



Faculty of Health and Medical Sciences



# Diarré i dieperioden hos mink

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## Motivation

- Tab
- Nedsat velfærd
- Antibiotikaforbrug

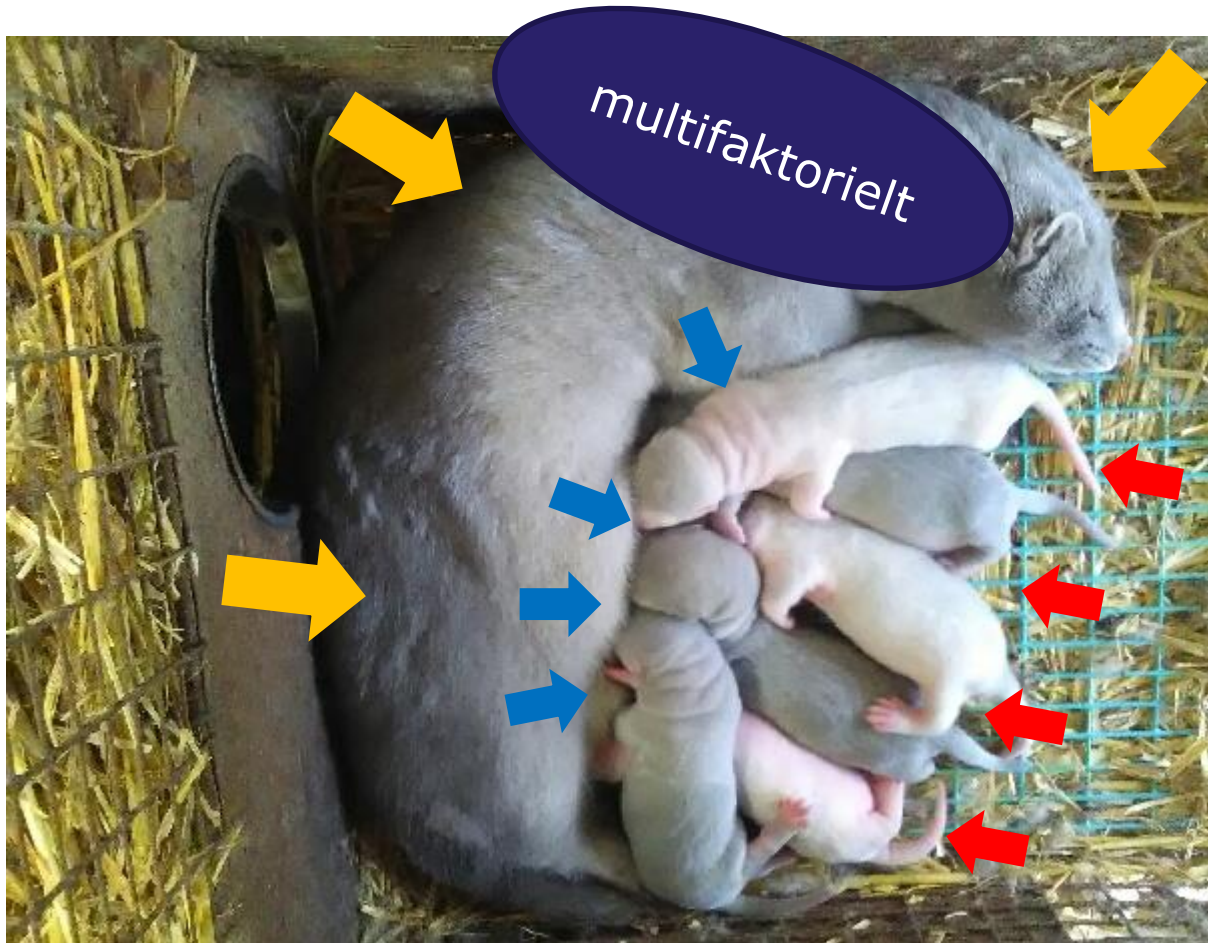


# Syndromet





# Årsagsforhold



# Virus

## Fra diende minkhvalpe med diarré:

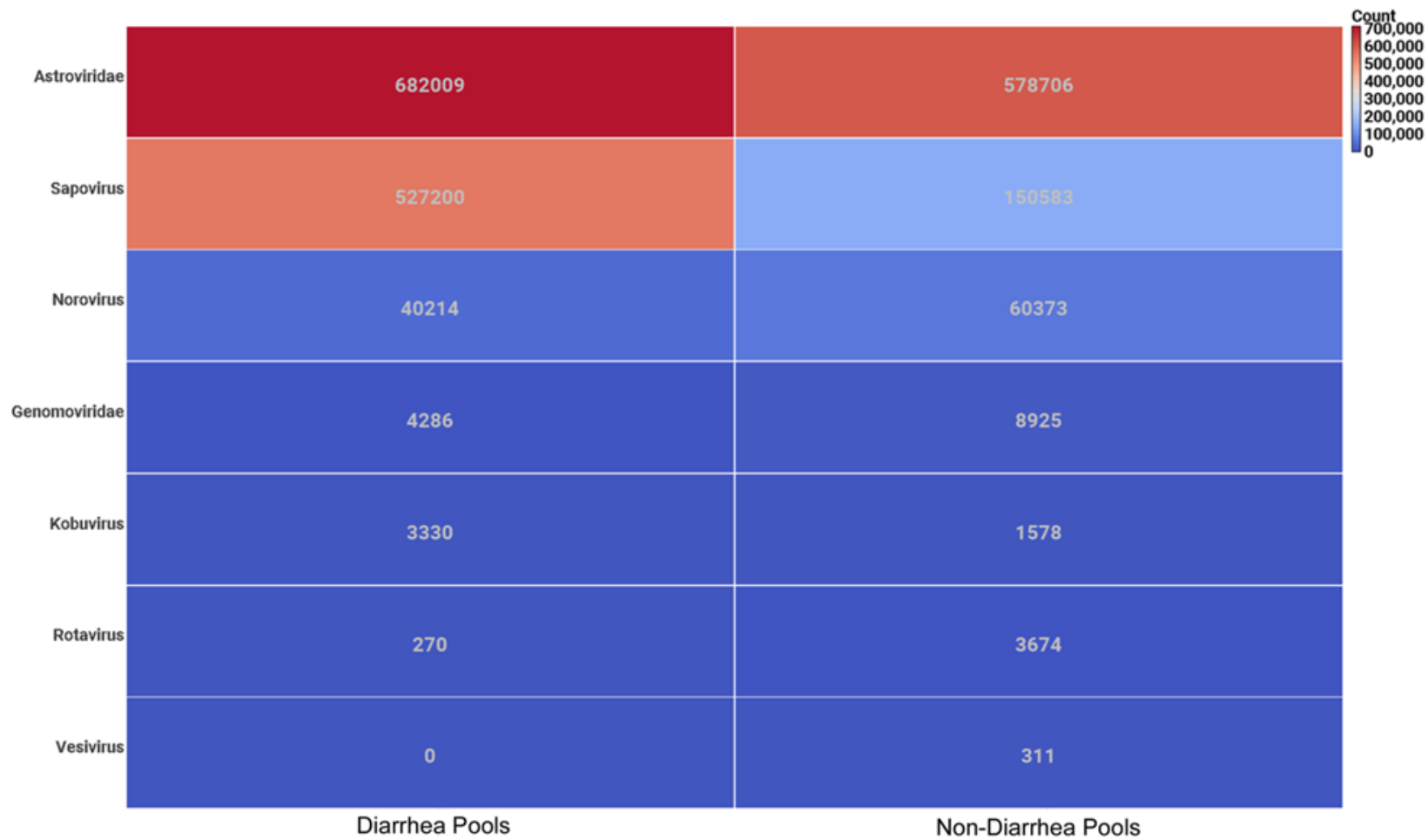
- **Astrovirus** (Englund et al. 2002, Hansen 2004)
- **Calicivirus** (Englund et al 2002, Svansson 1991, Guo et al 2001, Jørgensen et al. 1996, Hansen 2014)
- **Coronavirus** (Svansson 1991, Jørgensen et al. 1996)
- **Rotavirus** (Svansson 1991, Jørgensen et al. 1996)

## Men:

- **Astrovirus, calicivirus and rotavirus også fundet i raske mink hvalpe** (Englund et al 2002, Hansen 2014, Svansson 1991, Jørgensen et al 1996)



## Virus



Fra Birch et al. 2018, submitted



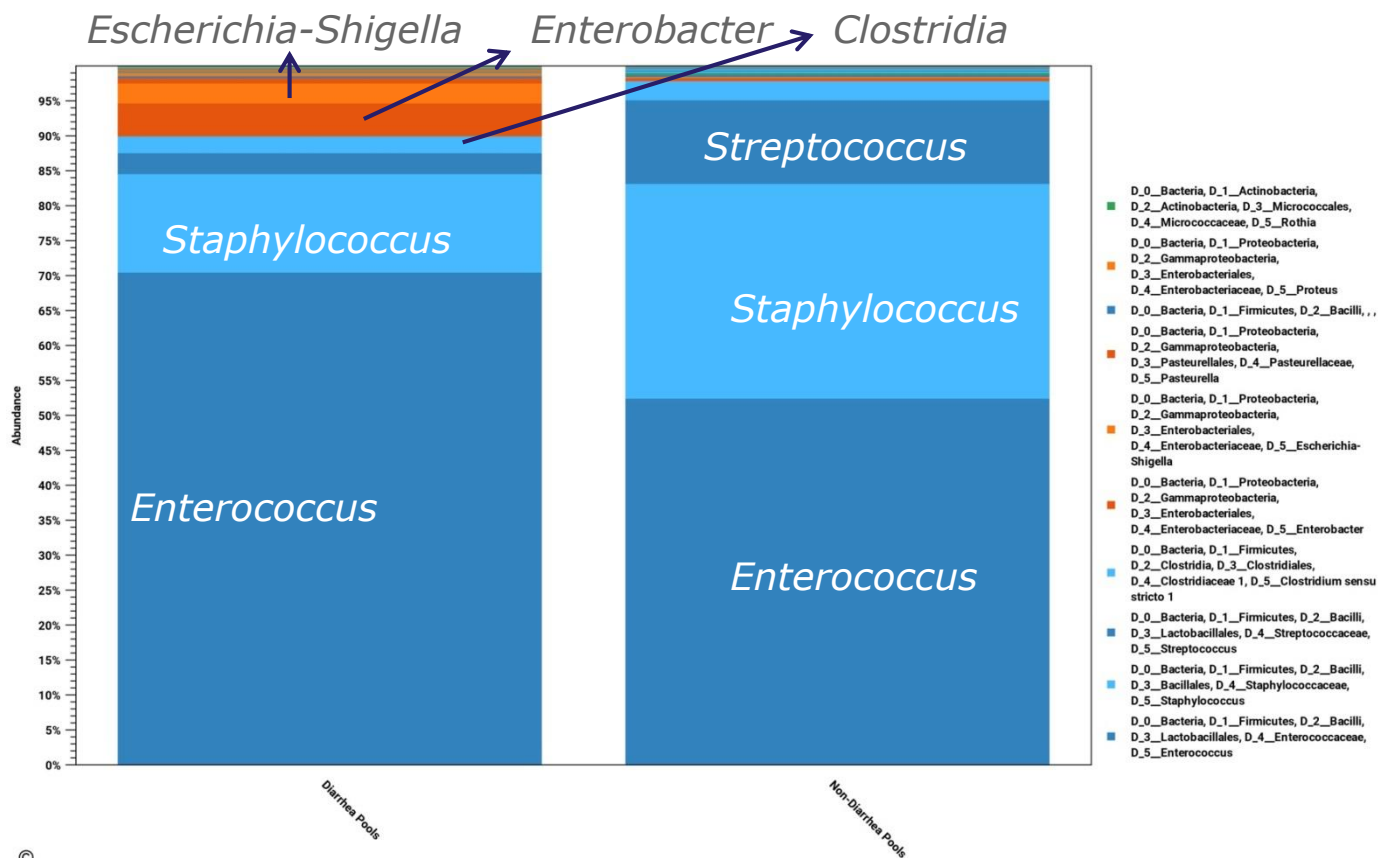
# Bakterier

Bacteria undersøgt for deres sammenhæng med pre-weaning diarré syndromet

- *Staphylococcus intermedius/Staphylococcus delphini* (Danieu et al. 2005, Sledge et al. 1991)
- *E. coli* (Jørgensen et al. 1996, Vulfson et al. 2001)



# Bakterier



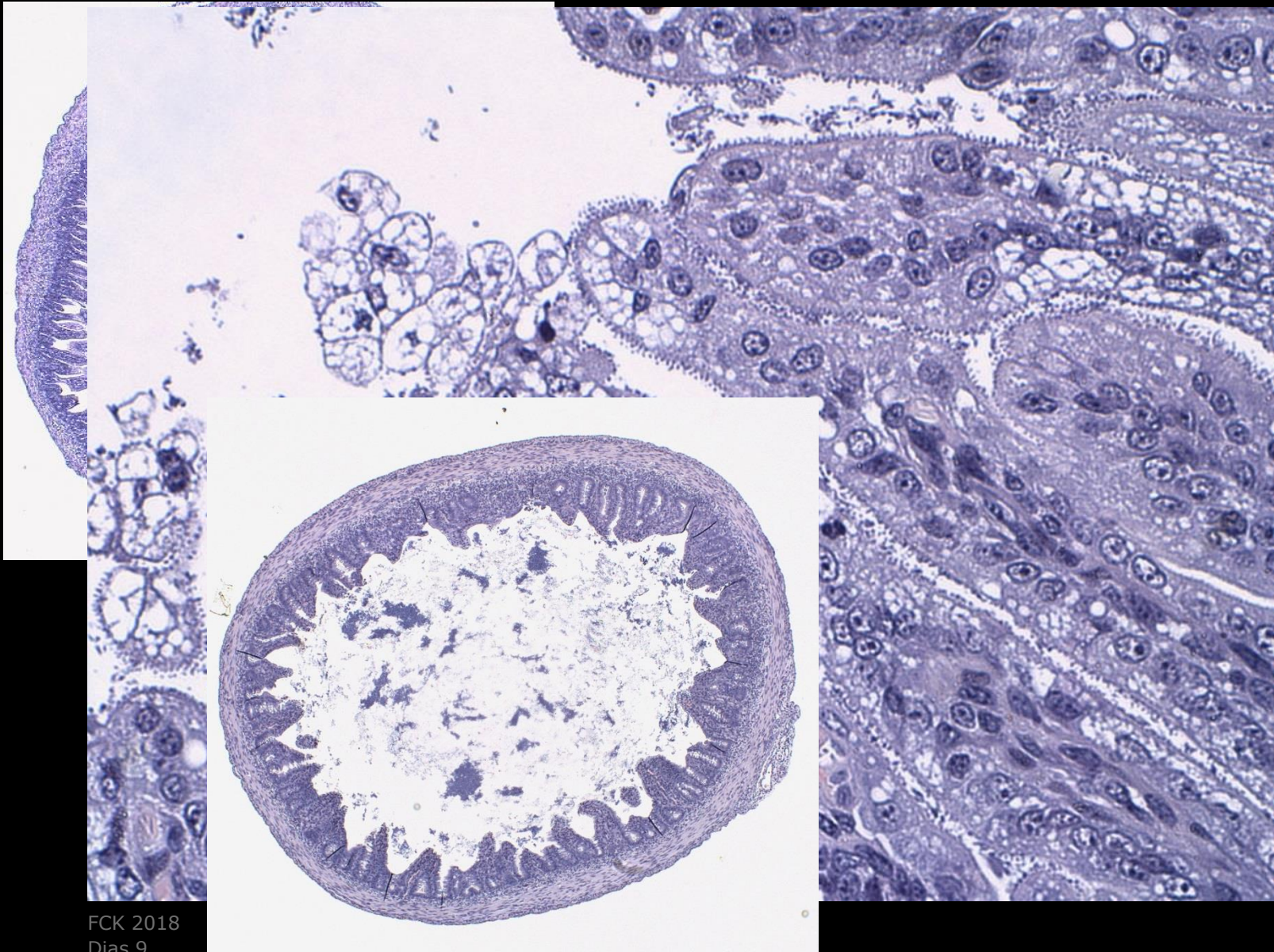
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Fra Birch et al. 2018, submitted





# Hvilke skader se vi ?



## Hvorfor er det interessant ?

- Typen af diarré
- Noget tyder på den er sekretorisk

+ Væsketab

+ Malabsorbtion

Ingen/ringe tegn på inflammation (betændelses-reaktion)



# Risikofaktorer

- Farmindretning
- Management
- Tæve relaterede
- Mikrobiologiske



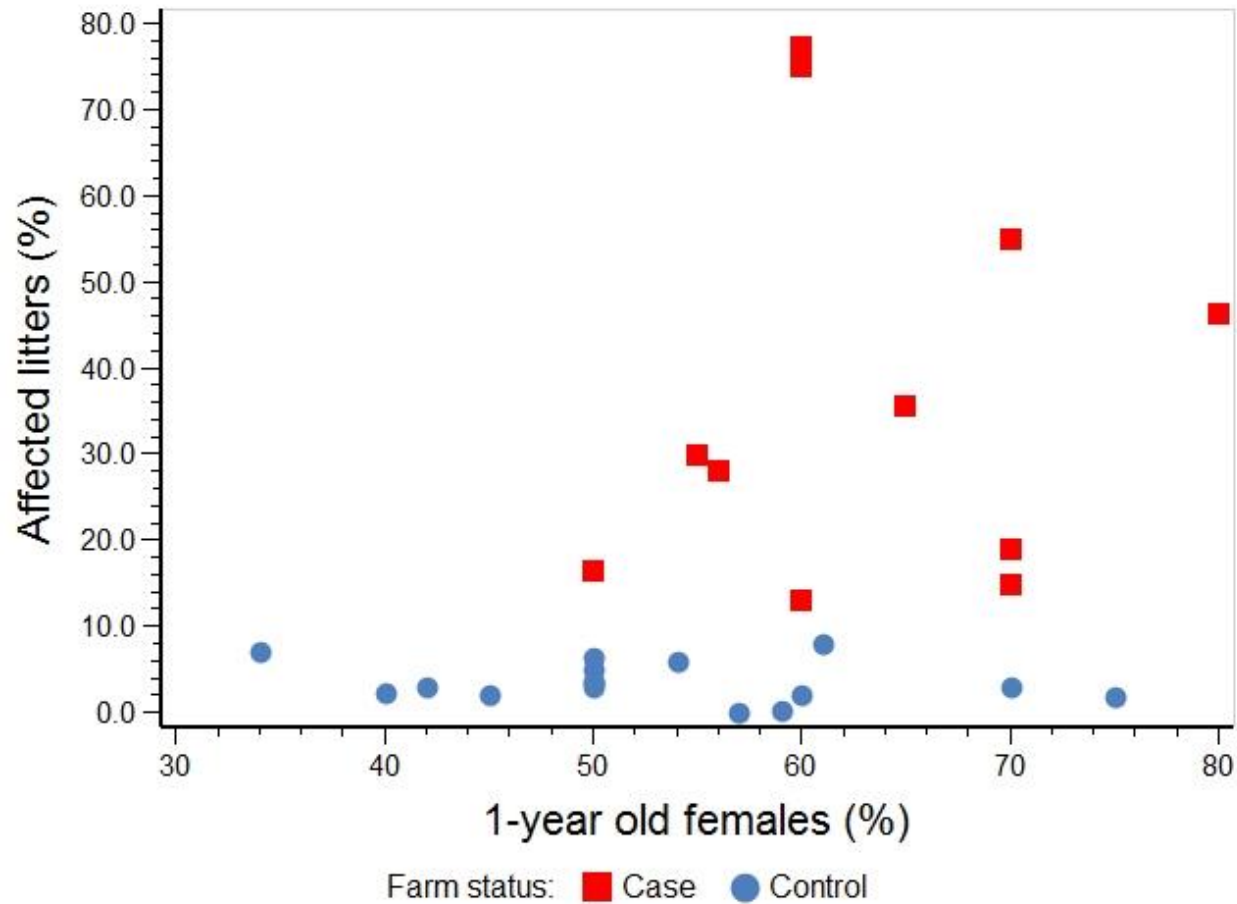
## Observations-studie

- 30 farme
- Indhusning
- Sammensætning af dyr
- Management
- Hygiejne og biosikkerhed
- Vandkvalitet
- Energitaldeling til tæverne i uge 14-19



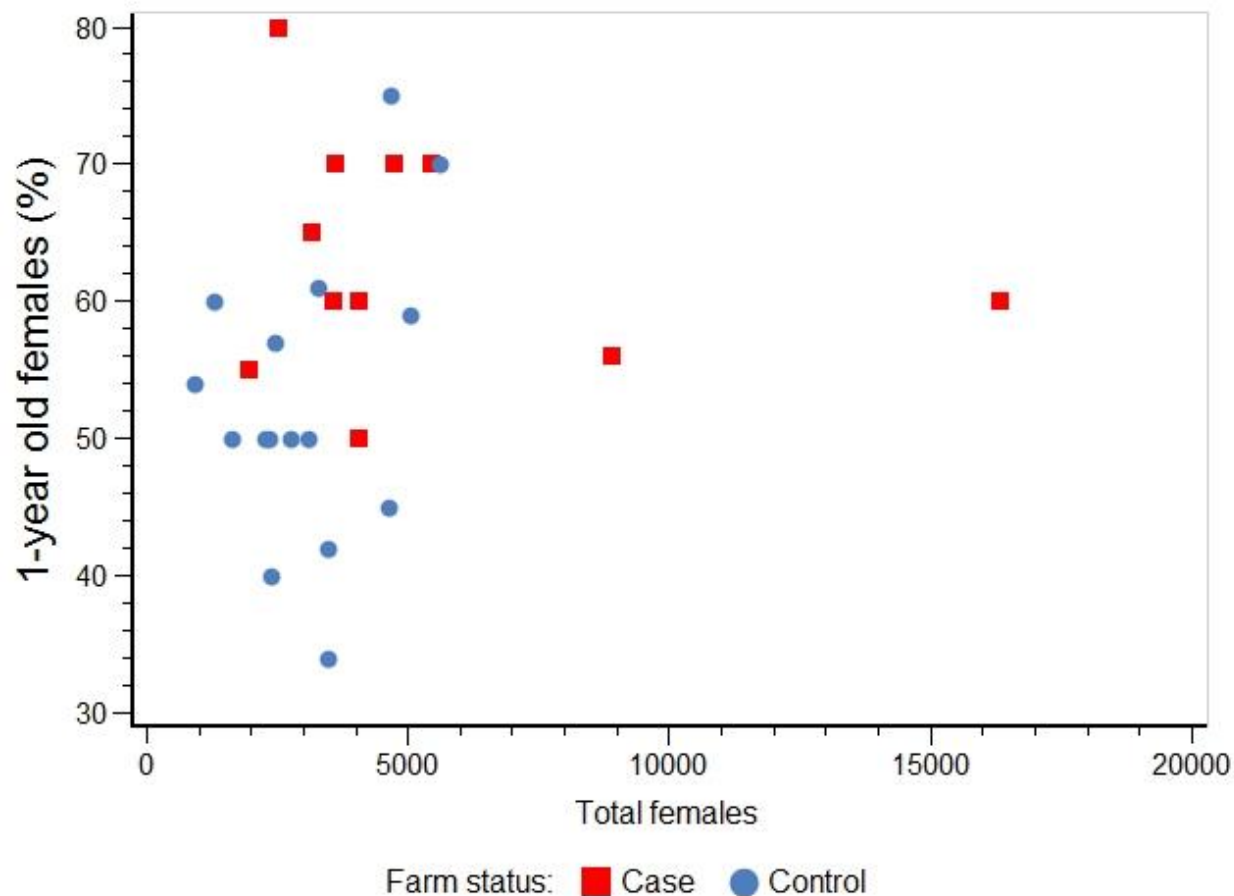


## Andelen af førsteårstæver



Fra Birch et al. (2017). Risk factors associated with diarrhea in Danish commercial mink (*Neovison vison*) during the pre-weaning period. *Acta Vet Scand*: 59:43

## Farmstørrelse

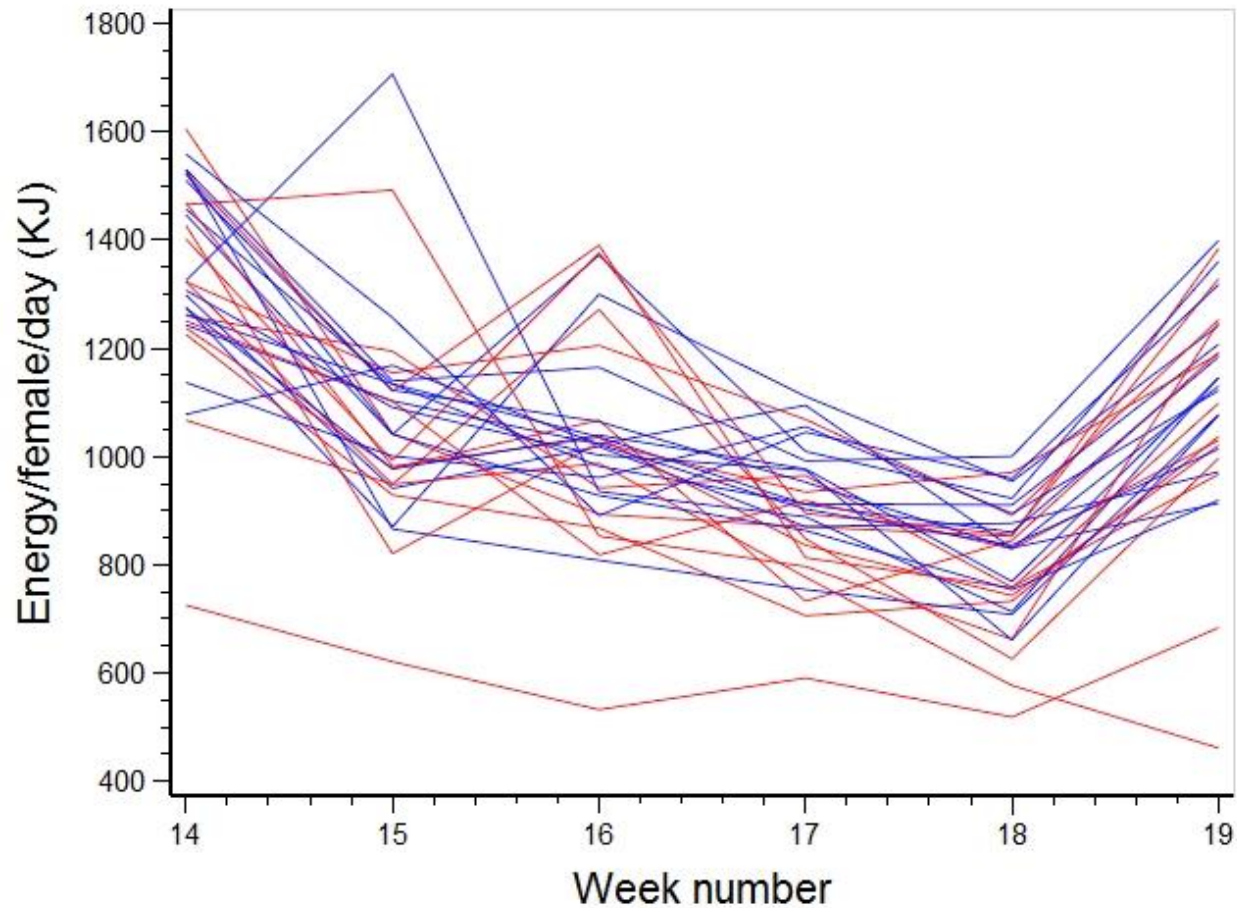


Fra Birch et al. (2017). Risk factors associated with diarrhea in Danish commercial mink (*Neovison vison*) during the pre-weaning period. *Acta Vet Scand*: 59:43





## Energitildeling til tæverne i sidste del af drægtigheden



Fra Birch et al. (2017). Risk factors associated with diarrhea in Danish commercial mink (*Neovison vison*) during the pre-weaning period. *Acta Vet Scand*: 59:43

## Energitildeling til tæverne i sidste del af drægtigheden

Feed energy supply per mink female per day (kJ)

Period	Case farms (n = 14)	Control farms (n = 16)
Week 14	1307 ± 219	1360 ± 150
Week 15	1023 ± 198	1099 ± 194
Week 16	1019 ± 235	1034 ± 143
Week 17**	839 ± 119	957 ± 95
Week 18*	758 ± 128	842 ± 99
Week 19	1063 ± 248	1139 ± 145

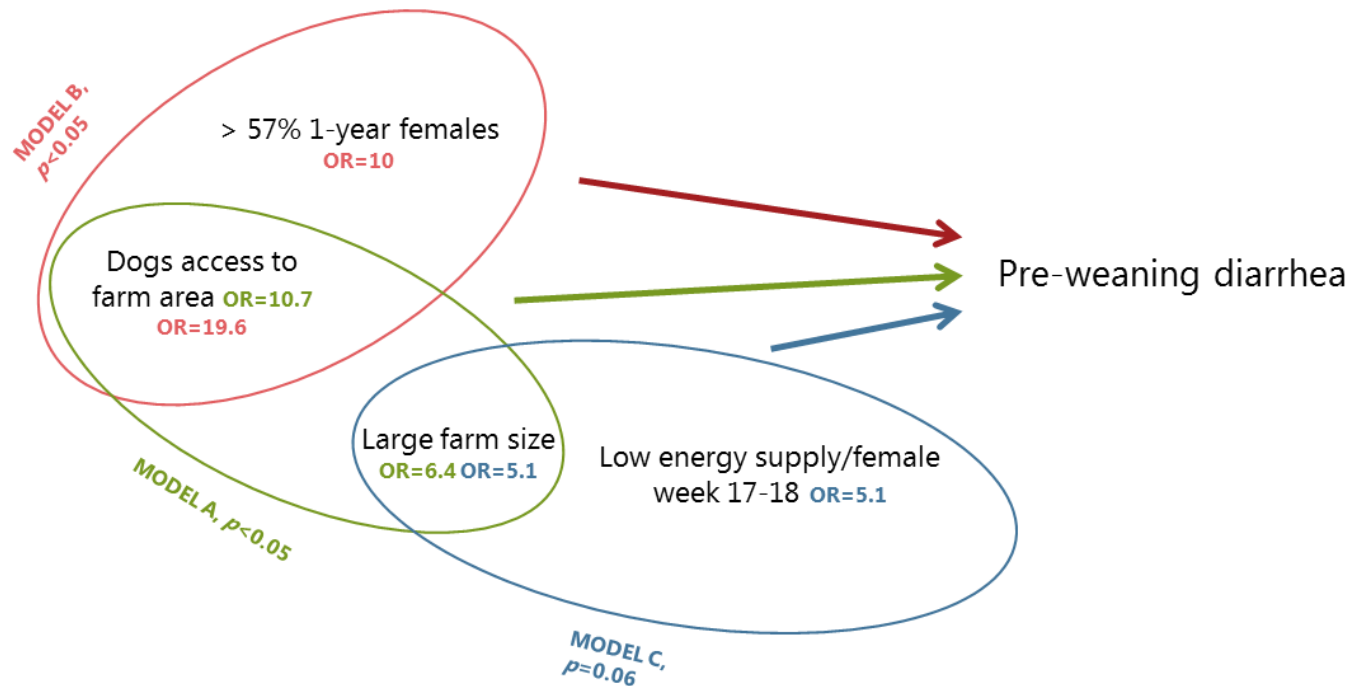
Mean values ± standard deviation

\*\* P < 0.01; \* P = 0.05

Fra Birch et al. (2017). Risk factors associated with diarrhea in Danish commercial mink (*Neovison vison*) during the pre-weaning period. Acta Vet Scand: 59:43



# Konklusion på observations-studiet



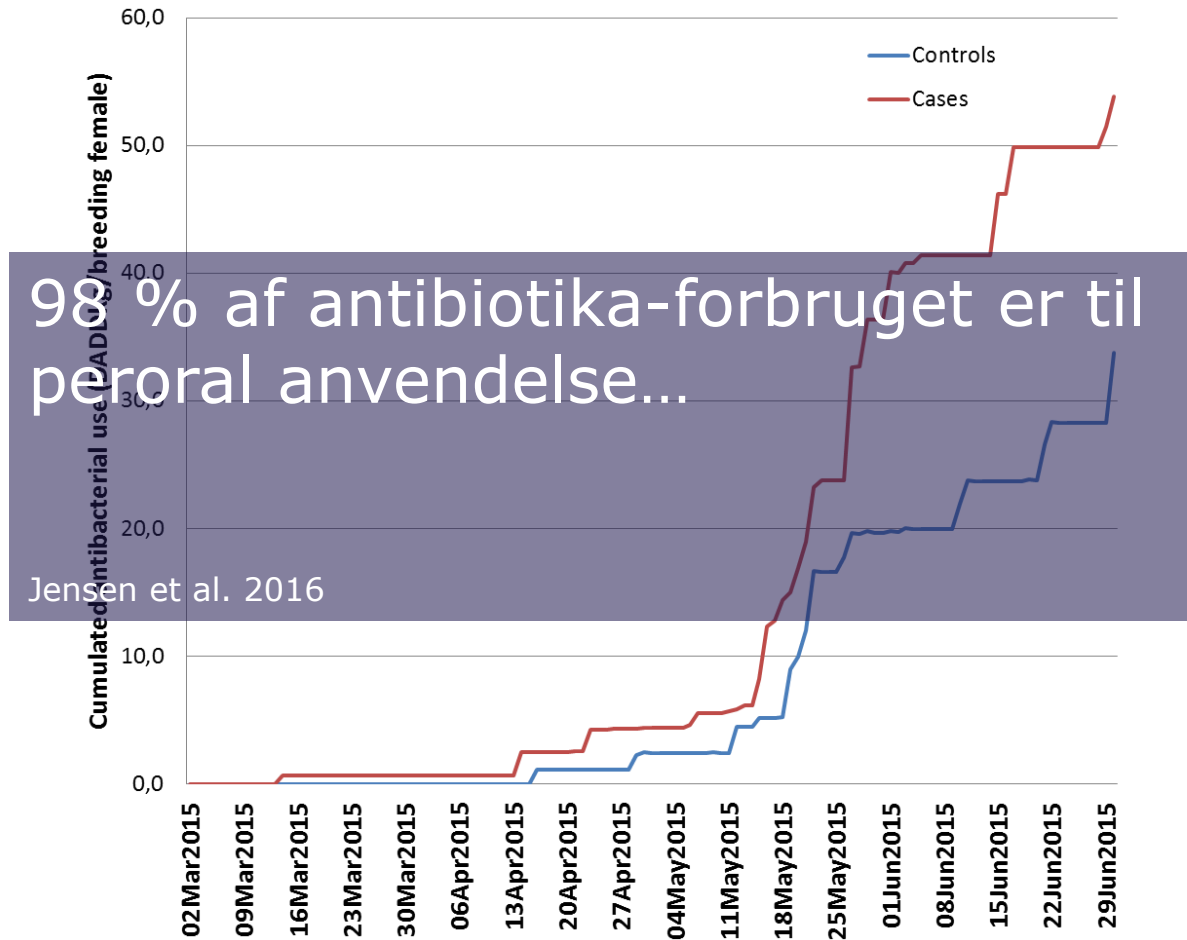
Fra Birch et al. (2017). Risk factors associated with diarrhea in Danish commercial mink (*Neovison vison*) during the pre-weaning period. Acta Vet Scand: 59:43

## Restriktion af foder i drægtigheden øger risikoen for diarre/"Fedtede hvalpe"

- Chriél M. Lad minktæverne selv bestemme!. Dansk Pelsdyravl. 1997;60:196-8
- Møller SH & Chriél M. Health effects of the feeding strategies in the pre-mating and gestation periods of mink. Scientifur. 2000;24:37-41.
- Møller SH. Management of health in mink. A HACCP plan for energy allowance during winter and gestation in order to control sticky kits. Scientifur. 2000;28:50-7



## Og hvordan gik det så med antibiotikaforbruget?



Fra Birch et al. (2017). Risk factors associated with diarrhea in Danish commercial mink (*Neovison vison*) during the pre-weaning period. Acta Vet Scand: 59:43

...til tæverne... Hjælper det så?

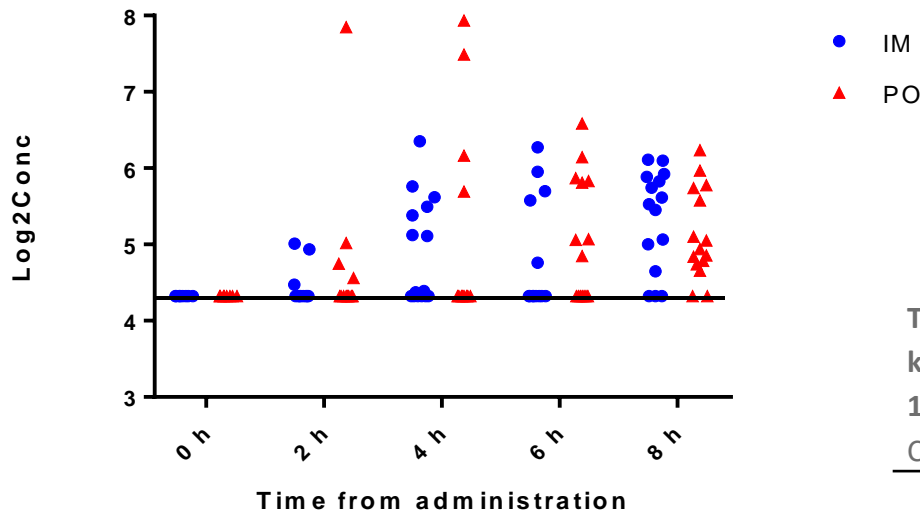


Table 2. Serum concentrations of amoxicillin in mink kits at different time points after administration of 150mg to the dam (PO or IM). SD standard deviation, CI confidence interval.

Hours after administration	Mean (SD) (ng/mL)	95 % CI
2 (n=30)	10.6 (1.33)	[7.9-13.2]
4 (n=30)	20.4 (1.29)	[17.8-23.0]
6 (n=30)	19.6 (1.29)	[17.0-22.2]
8 (n=30)	34 (5.6)	[22.9-45.1]

7-235 x lavere end MIC værdierne hos relevante bakterier



# Kan man behandle med andet?

**Table 1. Treatment protocol for the included mink kits.**

N number of mink kits, PO orally, SC subcutaneous, BW bodyweight

Group	N	Treatment	Medication	Adm. route	Day 0	Day 1	Day 2	Day 3
A	37	Probiotics	<i>Lactobacillus reuteri</i>	PO	0.1 mL	0.1 mL	0.1 mL	0.1 mL
	36	Control	amoxicillin	SC	15mg		15mg	
B	41	Penicillin	benzylpenicillin -prokain	SC	30000I E		30000I E	
	37	Control	amoxicillin	SC	15mg		15mg	
C	37	Fluid	Ringer lactate	SC	5-15% of BW	5-15% of BW	5-15% of BW	5-15% of BW
	38	Control	amoxicillin	SC	15mg		15mg	

**Table 2. Summary statistics of weight gain and mortality among diarrheic kits treated with alternatives (probiotics, penicillin and fluid) and control kits (amoxicillin).**

	Trial A (n=73)		Trial B (n=78)		Trial C (n=75)	
	Probiotics n=37	Control n=36	Penicillin n=41	Control n=37	Fluid n=37	Control n=38
<b>Mean age at entrance into the trial (days)</b>	14.3	14.3	15.0	15.0	14.4	14.4
<b>Mean weight day0 (g)</b>	79.7 (23.7)	76.0 (21.6)	72.0 (18.5)	70.6 (15.5)	75.8 (30.1)	73.8 (29.2)
<b>Mean weight gain period 1 (day0-7)(g)</b>	43.8 (20.4)	46.8 (15.9)	39.3 (20.7)	41.9 (19.0)	36.8 (17.8)	44.4 (19.3)
<b>Mean weight gain period 2 (day7-15)(g)</b>	76.7 (30.0)	71.6 (29.9)	65.0 (30.6)	69.6 (26.6)	71.5 (31.8)	67.6 (33.4)
<b>Number of dead kits day0-15</b>	9 (24.3%)	3 (8.3%)	4 (9.8%)	6 (16.2%)	6 (16.2%)	2 (5.3%)
<b>Mean weight at the age of 42 days</b>	407.7 (75.9)	416.0 (48.6)	354.5 (77.5)	370.1 (69.7)	376.2 (93.5)	381.7 (89.8)

**g: gram, Standard deviation in brackets**

- Ingen statistisk forskel på de forskellige behandlinger i forhold til vægtøgning og mortalitet



## Take home message

- Diarré i dieperioden er et komplekst syndrom, hvor årsagsfaktorerne og mekanismerne stadig ikke er afklaret
- Diarré i dieperioden er årsag til et højt antibiotikaforbrug
- Flere risikofaktorer er tæve-relaterede
- Undgå restriktiv fodring under drægtighed.
- Hjælp tæverne, de har udfordringer nok i denne periode

Tak for finansiel støtte fra KF, Pelsdyragiftsfonden, Dansk Pelsdyravlerforenings Forskningsfond og Innovationsfonden.

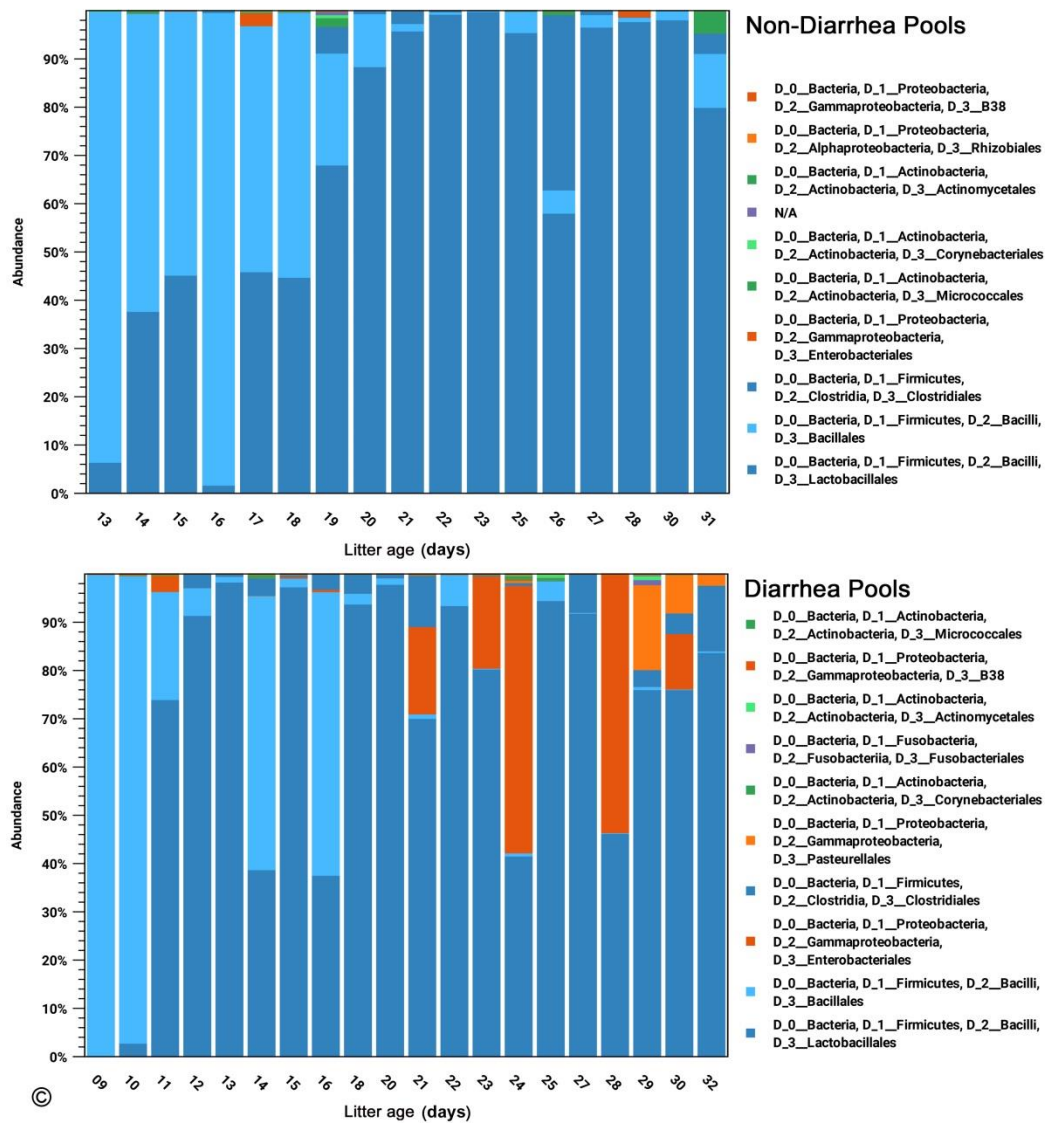
Danske minkavlere takkes for deres engagement i projektet og for samarbejde med at stille dyr til rådighed.

Medforfattere: Henrik Elvang Jensen, Jens Fredrik Agger, Tina Struve, Karin Ullman, Mikael Leijon, Henrik Lauritz Frandsen, Vibeke Frøkjær Jensen, Anne Sofie Hammer, Christina Dahlin, Ronja Mathiesen, Mariann Chriél, Peter Heegaard

Anabelle Jakobsen, Nicole Lind Henriksen, Elisabeth Wairimu Petersen, Dennis Brok og Anne Sofie Johansen takkes for uvurderlig praktisk hjælp.



# Bacterial Microbiota



## Results

- Tobit Model: No difference in serum concentrations between the groups

Hours after administration	Mean (SD) (ng/ml)	95 % CI
2 (n=30)	10.6 (1.33)	[7.9-13.2]
4 (n=30)	20.4 (1.29)	[17.8-23.0]
6 (n=30)	19.6 (1.29)	[17.0-22.2]
8 (n=30)	34 (5.6)	[22.9-45.1]

- MIC of relevant bacteria:

Enterococcus spp., E. coli:  
**8  $\mu$ /ml** of ampicillin

Streptococcus spp.:  
**0.25  $\mu$ /ml**

Staphylococcus spp.:  
 Most strains are penicillinase producers and resistant to amoxicillin

(EUCAST 2017, CLSI 2017)



## Study group: Healthy mink kits!

- Consumption of milk
- Intestinal transit time



## Route of administration

- Uptake in the female: Bolus vs. protracted by feed medication





## Conclusions

- Amoxicillin is transferred to the kits by the milk
- Could be measured with increasing concentrations from 0 to 8 hours after administration
- No difference between PO and IM group
- The concentrations were 7-235 times lower than those required to inhibit common bacteria in the mink kit gut



## Diarrhea in the pre-weaning period of mink (*Neovison vison*) – optimization of prevention and treatment

