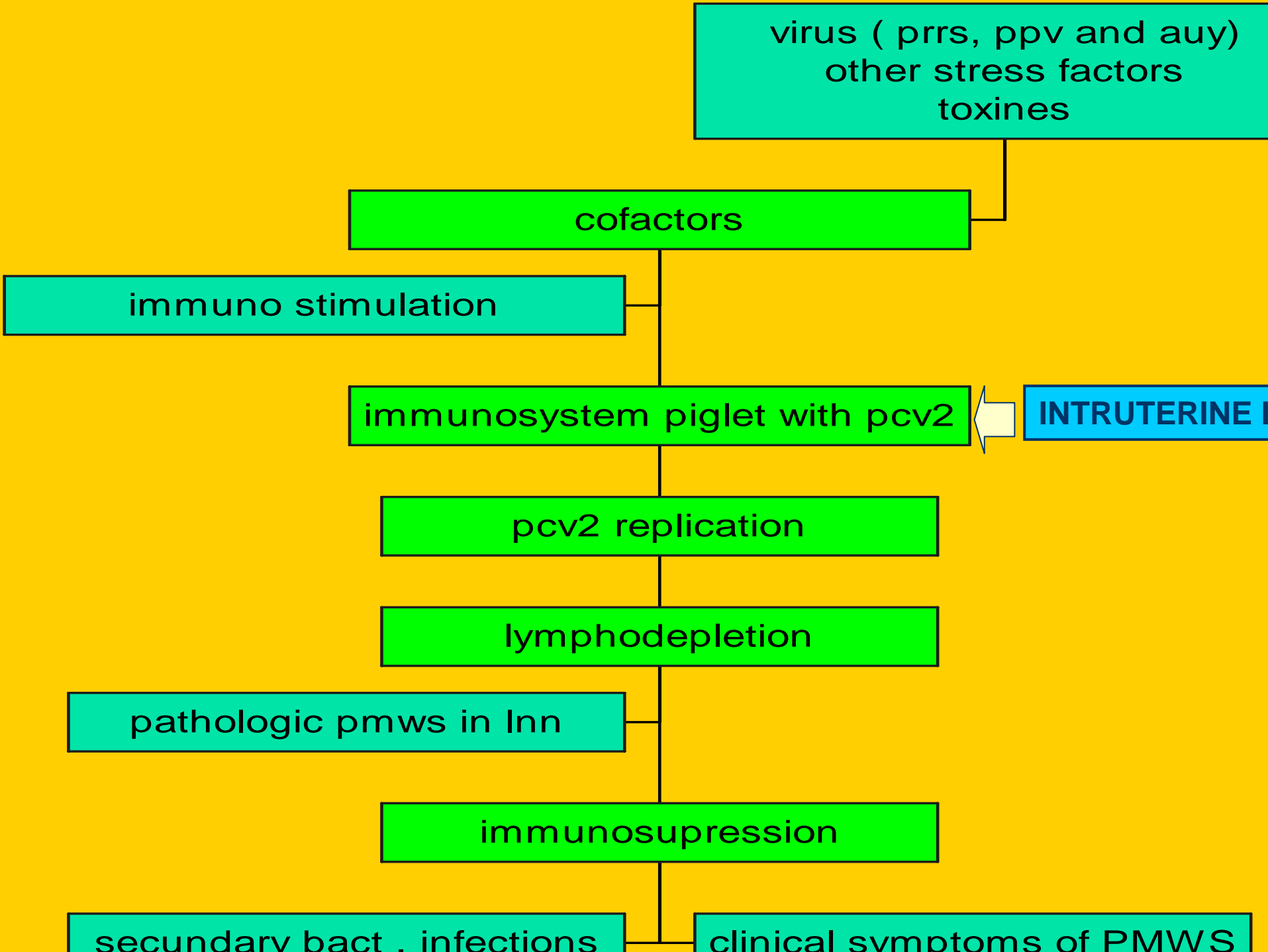
Lymphoid depletion in lymphnodes due to PCV2

- Lnn. are producing cells for the immunesystem
- Decreased production lymphocytes (defense cells)
- Macrophages (pac man) are destroyed (monocyte infiltration), a decrease up to 30%
- Immune system (defense system) is weakened and sometimes unable to challenge new sec. infections
- At this stage **pcv2** is not yet developing disease, the piglet is infected with pcv2 virus without symptoms (only enlarged lnn. and dark tear traces)

Pathogenesis (**pcv2**) in field conditions

Important role by cofactors

- Cofactors stimulate immunesystem of a piglet infected with **pcv2**
- **Pcv2** replication and **pcv2** infiltration in lnn
- **Pcv2** responsible or lymphodepletion in lnn which indicates immunosuppression
- Secondary infections → **PMWS**



virus (prrs, ppv and auy)
other stress factors
toxines

cofactors

immuno stimulation

immunosystem piglet with pcv2

INTRUTERINE I

pcv2 replication

lymphodepletion

pathologic pmws in Inn

immunosupression

secondary bact , infections

clinical symptoms of PMWS

PMIWS

Postweaning

Multisystemic

Wasting

Syndrom

Co-factors

- Viruses as prrs and ppv (often together)
- Vaccination ; every irrelevant immunogen (adjuvant) can give immunostimulation
- Stress factors: mixing, overcrowding and feed changes
- Mycotoxins
- Other bacteria.

PCV2 – Potentiation of clinical symptoms due to coinfection with PRRSV

(Infection of 3 weeks old CD/CD pigs)

Group	N	Infection	Mortal. (%)	clinic (scale)
G1	9	---	0	<1
G2	19	PCV2	32	<1
G3	13	PRRSV	0	9
G4	17	PRRSV+PCV2	59	12

Harms et al., AASP 2000

Immunstimulation may induce PMWS

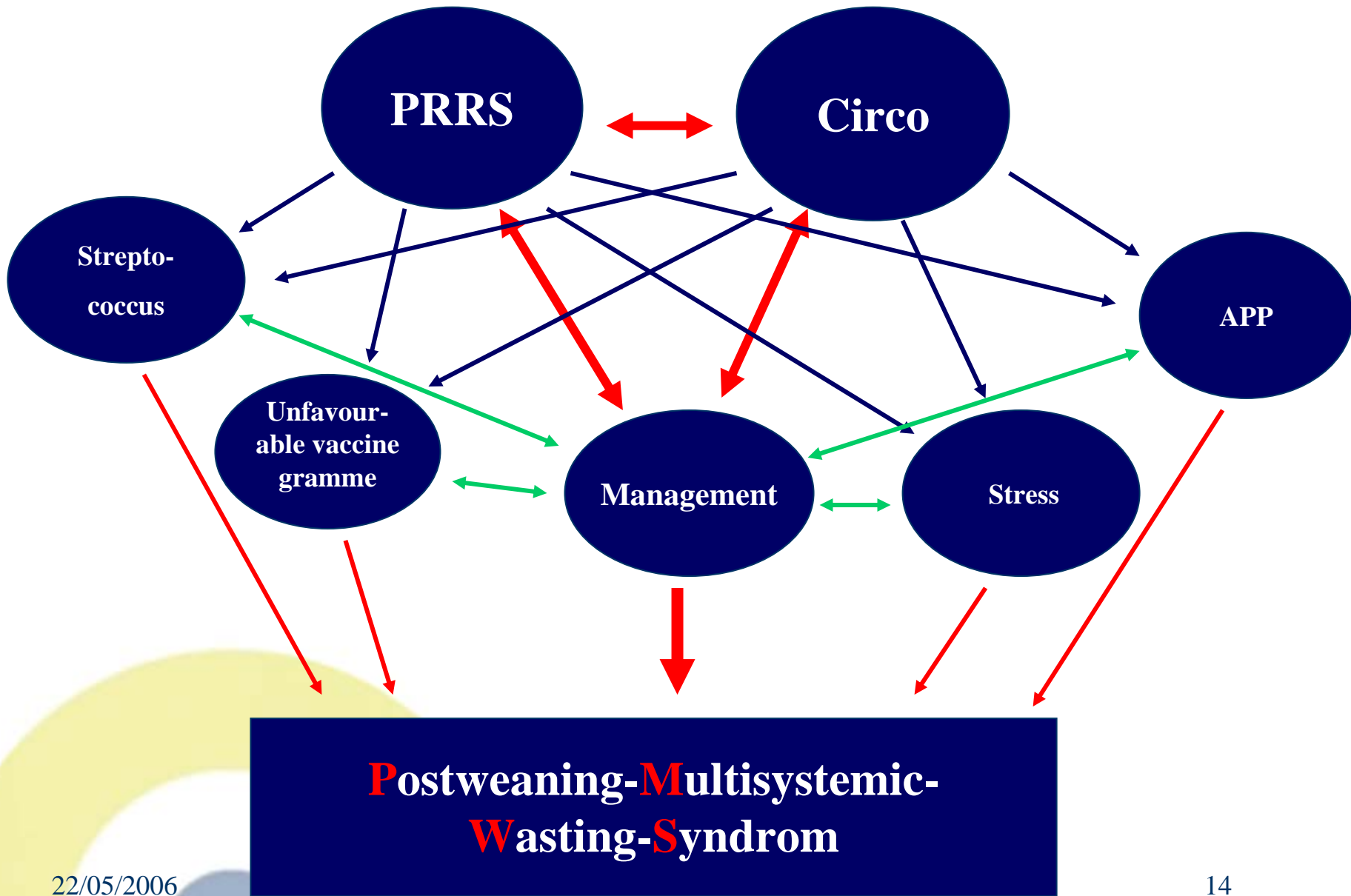
↙ **Controlled field study with 3 groups (28 piglets each) in a farm with PMWS symptoms**

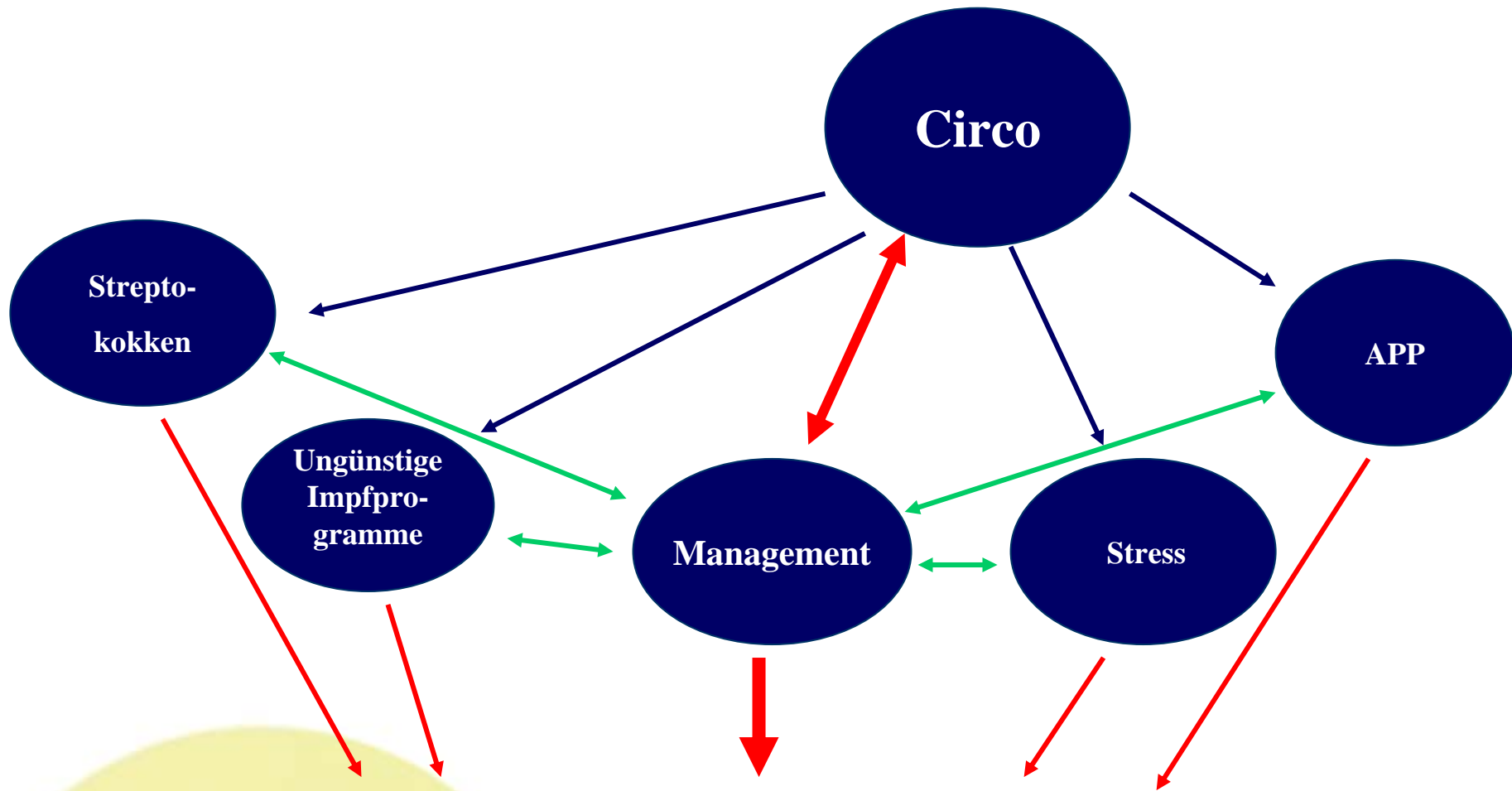
Group	Injections at day of live		
	Day 7	Day 28	Day 42
1	M.hyo	M.hyo	NaCl-Sol.
2	NaCl-Sol.	Baypamune	Baypamune
3	NaCl-Sol.	NaCl-Sol.	NaCl-Sol.

PMWS-Symptoms in :

**42,9% of M.hyo vaccinated group,
50% of Baypamune injected group and
only 10,7% of NaCl-injected group !**

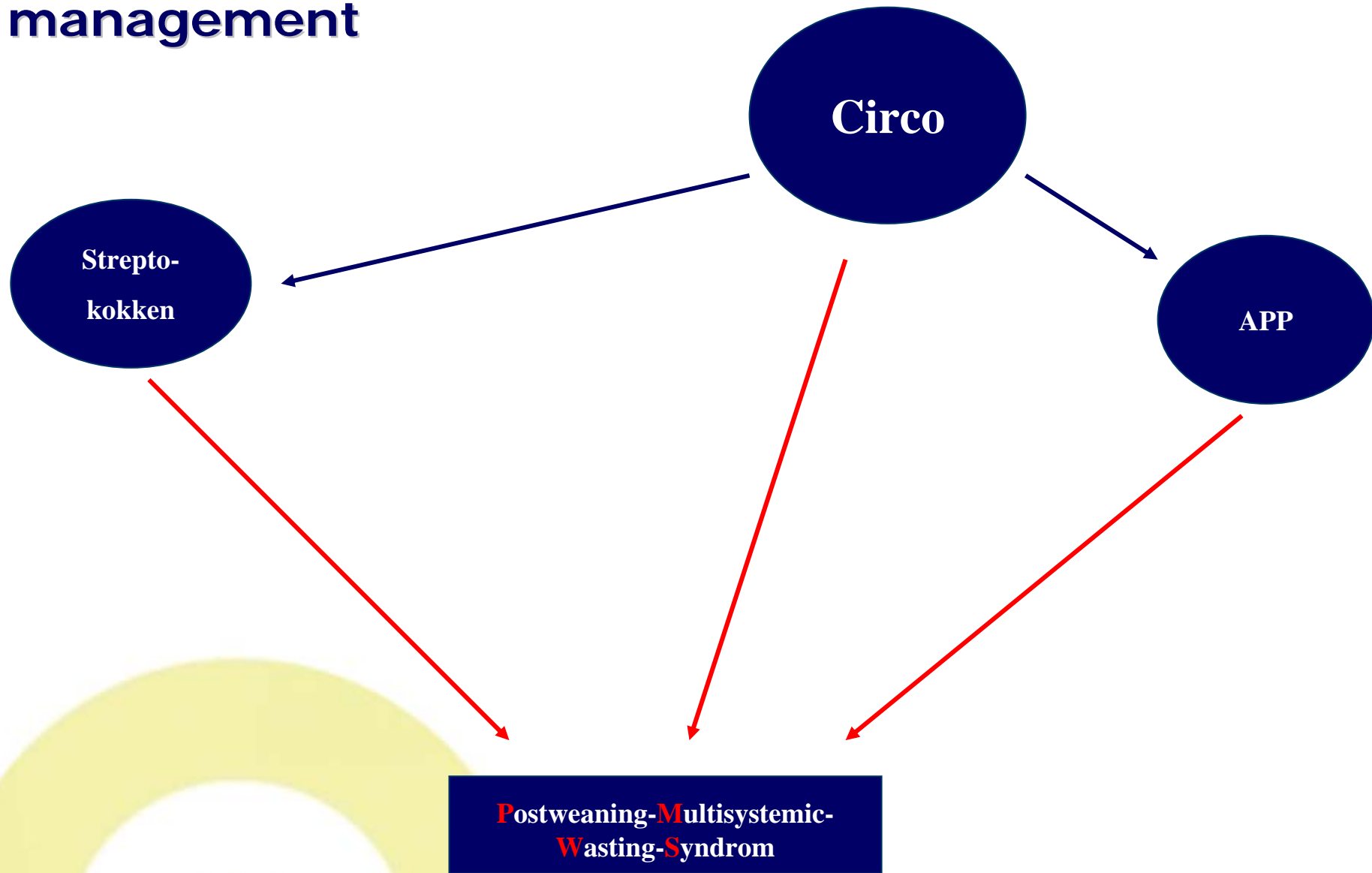
PMWS: a complex with many faces !!





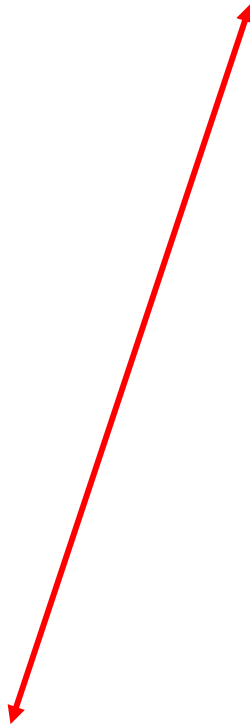
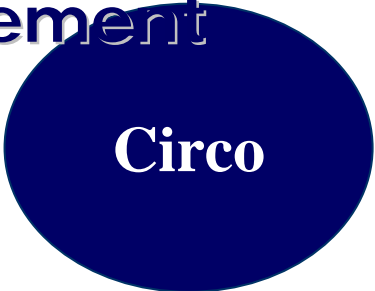
Postweaning-Multisystemic-Wasting-Syndrom

PMWS after control of PRRSV and optimization of management



PCV2 after control of PRRSV, other infections and optimization of management

PCV2 alone usually does not induce clinical symptoms



Postweaning-Multisystemic-Wasting-syndrom

PMWS

First in Canada (1991), now almost worldwide.

Responsible for many economical losses.

Netherlands first symptoms in 1997.

CLINICAL SIGNS

- From weaning until 40 kg bodyweight .
- Sneezing, coughing and pneumonia.
- Fever, lowered daily intake.
- Paleness (stomach ulceration)
- Wasting up to 10 %.
- Lowered uniformity.
- Combination with PDNS.

PDNS

P orcine

D ermatitis und

N ephropathie

S yndrom

PDNS

- High conc. **pcv2** antibodies
- persistent immunostimulation (viruses, stress, mycotoxines etc.)
- production (auto)immunecomplexes
- Obstruction smaller bloodvessels (skin, kidneys)
- No therapy (sometimes in early stage cortico's)
- Losses up to 5 % (all ages)

Pathologic Findings (PMWS)

- Enlarged inguinal lymph nodes
- Gastric ulceration
- Enlarged kidneys (pdns)
- Interstitial pneumonia
- Bronchopneumonia

Technical data

- Mortality up to 25-30 %
- Daily gain lowered - after weaning
- in fattening period
- Higher feed conversion

Epidemiological

- All types of farms are dealing with pmws (also SPF herds)
- Only reproductive part is not affected
- 100 % prevalence of **pcv2** antibodies
- Influence of management factors
- Frequently in combination with **PRRS**

Secondary infections

- **M. Hyopneumoniae**: vaccination (double shot)
relapses
vaccination in pmws context
- **APP** : Type 2 and 9.
- **Haemophilus parasuis**: frequently involved
- **Pasteurella / bordetella** : sneezing/ coughing
- **Streptococcus** : different types

Prevention and control

Reduce the economical losses by

- Reducing infection pressure (sec. inf.)
- Increase the immune status (increase of passive and active immunity)
- Vaccination sows during gestation with **pcv2** vaccin

Vaccination

- Serotherapy (difficult and risky)
- New safe vaccin (sow vaccination)
- Maternal **PCV** antibodies (by sow vaccination) are protecting for **PMWS** (challenge at 3 weeks age gives less clinical **pmws** signs)
- Maternal antibodies present until 4 weeks in a piglet
- High **pcv2** antibodies after several piglet vaccinations (min. 4 weeks old) gave also protection against **PMWS**, but immunity only after 25 days
- Conclusion: Vaccination of piglets after 4 weeks of age is too late (antibody production only 25 days later), herd vaccination is more economic en efficient

Passive immunity by piglets

- **Bodyweight at birth:** sow feeding schedule
feed composition (vitamins, minerals etc.)
co infections (prrs, ppv ,infl.)
- **Colostrum immunity :** piglet and sow
- **Lactation of the sow :** genetically
duration
- **Weight at weaning :** 5 – 7 kg bodyweight

Active immunity of piglet

After weaning passive immunity turns to active immunity

- Feed intake
- Feed composition
- Housing
- Stress factors
- Genetics
- Vaccinations

Reducing infection pressure in general

- **Strict biosecurity**, no animals or semen from outside unless quarantine
- **Hygiene**, cleaning and disinfect every room , sterile instruments
- **Cross fostering** only strictly necessarily in first days
- **All in all out systems**
- **Separation or euthanasia** (sick animals to hospital room)

Reducing infection pressure specific

- Which infections are present? (prrs, m.hyo, influenza, app, h. parasuis, pasteurilla etc.)
- Primary and secondary infections
- How to reduce these infections?
(Starting up management measures, strategic antibiotic therapy, vaccination programs)

Control of PMWS

Strictly carrying out of

- Management programs
- Vaccination programs
- Antibiotic therapy

Monitoring

Management factors

Hygiene	Lower stock density	Removal to hospital room
Biosecurity	No (re) mixing	Extra vitamins
Climate control	Small groups	Appropriate vaccination program
One site herds	Feeding systems/schedule	rodents
All in all out	Cross fostering	

Vaccination program example

disease	gilt	SOW	piglets
auy	12,16 and 26 weeks	Every 4 months	12 weeks
ery	12, 16 weeks	lactation	
parvo	26, 30 weeks	lactation	
prrs	18 weeks	Every 4 months	2 weeks
m. hyo	17 weeks		1, 3 weeks
app	17 weeks	Every 3 months	6, 10 weeks
influenza	Comb auy	Combination auy	Combination auy
e. coli		3 weeks before farrowing	
pcv		gestation	

Monitoring

- Rapid reaction on new pathogens or reinfections
- Measurement tool for effect of vaccinations (seroconversions)
- Health status
- Eradication of certain diseases

Depop and repop

- Only when severe economical losses due to PMWS
- Not in swine dense areas
- No animals or semen from outside (spf)
- Partial depop- repop.

Conclusions

- **PCV2** and **PRRS** are responsible for lymphodepletion. It opens “the door” to sec. infections by immunosuppression.
- Also other cofactors give immunosuppression (stress, vaccinations)
- The complex pcv2 - prrs- cofactors - sec. infections is called **PMWS**
- Prevention by reducing secondary Infection pressure and increasing immunity
- Control by management - vaccination programs and strategic antibiotic therapies
- New **PCV2** vaccine is launched in a few country's
- Total repop is very risky and expensive, partial depop is perhaps an option
- Monitoring is important



DE KLINTJESHOF

dierenartsen
diagnostiek
apotheek



Bierwoude
Haarmond

**Thank you for
you're attention**

Dr. F. Dirven