NOTE

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Organic pig production without zinc

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Conclusion

An additive that can replace zinc 1:1 has not yet been found. There is little likelihood of this happening.

Practical experience, from both conventional and organic producers, show that it is possible to avoid the use of medical zinc. However, it requires a high level of management, and often, results and experiences cannot be directly transferred from one farm to another. Every farm must develop its own concept, based on inspiration and own experience.

Weaning diarrhoea has been a problem for more than 50 years and it has been worked on nonstop. One should accept, that this challenge requires resources both in terms of quality and time for supervision.

1. Introduction

Phasing out zinc as a veterinary remedy must be realized by mid-2022. As such it is a matter of great concern. SEGES Organic Innovation has managed a project of mapping the pressure of infection in organic pig production and been a partner in both the EU-project “Organic Plus” and a national project about utilization of seaweed. The common denominator of the three projects, is to generate knowledge to facilitate a phase-out of veterinary zinc. Results from the projects combined with knowledge from conventional production is compiled in this report.

2. Why should zinc be phased out?

Zinc is a heavy metal that works effectively against E. Coli. (gram-negative bacterium), which causes diarrhea in pigs, especially at weaning. Zinc helps to ensure a stable production with high productivity and a low consumption of antibiotics.

Why is it important to phase out zinc then?

Zinc has a negative impact on the microbiology in nature and, like antibiotics, it can lead to resistance in some bacteria.

Excerpt from a Danish report on zinc and copper in the aquatic environment:

The relatively high content of zinc in fresh water means, that zinc can be found in lake- and stream sediments, at concentrations that in more than 50% of the samples are assessed to pose a risk to the sediment-living organisms, even after general bioavailability considerations has been included. Aarhus University, “Zink og kobber i vandmiljøet”, scientific report no. 263, 2018.

In 2014 and 2015, the consumption of zinc in the Danish pig production was approximately 440 tons annually. In 2018, this was reduced to approximately 410 tons. No later than mid-2020, the use of zinc as a veterinary remedy must be completely phased-out at EU-level. Specifically, it is the high dose at 2500 mg per kg feed used in the first 2 weeks of weaning, that needs to be eliminated.

3. Knowledge from the conventional production

The challenge of not using veterinary zinc is shared by both conventional and organic pig producers, however the basis of the challenges is widely different. As such, there is no guarantee that effective solutions in conventional production can be directly transferred to organic production. In addition, it is not certain that measures in conventional production are allowed in the organic.

In June 2019, an international two-day conference, ZeroZincSummit, was held in Copenhagen. The following is a brief extract of the many messages from the contributors. The outline is meant as an appetizer and is not in itself comprehensive for the entire conference.

Tabel 1: An overview of different messages from contributers of the conference ZeroZincSummit in June 2019

Initiative	Effect	Read more here: https://svineproduktion.dk/Services/Plancher Zero Zinc
Zinc Oxide	The ability of zinc to increase daily gain is explained as the ability to influence the immune system or the digestibility rather than the ability to transport nutrients through the intestinal epithelium.	C.M. DE Mille et al, Iowe
Zinc Oxide	A low dose of micronized zinc oxide shows potential in laboratory experiments – should be examined further.	Saara Sander et al, GmbH

Initiative	Effect	Read more here: https://svineproduktion.dk/Services/Plancher Zero Zinc
Causes and diagnostics	Cause: E. Coli, high protein level, poor raw materials, cold and draught. Diarrhoea is caused by a mix of E. Coli, Lawsonia and/or dysentery and possibly Salmonella. Pigs receiving high doses of zinc within 2 weeks after weaning contracts diarrhoea 3-7 weeks after weaning. A distinction is made between whether diarrhoea is caused by infectors or feeding conditions. Infectors also include virus (PCV2, Rotavirus, TGE and PED (PED and TGE not in Denmark) and coccidia.	Ken Steen Petersen, Ø-vet
Wheat bran	4% wheat bran in the feed 12 days after weaning shows potential.	Emma Suckling et al, UK
Protein level	Protein levels varied between 19% and 14%. Fed to 6 different groups, whereas 1 was a control group with zinc and 1 was a control group without zinc. There was no difference in production results between the two control groups, however the control group with zinc had significantly lower levels of treatment than the control group with zinc. Weight group 6-9 kg: Reduced protein level, but with synthetic amino acids, caused reduced daily gain and feed efficiency compared to the control group without zinc. None of the chosen protein strategies yielded better results than the control group without zinc. Low protein level had no influence on the number of treatments compared to the control group without zinc – except for the group which first reached a high level of protein in the weight interval of 13-50 kg. This group had lower daily gain.	Niels Kjeldsen, SEGES
Protein and fibre	High protein and fibre digestibility has the potential to provide the same productivity as veterinary zinc.	N. W, Jaworski et al, Netherlands
Macleaya Cordate Extract, Sangrovit	Plant-/herb extract shows potential.	Sophie-Charlotte Wall, GmbH
Celmanax	Yeast products. Show potential.	S. Jalukar, USA
Strategies to reduce E. Coli.	Allocation of antibodies via feed show effect against F4 but needs allocation in a period of at least 10 days. Weaning diarrhoea often occurs earlier. Receptor analogues have shown effect against F18. It is thus considered, that this strategy has potential, and an industrial production of antibodies is very realistic.	E. Cox, Belgium
Coliprotect vaccination	Vaccination with Coliprotect F4 has a good effect on E. Coli F4. Different feeding strategies showed no significant effect on productivity. Vaccination provides improved production economy through improved daily gain and low antibiotics consumption.	Frederic Vangroenweghe, Elanco, Belgium

Initiative	Effect	Read more here: https://svineproduktion.dk/Services/Plancher Zero Zinc
Management	Important elements of good management: Quality pigs, feeding in the nursing period, facilities, access to water and water quality, access to feed and feed quality, protein level etc.	Fabien Larcher, France
Practical tips	Important elements of good management: Feed intake, weaning feed, low protein level, high protein digestibility, biosecurity, experienced and well-educated staff.	Nicolai R. Weber, SEGES
Management	Systematic interdisciplinary cooperation between all actors (farmer, employees, veterinarian, etc.). Education and frequent dissemination.	Ina Toppari et al, Finland
Feed intake	Pay attention to feed curve etc.	J W Resink et al, Netherlands
Provenia CF-Z	Benzoic acid products show potential.	M. Castillo, Spain

- Note that foreign and Danish conditions are not always comparable.
- As an example, there can be different perceptions of what is a high/low protein level.
- Some results are from laboratories – others are from practical experiments.
- Good results achieved in laboratories can be difficult to prove in practice.
- Some results are from company tests, which is ok, however results from independent party tests are better.
- There can be a big difference in the quality of facilities (housing units, heating, hygiene, etc.)

Soy meal, synthetic amino acids, benzoic acids and many enzyme products are not allowed in organic production.
A guide for conventional production can be found here: https://zinkguide.dk/
The guide is based on areas indicated by a small initial questionnaire, as well as relevant key areas in the specific herd.

4. Differences between organic and conventional production

Tabel 2 Some differences in conventional - and organic pig production

	Conventional	Organic
Age of weaning, days	21 - 30	50 - 70
Weight on weaning, kg	6 - 7	14 - 30
Feed balanced with synthetic amino acids	yes	no
Phytase in feed	yes	no
Soy meal vs soya-bean cake	meal	cake
Produce selection	free	limited
Residence - nursing period	indoor	outdoor
Residence - weaning	indoor	open housing/outdoor

With a minimum of 7 weeks of weaning, one may think that the risk of weaning diarrhea is over, but reality indicates something else. Companies that practice 10 weeks of weaning have also experienced that increased weaning age does not solve the issue alone.

5. What causes diarrhoea in the organic production?

Analysis work and diagnostics (pressure of infection)
It is important to make clear that diarrhoea is a symptom and not a disease. Often, we associate diarrhoea with intestinal infection, but diarrhoea will in many cases be caused by other conditions such as cold, draught, stress, general infections, unfortunate feed compositions or unintentional uptake of contaminated material.

Various infections with different infectors (virus, parasites or bacteria) will in many cases deteriorate conditions and, in some cases, it might also cause diarrhoea by itself. It is all about the balance between the power of resistance and infector virulence, amount and concentration.
The pigs can contract intestinal infections by different sources of infectors depending on their life stage.

In their first week of life, the piglets will often be protected by antibodies from the sow's colostrum. Thus, there are primarily 2 types of diarrhoea syndromes at this age:

1. Enteritis caused by clostridium perfringens type C. Severe infection of the intestinal wall with profound levels of necrosis. This type of intestinal infection is related to high mortality, but fortunately it is rare. The low prevalence is presumably a result of widespread use of sow-vaccination.

2. Non-specific diarrhoea. A range of infectors is observed (non-haemolytic E. Coli, enterococcus hirae, rotavirus and clostridium perfringens type A), all of which are attributed to some importance, however it is also of influence that the piglet must establish an intestinal flora after its birth. This type of diarrhoea rarely causes death, but it can impede the piglet's wellbeing and growth.

From the second week of life, coccidia can cause intestinal infections. Coccidia are small unicellular parasites. The coccidia species usually causing disease is named cystoisospora suis. Coccidia divide in the intestinal wall and secrete oocysts (a form of "egg"), into the intestinal content, which can be detected in faeces. If the pig secretes more than 5000 oocysts per gram of faeces, it is considered heavily infected.

In this study we also observed a high prevalence of the coccidia species Eimeria, which was surprising. In several of the herds a secretion of about 200.000 oocytes per gram of faeces was observed. The pig has 8 different species of Eimeria and they are not usually considered to play any role in disease development, but with this massive occurrence it may be of significance.
From the second week of life until the week after weaning, the pigs can be infected with the intestinal infection popularly named "turbo-coli" or post weaning diarrhoea. This is an infection caused by particularly aggressive coli bacteria. Usually it is associated with high mortality, even without diarrhoea symptoms.

From the second to the third week after weaning, non-specific diarrhoea can be observed. It is rarely associated with high mortality, but with impeded growth and sometimes chronic unthriving. The

diarrhoea can be caused by infection with E. Coli, Lawsonia, Brachyspiae pilosicoli, dysentery, Salmonella or whipworm. These infectious agents can occur either alone or in combination.
The main project of mapping infection pressure in organic pig production was focused on diagnostics in the farrowing field and the weaning path. With the aim of clarifying the exact cause, to choose the correct measure.

The hypothesis was that E. Coli infection pressure varies according to weather and the duration of the farrowing pen usage under wet weather conditions. Using the acreage for almost one year leads to a high risk of building up severe infection pressures. The hypothesis was formed from widespread practical experience, which shows that moving the sows to new areas in March-April leads to an easy and safe production, when compared to sows that stay in the old areas in January-February. Within this project we wanted to survey the infection pressure and try out initiatives, that might disrupt the build-up of infectious agents.

Materials and method:
Initially, herds reporting problems with diarrhoea were widely analysed. Faecal samples from 5 herds, both sows and piglets, were analysed to determine the level of infection pressure. However, the reported number of cases were far from the expected amount. 2018 was a very dry year with both frost and sun. These conditions helped destroy/reduce E. Coli, which was confirmed by the faecal sample analyses.

The conclusion of the work in 2018 was that diagnostic fieldwork, investigating the general infection pressure in outdoor pens, is very difficult. Diarrhoea faeces easily vanishes in the immediate environment or evaporates because of the thin texture, which made it difficult to collect representative material for laboratory analyses. By contrast, diagnostics on sick/dead pigs, or faeces collected directly from the sick pig, proved good indicators of the disease occurrence in each section of the herd. Results from the diagnostic samples in the 5 herds are illustrated in appendix table 1-5, and in figure 1-5, where the individual results are distributed over seasons.

The results outline does not provide an adequate story, since not all disease incidents have been submitted. There is no obvious correlation to seasonality or development over time. It can however be seen, that a wide range of serious diseases exist in all seasons, and that the same syndrome may be caused by different infectious agents.

As such, the project went from sample collection in a wide range of farms, to concentrating efforts on a single farm, where a natural product was also pilot tested.

In 2019, a farm agreement was made to pilot a natural product with a high content of p-phenol (tannin), replacing zinc. The product was chosen because of promising expectations at EU-level. In the project Organic Plus, another tannin-rich product is tested for efficacy against intestinal parasites in sheep. From practice, experience with fresh branches from pines given to weaned organic pigs has a positive effect on ear wounds. It was clear that the pigs purposefully focused on debarking and eating the branches. The organic pigs were 7 weeks old at weaning, were kept on deep litter, and fed roughage. Thus, the pigs did not lack materials for rummaging or structure in the feed rations. The control feed already contains a range of health products, including probiotics, acids, herbs and yeast. Faecal samples from the piglets with diarrhoea are analysed and the dead pigs are autopsied.

6. Pilot test of p-phenol as an alternative to zinc

Project host farm production:
Approx. 350 sows per year – 8000 to 8400 weaned pigs per year – 3-week batch operation ~ 460 to 485 pigs per weaned batch.

In addition to veterinary prescribed medical zinc (2500 ppm in the feed for the first 14 days after weaning), the following additives were already standardly used in the feed:

- Probiotics – living, defined bacterial cultures, e.g. junket.
- Prebiotics – bacteria nutrients, e.g. fibres.
- Acids
- Yeast, living
- Yeast, killed
- Oils
- Fibres
- Herbs, bacteriostatic
- Flavour additives

The pilot test
Product with P-phenol/tannin was added to the feed with 0,2% (company instruction) and fed to nursing sows, suckling pigs and weaned pigs. The test parameter was whether the pigs developed treatment necessitating diarrhoea.

Tabel 3 Schematic test design

Week no.	Weaned	Category (test/idling/control)
1		
2		
3	x	Test
4		
5		
6	x	”Idling” – i.e. residues of test feed were used up and replaced by control feed.
7		
8		
9	x	Control

Batch descriptions:

First batch	Batch where test design and the practical organisation of the work are tested.
Test batch	Pigs, only receiving test feed.
Idling batch	Pigs, receiving possible remaining test feed, followed by control feed.
Control batch	Pigs, only receiving control feed.

The test design makes it possible to have two types of control batches:

1) Independent control batch every ninth week.
2) Simultaneous control batch: 1 weaning batch at 460-485 pigs divided into 100 pigs for testing and 306-385 pigs for (simultaneous) control.

The pilot test was carried out in 2019. It was comprised of 1 first batch and 4 test batches.

Pilot test results

Tabel 4 Weaned pigs

Batch	Approx. #	Comments
1	100	First batch - zinc was given after 6-8 days
2	100	Test batch - zinc was given after 6-8 days
3	100	Test batch - zinc was given after 6-8 days
4	100	Test batch - zinc was given after 6-8 days
5	100	Double dose p-phenol Test batch - zinc was given after 6-8 days

Sows as well as pigs ate the feed with p-phenol. They even displayed a tendency for increased appetite when the dose was doubled.

Since all test batches developed such severe weaning diarrhoea, that it was necessary to assign veterinary zinc (as well as treatment with antibiotics at individual level) on day 5-7 after weaning, there are no data for completed test batches. The farm owners estimate, was a difference of 2 kg less weight for the test batch pigs, than the total weight of 30 kg per pig, in the control batch.

Batch 1 and 2 had diarrhoea in the farrowing field, and 5-7 days after weaning, they had such severe diarrhoea, that it was necessary to assign zinc.

Following batch 1 and 2 it was decided to change the piglet feed to a mixture from a higher quality class (better raw materials and a special heat treatment) than the first. It immediately led to increased feed intake and the pigs were healthy at weaning, giving a belief that batch 3 were robust enough to manage without zinc.

Despite an initial high level of management, the management routines were reviewed, and water samples were collected for analyses.

Batch 3 developed severe and acute diarrhoea 5-7 days after weaning and 10% (10 pigs) died within 24 hours. Medical zinc was administered, as well as antibiotics at individual level. There were 0 dead pigs in the control batch.

Batch 4: It was decided to double the p-phenol dosage from 0.2 to 0.4 % as a final initiative. This led to increased appetite, but on day 7 after weaning, there was an outbreak of diarrhoea. Medical zinc and antibiotics at individual level was administered.

The conclusion was that p-phenol, in this case, could not replace medical zinc as a prevention method of weaning diarrhoea.

7. Other initiatives to phase out zinc in organic production

Seaweed

In the project ”Tang.nu”, 3 different types of Danish seaweed has been tested for conventional pigs, weaned at 4 weeks. The three seaweeds “sea belt”, “sea lettuce” and “knotted wrack” were compared to a feedstuff with veterinary zinc and a control feedstuff without any additives. The experiment was conducted by Aarhus University, Foulum. The project is supported by The Velux Foundation.

Study design:
90 pigs, divided in the following groups with 18 pigs in each:

- Positive control normal feed with medical zinc
- Negative control normal feed without medical zinc
- "Sea belt" 5% and without medical zinc
- "Sea lettuce" 5% and without medical zinc
- "Knotted wrack" 5% and without medical zinc

Preliminary results show, that addition of 5% seaweed indicates a tendency to more solid faeces, but no difference in productivity measured as daily gain and feed intake. Final results are awaited.

8. Perspectives

The results do not mean that p-phenol and seaweed are irrelevant. Further tests with seaweed are needed. The test performed with three types of seaweed would possibly show more evident results, if it was repeated on a larger scale.

There are still several relevant issues, e.g. whether harvest time and processing influence the results, and whether dosage is correct. 0.2% p-phenol seems like a small dosage, while 5% seaweed seems like a high dosage. Dose-response experiments could certainly add new knowledge.

At EU-level, there is great interest in p-phenol for other animal groups as well. In the Organic Plus project "Pathways to phase-out contentious inputs from organic agriculture in Europe" p-phenol is tested on sheep. Results from the projects "Kortlægning af smittetryk i økologisk produktion", "Tang.nu" and "Pathways to phase-out contentious inputs from organic agriculture in Europe" is shared through collaboration.

9. Recommendations

From conventional production:

- High quality feed for pigs during nursing period
- High quality feed for weaned pigs
- Easy access to feed
- Low protein level
- High digestibility of fibres, e.g. wheat bran.
- High protein digestibility
- Feeding strategy - almost restrictive
- Securing a dry bed free from draught
- Optimal weaning facilities (warm, dry, draught free, clean)
- Good general hygiene
- Easy access to water
- High water quality

Check list and test https://zinkguide.dk/.
Notice that the material is updated regularly.

Practical experience from organic production collected from interviews:

- Ensure high feed intake in the farrowing paddock. Plenty of feed dispensers, which should be well covered to ensure good hygiene.
- Physical handling of the pigs at weaning should be as gentle as possible. During gathering and distribution, it is important that the pigs have easy access to feed and water, as well as optimal temperature regulation according to weather and season.
- Small herd size is preferable if the focus is health.
- Use nursing sows only if necessary.
- Move the pigs as little as possible.
- Ensuring good sow conditions – especially 1. parity sows. Diarrhoea pigs usually stem from 1. parity sows.
- Extension of the nursing period with 1-2 weeks is preferable.
- Give the same feed to the weaned pigs, as they were fed in the farrowing field, for one week after weaning.
- Outdoor weaning is preferable, if it can be kept dry. Make a plateau of straws outside the hut entrance.
- Access to soil is considered very important.
- Access to quality roughage is considered very important.
- If the pigs vary in size and weight it is mainly caused by lower milk yield.
- The absence of zinc has also caused variance in pig size and weight.
- A slight decrease in productivity in favour of stability should be accepted.
- Avoid vaccination in the weaning period if possible.
- Ensure a deliberate plan for vaccination:
    - Make sure the sows are well vaccinated (at least against E. Coli and intestinal infections)
    - Vaccinate with COLIPROTEC F4/F18 and be aware that timing in relation to infection is important.
    - Vaccinate against Oedema disease if found in the herd (analyse faeces for Vt2e).
- Ensure a deliberate plan for treatment of Coccidiosis.
- Examine the need for iron supplements within the first 24 hours.
- Collaborate with feed supplier, consultants and veterinarian.
- Problem pigs should be analysed/autopsied.
- Use experienced and well-educated staff.
- Be prepared to (temporarily) accept a slight decline in productivity.
- Use alternative additives based on your own criteria but consider them as a supplement and not as a substitute for the above.

Remember: it is also time-consuming to USE medical zinc. (Prescription/storage/fertilizer regulations etc.). In addition, zinc suppresses appetite and thus feed intake.

10. Conclusion

An additive that can replace zinc 1:1 has not yet been found. There is little likelihood of this happening.

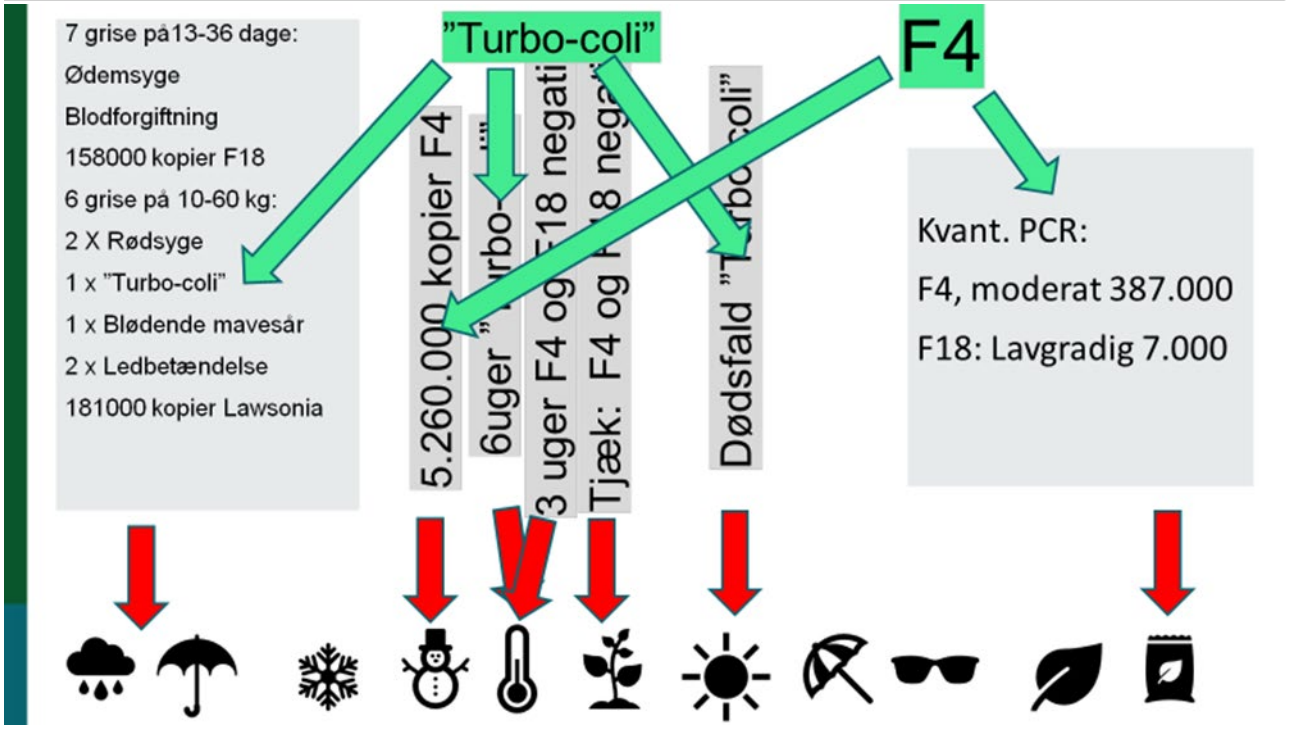
Practical experience, from both conventional and organic producers, show that it is possible to avoid the use of medical zinc. However, it requires a high level of management, and often, results and experiences cannot be directly transferred from one farm to another. Every farm must develop its own concept, based on inspiration and own experience.

Weaning diarrhoea has been a problem for more than 50 years and it has been worked on nonstop. One should accept, that this challenge requires resources both in terms of quality and time for supervision.

11. Appendix – Results from analysis of 5 herds

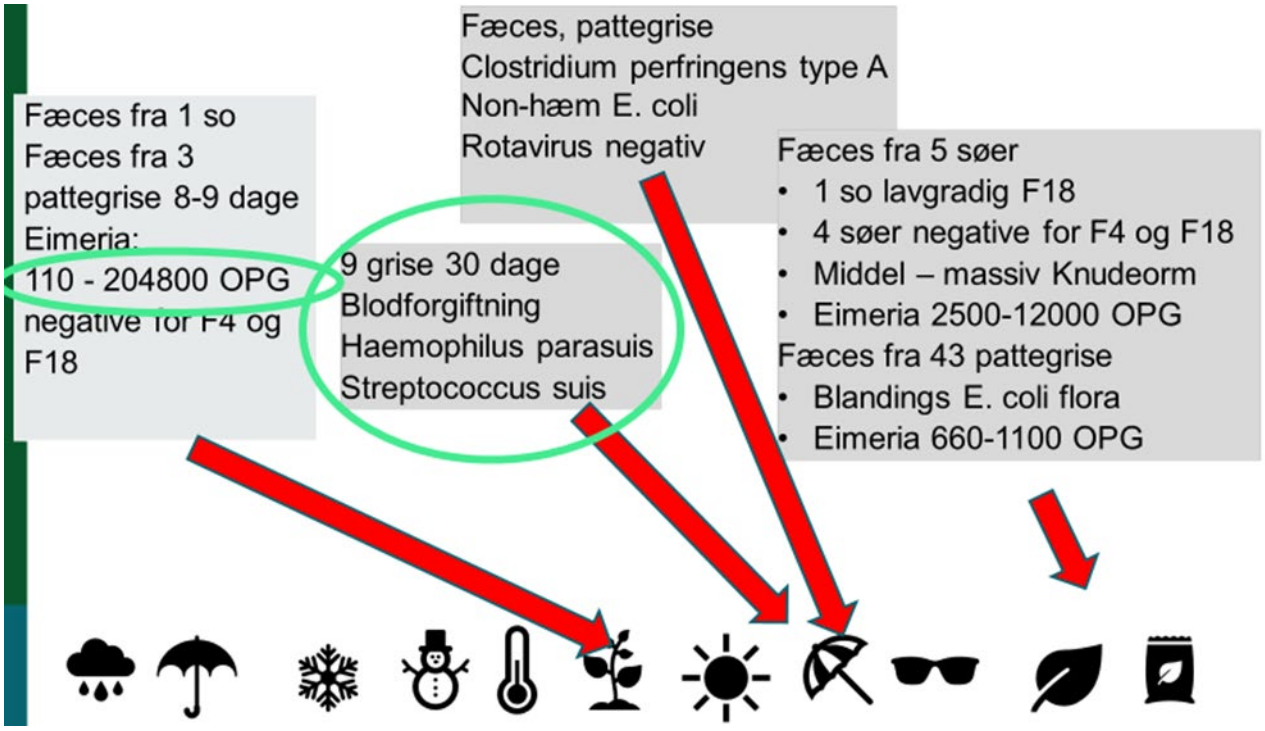
Besætning 1

Dato	Journalnr	Indsendt materiale	resultat	betydning
4. 10. 2018	Dødsfald	6 grise 10 – 60 KG 7 grise 13 – 36 dage	2 grise: Hjerteklapbetændelse med rødsyge 1 gris (< 1) lammebetændelse med Haem E.coli F4 ST2 og LT 1 gris blødende mavesår 2 grise ledbetændelse Fæces pod af (<2 til <6): kvant PCR: 181000 kopier Lawsonia pr. g. 1 med ødemsyge. Haem E.coli med F18 og Vle2 1 stk! 5 med tegn på blodforgiftning, non-haem. E. coli påvist i 1 gris Pool af fæces: kvant PCR: 158000 kopier F18 1650 OPG Coccidier i 1 pool (middel) 2. pool negativ for coccidier	Blodforgiftning, dødsårsag. "Turbo-coli", dødsårsag dødsårsag Ja Ja, lammebetændelse Dødsårsag Dødsårsag Helt indtil dd, tømmelig ødem-Syge bakterien Betydning usikker, men holdes med
21. 2. 2018	Diarre	fæcespool 21 dage	F4: 5260000 kopier/g. Coccidier ikke påvist.	"turbo-coli" diarre i dødsfald
8. 3. 2018	Tjek	fæcespool 20 dage	F4 negativ, F18 negativ. Coccidier ikke påvist.	
8. 3. 2018	Dødsfald	2 grise 42 og 44 dage	Tarmbetændelse. Hæmolytisk e. coli F4, ST2 og LT. Coccidier ikke påvist.	"turbo-coli" diarre i dødsfald
26. 3. 2018	Tjek	Fæces fra grise 17 dage, forsøgshold 1 Fæces fra grise 36 dage, forsøgshold 2	F4 negativ, F18 negativ. Coccidier ikke påvist. F4 negativ, F18 negativ. Coccidier ikke påvist.	
28.6	Diarre og Dødsfald	6 stk. grise obduk.	Tarmbetændelse "Turbo coli" F4, ST1, ST2, LT og VT2 ikke påvist	Dødsårsag, forkert behandlet tunvie i
24.8	Diarre og Dødsfald	Fæceprøve 55 dage 4 dage efter fravænning	F 4 moderat 387.000 F 18 lavgradig 7.000 Coccidie 1320	Det hele niveau af F4 lyder på, at EColi med F4 er årsag til diarre og dødsfald



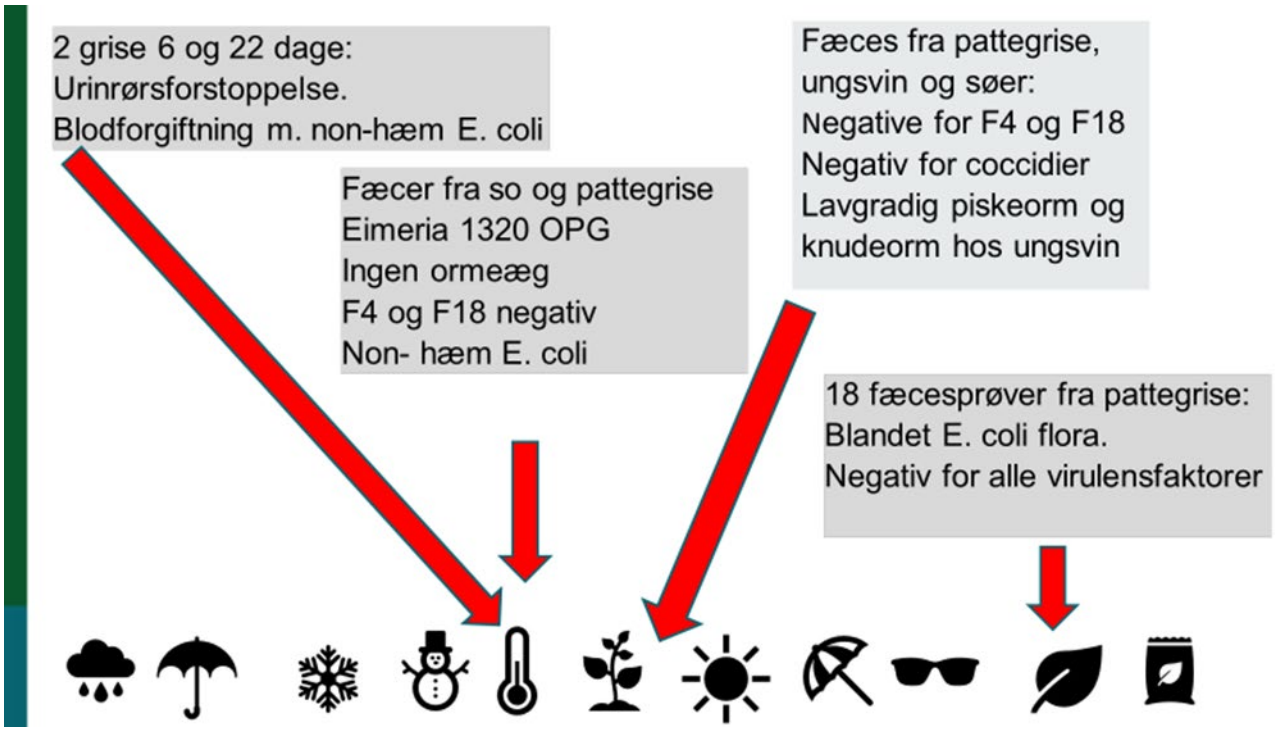
Besætning 2

Dato	Årsag	Materiale	Resultat	betydning
10.4. 2018	Tjek	Fæces fra 1 so Fæces fra 3 pattegrise 8-9 dage	Eimeria 110 - 204800 OPG negative for F4 og F18	Usikker
6.8. 2018	dødsfald	9 grise 30 dage	Blodforgiftning Haemophilus parasuis, Streptococcus suis	Dødsårsag
7.8. 2018	Diarre	Fæces, pattegrise	Clostridium perfringens type A Non-hæm E. coli, ingen virulensfaktorer påvist Rotavirus negativ	usikker
28.9. 2018		Fæces fra 5 søer	1 so lavgradig F18 Ellers negative for F4 og F18 Middel – massiv Knudeorm Eimeria 2500-12000 OPG	Usikker Usikker Usikker, formentlig ikke Usikker
		Fæces svaber fra 43 pattegrise	Blandings flora med non- hæm E. coli + enklte hæm. E. coli, ingen virulensfaktorer påvist Eimeria 660-1100 OPG	Usikker, formentlig ikke Usikker, formentlig ikke Usikker, formentlig ikke



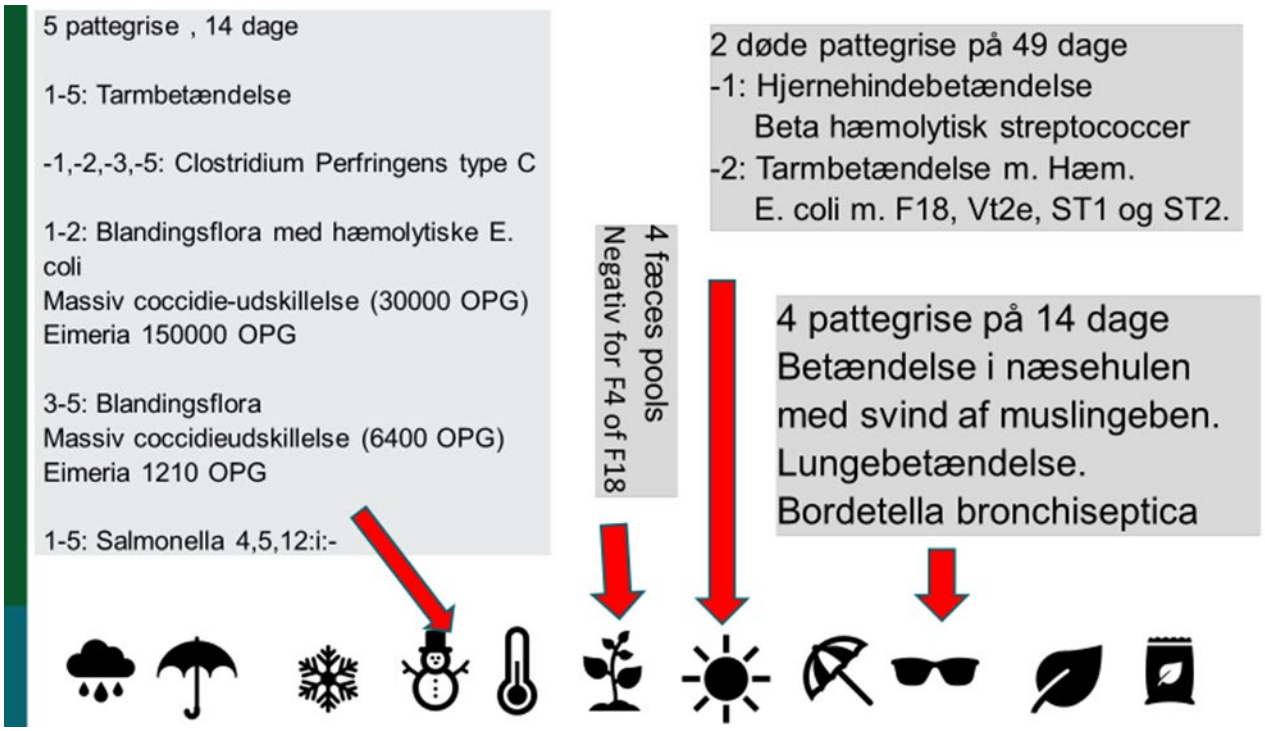
Besætning 3

Dato	Årsag	Materiale	Resultat	betydning
10.4. 2018	Tjek	-1, Fravænnet d. 26/3, fæces -2, Fravænnet d. 26/3, fæces -3: 220 -4: Sogødning -5: 62, farehytte -6: 92 farehytte	Lavgradig knudeorm, ingen coccidier Lavgradig piskeorm, lavgradig coccidier(110 OPG) F4 og F18 negativ F4 og F18 negativ Ingen coccidier Ingen coccidier	Formentlig ingen Formentlig ingen, (Passanter?)
7.9, 2018	Tjek	18 fæcesprøver, pattegrise	Blandingsflora med Non-hæmolytisk E. coli + enkelte kolonier Hæmolytisk E. coli. Negativ for alle virulensfaktorer	Usikker
21.3. 2019	Dødsfald	Gris, 6 dage Gris, 22 dage	Urinrørsforstoppelse Ingen coccidieoocyster Blodforgiftning, non hæm E. coli Ingen coccidieoocyster	Dødsårsag, tilfældigt fund Dødsårsag
21.3. 2019	112764	Fæces fra so 1109 Fæces svaber fra 5 pattegrise på 3-6 dage	Eimeria 1320 OPG Ingen ormeæg F4 og F18 negativ Non- hæm E. coli	Ingen betydning Kun godt Usikker



Besætning 4

Dato	Årsag	Materiale	Resultat	betydning
14.2.2018	Diarre og dødsfald	5 pattegrise , 14 dage	1-5: Tarmbetændelse -1,-2,-3,-5: Clostridium Perfringens type C 1-2: Blandingsflora med hæmolytiske E. coli Massiv coccidie-udskillelse (30000 OPG) Eimeria 150000 OPG 3-5: Blandingsflora Massiv coccidieudskillelse (6400 OPG) Eimeria 1210 OPG 1-5: Salmonella 4,5,12:i:-	 Formentlig dødsårsagen Mulig betydning, men usikker Bidrager til betydelig svækkelse Usikker Ingen betydning Bidrager til betydelig svækkelse Ingen Formentlig sekunder, men bidrager til svækkelse.
3.4.2018	Parregrisediarre	4 fæcespool	F4 og F18 negativ	
14.6.2018	Dødsfald	2 pattegrise , 49 dage	-1: hjernehindebetændelse Beta hæmolytisk streptococcer -2: tarmbetændelse Hæm. E. coli m. F18, Vt2e, ST1 og ST2. Betændelse i næsehulen med svind af muslingeben. Lungebetændelse. Bordetella bronchiseptica Haemophilus parasuis	Formentlig betydende, men et enkeltdyrsproblem Dødsårsag (ødemsyge lignende) Årsag til svækkelse, øget disponering for infektion og nedsat modstandskraft
21.8.2018	Luftvejsproblemer	4 pattegrise 14 dage	Betændelse i næsehulen med svind af muslingeben. Lungebetændelse. Bordetella bronchiseptica	Stor betydning



Besætning 5

Dato	Årsag	Materiale	Resultat	betydning
22.02. 2018	Slinger gris	1 gris 27 dage	Brok med bughuleorganer i brysthulen	Årsagen til sygdom. Men enkeltdyrs diagnose
16.7. 2018	Dødsfald	2 grise 49 dage	Katarrhalsk bronchopneumoni Blodforgiftning Streptococcus suis ½ Negativ luftvejspakke næsten negativ diarrepakke	Patologiske forandringer En vis betydning, måske ikke hele årsagen. Negativ for ødemsyge
4.09. 2018	Tjek for parasitter	4 Fæcesprøver 3 uger, 5-6 uger 2 x 30 kg	-1: Eimeria 186.000 OPG 2-4: ingen coccidier, ingen parasitæg	Usikker
11.10. 2018	Diarre	4 fæcesprøver 3-8 uger gamle	Blandet E. coli flora Ingen parasitter	usikker
11.12. 2018	Fugtig hoste	2 lungesæt 65 dage	Katarrhalsk bronchopneumoni Bordetella bronchiseptica Influenza Mycoplasma hyorhinis	Patologisk forandring Betydende smitstof Betydende smitstof Medvirkende årsag