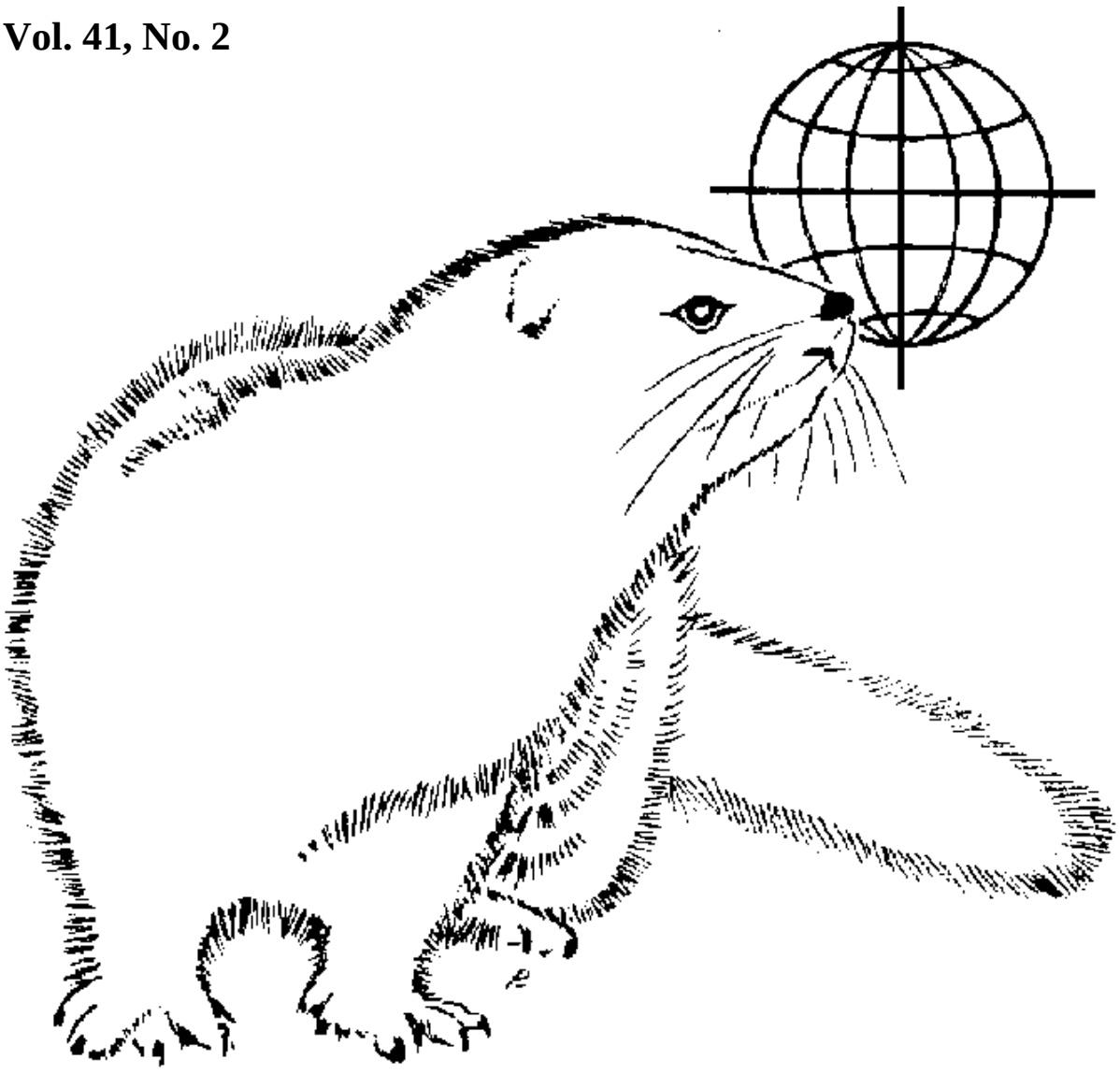
SCIENTIFUR

SCIENTIFIC INFORMATION IN FUR ANIMAL PRODUCTION

Vol. 41, No. 2



IFASA

INTERNATIONAL FUR ANIMAL SCIENTIFIC ASSOCIATION

SCIENTIFUR scientific information for those involved in fur animal production is published by the International Fur Animal Scientific Association (IFASA).

SCIENTIFUR is the focal point for fur animal researchers all over the world and serves as a platform for scientific and other communication among researchers and others who are interested in the production of fur bearing animals. As such **SCIENTIFUR** contains reports of both basic and applied research as well as abstracts of publications published elsewhere and information regarding congresses, scientific meetings etc.

SCIENTIFUR is published as four issues per year (one volume).

SCIENTIFIC ARTICLES. Papers forwarded can be published in Scientifur. The scientific content of the article is the sole responsibility of the author(s)

EDITOR'S ADDRESS. Articles for publication in SCIENTIFUR have to be forwarded to the Editor:

Vivi Hunnicke Nielsen
SCIENTIFUR
P.O Box 14
DK-8830 Tjele, Denmark

Tel: **+45 2219 1351**
E-mail: Scientifur@dca.au.dk

SUBSCRIPTION: Free of charge: http://www.ifasanet.org

TREASURER'S ADDRESS. Correspondence to the Treasurer should be addressed to:

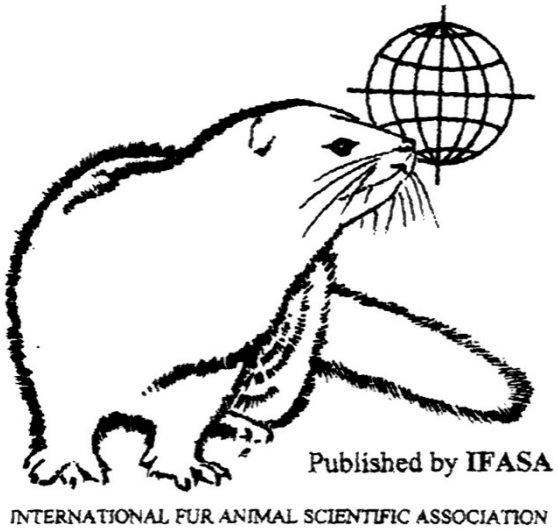
Steen H. Møller
IFASA
P.O. Box 14
DK-8830 Tjele, Denmark

Tel: **+45 8715 7926**
Fax: **+45 8715 4249**
E-mail: IFASA@anis.au.dk

INDEXING: Titles that have been published in SCIENTIFUR are covered in an electronic SCIENTIFUR INDEX.

ISSN: 2445-6292

SCIENTIFUR
ISSN 0105-2403
Vol. 41, No. 2



Notes from the Editor

Control of infectious diseases is crucial for fur animal production. Scientifur 41.2 contains several studies dealing with viruses well known to cause diseases in mink e.g. Aleutian mink disease virus, mink enteritis virus, and mink influenza virus. Awareness of infections in fur animals with pathogens known normally to infect other species is important due to the risk of potential newly emerging diseases. Thus, Newcastle disease virus that most often infects poultry is able to infect mink causing encephalitic and pneumonic diseases. On the other hand, the results of a study of a range of species indicate that e.g. mink is unlikely to act as an animal reservoir for Zika virus.

Growth, fur quality parameters and health are important traits in fur animal production. New results show negative correlations between pelt quality traits and body size suggesting that selection should be performed for the traits simultaneously. Selection for tolerance to Aleutian disease virus infection improved health in mink. Thus, mink tolerant to Aleutian mink disease virus infection exhibited reduced severity of histopathological lesions.

Survival of the kits is both an economic factor and a welfare issue. Good management including plenty of straw for nest building is a prerequisite for this. However, a new study shows that focus should be on litter size and dam welfare around the time of gestation and birth rather than nest temperature to increase early kit survival in mink.

Good health depends on the composition of the gut microbiota. New results in mink show that the colon bacterial community differs from the bacterial composition in the feed, and that it differs among individuals but that for each individual the microbiota is very stable.

Vivi Hunnicke Nielsen

Editor Scientifur

BREEDING, GENETICS AND REPRODUCTION

Genetic parameters for fur quality graded on live animals and dried pelts of American mink *(Neovison vison)*

Thirstrup J.P.[1], Jensen J.[1], Lund M.S.[1].

[1]Center for Quantitative Genetics and Genomics, Department of Molecular Biology and Genetics, Faculty of Science and Technology, Aarhus University, Tjele, Denmark.

Fur quality and skin size are integral qualities in the mink industry and are main determinants of sales price and subsequent income for mink fur producers. Parental animals of future generations are selected based on quality grading from live animals, but selection response is obtained from dried skins sold after pelting. In this study, we evaluated traits assessed during live grading and pelt traits examined on dried skins to determine correlation between live and pelt traits. Grading traits and body weight were measured during live animal grading for 9,539 Brown American mink, and pelt quality traits and skin size were evaluated on 8,385 dried mink skins after pelting. Data were sampled from 2 yearly production cycles. Genetic parameters were estimated using the REML method implemented in the DMU package. Heritabilities and proportions of litter variance were calculated from estimated variance components for all traits, and genetic and phenotypic correlations between all traits were estimated in a series of bivariate analyses. Heritability estimates for live grading traits ranged from 0.06 to 0.28, heritability estimates for pelt quality traits ranged from 0.20 to 0.30, and finally heritability estimates for body size traits ranged from 0.43 to 0.48. Skin size and body weight were regarded as different traits for the two sexes and were therefore analysed for each sex separately. Genetic correlations between grading traits exhibited a range of 0.30-0.99 and genetic correlations between pelt quality traits ranged from 0.38 to 0.86. Genetic correlations between quality, wool density and silky appearance evaluated during live animal grading and on dried skin after pelting were 0.74, 0.41 and 0.33, respectively. Skin size and body weight were negatively correlated with pelt quality traits and ranged from -0.55 to -0.25. Using standard selection index theory and combined information from both live grading and skin evaluation increase of reliability of selection ranged from 0.6% to 14%. Due to moderate genetic correlations between traits evaluated during live grading and on dried skins, and negative correlations between pelt quality traits and body size, we concluded that traits should be selected simultaneously.

J Anim Breed Genet. 2017:
Doi: 10.1111/jbg.12258. [Epub ahead of print]

Reduced severity of histopathological lesions in mink selected for tolerance to Aleutian mink disease virus infection.

Farid A.H.[1], Ferns L.E.[2].

[1]Department of Animal Science and Aquaculture, Faculty of Agriculture, Dalhousie University, Canada. Electronic address: ah.farid@dal.ca.
[2]Pathology Laboratory, Veterinary Services, Nova Scotia Department of Agriculture, Canada.

Res Vet Sci. 2017: 111:127-134.
Doi: 10.1016/j.rvsc.2017.02.009. [Epub ahead of print]

Early kit mortality and growth in farmed mink are affected by litter size rather than nest climate.

Schou T.M.[1], Malmkvist J.[1]

[1]Department of Animal Science, Aarhus University, Blichers Allé 20, 8830 Tjele,Denmark.

We investigated the effects of nest box climate on early mink kit mortality and growth. We hypothesised that litters in warm nest boxes experience less hypothermia-induced mortality and higher growth rates during the 1st week of life. This study included data from 749, 1-year-old breeding dams with access to nesting materials. Kits were weighed on days 1 and 7, dead kits were collected daily from birth until day 7 after birth, and nest climate was measured continuously from days 1 to 6. We tested the influences of the following daily temperature (T) and humidity (H) parameters on the number of live-born kit deaths and kit growth: T mean, T min, T max, T var (fluctuation) and H mean. The nest microclimate experienced by the kits was buffered against the ambient climate, with higher temperatures and reduced climate fluctuation. Most (77.0%) live-born kit deaths in the 1st week occurred

on days 0 and 1. Seven of 15 climate parameters on days 1 to 3 had significant effects on live-born kit mortality. However, conflicting effects among days, marginal effects and late effects indicated that climate was not the primary cause of kit mortality. Five of 30 climate parameters had significant effects on kit growth. Few and conflicting effects indicated that the climate effect on growth was negligible. One exception was that large nest temperature fluctuations on day 1 were associated with reduced deaths of live-born kit ($P<0.001$) and increased kit growth ($P=0.003$). Litter size affected kit vitality; larger total litter size at birth was associated with greater risks of kit death ($P<0.001$) and reduced growth ($P<0.001$). The number of living kits in litters had the opposite effect, as kits in large liveborn litters had a reduced risk of death ($P<0.001$) and those with large mean litter size on days 1 to 7 had increased growth ($P=0.026$). Nest box temperature had little effect on early kit survival and growth, which could be due to dams' additional maternal behaviour. Therefore, we cannot confirm that temperature is the primary reason for kit mortality, under the conditions of plenty straw access for maternal nest building. Instead, prenatal and/or parturient litter size is the primary factor influencing early kit vitality. The results indicate that the focus should be on litter size and dam welfare around the times of gestation and birth to increase early kit survival in farmed mink.

Animal. 2017: 1-9.
Doi: 10.1017/S1751731117000234. [Epub ahead of print]

Effect of vitrification on meiotic maturation, mitochondrial distribution and glutathione synthesis in immature silver fox cumulus oocyte complexes.

Cao X.[1], Li J.[2], Xue H.[3], Wang S.[3], Zhao W.[3], Du Z.[3], Yang Y.[3], Yue Z.[3].

[1]Institute of Special Animal and Plant Sciences, Chinese Academy of Agricultural Sciences, Changchun, Jilin, 130112, China; State Key Laboratory for Molecular Biology of Special Economic Animal and Plant Science, Chinese Academy of Agricultural Sciences, Changchun, Jilin, 130112, China.
[2]College of Animal Science & Veterinary Medicine, Heilongjiang Bayi Agricultural University, Daqing, 163000, China.
[3]Institute of Special Animal and Plant Sciences, Chinese Academy of Agricultural Sciences, Changchun, Jilin, 130112, China; State Key Laboratory for Molecular Biology of Special Economic Animal and Plant Science, Chinese Academy of Agricultural Sciences, Changchun, Jilin, 130112, China.

Theriogenology. 2017: 91:104-111.
Doi: 10.1016/j.theriogenology.2016.12.037.
Epub 2016 Dec 31.

NUTRITION, FEEDING AND MANAGEMENT

The gastrointestinal tract of farmed mink *(Neovison vison)* maintains a diverse mucosa-associated microbiota following a 3-day fasting period.

Bahl M.I.[1], Hammer A.S.[2], Clausen T.[3], Jakobsen A.[2], Skov S.[2], Andresen L.[2]

[1]Division of Diet, Disease prevention and Toxicology, National Food Institute, Technical University of Denmark, Søborg, Denmark.
[2]Department of Veterinary Disease Biology, Faculty of Health and Medical Sciences, University of Copenhagen, Frederiksberg C, Denmark.
[3]Danish Fur Breeders Research Centre, Holstebro, Denmark.

Microbiologyopen. 2017.
Doi: 10.1002/mbo3.434. [Epub ahead of print]

Raw mechanically separated chicken meat and salmon protein hydrolysate as protein sources in extruded dog food: effect on protein and amino acid digestibility.

Tjernsbekk M.T.[1], Tauson A.H.[1,2], Kraugerud O.F.[1], Ahlstrøm Ø.[1]

[1]Department of Animal and Aquacultural Sciences, Faculty of Veterinary Medicine and Biosciences, Norwegian University of Life Sciences, Ås, Norway.
[2]Department of Large Animal Sciences, Faculty of Health and Medical Sciences, University of Copenhagen, Frederiksberg C, Denmark.

J Anim Physiol Anim Nutr (Berl). 2017.
Doi: 10.1111/jpn.12608. [Epub ahead of print]
Journal of Animal Physiology and Animal Nutrition

Health conditions in rural areas with high livestock density: Analysis of seven consecutive years.

van Dijk C.E.[1], Zock J.P.[2], Baliatsas C.[1], Smit L.A.[3], Borlée F.[4], Spreeuwenberg P.[1], Heederik D.[3], Yzermans C.J.[5]

[1]NIVEL, Netherlands Institute for Health Services Research, Otterstraat 118-124, 3513 CR Utrecht, The Netherlands.
[2]NIVEL, Netherlands Institute for Health Services Research, Otterstraat 118-124, 3513 CR Utrecht, The Netherlands; ISGlobal, Centre for Research in Environmental Epidemiology (CREAL), Dr. Aiguader 88, E-08003 Barcelona, Spain; Universitat Pompeu Fabra (UPF), Plaça de la Mercè 10, 08002 Barcelona, Spain; CIBER Epidemiología y Salud Pública (CIBERESP), Av. Monforte de Lemos, 3-5, Pabellón 11, Planta, 0 28029 Madrid, Spain.
[3]Utrecht University, Institute for Risk Assessment Sciences (IRAS), Division Environmental Epidemiology, Yalelaan 2, 2584 CM Utrecht, The Netherlands.
[4]NIVEL, Netherlands Institute for Health Services Research, Otterstraat 118-124, 3513 CR Utrecht, The Netherlands; Utrecht University, Institute for Risk Assessment Sciences (IRAS), Division Environmental Epidemiology, Yalelaan 2, 2584 CM Utrecht, The Netherlands.
[5]NIVEL, Netherlands Institute for Health Services Research, Otterstraat 118-124, 3513 CR Utrecht, The Netherlands.

Environ Pollut. 2017: 222:374-382.
Doi: 10.1016/j.envpol.2016.12.023.
Epub 2016 Dec 30.

HEALTH AND DISEASE

A fast and accurate method of detecting Aleutian mink disease virus in blood and tissues of chronically infected mink.

Farid A.H.[1], Rupasinghe P.P.[1]

[1]Department of Animal Science and Aquaculture, Dalhousie University Faculty of Agriculture, Truro, NS B2N 5E3, Canada.

The objective of this study was to assess the sensitivity of the Omni Klentaq-LA DNA polymerase for detecting Aleutian mink disease virus (AMDV) in mink blood and tissues by PCR without DNA extraction. The presence of AMDV DNA was directly tested by Klentaq in the plasma, serum, whole blood, and spleen homogenates of 188 mink 4 and 16 months after inoculation with the virus. Samples from bone marrow, small intestine, liver, lungs, kidneys, and lymph nodes of 20 of the same mink were also tested by Klentaq. DNA was extracted from paired samples of plasma and the aforesaid tissues by a commercial nucleic acid extraction kit (Dynabeads Silane) and tested by PCR. Compared with the extracted DNA, Klentaq detected a significantly greater number of samples in the whole blood, serum, plasma, spleen, and small intestine. It was concluded that Klentaq is a preferred system for directly detecting AMDV DNA in mink blood and tissues. The lower success rate of extracted DNA compared with Klentaq could be the result of DNA losses during the extraction process. This is an important factor in chronically infected mink, which have a low AMDV copy number in the bloodstream. Direct AMDV detection also reduces the cost of PCR amplification and lowers the risk of sample contamination.

Can J Microbiol. 2017: 1-9.
Doi: 10.1139/cjm-2016-0567. [Epub ahead of print]

Induction and suppression of type I interferon responses by mink enteritis virus in CRFK cells.

Zhang X.[1], Wang J.[1], Mao Y.[1], Xi J.[1], Yu Y.[1], Liu W.[2]

[1]State Key Laboratory of Agrobiotechnology, Department of Biochemistry and Molecular Biology, College of Biological Sciences, China Agricultural University, Beijing 100193, PR China.
[2]State Key Laboratory of Agrobiotechnology, Department of Biochemistry and Molecular Biology, College of Biological Sciences, China Agricultural University, Beijing 100193, PR China.

Vet Microbiol. 2017: 199:8-14.

Doi: 10.1016/j.vetmic.2016.12.002. Epub 2016 Dec 5.

Characterization of H5N1 highly pathogenic mink influenza viruses in eastern China.

Jiang W.[1], Wang S.[2], Zhang C.[3], Li J.[2], Hou G.[2], Peng C.[2], Chen J.[2], Shan H.[3]

[1]China Animal Health and Epidemiology Center, Qingdao, China.
[2]China Animal Health and Epidemiology Center, Qingdao, China.
[3]College of Animal Science and Veterinary Medicine, Qingdao Agricultural University, Qingdao, China.

Vet Microbiol. 2017: 201:225-230.
Doi: 10.1016/j.vetmic.2017.01.028.
Epub 2017 Jan 24.

Newcastle disease virus from domestic mink, China, 2014

Zhao P.[1], Sun L.[2], Sun X.[1], Li S.[1], Zhang W.[1], Pulscher L.A.[3], Chai H.[4], Xing M.[5]

[1]College of Wildlife Resource, University of Northeast Forestry, Harbin, Heilongjiang, China.
[2]College of Veterinary Medicine, South China Agricultural University, Guangzhou, Guangdong, China.
[3]Global Health Institute, Duke University, Durham, NC, USA.
[4]College of Wildlife Resource, University of Northeast Forestry, Harbin, Heilongjiang, China.
[5]College of Wildlife Resource, University of Northeast Forestry, Harbin, Heilongjiang, China.

Vet Microbiol. 2017: 198:104-107.
Doi: 10.1016/j.vetmic.2016.12.003. Epub 2016 Dec 5.

Experimental Pseudomonas aeruginosa mediated rhino sinusitis in mink

Kirkeby S.[1], Hammer A.S.[2], Høiby N.[3], Salomonsen C.M.[4]

[1]Department of Oral Medicine, Dental School, Panum Institute, University of Copenhagen, Nørre Alle 20, 2200 Copenhagen N, Denmark.
[2]Department of Veterinary Disease Biology, University of Copenhagen, Copenhagen, Denmark.
[3]Department of Clinical Microbiology, Rigshospitalet, Institute for Immunology and Microbiology, University of Copenhagen, Copenhagen, Denmark.
[4]National Veterinary Institute, Technical University of Denmark, Aarhus, Denmark.

Int J Pediatr Otorhinolaryngol. 2016. pii: S0165-5876(16)30474-8.
Doi: 10.1016/j.ijporl.2016.12.037. [Epub ahead of print]

Investigating the Potential Role of North American Animals as Hosts for Zika Virus

Ragan I.K.[1], Blizzard E.L.[2], Gordy P.[2], Bowen R.A.[2]

[1]Department of Diagnostic Medicine and Pathobiology, Kansas State University College of Veterinary Medicine, Manhattan, Kansas.
[2]Department of Biomedical Sciences, Colorado State University, Fort Collins, Colorado.

The recent emergence of the mosquito-borne Zika virus (ZIKV) in the Americas has become a global public health concern. We describe a series of experimental infections designed to investigate whether animals within certain taxonomic groups in North America have the potential to serve as ZIKV amplifying or maintenance hosts. Species investigated included armadillos, cottontail rabbits, goats, mink, chickens, pigeons, ground hogs, deer mice, cattle, raccoons, ducks, Syrian Golden hamsters, garter snakes, leopard frogs, house sparrows, and pigs. Infectious virus was isolated from blood only in frogs and armadillos; however, the magnitude of viremia was low. In addition, neutralizing antibodies were detected after infection in goats, rabbits, ducks, frogs, and pigs. This study indicates that the animals tested to date are unlikely to act as animal reservoirs for ZIKV, but that rabbits and pigs could potentially serve as sentinel species. Understanding the transmission cycle and maintenance of ZIKV in animals will help in developing effective surveillance programs and preventative measures for future outbreaks.

Comparison of different commercial DNA extraction kits and PCR protocols for the detection of Echinococcus multilocularis eggs in faecal samples from foxes

Maksimov P.[1], Schares G.[2], Press S.[3], Fröhlich A.[4], Basso W.[5], Herzig M.[6], Conraths F.J.[7]

[1]Friedrich-Loeffler-Institut, Federal Research Institute for Animal Health, Institute of Epidemiology, NRL for Echinococcosis, Südufer 10, 17493, Greifswald-Insel Riems, Germany.
[2]Friedrich-Loeffler-Institut, Federal Research Institute for Animal Health, Institute of Epidemiology, NRL for Echinococcosis, Südufer 10, 17493, Greifswald-Insel Riems, Germany.
[3]Friedrich-Loeffler-Institut, Federal Research Institute for Animal Health, Institute of Epidemiology, NRL for Echinococcosis, Südufer 10, 17493, Greifswald-Insel Riems, Germany.
[4]Friedrich-Loeffler-Institut, Federal Research Institute for Animal Health, Institute of Epidemiology, NRL for Echinococcosis, Südufer 10, 17493, Greifswald-Insel Riems, Germany.
[5]Institute of Parasitology, Vetsuisse-Faculty, University of Zurich, Winterthurerstrasse 266a, CH-8057, Zurich, Switzerland; Department of Farm Animals, Division of Swine Medicine, Vetsuisse-Faculty, University of Zurich, Winterthurerstrasse 260, CH-8057 Zurich, Switzerland.
[6]Friedrich-Loeffler-Institut, Federal Research Institute for Animal Health, Institute of Epidemiology, NRL for Echinococcosis, Südufer 10, 17493, Greifswald-Insel Riems, Germany.
[7]Friedrich-Loeffler-Institut, Federal Research Institute for Animal Health, Institute of Epidemiology, NRL for Echinococcosis, Südufer 10, 17493, Greifswald-Insel Riems, Germany.

Vet Parasitol. 2017. pii: S0304-4017(17)30064-X. Doi: 10.1016/j.vetpar.2017.02.015. [Epub ahead of print]

Epidemiology of bacterial conjunctivitis in chinchillas *(Chinchilla lanigera)*: 49 cases (2005 to 2015)

Ozawa S.[1], Mans C.[1], Szabo Z.[2], Di Girolamo N.[3]

[1]Department of Surgical Sciences, School of Veterinary Medicine, University of Wisconsin-Madison, Madison, WI, 53706, USA.
[2]Tai Wai Small Animal and Exotic Hospital, Tai Wai, New Territories, Hong Kong, China.
[3]EBMVet, Via Sigismondo Trecchi 20, 26100, Cremona, Italy.

J Small Anim Pract. 2017: 58(4):238-245. Doi: 10.1111/jsap.12644.

Faglig Årsberetning

2016

Kopenhagen Fur

Annual Report

2016

Kopenhagen Fur

The survival and early growth in mink kits is influenced by the litter size, rather than nests box climate when dams have free access to nest building materials

Toke M. Schou & Jens Malmkvist

We investigated the effects of nest box climate on early mink kit mortality and growth. We hypothesised that litters in warm nest boxes experience less hypothermia-induced mortality and higher growth rates during the first week of life. This study included data from 749 1-year-old breeding dams with access to nesting materials. We tested the influences of the following daily temperature (*T*) and humidity (*H*) parameters on the number of live-born kit deaths and kit growth: *Tmean*, *Tmin*, *Tmax*, *Tvar* (fluctuation), and *Hmean*. The nest microclimate experienced by the kits was buffered against the ambient climate, with higher temperatures and reduced climate fluctuation. Most (77.0%) live-born kit deaths in the first week occurred on days 0 and 1. Conflicting effects among days, marginal effects, and late effects indicated that climate was not the primary cause of kit mortality or growth. One exception was that large nest temperature fluctuations on day 1 were associated with reduced deaths of live-born kit ($P < 0.001$) and increased kit growth ($P = 0.003$). Litter size affected the kits survival and growth. Stillborn kits had a negative effect on the rest of the litter. Kits in litters with stillbirths had a higher risk of dying ($P < 0.001$) and a reduced growth during the first week of life ($P < 0.001$). This could be a result of a negative effect of dead kits and/or parturition problems on the dam's maternal care. Kits in litters with a high number of liveborn kits had opposite a reduced risk of dying ($P < 0{,}001$) and increased growth ($P = 0{,}025$). The reason for minor effect of nest box temperature can be due to dams' maternal behaviour (nest building, nursing) and that the climate challenge was relatively low. We cannot generalize to other circumstances, e.g. in harsher climates, for dams without nesting materials housed in open sheds. Under the given circumstances – with free access to nest building material - we cannot confirm that temperature is the primary reason for kit mortality. Litter size – mainly the reasons for stillbirths – appear under these conditions to be the main factor determining the survival and growth of mink kits.

Annual Report 2016, 7-14. Kopenhagen Research, Agro Food Park 15, DK-8200 Aarhus N, Denmark.

Enrichment and handling affect the temperament in mink

Anne Sandgrav Bak & Jens Malmkvist

We know that fear in farmed mink affects both the welfare and production negatively. Fear and exploration are also indicators in welfare assessments (WelFur), and should in Denmark be used for the selection of breeders. However, more knowledge about how fear and exploration is affected by enrichment and handling is needed. The aim of this study was to investigate if enrichment (shelf and tube) and handling affected the behaviour of mink in the stick test. Half of the cages (n=300) had enrichment for 4 weeks, while in the other half (n=300) of the cages the enrichment was removed. After 4 weeks, each of the two groups was further divided into three groups; a:'positive' treatment (canned cat food), b: 'neutral' (no treatment) and c: 'negative' treatment (in a trap for 15 min). The day after these treatments the animals were stick tested. In the following week, all animals were sorted as part of the selection of breeding animals, and the day after they were all tested again. The results showed that enriched animals were more explorative/less fearful and less sensitive to negative handling compared to those animals without enrichment. Animals being caught and kept in a trap, reacted more fearful during the test compared to the other animals. Also, sorting made the animals react more fearful. This knowledge is an important argument for the use of shelfs and tubes, like in Denmark, as it reduces fearfulness. The results also suggest that we have to take into account previous incidents in the interpretation of the results from the stick test.

Annual Report 2016, 15-21. Kopenhagen Research, Agro Food Park 15, DK-8200 Aarhus N, Denmark

Index selection as a means of improving mink breeding

Janne Thirstrup, Just Jensen, Per Madsen & Mogens Sandø Lund

Selection for breeding animals is primarily performed using phenotypic evaluations on the selection candidates while the economic response is obtained at the auctions where the skins are sold. In this analysis, the relationship between grading performed on live animals at selection and

evaluations performed on skin at sorting for auction were investigated. Traits important for the income of the mink breeder were analyzed. These traits were fur quality, skin size and litter size. We found 1) relative high genetic correlations between single traits evaluated on live animals and on skin, and 2) negative genetic correlations between animal/skin size and both fur quality and litter size, but also between fur quality and litter size. These results indicate index selection as a means of improving mink breeding, in order to obtain a balanced genetic improvement.

Annual Report 2016, 23-26. Kopenhagen Research, Agro Food Park 15, DK-8200 Aarhus N, Denmark.

Large individual variation in weight among mink kits from the same litter

Tove N. Clausen & Peter Foged Larsen

To follow the individual development of siblings from birth to pelting, 149 mink kits were chipmarked the day after birth. The kits were weighed regularly throughout the period and skins were quality graded after pelting.
Between full brothers and full sisters there can be very large variations in weight development during the period as well as skin size and quality. Average weight of male kits the day after birth was 12.3 g and the weight of female kits were 11.7 g. Birth weight decreased with increasing litter size. Around the time the kits were set out in pairs we observed a decrease in the daily weight gain, most likely a result of handling and adapting to eat on top of the cage.
From day 28 after birth and onwards a positive correlation between weight of male kits at day 28 and their weight and skin length at pelting was observed. From the day after birth and onwards a positive correlation between weight of female kits and their weight at pelting was observed.

Annual Report 2016, 27-35. Kopenhagen Research, Agro Food Park 15, DK-8200 Aarhus N, Denmark.

Optimized addition of B vitamins in the growing and furring period

Tove N. Clausen & Peter Foged Larsen

To study the mink needs for addition of B vitamins in the feed four groups of brown mink with 138 males and females were used. Except for the B vitamins the other vitamins and minerals were added according to the Danish recommendations to the feed kitchens. One group served as a control with the addition of B vitamins according to the recommendations, in one group the B vitamins were halved, and in another group, the B vitamins were omitted. Finally, one group were added extra B vitamins to the feed, where liquid B vitamin was used.
No effect on pelt length, fur quality parameters or health by reducing or omitting the addition of B vitamins to the diet was observed, also it had no positive effect to add extra B vitamins.

Annual Report 2016, 37-40. Kopenhagen Research, Agro Food Park 15, DK-8200 Aarhus N, Denmark.

Vitamin B in excess in mink feed is excreted in the urine

Mette S. Hedemann, Tove N. Clausen, Peter F. Larsen & Søren K. Jensen

The aim of the present study was to investigate whether analyzing urine samples from mink fed different levels of vitamin B and measuring the secretion of different vitamin B metabolites could be used to determine if a feed composed of natural ingredients contained adequate levels of vitamin B. Four experimental diets were formulated: a feed without addition of vitamin B, a feed with 50% of the usual vitamin B addition, a feed with the usual vitamin B addition (100%) and 100% with a supplement of liquid vitamin B. Urine samples were collected from 10 male mink from each group in September and blood samples were taken from the same animals in September and November. The analysis of the urine samples showed that vitamin B2, B5 and B6 were excreted in intact form, vitamin B9 was excreted at the biologically active form and metabolites of vitamin B3 and B6 were excreted as well. The excretion of vitamin B9 was very low in the group that had the feed without vitamin B addition, whereas the others all was concluded to be present in adequate amounts in feed made of good raw materials. Vitamin B9 is mainly found in vegetable ingredients and it may be necessary to supplement with vitamin B9 in mink feed. Vitamin B1 and B7 were not found in the urine samples and further studies are needed to investigate this. Vitamin B12 is primarily excreted in the bile and other types of

experiments are needed to disclose whether the amount in the feed is sufficient to cover the needs of the mink.

Annual Report 2016, 41-47. Kopenhagen Research, Agro Food Park 15, DK-8200 Aarhus N, Denmark.

Investigations of minerals to mink in the growing-furring period

Tove N. Clausen, Rikke Brødsgaard Kjærup & Peter Foged Larsen

To investigate the need for adding minerals to mink feed during the growing furring period we used 5 groups of 138 males and females. To the control group we added a standard vitamin and mineral mixture, one group got standard mixture without Zn, another group without Cu and a third group without Se, finally we had a group with no addition of vitamins and minerals at all.

Excluding the addition of Cu, Zn, Fe and Se from the feed had no negative effects on body weight and skin quality, neither had no addition of all minerals and vitamins at all. Further there was no negative effect on liver and blood parameters.

Annual Report 2016, 48-58. Kopenhagen Research, Agro Food Park 15, DK-8200 Aarhus N, Denmark.

Reduced protein to mink kits in the growing-furring period

Tove N. Clausen & Peter Foged Larsen

In attempt to optimize the protein content in mink feed it is necessary continuously to study the need of protein and amino acids in the growing and pelting period. It is also necessary to study whether black and brown mink has the same need of protein.

In this study, four groups of black mink with 138 males and females was used in each group and four groups of brown mink with 138 male and female mink in each group. Protein content varied from 32 to 24 MEp. One of the groups corresponded to the recommended content of nutrients what was advised to the Danish feed kitchens in 2014.

The groups with the advised amount of protein in the feed was not significantly different from the control group. The lowest protein content resulted in lower skin quality at pelting both in the black and brown mink and fewer silky and more metallic in black mink.

Annual Report 2016, 59-66. Kopenhagen Research, Agro Food Park 15, DK-8200 Aarhus N, Denmark.

Selection of mink that perform well on a low protein feed – Growing-furring period 2015

Tove N. Clausen & Peter Foged Larsen

At the start of the growing season 2011 two selection groups was created. A control group assigned to feed with protein content similar to the average level at the feed kitchens in 2009, and a selection group assigned to feed with a 15% reduction in protein content compared to the level in 2009.
Fifth growth period showed shorter skin in the selection group and lower skin quality compared to the control group. There was slightly higher mortality in the selection group and there were some kits with reduced growth.

Annual Report 2016, 67-72. Kopenhagen Research, Agro Food Park 15, DK-8200 Aarhus N, Denmark.

Selection of mink that perform well on a low protein feed - Final conclusion 2011 to 2015

Tove N. Clausen & Peter Foged Larsen

At the start of the growing season 2011 two selection groups was created. A control group assigned to feed with protein content similar to the average level at the feed kitchens in 2009, and a selection group assigned to feed with a 15% reduction in protein content compared to the level in 2009.

Statistical calculations of data from the nursing periods showed large variations from year to year, but there was no effect of feeding composition on reproduction results. For male kit body weight day 28, there were a tendency to an effect of feeding ($p = 0.09$), so that females fed 30 MEp (reduced protein) in the lactation period had the heaviest kits day 28. There was no effect of feeding on kit weight in the beginning of July, but there was a large variation among years. For body weight increase from July to

pelting, pelting weight, fur length, fur quality and fur thickness there was an interaction between feeding type and year. Overall, the control group had silkier skins and there was a tendency that there were more health problems in the selection group relative to the control group.

Annual Report 2016, 73-82, Kopenhagen Research, Agro Food Park 15, Aarhus N DK-8200, Denmark.

Fat digestibility and mink kit growth

Caroline Marcussen, Connie Frank Matthiesen, Tanya Timann Hansen, & Anne-Helene Tauson

Fat digestibility is usually relatively high in adult mink and is dependent on the fatty acid chain length, saturation and composition. Previous studies have shown that fat digestibility in mink kits can be very low when the fat content of the feed is high. The objective of this study was to determine the fat digestibility for mink kits from 6 to 11 weeks of age in diets high in fat content (50% of metabolizable energy (ME) from fat), and with different fatty acid compositions. Fat digestibility and growth were measured using four different fat sources with different fatty acid composition (soya oil, sunflower oil, coconut oil, Lipitec®) in three periods (6-7, 8-9 and 10-11 weeks of age) with the distribution of the ME from protein, fat and carbohydrates as 35:50:15 percent. In conclusion, fat digestibility was significantly higher for fat sources with a higher proportion of unsaturated fatty acids, 90.5% of soybean oil and 89.8% of sunflower oil compared to the lower fat digestibility of fat sources mainly consisting of short or medium chained saturated fatty acids in coconut oil, 78.4% (mainly C8:0 to C14:0) or Lipitec, 31.6% (mainly C16:0, C18:0) in mink kits from 6-11 weeks of age. Mink kits fed a diet high in fat consisting predominantly C16:0 and C18: saturated fatty acids had significantly higher feed intake in all periods, resulting in similar ME intake between the four feeding groups. The bodyweights were different between some of the groups, where kits from group 2 (sunflower oil) had the highest bodyweights. The age of the mink kits did not affect the fat digestibility in any of the feeding groups from 6 to 11 weeks of age.

Annual Report 2016, 83-88. Kopenhagen Research, Agro Food Park 15, DK-8200 Aarhus N, Denmark.

Feeding brown mink in the lactation period

Tove N. Clausen & Peter Foged Larsen

The purpose of the investigation was to determine if different feeding principles of females and kits during the lactation period had beneficial effect on milk production and kit growth. We used two groups of 300 brown mink females and their litters. The control group was feed a basic feed from birth to weaning and from day 28 the females were feed on the nest box together with the kits. The investigation group was given the same feed as the control group, but from day 28 we continued to feed the females on top of the cage and the kits on the nest box.

The results showed that females fed on the cage throughout the whole lactation period had a higher weight day 42 than females fed together with the kits on the nest box from day 28 onwards. Further female kits from the investigation group tended to have a lower weight loss from day 28 to day 42 than female kits form the control group.

Annual Report 2016, 89-92. Kopenhagen Research, Agro Food Park 15, DK-8200 Aarhus N, Denmark.

Method for estimating the digestibility in raw materials for mink feed

Kevin Byskov & Peter Foged Larsen

Annually Kopenhagen Research performs about 35-40 digestibility trials of raw materials for mink feed, which is the basis for the optimization of feed on the Danish feed kitchens. Digestibility coefficients are estimated by the regression method, where 12 male minks divided into 4 groups get an increasing proportion of the raw material in the feed. The animals receive a daily ration of 300 kcal and the energy distribution of the ration is set to 35:45:20 from digestible protein, fat and carbohydrate, respectively. In addition to test feed item the feed in these trials consists of cod fillet, soybean oil and corn starch and little grape sugar, cellulose and vitamin and mineral supplement. Results are used to update the raw material table.

Annual Report 2016, 93-97. Kopenhagen Research, Agro Food Park 15, DK-8200 Aarhus N, Denmark.

Digestibility of readymade mink feed

Kevin Byskov & Peter Foged Larsen

Feed Optimization is based on estimated in vivo digestion coefficients on single feed components, and there ought to be consistency with digestibility stated of feed plans and what can be determined in vivo on feed from feed kitchens. In this experiment, we have estimated in vivo digestion coefficients of four feed samples from Danish feed kitchens. The results show large variations of protein digestibility, where a single feed sample is not significantly different from that of ration specified level. The other three samples had a digestibility coefficient of protein, which was 2.2, 6.4 and 7.1 percent units lower than expected. For fat digestibility, all samples had a significantly higher digestibility coefficient, whereas for the carbohydrate fraction two samples had a digestibility coefficient as expected, and 2 samples had a significantly higher digestibility coefficient.

Annual Report 2016, 99-102. Kopenhagen Research, Agro Food Park 15, DK-8200 Aarhus N, Denmark.

Reduced addition of E vitamin in the growing and furring period

Tove N. Clausen & Peter Foged Larsen

To investigate the minks needs for addition of E vitamin in the feed in the growing furring period we used five groups of brown mink with 138 males and females each. Except for the E vitamin the other vitamins and minerals were added according to the Danish recommendations to the feed kitchens. One group served as a control with the addition of synthetic E vitamin according to the recommendations, in two groups half amount of either natural or synthetic E vitamin was added. Further we had one group without addition of E vitamin and one group without addition of all vitamins and minerals.

We observed no effect on pelt length, fur quality parameters or health by reducing or omitting the addition of E vitamin to the diet in the growing furring period, moreover we observed no difference between natural and synthetic vitamin E.

Annual Report 2016, 103-106. Kopenhagen Research, Agro Food Park 15, DK-8200 Aarhus N, Denmark.

Diarrhea in the pre-weaning period in farmed mink (Neovison vison) – Preliminary results from interviews of mink farmers from a case-control study

J. Melsted Birch, J. F. Agger, C. Dahlin, T. Struve, A.S. Hammer & H. E. Jensen

Despite certain agents have been associated with pre-weaning diarrhea in mink kits, the syndrome is still regarded as multifactorial. The aim of this study was to identify possible risk factors on farm level for outbreak of diarrhea in the nursing period. In May and June 2015, 30 farms were visited as a part of a case-control study. Results from interviews of mink farmers showed among other things that the farm size and the proportion of 1-year old females were significant risk factors. Dogs access to the farm area also showed to be a significant risk factor, whereas management routines about hygiene, biosecurity, housing and litter equalization did not show an effect on case control status.

Annual Report 2016, 107-111. Kopenhagen Research, Agro Food Park 15, DK-8200 Aarhus N, Denmark.

Non-suppurative pneumonia in mink

Mette Sif Hansen, Jesper Schak Krog, Charlotte Kristiane Hjulsager, Mariann Chriél, Lars Erik Larsen & Branko Kokotovic

Accumulations of mononuclear inflammatory cells especially around blood vessels (cuffings) and bronchi are often seen in the lungs of mink submitted for diagnostic examination at the National Veterinary Institute, DTU. In other animal species similar lung lesions are caused by viral- and mycoplasma infections. In 2014, a project was launched to look into the cause of these pulmonary changes and thus broaden the knowledge of pneumonia in mink. Histological examination of 45 sampled mink (3 young males, 3 young females and 3 old females from 5 farms) revealed chronic non-suppurative pneumonia with accumulation of mononuclear inflammatory cells around blood vessels and bronchi in the majority of the mink. No virus particles were

detected by electron microscopic examination of 16 lung samples, but organisms having mycoplasma-like morphology were seen in all samples. However, the following examinations by cultivation, PCR and NGS could not confirm the presence of microorganisms in the samples. The study confirms that the cuffing-syndrome is widespread in mink, but it remains unclear whether it is caused by specific microorganisms or if it is a nonspecific response to lung inflammation.

Annual Report 2016, 113-119. Kopenhagen Research, Agro Food Park 15, DK-8200 Aarhus N, Denmark.

Differences between the kidneys of black and brown mink

Tove N. Clausen & Anne Sofie Hammer

Black mink is often considered more sensitive to changes in feed and environment than brown mink and the number of black mink dying during the growth period for various reasons is higher than the number of brown mink. To investigate if there could be any difference in kidney function, we examined the water balance in groups of black and brown male mink in October. At pelting the kidneys were examined histologically. The results showed differences in water balance and histopatological changes of the kidneys.

Annual Report 2016, 121-125. Kopenhagen Research, Agro Food Park 15, DK-8200 Aarhus N, Denmark.

Longer passage time through the intestine, low fat digestibility and altered levels of several measured blood parameters in kidney mink

Kevin Byskov, Anne Sofie Vedsted Hammer, Pernille Isaack, Laura Meier Marker, Ida Sebbelov & Tove N. Clausen

In this study, results are presented for digestibility trials, passage time through the intestine, autopsies, and measured blood parameters for a group of six male minks with characteristic symptoms of the condition referred to as “kidney mink”. These are compared with the results of similar studies in 12 male minks without visual symptoms. The group of kidney mink differed from the control group by having a longer passage time through the intestine, low fat digestibility, and the animals were emaciated and had kidney changes. Furthermore, the kidney minks had altered levels of several measured blood parameters indicative of renal failure (including Urea and Creatinine and Creatinine kinase), liver damage / impaired liver function (ALAT and ASAT), and possibly damage to the bile ducts (BASP). These results can provide insight into the underlying disease mechanisms behind the development of symptoms in affected animals.

Annual Report 2016, 127-136. Kopenhagen Research, Agro Food Park 15, DK-8200 Aarhus N, Denmark.

Dermatitis in the abdominal region (also known as wet belly) in female mink may be related to body conformation

Anne Sofie Hammer, Christina Dahlin, Line Larsen, Peter Damborg & Ida Sebbelov

Dermatitis in the abdominal region (also known as ”Wet belly”) may be an emerging disease problem in mink females. Wet belly has so far been described as a fur condition in male mink, associated with discoloration of the hair and the leather side of the skin, around the external urethral orifice. Wet belly in male mink has been known and studied for the past 50 years, however abdominal dermatitis in female mink are rarely mentioned in the literature. This report will describe the research conducted on a farm with a high prevalence of wet belly in female mink. Bacteriological analysis was carried out on healthy female mink as well as females with dermatitis. Bacterial findings varied and most animals the microbiological findings were mixed cultures. Macroscopic and microscopic pathological examination showed a very profound dermatitis with wounds. Wet belly has previously been described as a mild superficial dermatitis, however these pathological findings revealed a much more severe type of dermatitis. The prevalence of wet belly amongst female mink in November was estimated to 19.8% based on a sample size of 174 animals. There was a significant higher prevalence of wet belly among females with a short body length and a high body weight. The preliminary conclusion of this study is that short and heavy female mink are most likely to develop wet belly. This emphasizes the

importance of focusing on body conformation when selecting females for breeding.

Annual Report 2016, 137-142 Kopenhagen Research, Agro Food Park 15, DK-8200 Aarhus N, Denmark.

Probiotics effect on the intestinal flora in mink kits

Anne Sofie Hammer, Tina Seidelin, Christina Dahlin, Ida Sebbelov, Tove Clausen

A frequent cause for disease and mortality in mink during their growth period, and one of the main reasons for antibiotic use in fur production is diarrhea. In other production animals and humans probiotics are assumed to have a positive effect on gut health and may have a protective effect in relation to some types of diarrhea.

To investigate the effect of certain types of probiotics in mink kits, we studied the growth of mink kits aged 35 to 56 days kept in so-called "nursing boxes". The mink kits were treated with one of two probiotics, "*Lactobacillus reuteri"* and "*Actobacillus plantarum and Pediococcus acidilactici"*. Mink kits in the control group received a placebo treatment without probiotics. The results did not show an effect of either of the two probiotics on growth performance and survival ($p > 0.9$).

Annual Report 2016, 143-147. Kopenhagen Research, Agro Food Park 15, DK-8200 Aarhus N, Denmark

MRSA in mink (*Neovison vison*) submitted for diagnostic examination

Gitte Larsen, Mariann Chriél, Julie Elvekjær Hansen, Karl Pedersen

Methicillin-resistant *Staphylococcus aureus* (MRSA) may be isolated from humans as well as production animals – including mink (*Neovison vison*). Presence of MRSA in mink was isolated for the first time in 2013 in two Danish mink submitted for routine laboratory investigation. The two isolates both belonged to CC398 and the infections were presumably caused by contamination of the feed containing slaughter offal from the pig industry. As a result of these findings an active surveillance was initiated in 2014 and all submissions were tested for MRSA. The samples were collected from 5 different locations on the carcass from all mink in a submission and pooled across mink by sample location. The results documented that MRSA can be isolated from 1/3 of the diagnostic submissions. The main sites for recovering MRSA are the paws and swab sample from the pharynx.

Annual Report 2016, 149-152. Kopenhagen Research, Agro Food Park 15, DK-8200 Aarhus N, Denmark.

Antimicrobial resistance among bacteria from Danish mink

Mariann Chriél, Desireé C.K. Lassen, Gitte Larsen, Vibeke F. Jensen, Karl Pedersen

Treatments of bacterial infections in mink require knowledge of the causative agents and their antimicrobial susceptibility patterns. This study report the patterns of antimicrobial resistance among pathogenic bacteria from Danish mink isolated from diagnostic submissions in 2014-2015. A total number of 213 *Escherichia coli* isolates was tested; 109 haemolytic and 104 non-haemolytic. Furthermore, 35 *Pseudomonas aeruginosa*, 19 *Streptococcus canis*, 15 *Streptococcus dysgalactia*, 38 *Staphylococcus delphini*, 4 *Staphylococcus aureus*, and 8 *Staphylococcus schleiferi* were included in this study. Among *E. coli*, resistance was more frequent in the haemolytic isolates than the non-haemolytic. All *P. aeruginosa* isolates were sensitive to apramycin, ciprofloxacin, colistin and gentamicin, whereas most isolates were found resistant to all others antimicrobials. Among *S. delphini*, far the highest frequency of resistance was found for tetracycline (52.5%), while resistance levels to all other antimicrobials were less than 5%. One of the four *S. aureus* was MRSA. All streptococci isolates were sensitive to penicillin.

Annual Report 2016, 153-158. Kopenhagen Research, Agro Food Park 15, DK-8200 Aarhus N, Denmark.

Development of a sandwich ELISA to measure IgG in mink blood

Ronja Mathiesen, Mariann Chriél, Tina Struve & Peter M.H. Heegaard

The pre-weaning diarrhea syndrome in mink kits results in increased management, reduces the welfare of the mink, and increases mortality. The etiology of the syndrome is considered multifactorial as no specific cause has been established. Mink kits are born with very low concentrations of circulating immunoglobulins, which are important for a good immune system. It is vital for the mink kits to obtain high concentrations of immunoglobulins in the bloodstream ensuring immunity against pathogens found in the environment. In the present project, the hypothesis is that low immunoglobulin serum concentrations are associated with increased disease susceptibility. This study describes a sandwich enzyme-linked immunosorbent assay (ELISA) for quantification of the concentration of total immunoglobulin G in mink blood. The ELISA was validated with serum samples from females and their kits and was shown to be precise, robust and with a low limit of detection. Preliminary results indicate that IgG serum concentrations among kits from the same litter were more similar than between litters. This sandwich ELISA can later be used to investigate the correlation between the mink dam´s IgG concentration and the development of the pre-weaning diarrhea syndrome in her offspring.

Annual Report 2016, 159-162. Kopenhagen Research, Agro Food Park 15, DK-8200 Aarhus N, Denmark.

Different strains of plasmacytosis virus were responsible for outbreaks of plasmacytosis in Danish mink (*Neovison vison*) in 2015

Pia Ryt-Hansen, Charlotte Hjulsager, Emma Hagberg, Mariann Chriél, Tina Struve, Anders Pedersen & Lars Larsen

Systematic eradication of Aleutian Mink Disease Virus (AMDV) from Danish mink farms was initiated in 1976 and in the last decades the disease was mainly restricted to Northern Jutland. However, in 2015 multiple outbreaks of AMDV occurred in farms throughout Denmark with unknown source. Phylogenetic analyses of partial NS1 gene sequences concluded that the outbreaks were caused by two new different clusters of viruses - clearly different from the strain found in Northern Jutland. The variation within the clusters was remarkably low. The outbreaks on Zealand were epidemiologically linked through shared farm and pelting facilities as well as personnel. The other outbreak cluster was located throughout Jutland and Funen. Only identified link was through the feed producers. However, the possibility of secondary transmissions between farms in the same geographical area cannot be excluded.

Annual Report 2016, 163-167. Kopenhagen Research, Agro Food Park 15, DK-8200 Aarhus N, Denmark.

Global clustering of Aleutian Mink Disease virus isolates from mink (*Neovison vison*)

Pia Ryt-Hansen, Emma Hagberg, Mariann Chriél, Tina Struve, Anders Gorm Pedersen, Lars Erik Larsen & Charlotte Hjulsager

On the basis of outbreaks with Aleutian Mink Disease virus in a large number of Danish mink farms in 2015, where the origin of the infection was unknown, sampling of suspected plasmacytosis infected mink from other large mink producing countries was initiated. Plasmacytosis virus partial NS1 gene sequences from the different samplings were compared in a phylogenetic tree. The analysis revealed large variations both between countries, within countries, and some times also within the individual farms. The close genetic relation between viruses of different origin may be the result of trade with animals and products between different countries and between farms. It was not possible to identify the potential source of the new circulating virus strain in Jutland and on Funen. However, two Swedish sequences were genetically closely related to the sequences isolated from outbreaks on Zealand, indicating they might have a common ancestry.

Annual Report 2016, 169-172. Kopenhagen Research, Agro Food Park 15, DK-8200 Aarhus N, Denmark.

Impact of 1-3 positive blood samples for the spread of plasmacytosis

J. F. Agger, T. Struve, M. Kragh Jensen, M. Skovbjerg & M. Denwood

The goal of the study was to evaluate the risk of observing plasmacytosis test positive results associated with observing either 1-3 or ≥4 test-positive animals within a previous year, and to evaluate the risk of infection to other farms within a localised geographical area. A summary overview of the data shows that farms with a single positive blood test in one year had a 25% probability of observing at least one positive blood test in the following year. Farms with 2 or 3 positive blood tests had a 29% and 32% probability, respectively, and farms with 4 or more positive tests had between a 22 % and 44% probability of having a positive test in the following year. For comparison, farms without a positive test had only a 5% probability of one or more positive tests in the following year. This translates to a 5-6 times increased risk for positive tests in a year conditional on between 1-3 positive tests in the previous year, suggesting that 1, 2 or 3 positive tests should be considered in a similar manner to 4 or more positive tests. Further actions than simply removing the test-positive animals are therefore warranted for individual farmers in order to become free of this infectious disease.

Multivariable modelling results show that over and above the increased risk associated with some local geographical areas and feed kitchen, there was a further 2-2.5 times increased risk that farms classified as having had 1-3 or ≥4 test positive blood samples would continue to be classified as ≥4 test positives in the following year when compared with farms that were classified as uninfected. Pelting down was associated with a reduced risk of 0.4-0.6 compared to infected farms which did not pelt down, meaning that (after accounting for effects of geographical area and feed kitchen etc.) an infected farm that pelted down appears to be at approximately the same risk of being classified as infected in the next year as a farm that was classified as uninfected in the previous year. In addition, farms that were classified as 1-3 and ≥4 positive samples in a previous year are associated with a 1.3-1.6 increase in risk of infection for other farms within the same 10x10km^2 area. The analysis also showed differences in baseline risk associated with different feed kitchen, geographical areas and farms themselves.

Annual Report 2016, 173-181. Kopenhagen Research, Agro Food Park 15, DK-8200 Aarhus N, Denmark.

When is it best to move the females in April?

Tove N. Clausen & Peter Foged Larsen

Two groups of each 600 brown females were moved either April 7 or April 20 to study effect of movement of pregnant females. There were no significant differences in litter size between early and late moved females. Females moved late gave birth a little earlier than the early moved, and had little more treatments than the early moved. There was difference in the females' weight during the lactation period most likely due to different management in April.

Annual Report 2016, 183-185. Kopenhagen Research, Agro Food Park 15, DK-8200 Aarhus N, Denmark.

Feeding strategy in the late gestation and its influence on the mink females ability to perform early maternal care

Christina Dahlin, Anne Sofie Hammer, Steen H. Møller, Jens Malmkvist & Henrik Bækgaard

In the production of farmed mink, the litter sizes and kit mortality are relatively high, and majorities of the kits that die do so within the first seven days postpartum. Mink kits are born vulnerable, which makes them dependent on the female's ability to perform early maternal care.

The aim of this study was to investigate which effect the feeding strategy in the late gestation have on the female mink's ability to perform early maternal care under varying conditions on four commercial farms. This were investigated by comparing the groups where the females were allocated a reduced amount of feed, with the groups where the females not were allocated a reduced amount of feed.

This farm experiment included 3,351 gestated female mink distributed on four farms. The present study included females with an age of one to four years, and seven color types were represented. The litter was counted one and seven days postpartum, and the females' body conditions were assessed. Data were

collected from April 18 or 21 (depending on farm) and ended when the litter had the age of seven days. The results did not show differences across farms in kit survival one or seven days postpartum and there were no difference in kit mortality between groups fed 50% restrictedly and groups fed non-restrictedly in the late gestation. However, on farm level, one of the farms had had more kits in the non-restrictedly fed groups.

Annual Report 2016, 187-193. Kopenhagen Research, Agro Food Park 15, DK-8200 Aarhus N, Denmark

INSTRUCTIONS FOR AUTHORS

SCIENTIFUR is published as four issues per year (one volume).

SCIENTIFIC ARTICLES. Papers submitted for publication as scientific articles are received with the understanding that the work has not been published before, and is not considered for publication elsewhere and has been read and approved by all authors. In regard to forwarded articles the author(s) alone is (are) responsible for the scientific content of the article. Experimental methods used and reported in SCIENTIFUR shall meet ethical standards of animal treatment.

MANUSCRIPTS
Manuscripts must be sent by e-mail, preferably in Microsoft Word. The material should be sent to: **E-mail: Scientifur@dca.au.dk.** In case of no access to e-mail, manuscripts can be forwarded to:
SCIENTIFUR, Danish Centre for Food and Agriculture, Aarhus University, P.O. Box 14, DK-8830 Tjele, Denmark

Manuscripts must be written in English, typed with double spacing and with page and line numbering and consisting of:

Title, which should be concise and informative, but as short as possible, and contain the main key words.

Authors name(s) as well as name(s) and address(es) of the institutions to which the work is attributed.
E-mail address of the corresponding author should be given.

Summary/Abstract.

Keywords in alphabetic order if not included in the title.

Text. The text should normally be divided into: Introduction, Material and Methods, Results, Discussion, Acknowledgements and References and follow internationally accepted rules. Double documentation in both figures and tables will not be accepted.

Illustrations. All graphs, photos and pictures are considered as figures. All drawings have to be professionally drafted (photocopies are not an acceptable standard). The illustrations should be JPG-, GIF- or TIF-files. Any halftones must exhibit high contrast and text and other details must be large enough to retain the readability even after reduction of figure size to single column (width 80 mm). The width of 170 mm can also be accepted. Colour illustrations can be included in SCIENTIFUR.

Tables. Each table should be typed on a separate page. Tables must be numbered consecutively with Arabic numerals, and have a self-explanatory title. Tables should be planned to fit a final width of 80 or 170 mm.

References. References in the text should be made according to the following examples:

Nielsen, 1992; Hansen & Berg, 1993; Bakken *et al*., 1999.

The list of references should be arranged in alphabetic order according to the name of the first author and the year of publication within the names. The year of publication should be written between the name(s) and the title:

Nielsen, V.H., Møller, S.H., Hansen, B.K. & Berg, P. (2007). Genotype - environment interaction in mink. *Scientifur*, 31 (3), 89.

Shirali, M., Nielsen, V.H., Møller S.H. & Jensen, J. (2015). Longitudinal analysis of residual feed intake and BW in mink using random regression with heterogeneous residual variance. *Animal,* 8 (10), 1597-1604.