OHAR MSc projects

Find more projects here → ivh.ku.dk/ohar

Luca Guardabassi
Peter Damborg
Rikke Olsen
Mattia Pirolo

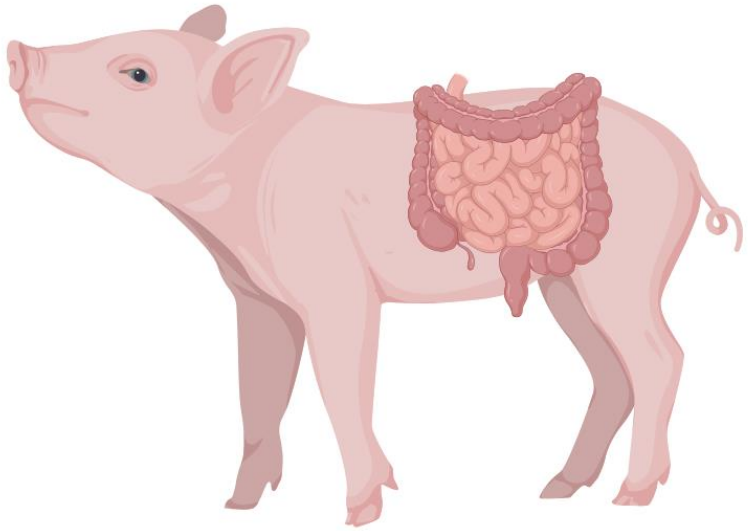
UNIVERSITY OF COPENHAGEN

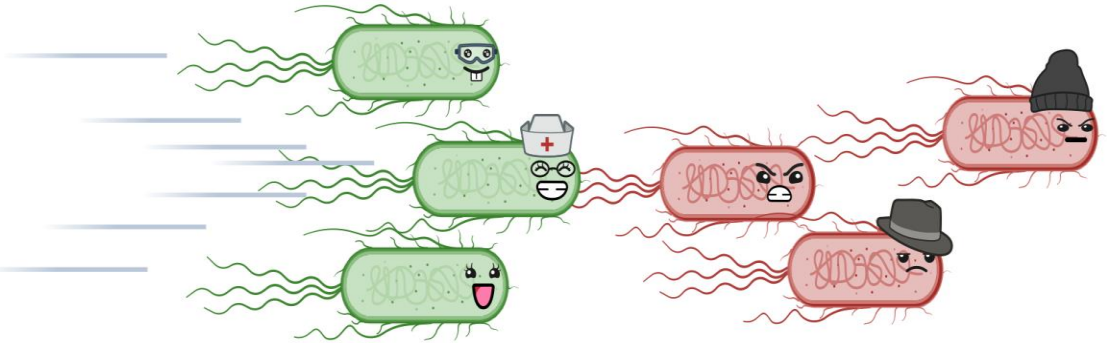
MSc projects

Luca Guardabassi

The good *Escherichia coli*

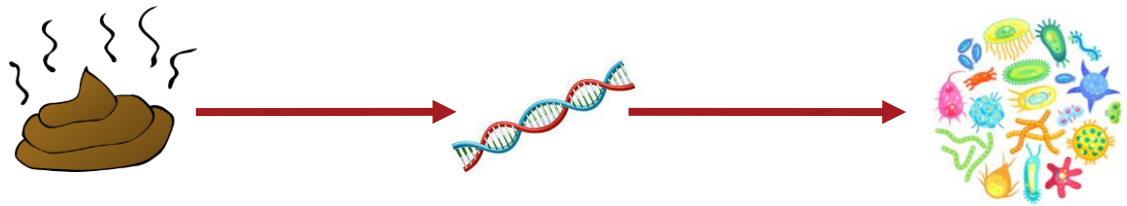
- **Background:** Effective vaccines and antibiotics are lacking for prevention and control of post-weaning diarrhea in pigs caused by enterotoxigenic *E. coli* (ETEC)
- **Objective:** To evaluate the probiotic potential of non-pathogenic *E. coli* isolated from the small intestine of healthy pigs
- **Methods:**
  - Sampling of euthanized/slaughtered pigs
  - Isolation & identification of *E. coli*
  - Screening for virulence & AMR genes
  - *In vitro* competition experiments with ETEC

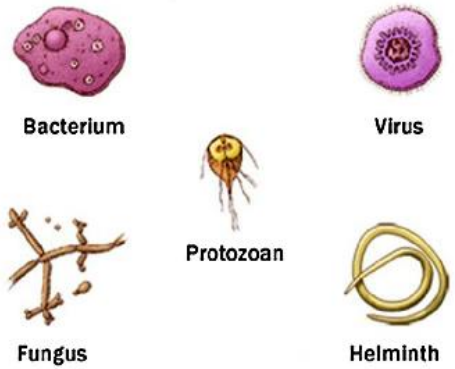


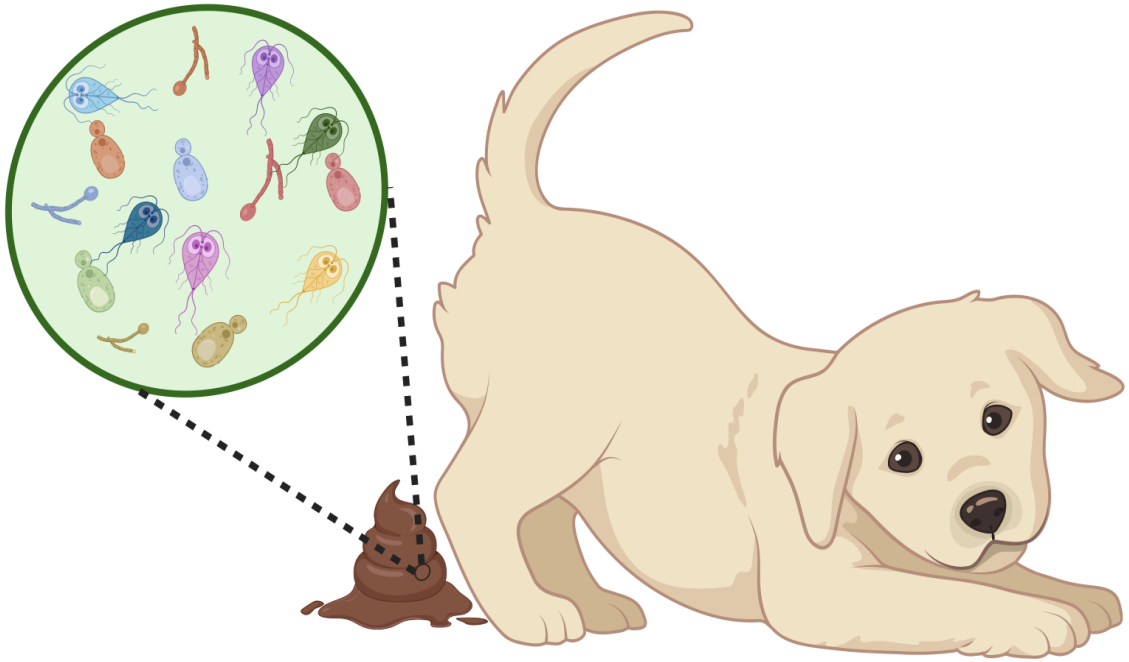


The Eukaryotic microbiome in dog feces

- **Background:** Little is known on the relationships between eukaryotic (fungi and protozoa) and prokaryotic (bacteria) microbiomes in the gut
- **Objective:** To identify fungi and protozoa in dog feces and study if their presence or abundance may influence diversity and composition of the bacterial community
- **Methods:**
  - Sampling of dog feces in public gardens
  - DNA extraction
  - ITS & 18S rRNA amplification & sequencing
  - Bioinformatics analyses







MSc projects

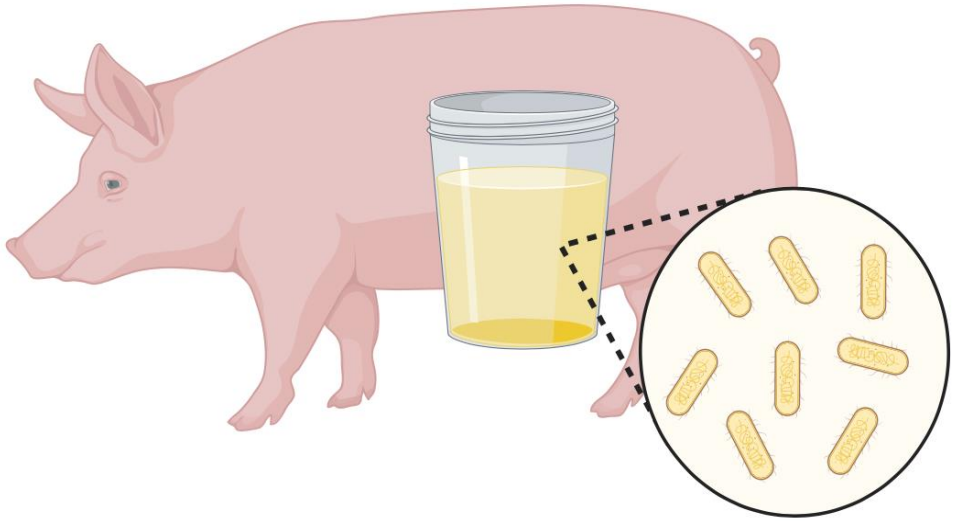
Rikke Olsen

Is cystitis in slaughter pigs an underdiagnosed disease?

Rikke H. Olsen,
cava@sund.ku.dk

- Nephritis is a common finding in Danish slaughter pigs
- Cystitis can progress to nephritis
- Cystitis is only poorly investigated in slaughter pigs

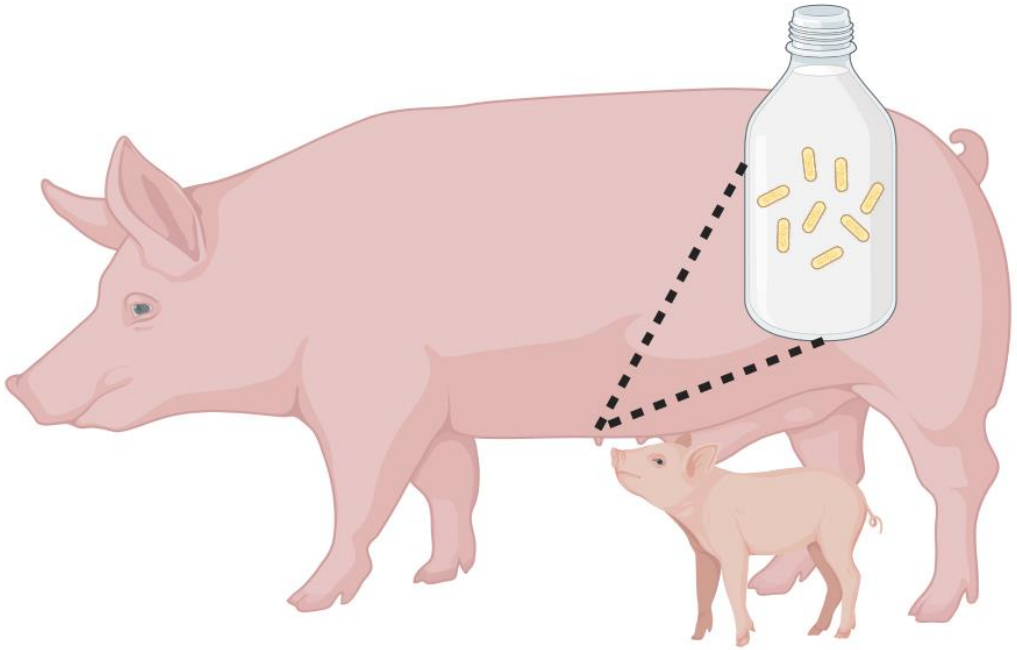
Research question:
Is there a correlation between bacterial cystitis and nephritis in slaughter pigs?



Mastitis in sows – prevalence and bacterial causes

- Mastitis in sows is a common type of infection
- Mastitis can lead to decreased milk-production and may progress to systemic infection

Research question:
How diverse is the bacterial population of mastitis associated pathogens (with-in and between herds)?

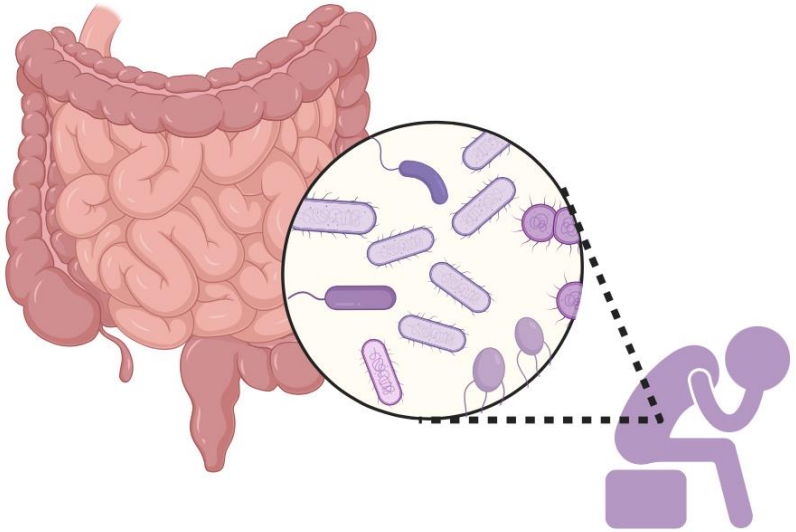


Do antidepressants induce antimicrobial resistance in fecal bacteria?

- Antidepressants posses (low) antimicrobial activity
- (Gut) bacteria can develop resistance toward antidepressants

Research question:

Is cross/co resistance to conventional antimicrobials present in bacteria with increased tolerance (resistance) to antidepressants?

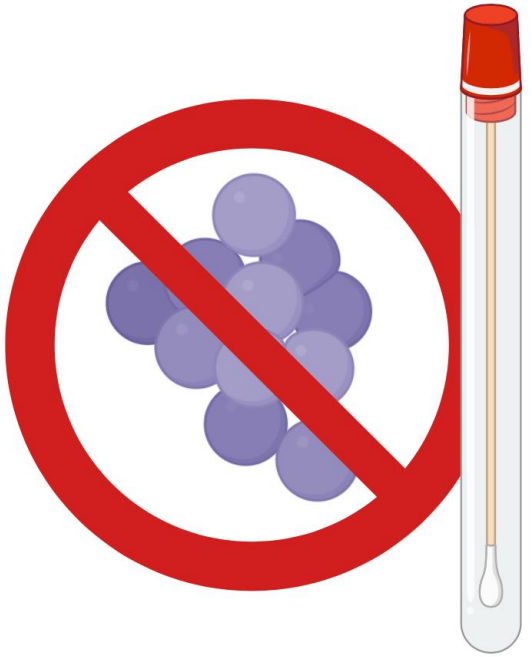


MSc projects

Peter Damborg

Opdatering af infektionskontrol i Tåstrup

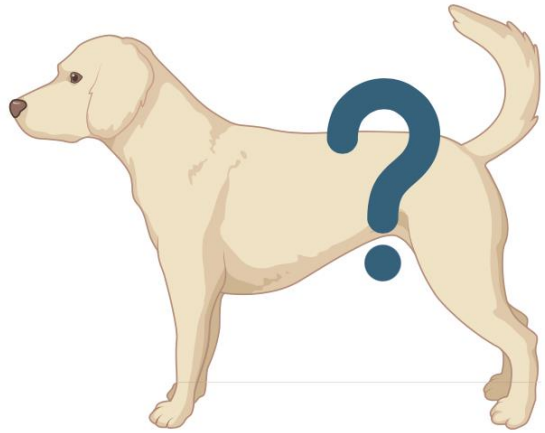
- **Formål**: At undersøge Universitetshospitalet for f.eks. MRSA og ESBL-bakterier, og bringe idéer til et infektionskontrolprogram
- **Metoder og opgaver**:
  - Prøvetagning af miljø + evt. patienter, studerende og ansatte
  - Analyse af prøver i mikrobiologisk lab + typning af bakterier
  - Vurdere infektionskontrol
- **Samarbejdspartner**: Sanni Hansen
- **Opstartsdato**: Fleksibel

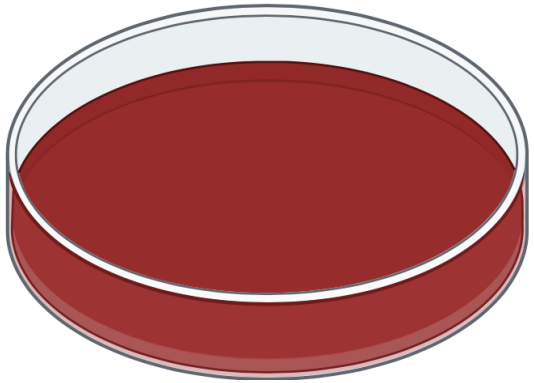


Kontakt: pedam@sund.ku.dk

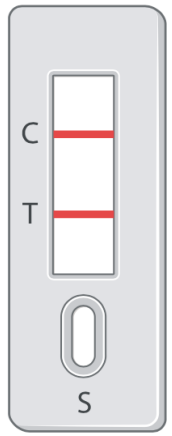
Ny hurtigtest til urinvejsdiagnostik i hund

- **Formål**: At undersøge hvorvidt en mastitis hurtigtest kan adapteres til diagnostik af urinvejsinfektion i hunde
- **Metoder og opgaver**:
  - Traditionel dyrkning vs POC
  - Forsøg med tilføjelse af resistenstest
  - Test i lab af særligt udfordrende bakteriespecies
- **Samarbejdspartner**: Tomas Ussing
- **Opstartsdato**: Fleksibel





vs



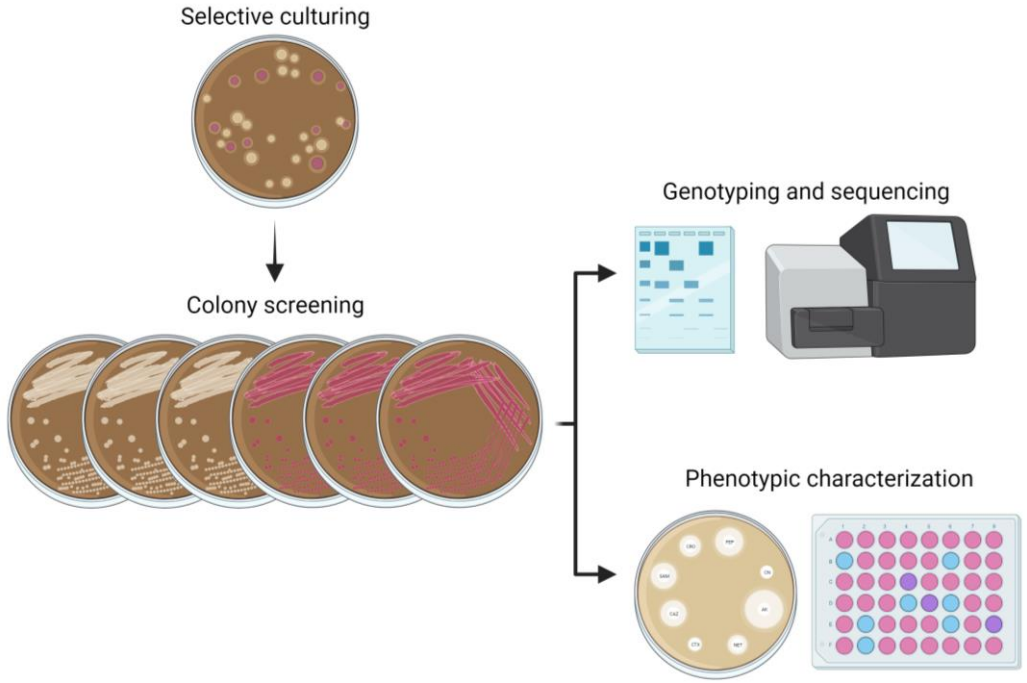
Kontakt: pedam@sund.ku.dk

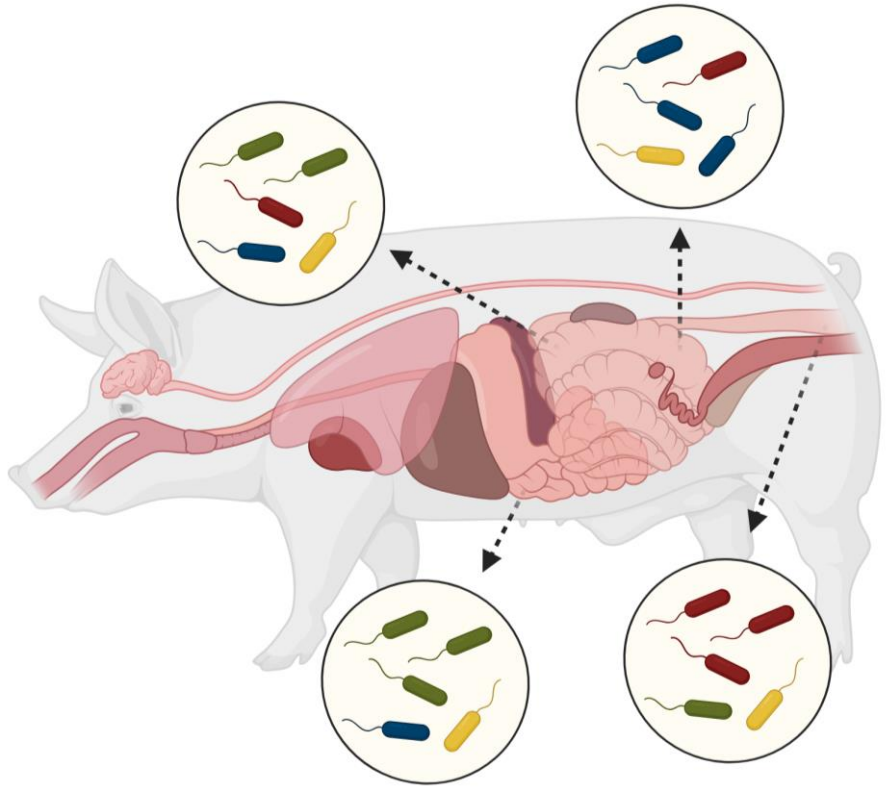
MSc projects

Mattia Pirolo

E. coli diversity in the pig GI tract

Much of our understanding of the factors influencing the dynamics and diversity of *E. coli* populations in the pig GI tract come from studies based on fecal isolates

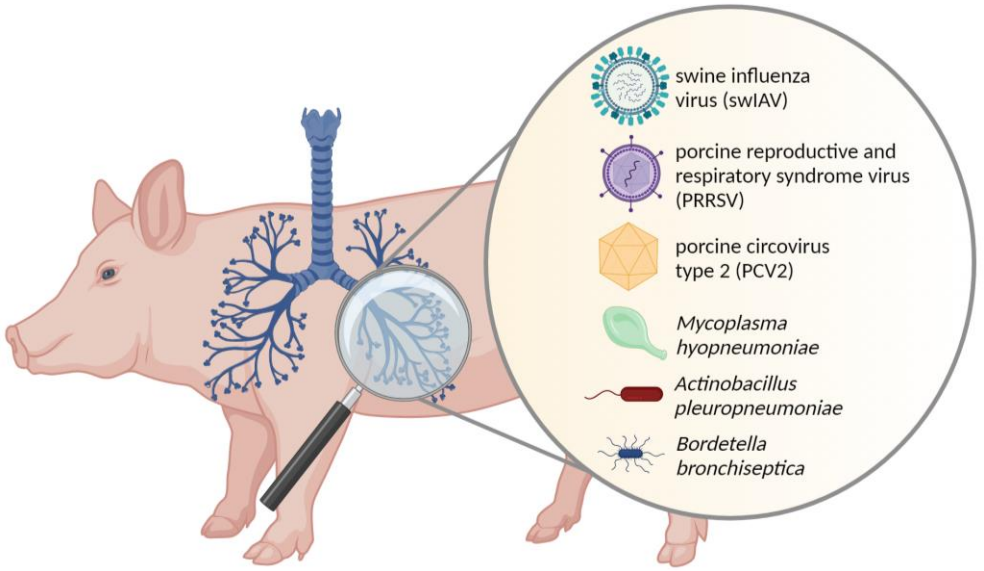


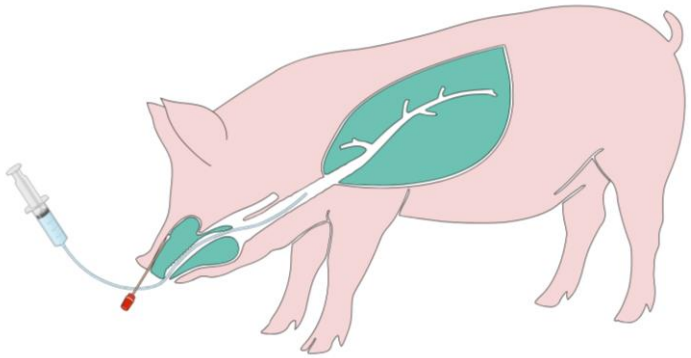


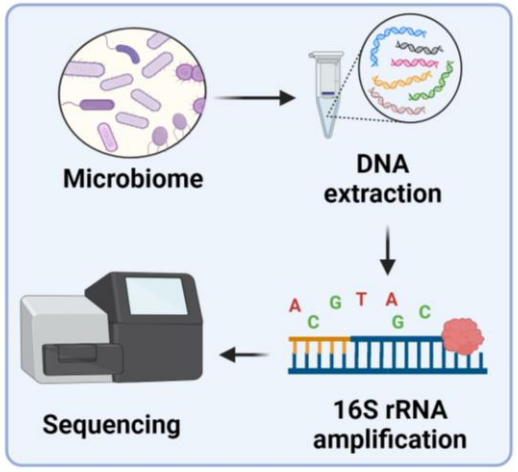
Research question:
To determine if strains of E.coli inhabiting different regions of the pig gut represent genetically and phenotypically distinct populations

Changes in microbiota during PRDC

- Porcine Respiratory Disease Complex (PRDC) is a critical health and economic issue for pig farming
- Within the same pen some pigs develop pneumonia, whereas others remain healthy or present mild symptoms







Research question:
To investigate differences in the respiratory microbiome of pigs presenting PRDC symptoms and healthy pigs

Molecular Veterinary Microbiology

John Elmerdahl Olsen
Line Elnif Thomsen
Arshnee Moodley
Henrik Christensen

Forslag til Masterprojekter

John E. Olsen
jeo@sund.ku.dk

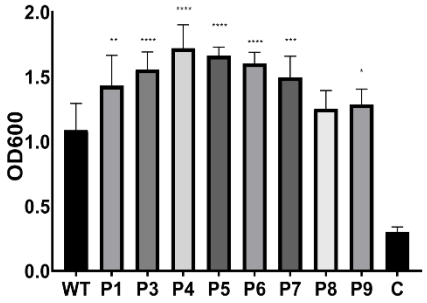
- **Ser vi et skift i hvilke *E. coli* der er årsag til diarre hos kalve.**
  - Klassisk ETEC F5 påvises meget sjældent, men coli-diarre uge 1 stadig hyppigt
  - Baseret på indsamlet stammemateriale ønskes sekvensundersøgelse og adhæsion til tarmceller i kultur til at undersøge hvilke typer af *E. coli* der er tale om
- **Kan UV lys i stalde begrænse smittetryk**
  - Firmaet Farmlight har udviklet kombinerede UV/synligt lys-lamper til stalde
  - Lamper afprøves i stalde april/maj 2024. Prøver fra grise i stalde ønskes brugt til at undersøge hvad der sker med antal af bakterier/virus, og eventuelt om der er øget mutationsfrekvens hos UV bestrålede bakterier
- **Det sidst store spørgsmål med *Salmonella* patogense. Hvorfor er nogle serotyper værtsspecifikke og med stor tendens til at give invasive infektioner.**
  - "join a research project". Du laver mutationer, måler gen-ekspressioner, arbejder med cellekultur og dyreforsøg med din egen vinkel på historien.

Line Elnif Thomsen
(leth@sund.ku.dk)

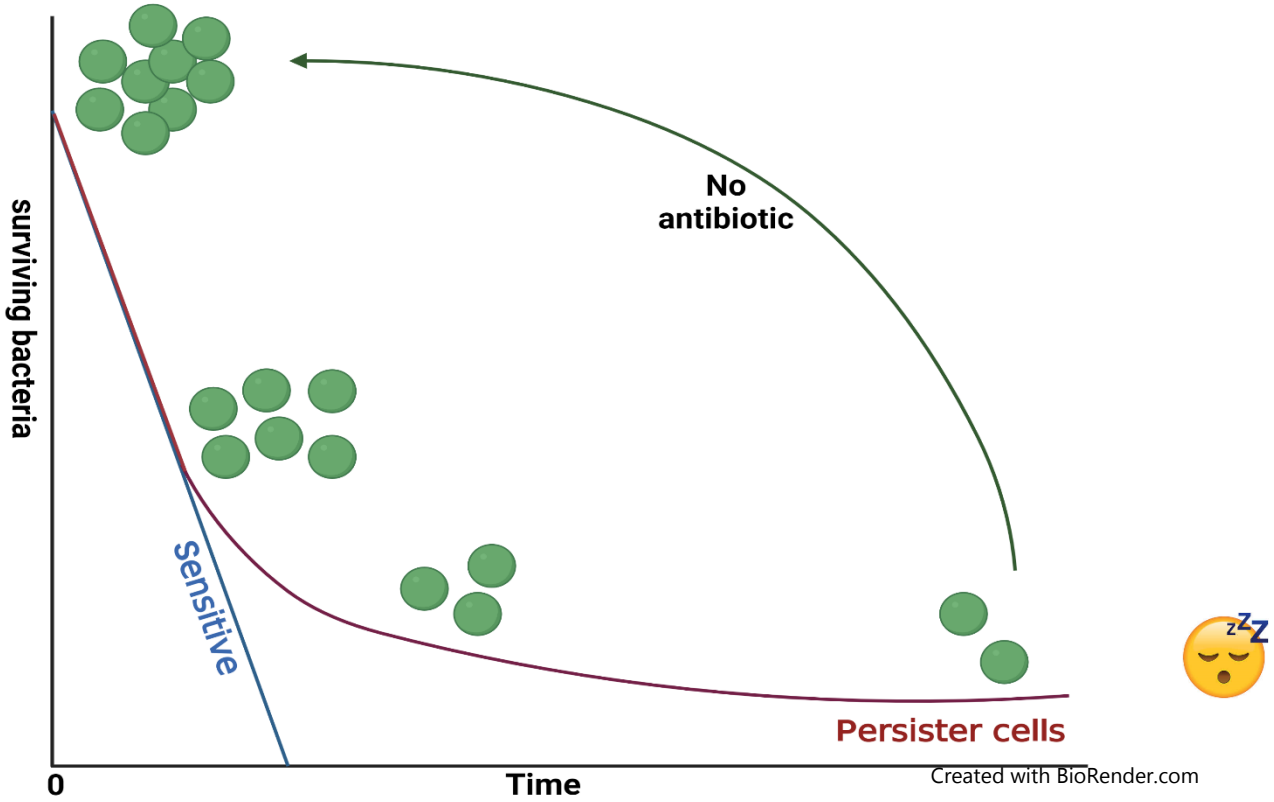
PERSISTER CELLS

Problem : Sensitive bakterier kan overleve antibiotika behandling
0.05 – 2% af en bakterie population danner persister celler
persister cells laver mere biofilm

= Tilbagevendende sygdom ?



Persister cells (P1-P9) laver mere biofilm



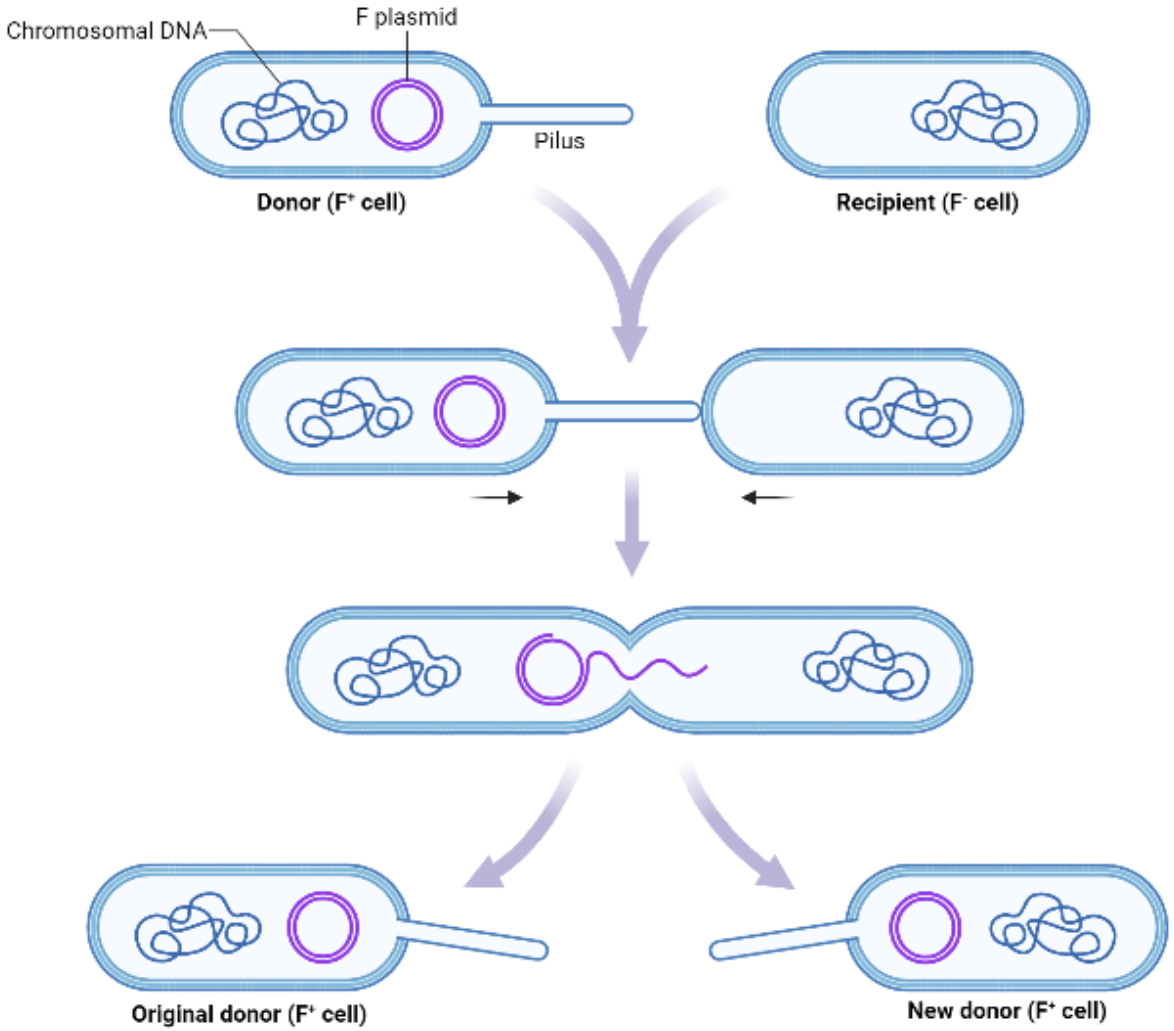
Perspektiv: forståelse fremmer mulighed for bekæmpelse, identifikation af nye targets

Metoder : feks. Killing assay, MIC, vækst, biofilm, mikroskopi, genetisk modifikation laboratorie-stammer, kliniske isolater

Opstartsdato: fleksibel

ANTIBIOTIKA-INDUCERET KONJUGATION

Line Elnif Thomsen
(leth@sund.ku.dk)



Problem: Horizontal gen-overførsel medfører spredning af gener, herunder antibiotika-resistens og virulens gener. Antibiotika-behandling kan øge frekvensen af spredning

Formål: Forstå mekansimerne bag problemet

Perspektiv: forståelse fremmer mulighed for identifikation af nye targets og dermed fremtidig forhindring af øget gen-overførsel

Metoder: feks. Konjugations-forsøg, MIC, vækst, genetisk modifikation, Laboratorie-stammer, kliniske isolater, konjugation mellem forskellige species

Eksempel på et masterprojekt i Kenya

Hvis du er interesseret i et projekt inden for AMR, fødevaresikkerhed, zoonose OG forskning i et andet land ...kontakt mig:

Arshnee Moodley
Joint appointee between KU and ILRI (Nairobi, Kenya)
asm@sund.ku.dk

- Nanna og Rikke er lige nu i Kenya
- Deres projekt handler om mastitis og pilottestning af *point of cow* i et lavt ressourcemiljø for at hjælpe med beslutning om antibiotikabehandling

Fjerkræsygdomme

Jens Peter Christensen, jpch@sund.ku.dk
Ida Thøfner, icnt@sund.ku.dk

KØBENHAVNS UNIVERSITET

Kyllinger af racen Ross 308 har en daglig
tilvækst på 63 gram og når slagtevægt
På 33 dage

Kyllinger af racen Ranger gold har en daglig tilvækst på 46 gram og
lever i 49 dage.

Fjerkræsygdomme (kontakt: Jens P. Christensen: jpch@sund.ku.dk)

Dødsårsager og velfærdskompromitterende tilstande hos langsomtvoksende slagtekyllinger

Formål:

- Projektet vil kortlægge forekomsten af velkendte vækstrelaterede lidelser såsom ascites, sudden death syndrome og benproblemer i langsomtvoksende slagtekyllinger og sammenligne medforekomsten i konventionelle kyllinger. Andre velfærdsrelaterede lidelser vil også indgå i undersøgelsen.
- Der mangler solide data mht disse forhold og for at kunne dokumentere at langsomtvoksende slagtekyllinger har bedre velfærd er det nødvendigt med sådanne undersøgelser i forhold til beslutninger i forhold til den fremtidige produktion.

Metoder og opgaver:

- Opgaverne vil primært bestå i at udføre obduktioner af begge typer af slagtekyllinger samt lav bakteriologiske undersøgelser på indikation. Selve projektet er stort set færdigdesignet.
- Projektet er del af et PhD projekt og vil blive udført i samarbejde med den PhD studerende og vejledere (Ida Thøfner & Jens Peter Christensen)

Opstartsdato: Fleksibel

Brystbensfraktur hos æglæggere – et globalt velfærdsproblem!
Vil du være med at reducere forekomsten?

Ida Thøfner
icnt@sund.ku.dk

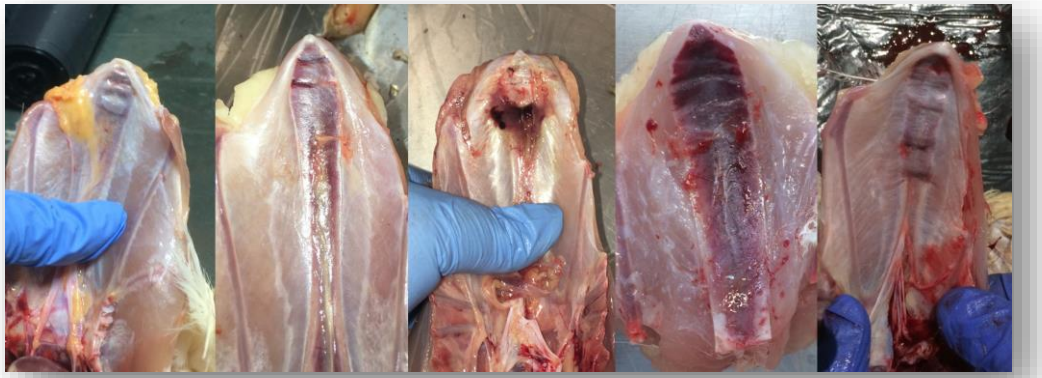
Titel: Effekt af forsinket kønsmodenhed på forekomst af brystbensbrud hos kommercielle æglæggere

Formål: Projektet vil undersøge hvordan planlagt udsættelse af alder ved ægstart, foderplaner og kropsvægt påvirker forekomsten af brystbensbrud.

Hypotesen er at vi kan reducere forekomsten 12%/uge forsinket ægstart. Vi har tidligere identificeret alder ved ægstart og tung kropsvægt som risikofaktorer for udvikling af brystbensbrud. Dem skal vi nu afprøve videnskabeligt med henblik på at udarbejde et sæt anbefalinger til fremtidig brug i produktionen.

Metoder og opgaver: Projektet er meget praktisk og centreret om æglæggere, der hhv. har normal og forsinket ægstart. Dyrene undersøges regelmæssigt vha bl.a. røntgen, hormonanalyser af æg og serum. Selve hønseforsøget og prøveudtagelse/analyse er stort set færdigdesignet.
Dataanalyse afhænger lidt af fokus for det enkelte speciale (eksempler nedenfor)

- Radiologisk evaluering og udvikling af automatisk billedanalyse (og måske prediktion af brudrisiko??)
- Hormonel (østrogen og/eller cortisol) evalering i både æg og blod. Undersøgelse af østrogen/cortisol i æg som noninvasiv markør for brudrisiko



Projektet er en del af et stort forskningsprojekt (2023-2025) med Ida Thøfner som projektleder. Medvejledere afhænger af det enkelte speciale (Jens Peter Christensen, Datalogisk institut, Radiologer, Centrallab, Epidemiology mfl.)

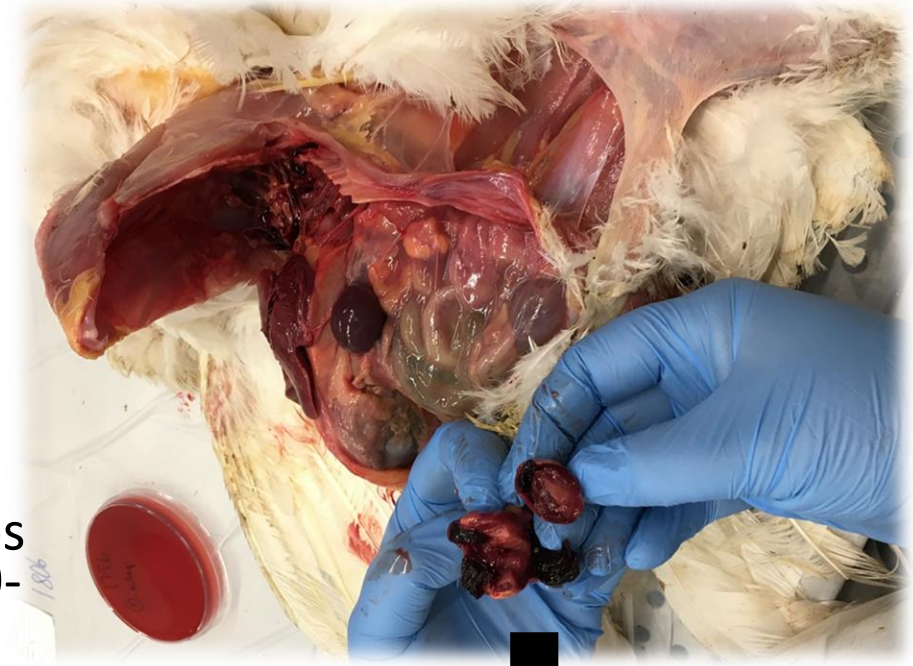
Opstartsdato: Fleksibel fra nu

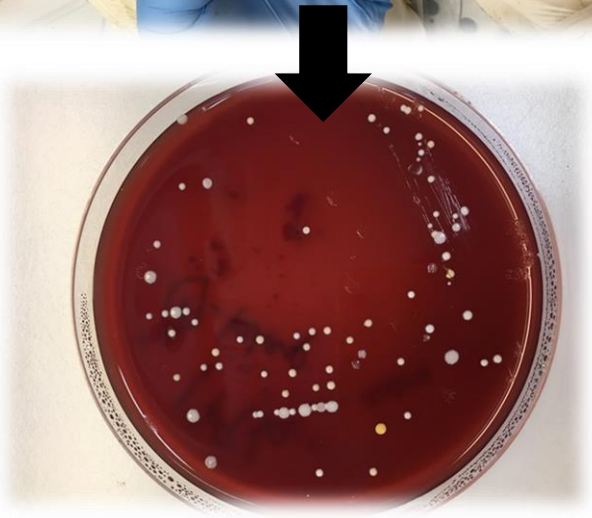
Ida Thøfner
icnt@sund.ku.dk

Vil du undersøge et nyt patogen hos æglæggere?

Staphylococcus equorum

- En bakterie, der ikke tidligere er beskrevet som sygdomsfremkaldende hos æglæggere
  - Potentiel zoonose (Novakova et al 2006)
  - Påvist som mastitis-patogen (Calcutt et al 2013)
  - Påvist i luften i kyllingestalde (Oppliger et al 2008)
  - 3 % af *Staphylococcus spp* isolater fra læsioner hos slagtekyllinger og kalkuner i Polen i 2016-2017 (Pyzik et al 2019)
- Isoleret i renkultur og blandingskultur fra forskellige læsioner hos konsumægshøner fra danske skrabe- og økologiske flokke i 2020-2022
- Vær med til at karakterisere bakterien, undersøge dens epidemiologi og sammenhænge med patologiske og produktionsdata fra danske konsumægshøner





Metoder og opgaver: Projektet er meget praktisk og centreret omkring laboratoriearbejde i forbindelse med fæno- og genotypisk karakteristik af bakteriestammer. Der forventes også sammenholdelse af patologifund knyttet til de enkelte isolater

Opstartsdato: Fleksibel fra nu

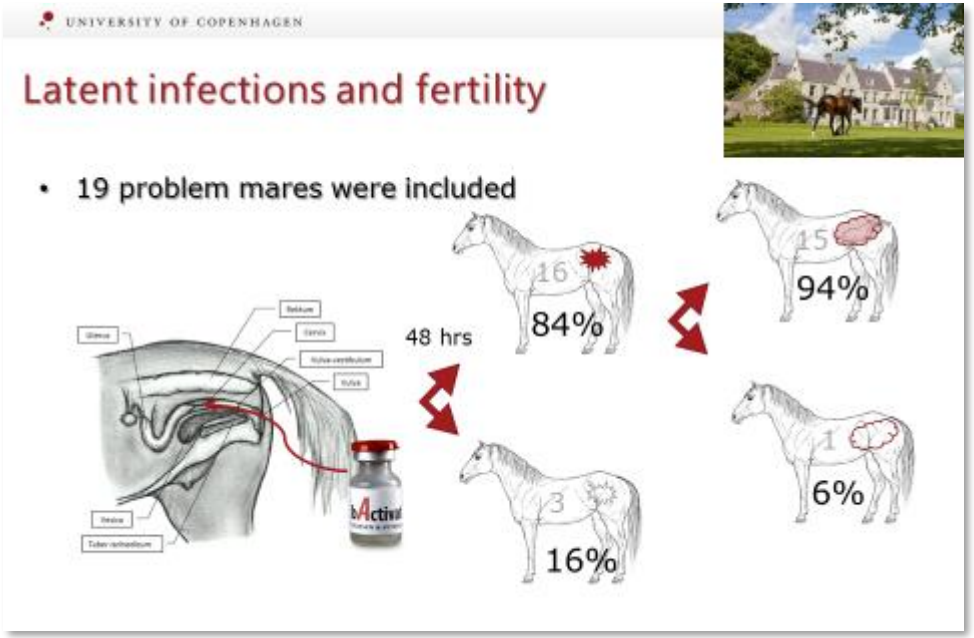
Preventive Veterinary Microbiology

Anders Miki Bojesen
Kasper Rømer Villumsen
Louise Ladefoged Poulsen
Ida Thøfner

Host – Microbe interactions

Professor Anders Miki Bojes
miki@sund.ku.dk

Equine endometritis



Oral microbiota of exotics

Probiotika i akvakultur

Mulighed for deltagelse i aktivt projekt – Udvikling af probiotika til brug i ørredopdræt

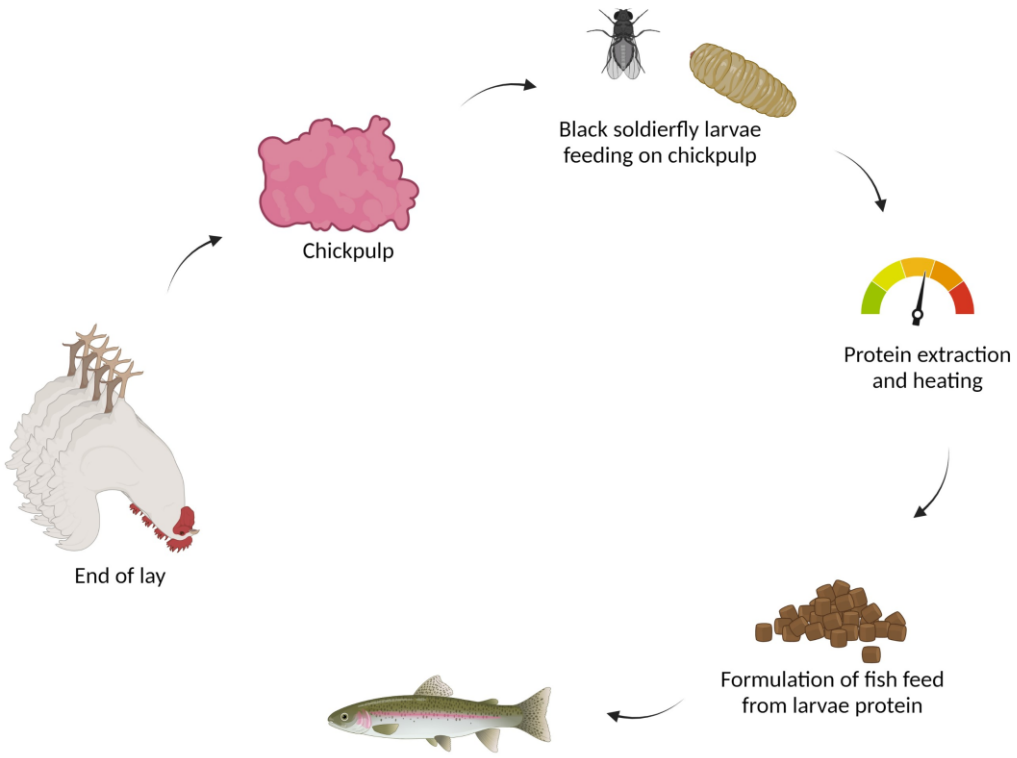
- Tag del i løsningsorienteret forskningsprojekt med virksomhedspartnere
- Få indsigt i vejen fra problem, gennem projekt og mod implementering
- Kobling mellem teori og praksis
- Analyse af eksisterende og nye data fra projektet
- Mulighed for deltagelse i laboratoriearbejde

Hvis du/I er klar på at gå lidt mod strømmen, så giv lyd på:

krv@sund.ku.dk

Lad os snakke om mulighederne. Jeg giver en kop kaffe ☺

Risici ved anvendelse af insektmel til dyrefoder



Baggrund:

Cirkulær udnyttelse af ressourcer er vigtig i en bæredygtig produktion.

Sort soldaterflue larver (*Hermeticus illucens*) kan ernæres ved mange forskellige substrater, f.eks. udtjente æglægger høner.

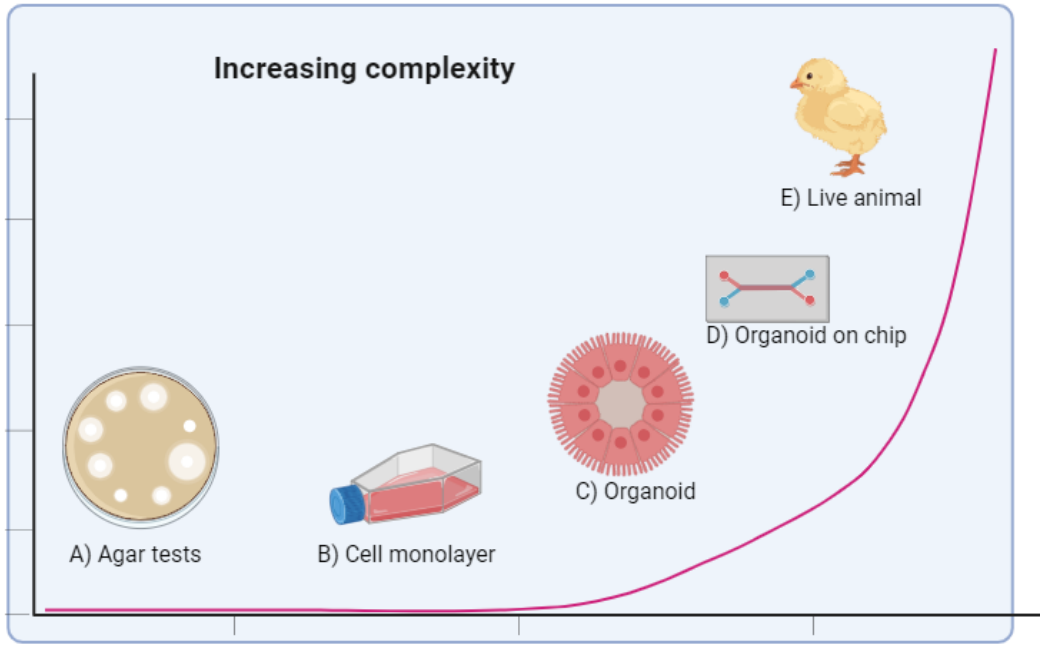
Forskningsspørgsmål:

Hvad er risikoen for transmission af patogener fra udtjente æglæggere til insektmel fremstillet af *Hermeticus illucens.*

- ***Kom med på forskningsprojektet som starter januar 2024☺***

Kontakt: Lektor, Louise Ladefoged Poulsen, Ladefog@sund.ku.dk

Alternativer til dyreforsøg



Baggrund:

Gode alternativer til dyreforsøg er vigtige for at efterkomme 3R-princippet (*Reduction, refinement, replacement*) indenfor dyreforsøg.

Forskningsspørgsmål:

Hvilke metoder er til rådighed?

Hvilke fordele og begrænsninger er der ved metoderne.

Kontakt Louise på Ladefog@sund.ku.dk og lad os snakke om mulighederne og dine interesser ☺

Kontakt: Lektor, Louise Ladefoged Poulsen, Ladefog@sund.ku.dk

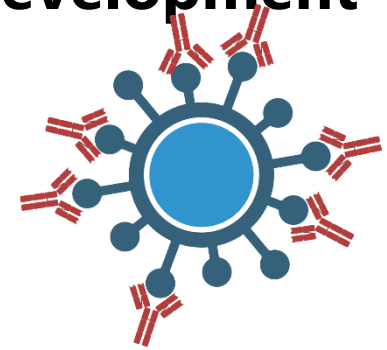
The **V**eterinary **E**nzootic and **Z**oonotic viruses group

We research:

- Mechanisms underlying viral disease
- Host-pathogen interactions
- Virus evolution and adaptation

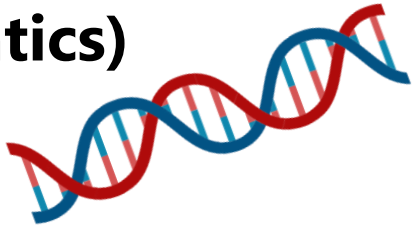
Available projects at **VEZ** for the curious and motivated:

Antibody neutralization method development



1. Influenza D virus
2. Newcastle disease
3. Porcine Rotavirus A

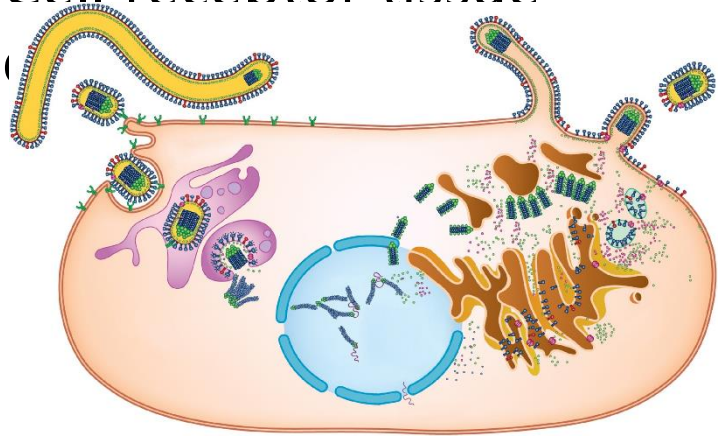
Viral prevalence in Danish pigs (sequencing & bioinformatics)



4. Influenza D virus
5. Porcine Respirovirus and Orthopneumovirus

Influenza A viral mechanisms

6. Replication
7. Entry into the host cell
8. Host cell immunomodulation
9. Cell receptor tissue



Hutchinson et al., 2018 DOI: 10.1016/j.tim.2018.05.013

1. Establishment of an influenza D virus antibody test

Influenza D virus is a relatively new virus discovered in the same virus family as influenza A virus. Influenza D virus was recently found in Denmark for the first time during an investigation into pathogens infecting calves from 100 Danish cattle herds.

The prevalence of influenza D virus in the Danish calf population is unknown but **can be estimated by detecting specific antibodies** generated by previous exposure to the virus. Therefore, the aim of this project is to **establish an antibody analysis (ELISA test)**, which is specific for antibodies against influenza D virus.

Contact us: Professor Lars Erik Larsen (lael@sund.ku.dk) or Postdoc Nicole B. Goecke (nbgo@sund.ku.dk)

2. Development of Newcastle disease neutralization assay

Newcastle disease (NCD) is a highly infectious virus affecting poultry and other birds but causes only mild flu-like symptoms in humans. However, the requirement to work with NCD in a biosafety level (BSL)-3 facility makes serotyping new variants of the virus cumbersome.

In this project, we will **develop a NCD antibody test based on non-infectious virus-like particles** that only carry NCD surface proteins without the genome, making these particles safe to handle outside a BSL facility. You will create virus-like particles pseudotyped with NCD surface proteins **using cells and demonstrate binding to cellular receptors using western blot assay and flow cytometry**.

Contact us: Professor Lars Erik Larsen (lael@sund.ku.dk) or Postdoc Denis Selnihhin (denis@sund.ku.dk)

3. Culturing of Porcine Rotavirus A and cross neutralization test against the most frequently detected RVA genotypes

The level of **cross protection provided by the Rotavirus A virus (RVA) vaccine** strain towards commonly found RVA genotypes in Danish pigs requires investigation.

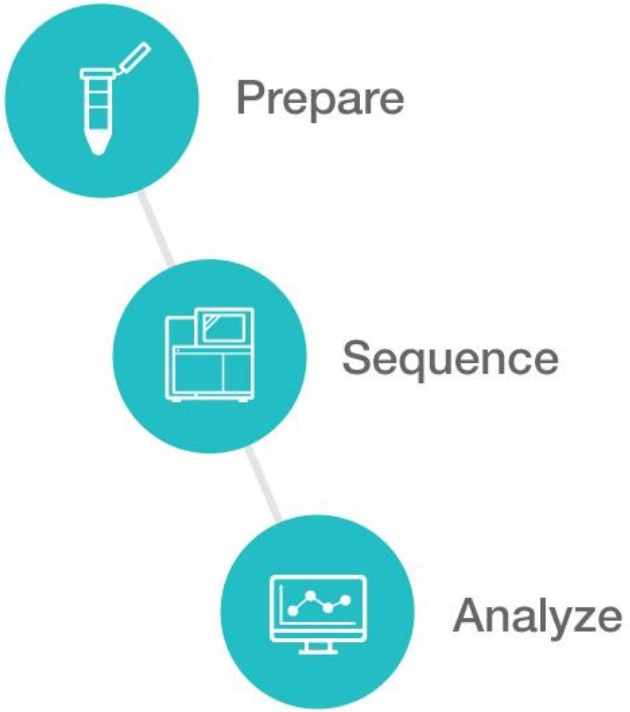
This project aims to formulate a laboratory protocol to **culture some of the most commonly found and genetically diverse RVA genotypes** in Denmark. Monospecific polyclonal serum will be isolated, purified and tested in *in vitro* neutralization assays against the panel of cultured RVA genotypes to **assess vaccine efficacy**.

Contact us: Professor Lars Erik Larsen (lael@sund.ku.dk) or PhD student Kasper Pedersen (kasper.pedersen@sund.ku.dk)

4. Influenza D virus in Danish pigs

Influenza D virus is a relatively new virus discovered in the same virus family as influenza A virus. Influenza D virus was recently found in Denmark for the first time during an investigation into pathogens infecting calves from 100 Danish cattle herds. In other countries, influenza D virus has also been detected in animal species like pigs, horses, sheep and goats.

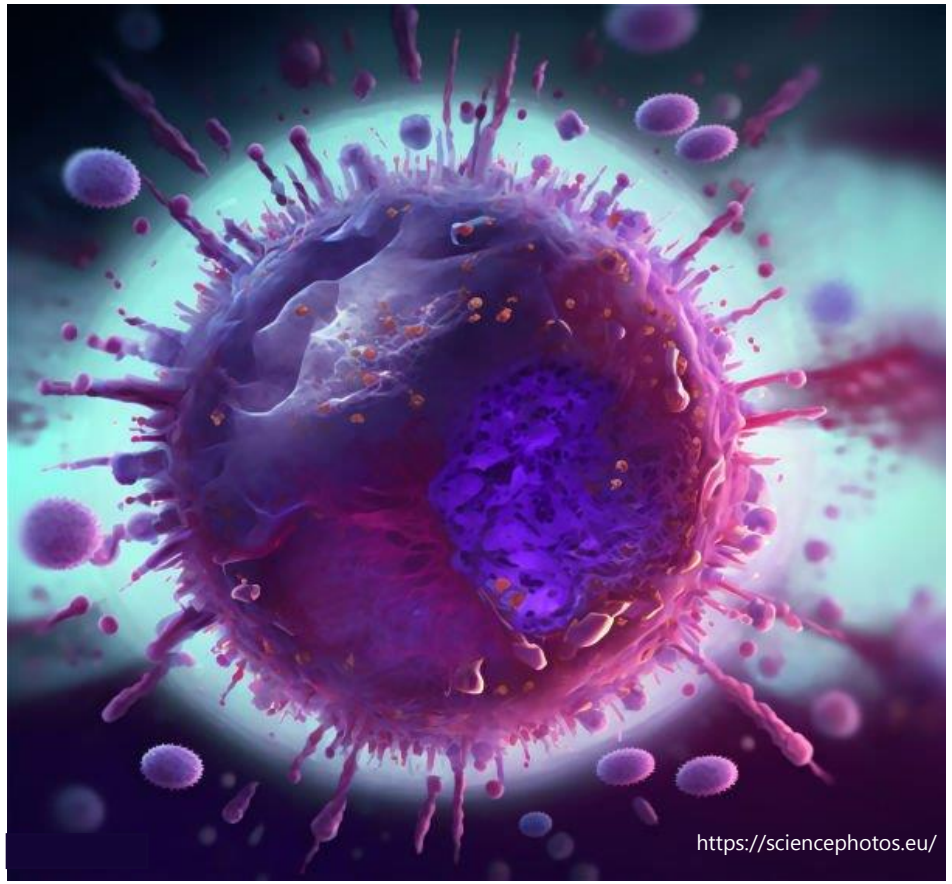
This project will investigate how widespread influenza D virus is in Danish pigs using methods like RNA extraction, PCR, next generation sequencing library preparation and bioinformatics.



solihsatrio.blogspot.com

Contact us: Professor Lars Erik Larsen (lael@sund.ku.dk) or Postdoc Nicole B. Goecke (nbgo@sund.ku.dk)

5. Prevalence and characterization of Porcine Respirovirus and Orthopneumovirus in Danish pigs



Porcine Respirovirus and Orthopneumovirus are novel pathogens detected in swine production, which cause symptoms related to respiratory disease. However, the **prevalence** of these viruses in Danish pigs is currently unknown.

This project will **assess a collection of samples from pigs with respiratory disease** for the presence of Porcine Respirovirus and/or Orthopneumovirus. Positive samples will be genetically analyzed using next generation sequencing and **bioinformatics**.

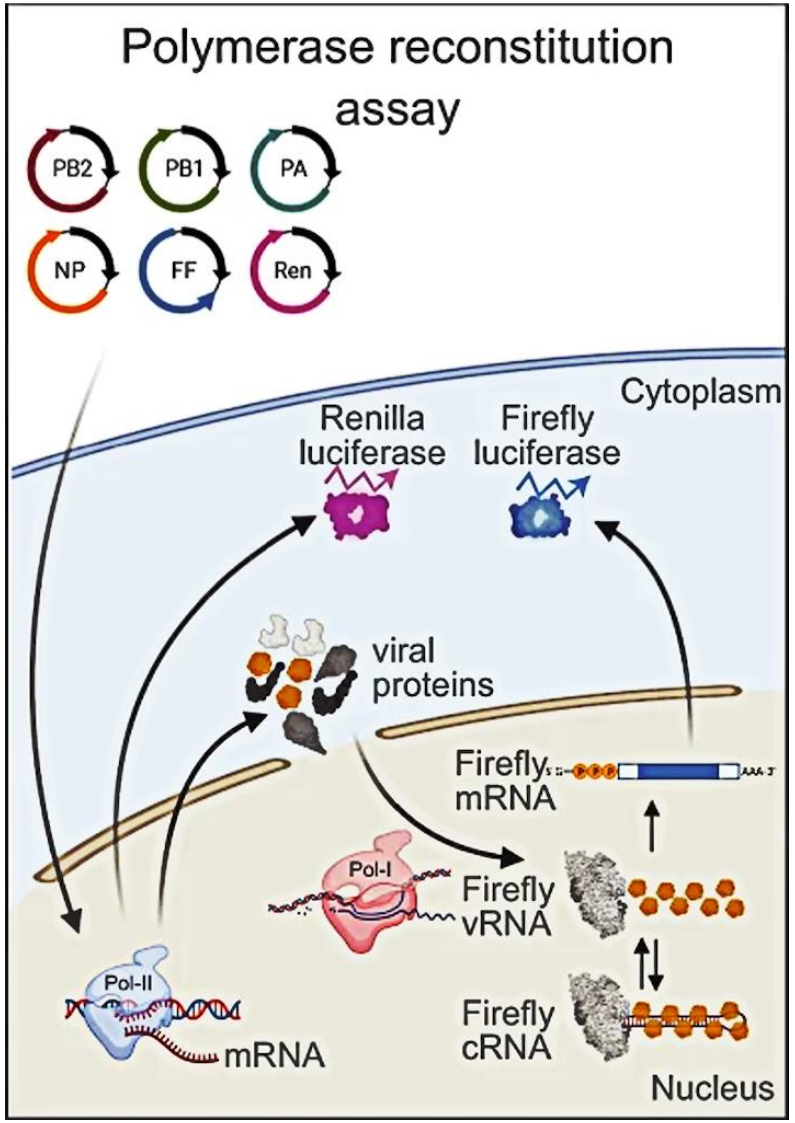
Contact us: Professor Lars Erik Larsen (lael@sund.ku.dk)

6. Influenza A virus replication

Some influenza A viruses (IAVs) circulating in pigs must acquire **mutations in the IAV polymerase** to replicate effectively in humans and become a zoonotic threat.

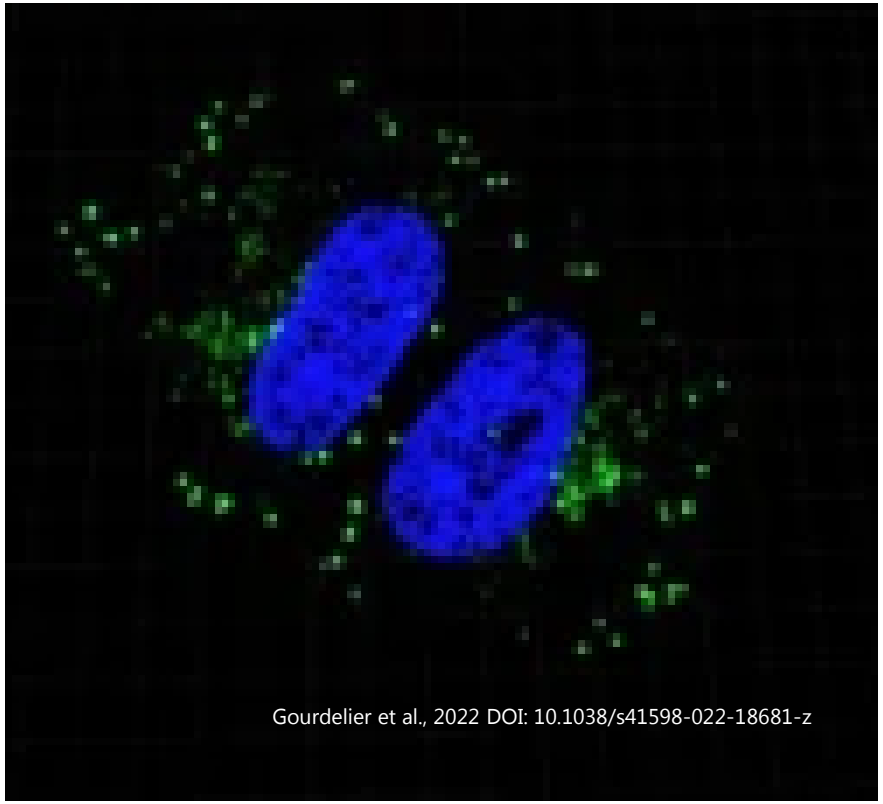
This project aims to **measure and compare the replication activity of pig-origin IAVs** in human respiratory cell lines using an established replication reporter system. The methods involve cloning, cell culturing and transfection among other viral techniques.

Contact us: Professor Lars Erik Larsen (lael@sund.ku.dk) or PhD student Sophie George (sophie.george@sund.ku.dk)



Günl et al., 2023 DOI: 10.1038/s41467-023-36389-0

7. Creation of authentic fluorescence influenza A virions for visualization of virus-host cell interactions



The initial stages of an influenza A virus infection involve **binding** to the cellular receptor, **entry** into the cell by endocytosis, **fusion** with the endosome membrane to **release** the virus genome and **transport** of the ribonucleoprotein complex into the nucleus of the host cell for replication.

This project aims to **visualize these stages by creating and biochemically analyzing authentic fluorescently tagged influenza A particles**. These particles will then be used in a state-of-the-art microscopy setup to observe the path of single virions entering the host cell.

Contact us: Professor Lars Erik Larsen (lael@sund.ku.dk) or Postdoc Denis Selnihhin (denis@sund.ku.dk)

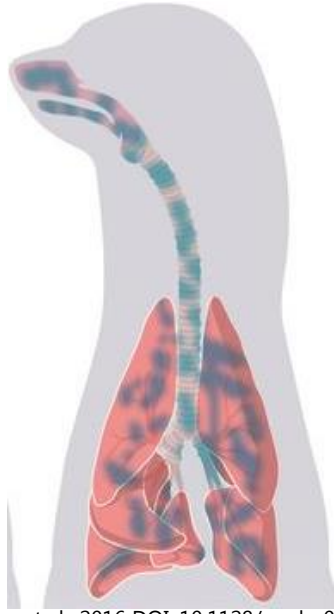
8. Molecular characterization of the interferon-antagonistic non-structural protein 1 (NS1) of zoonotic influenza A viruses

The interferon-driven innate immune response is one of the first lines of defense against infections with influenza A viruses (IAVs). Despite this potent antiviral barrier, IAVs successfully infect humans by constantly evolving to surmount the innate immune system. **The non-structural protein 1 (NS1)** of IAVs has previously been described as an interferon antagonist dampening the interferon pathway.

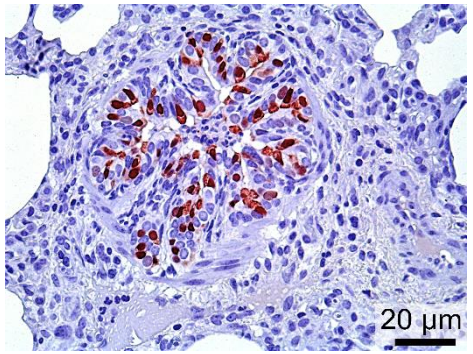
Recent zoonotic pig-to-human spillover infections in Denmark were caused by IAV strains carrying peculiar NS1 proteins that might lead to an enhanced zoonotic potential of these viruses. **The goal of this project is to analyze the interferon-antagonistic potential of these NS1 proteins *in vitro*.** Techniques will include, but are not limited to, molecular cloning, mutational analysis, cell culture, and reporter assays.

Contact us: Professor Lars Erik Larsen (lael@sund.ku.dk) or Postdoc Philipp P. Petric (ppp@sund.ku.dk)

9. Diversity in tropism among influenza A virus strains and characterization of receptor distribution in ferrets



Belser et al., 2016 DOI: 10.1128/mmbr.00022-16



Influenza A virus (IAV) causes respiratory disease in a variety of animal species and humans. Some strains of IAV can transmit between humans and pigs, while others cannot. The reason for this is still unknown. **The ferret transmission model is often used to study the pandemic potential of IAVs as human seasonal IAVs transmit efficiently between the ferrets and avian and swine IAVs are poorly transmitted**. IAV enters the host cell by receptor-mediated endocytosis. The IAV host receptors are sialic acids (SA) linked to a galactose (gal) in either an α2,3 or α2,6 linkage (SA-Gal-α2,3 or SA-Gal-α2,6). Avian IAVs prefer the SA-Gal-α2,3 receptors, whereas human and swine generally prefer SA-Gal-α2,6 receptors. These IAV receptors can be visualized within host tissues through **lectin histochemistry**.

The objective of this project is to comprehensively analyze tissue samples obtained from ferrets infected with diverse IAV strains, including ones adapted to pigs and humans. This analysis will primarily involve **lectin histochemistry** to map the distribution of IAV receptors and **IAV immunohistochemistry** to determine the tissue tropism of the virus.

Contact us: Professor Lars Erik Larsen (lael@sund.ku.dk) or PhD student Charlotte Kristensen (chark@sund.ku.dk)

Please enquire for an exciting MSc project!

- Professor Lars Erik Larsen lael@sund.ku.dk
- Postdoc Nicole B. Goecke nbgo@sund.ku.dk
- Postdoc Denis Selnihhin denis@sund.ku.dk
- PhD student Kasper Pedersen kasper.pedersen@sund.ku.dk
- PhD student Sophie George sophie.george@sund.ku.dk
- Postdoc Philipp P. Petric ppp@sund.ku.dk
- PhD student Charlotte Kristensen chark@sund.ku.dk