Grunnleggende lusebiologi – hva vet vi, og hva skal studeres

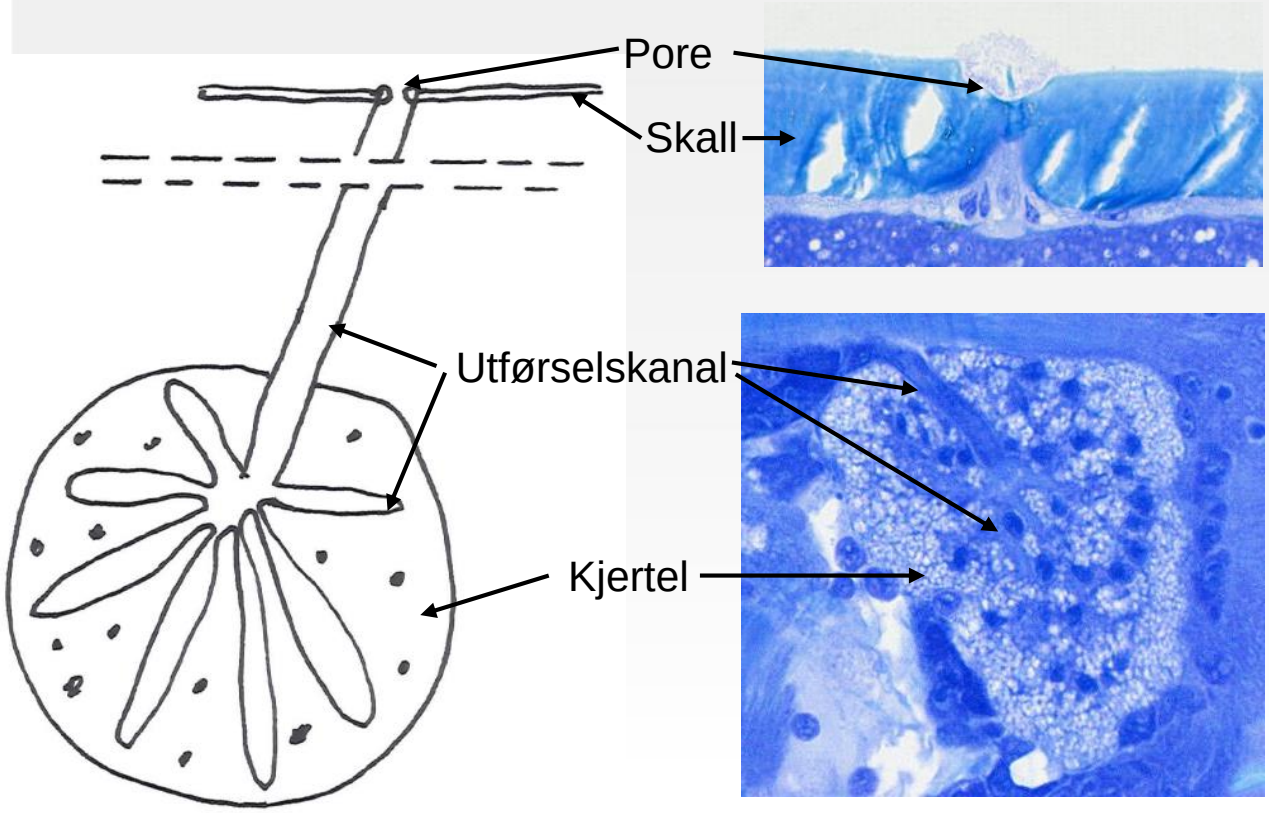
Aina-Cathrine Øvergård
Førsteamanuensis, faggruppe Fiskehelse
Fungerende leder, SLRC

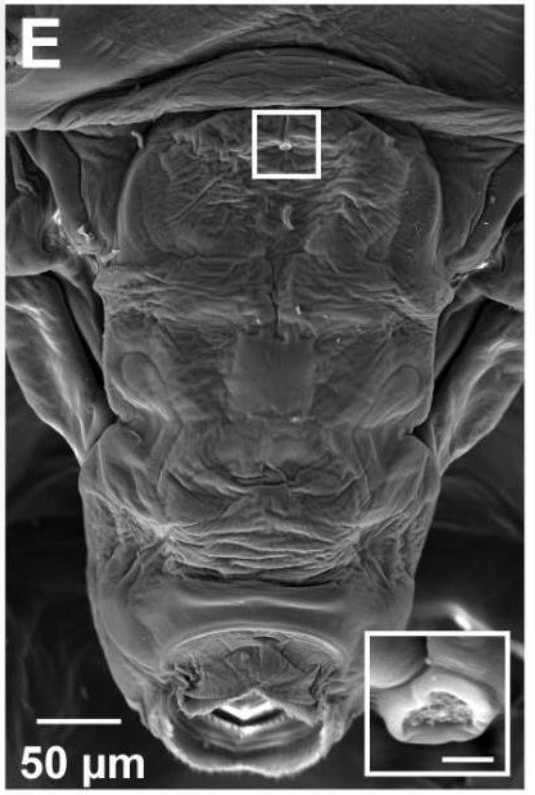
Grunnleggende lusebiologi

- **Grunnleggende lusebiologi relatert til vert-parasitt interaksjonen**
  - Lus
  - Laks
  - Hvilke kunnskapshull vil **ModuLus** forsøke å fylle

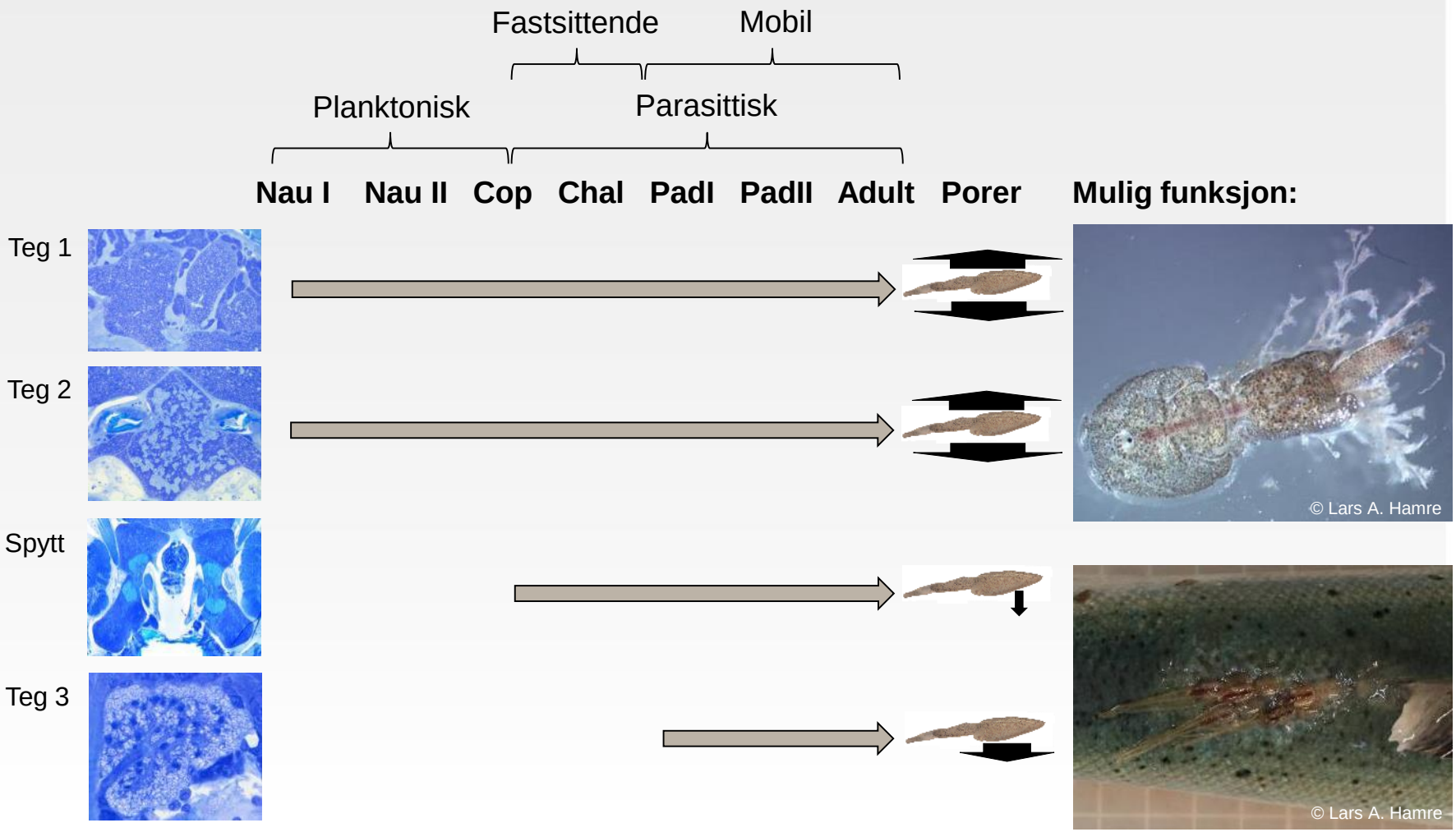
Eksokrine kjertler

- Produserer substanser som blir sekrert ut gjennom en utførselskanal





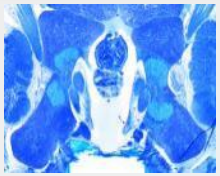
Eksokrine kjerler i lakselus

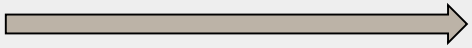


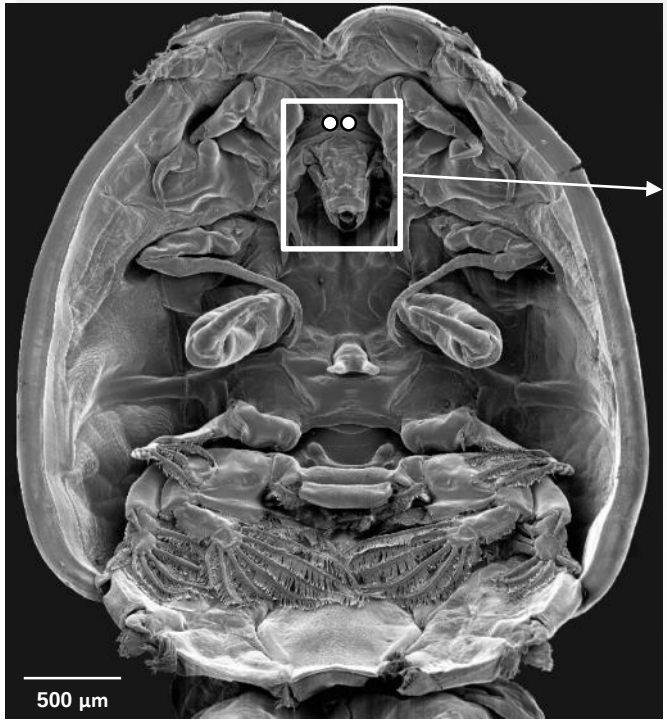
Spyttkjertelen

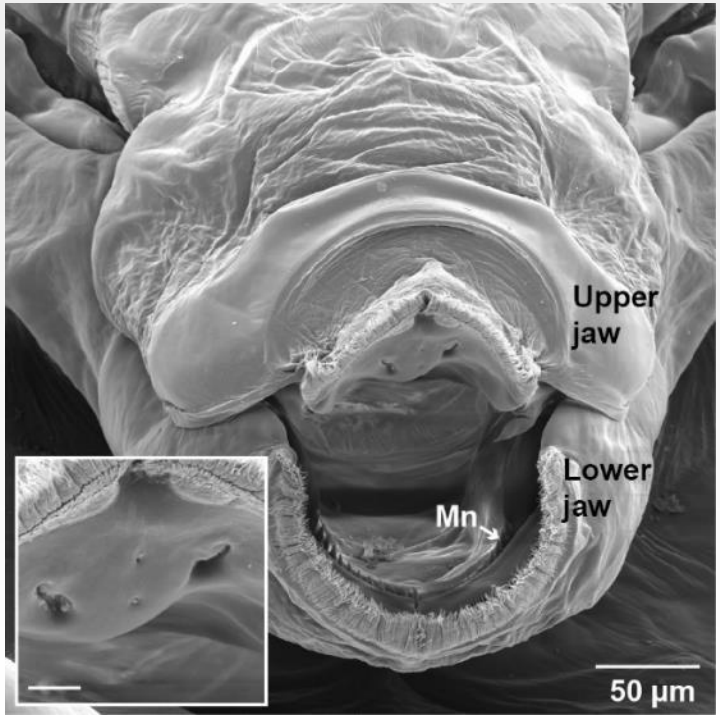
Nau I Nau II Cop Chal Padl PadII Adult Porer Mulig funksjon:

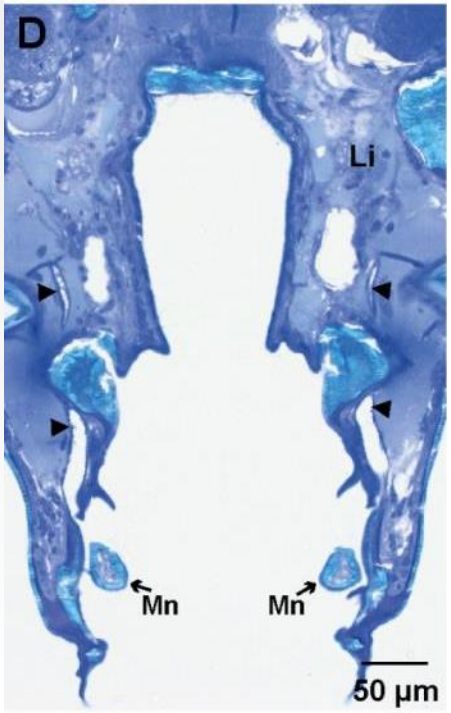
Spytt









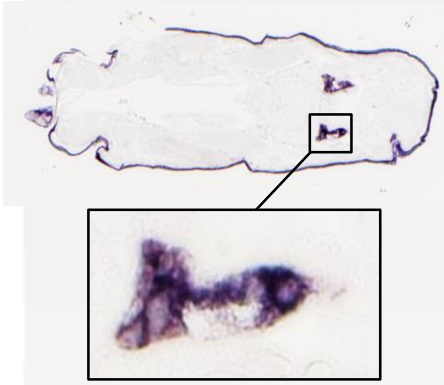


Identifisering av potensielle gen

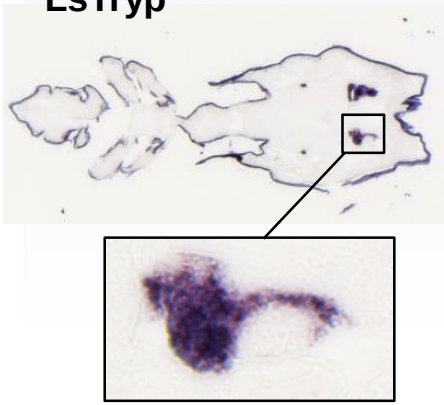
- RNAsekvensering

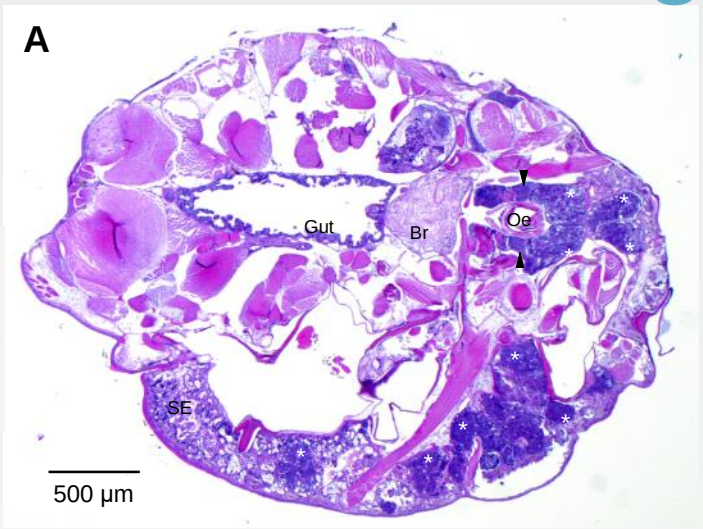
Bekrefter lokalisering

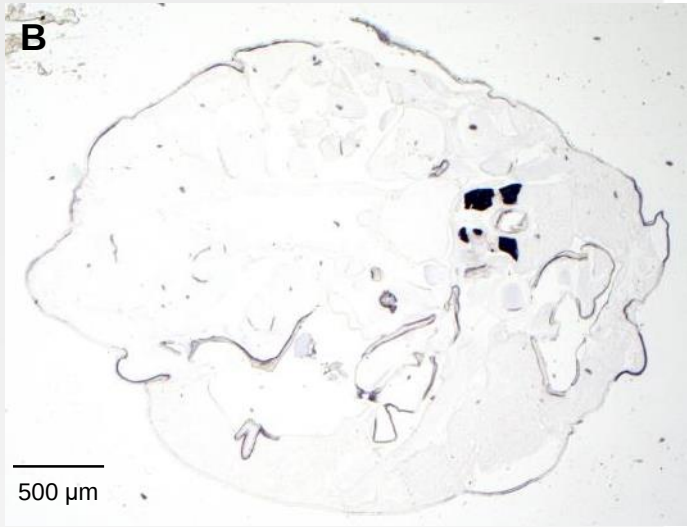
LsAst

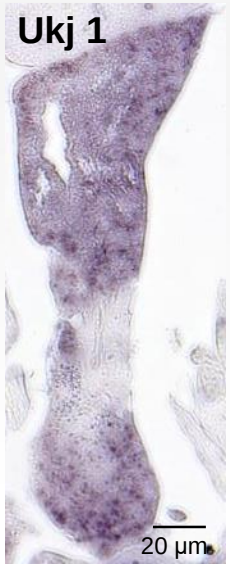


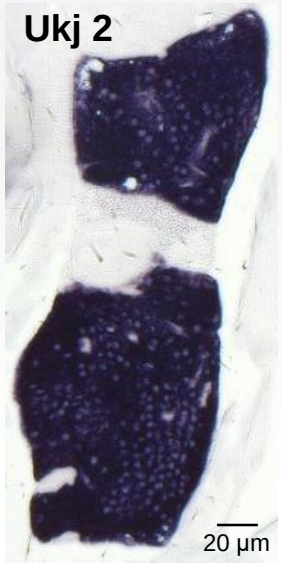
LsTryp

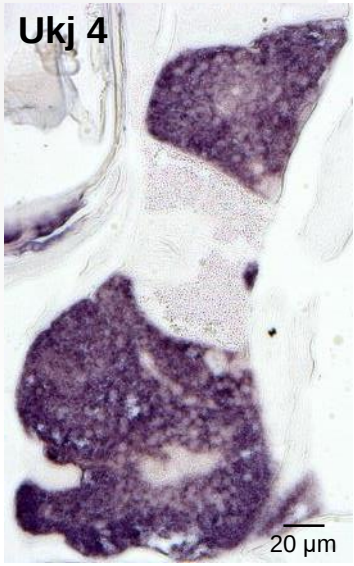




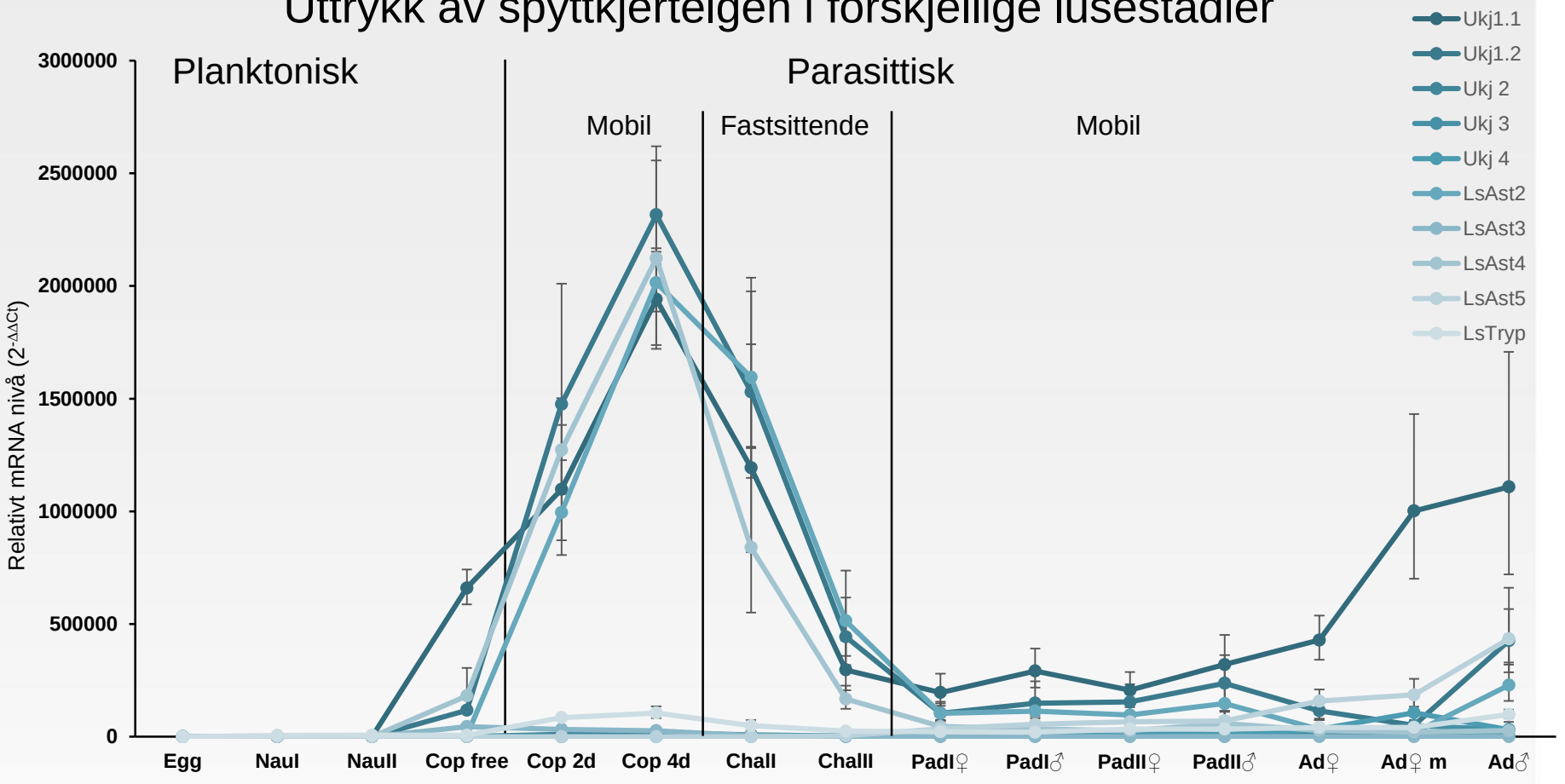




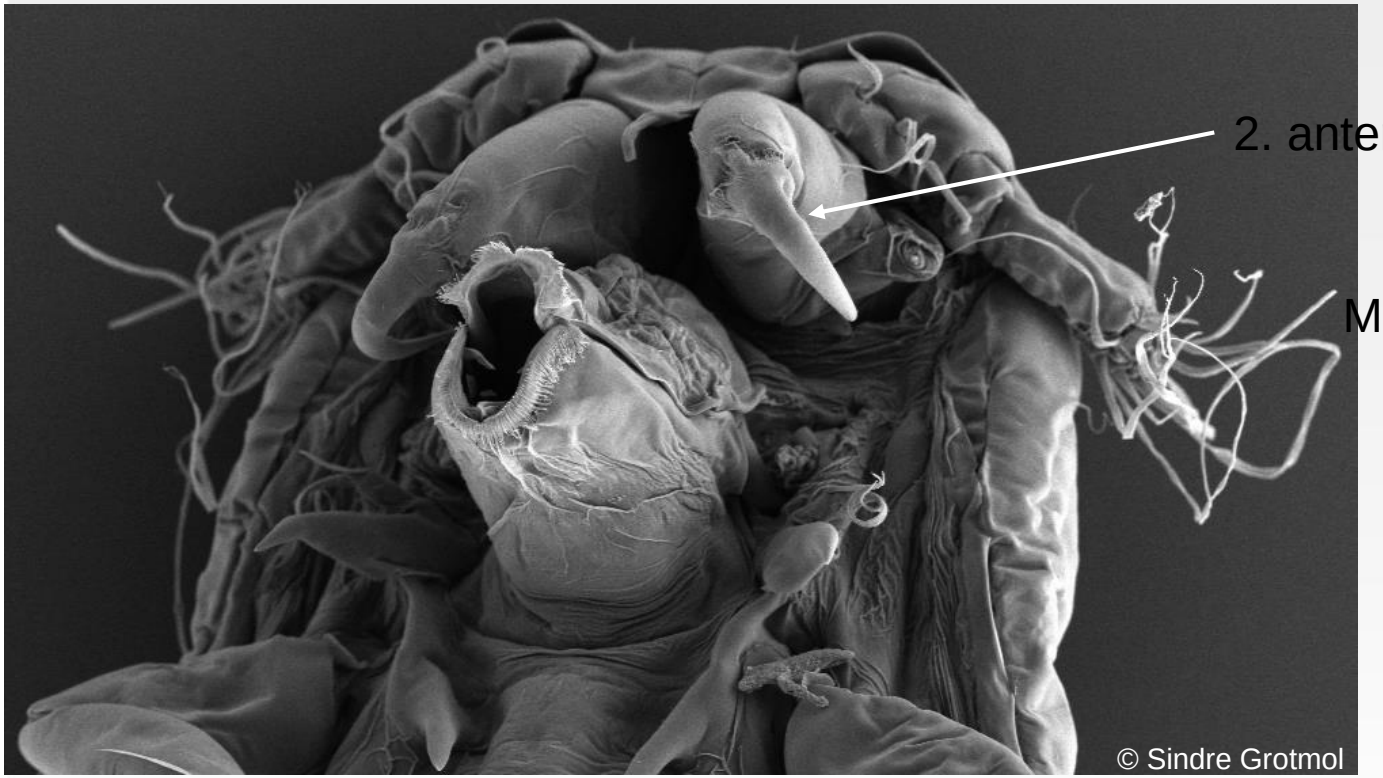




Uttrykk av spyttkjertelgen i forskjellige lusestadier



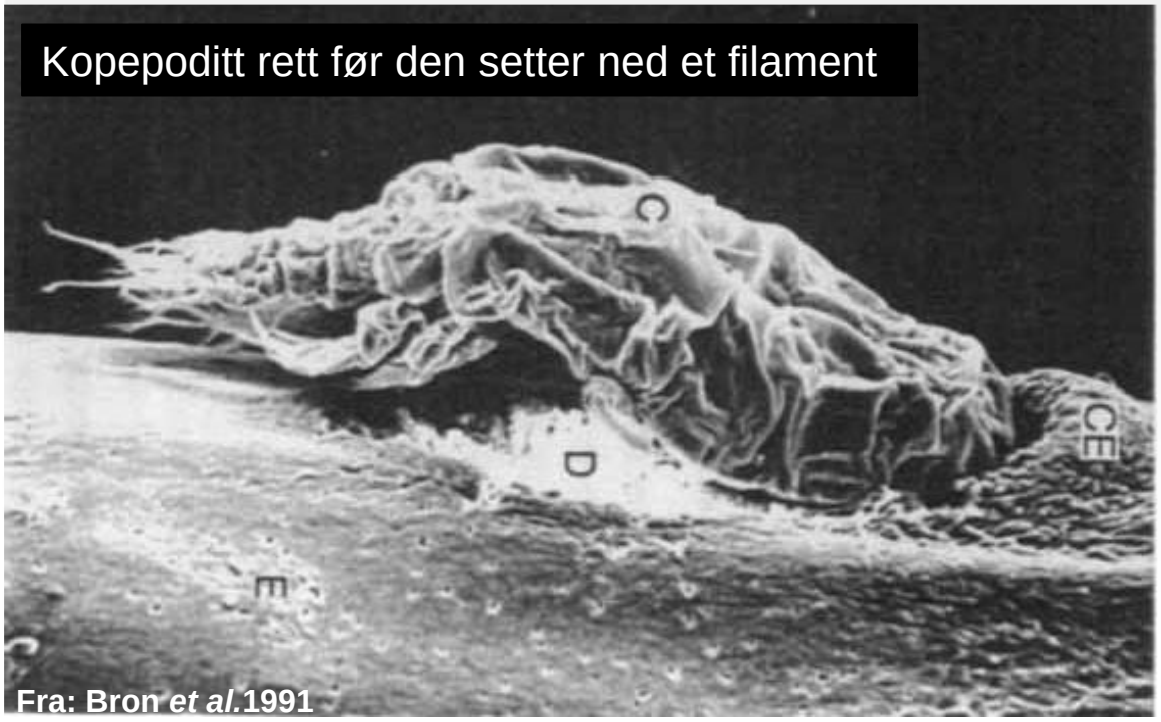
Kopepodittens etablering



Kopepodittens etablering

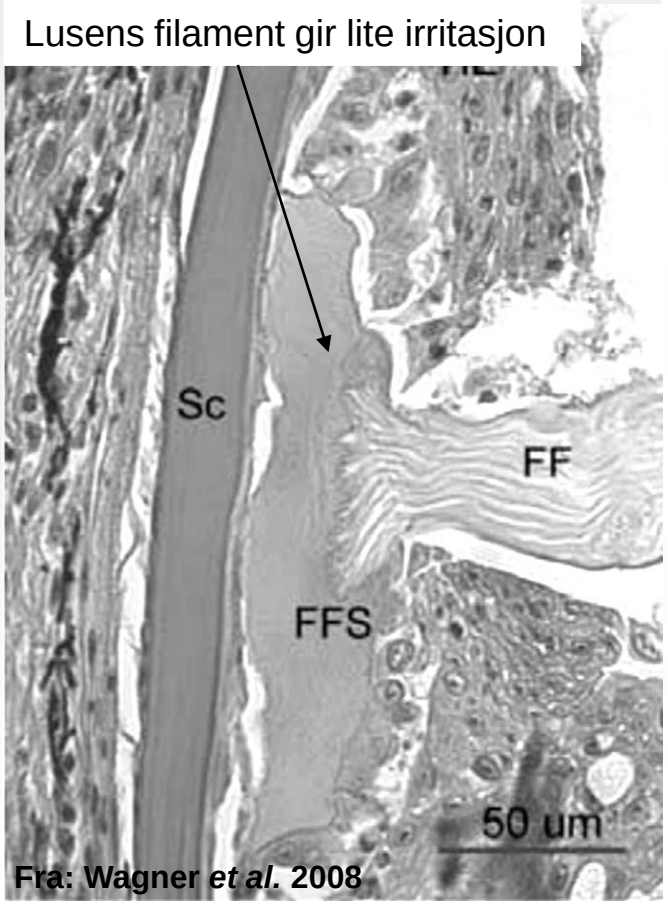
Mobil kopepoditt
- Spiser mucus/skinn
- Setter filament rett før skallskifte

Kopepoditt rett før den setter ned et filament



Fra: Bron *et al.*1991

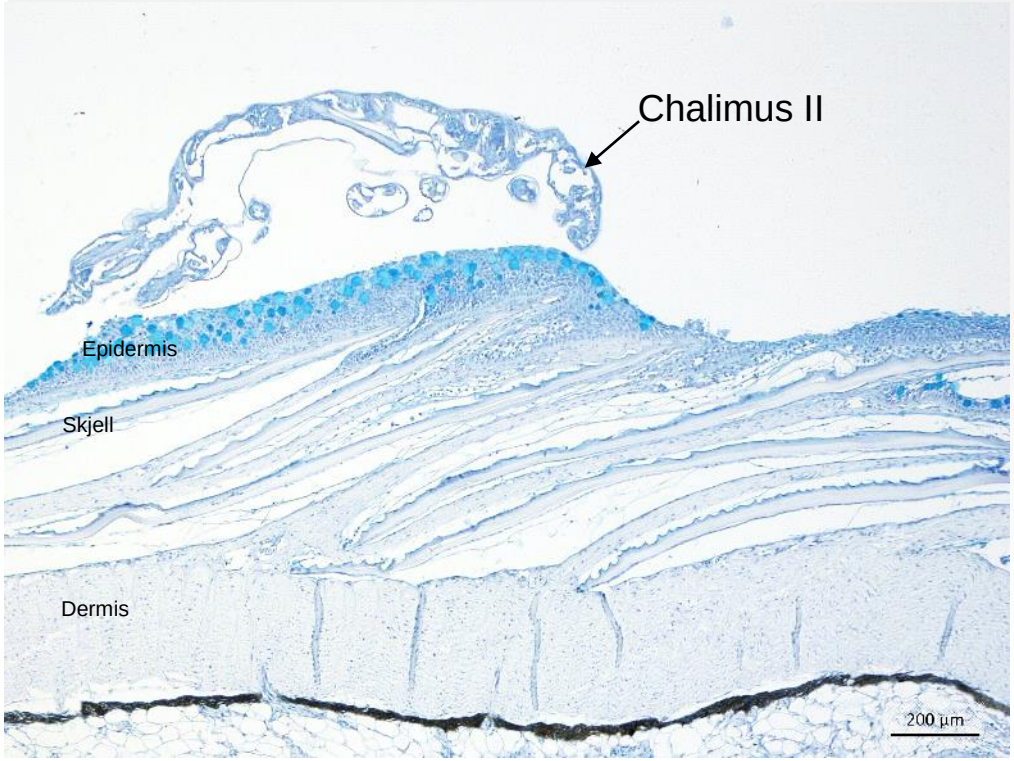
Lusens filament gir lite irritasjon

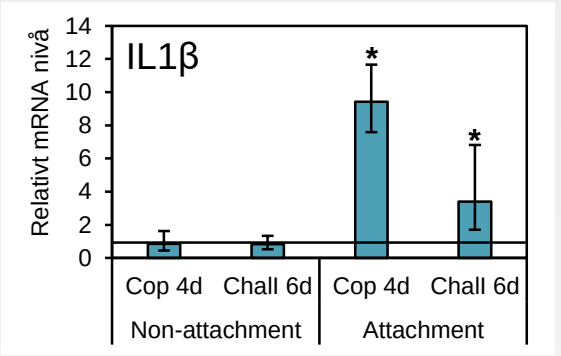


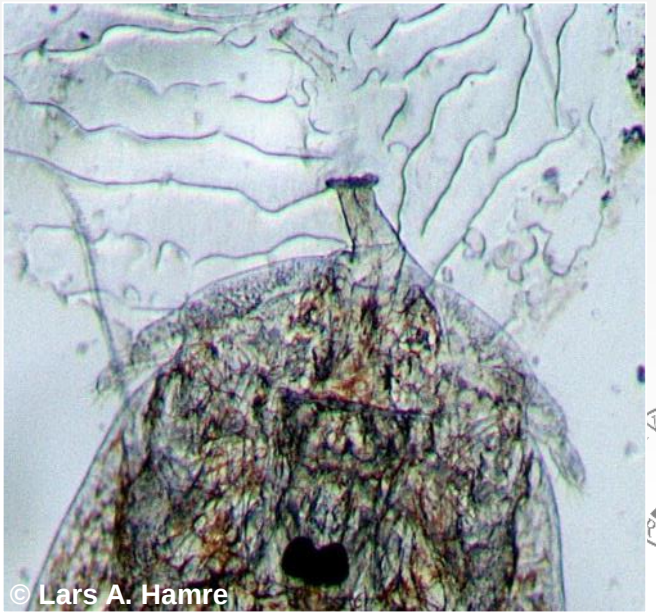
Fra: Wagner *et al.* 2008

Fastsittende stadier

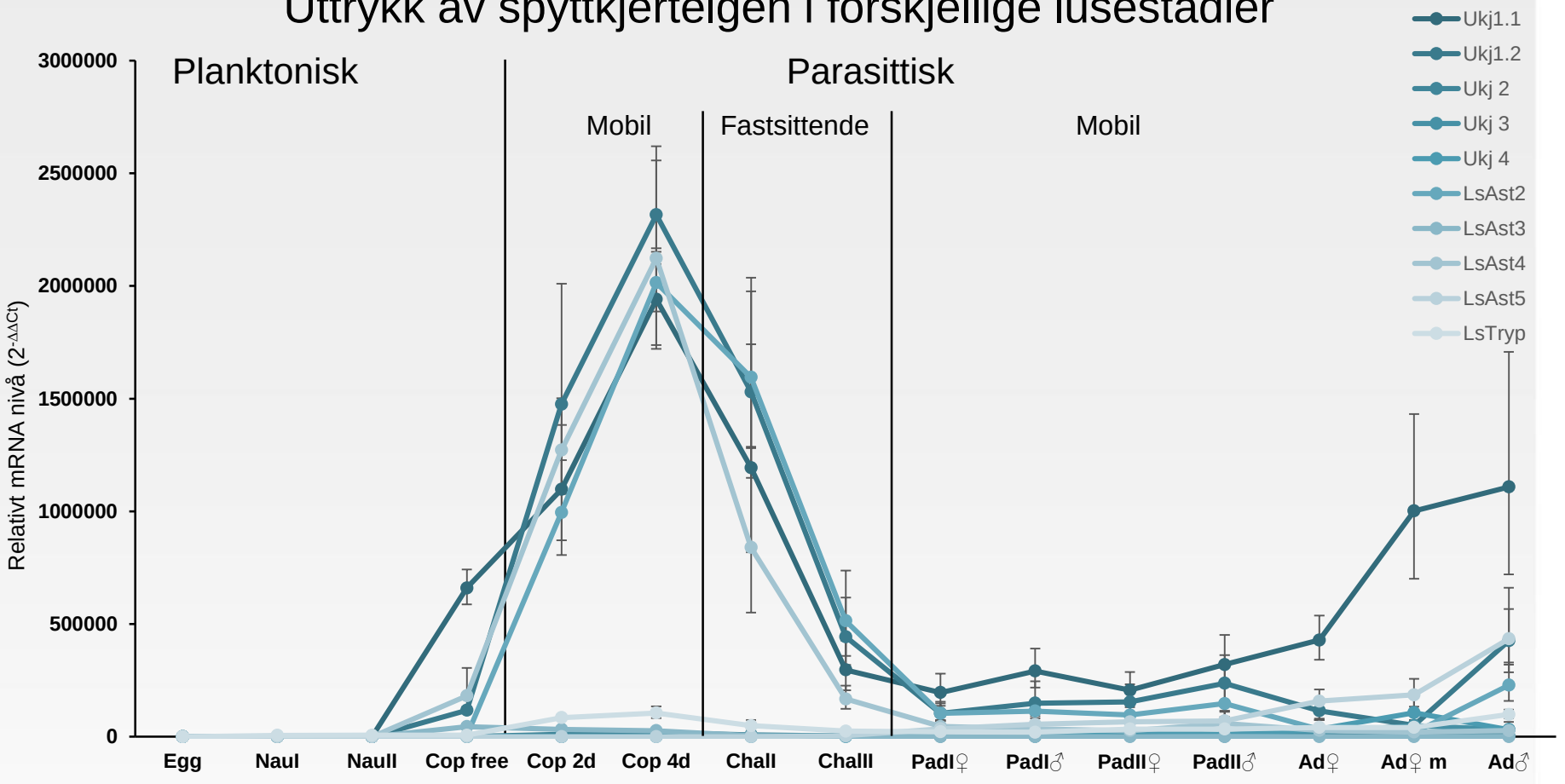
- Spiser mucus/skinn
- Avgrenset av filamentet







Uttrykk av spyttkjertelgen i forskjellige lusestadier

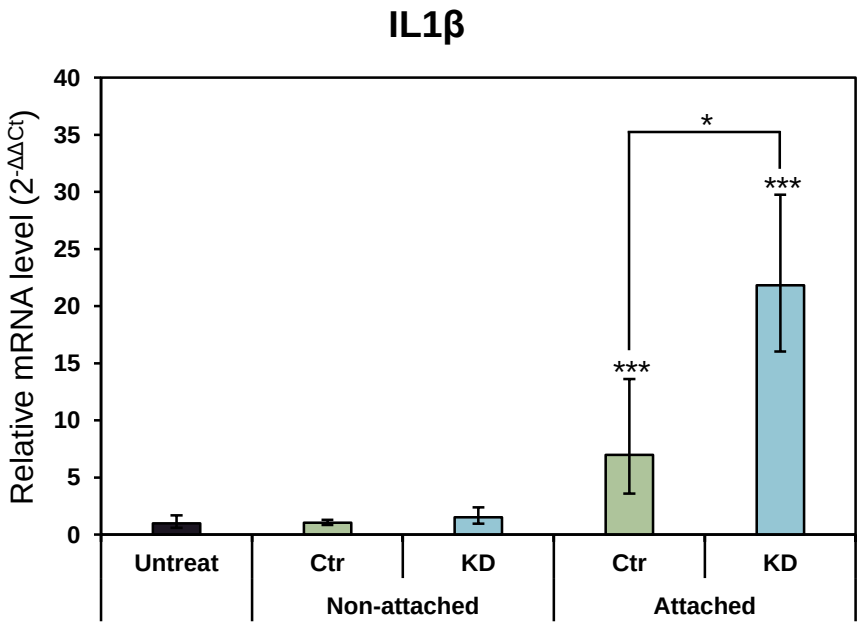


Funksjonelle studier

Ubehandlet Ctr | **Luseinfisert Ctr lus** | **Luseinfisert KD lus**

Nedregulering av spyttkjertelproteiner

Skinnprøver
- Uten lus
- Med lus



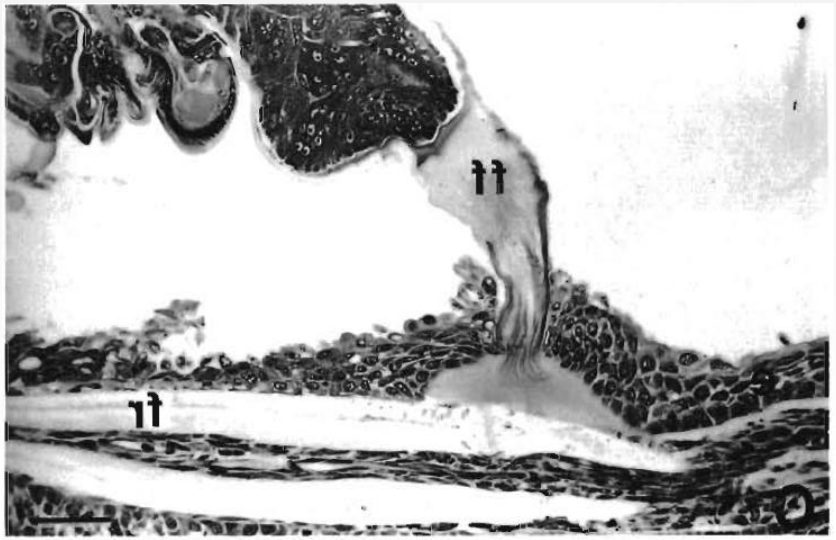
Lakselusen har flere immunmodulatoriske proteiner

Resistente salmonider

- Er de mottagelige artene dårlige på skinnresponsen?
- Eller virker ikke de immun-modulatoriske proteinene her?

Pukkellaks

Atlantisk laks

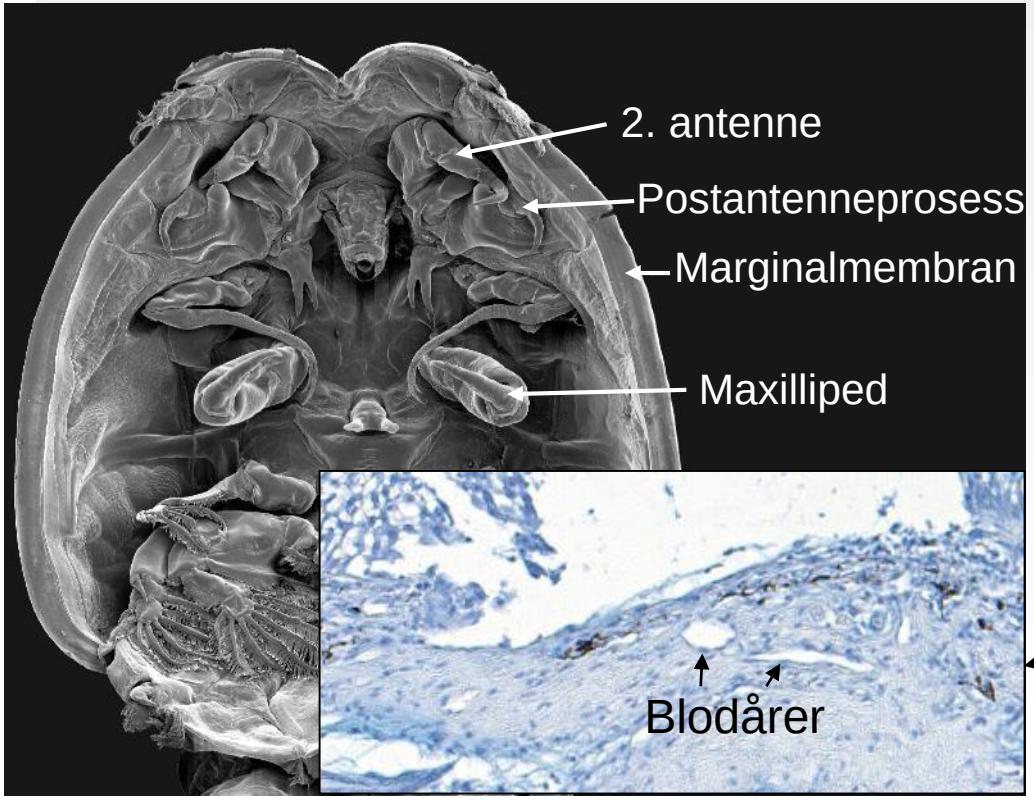


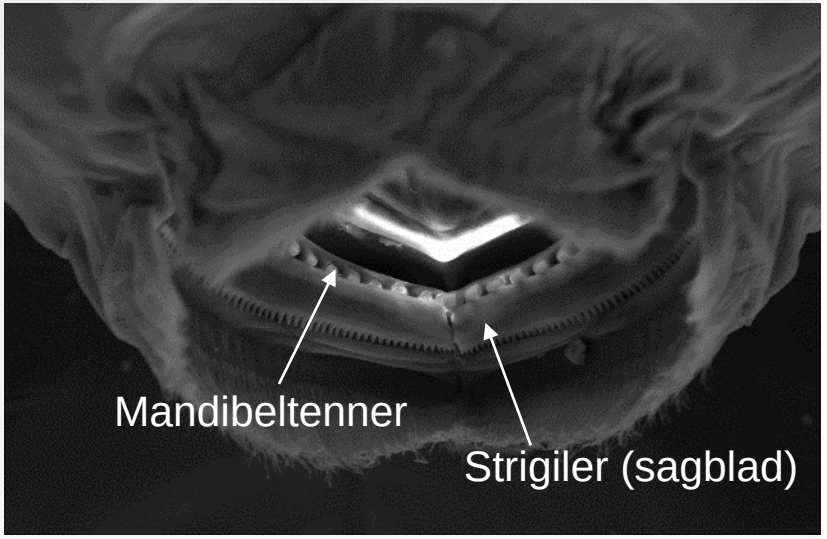
Coho laks

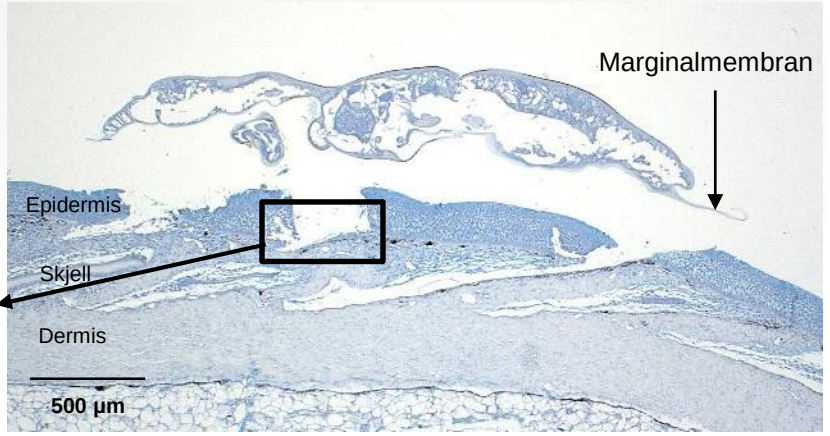
Ref: Johnson & Albright 1992

Mobile stadier

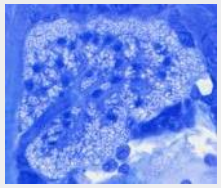
- Bruker marginalmembranen for å sitte på
- Spiser mest blod

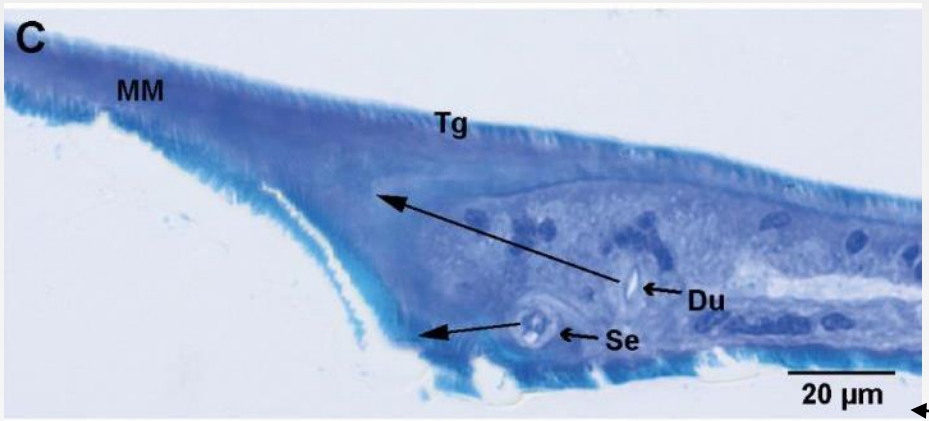


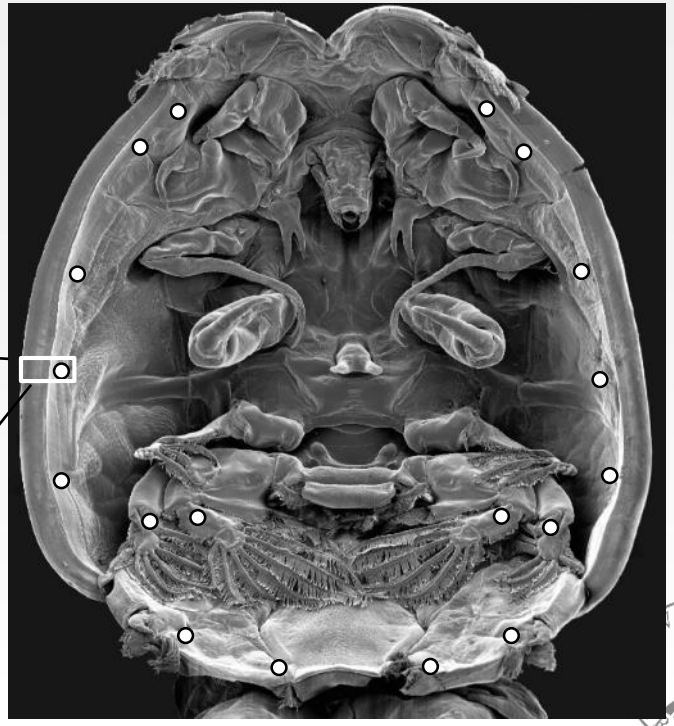


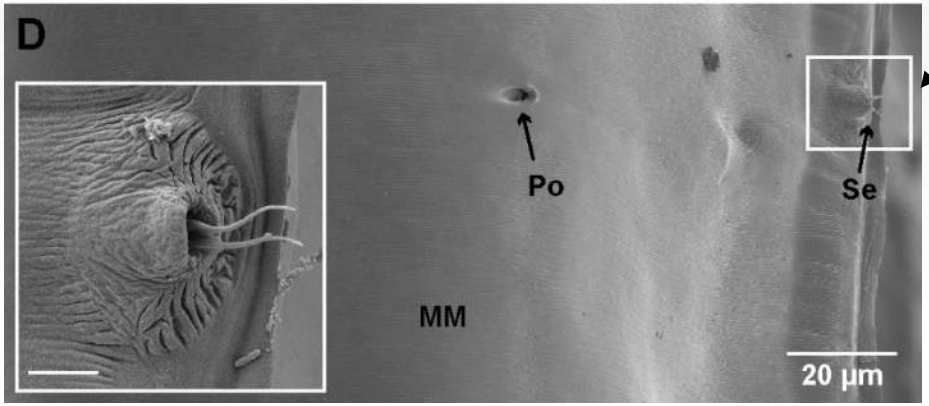


Kjertler viktig for modulasjon?

	Nau I	Nau II	Cop	Chal	Padl	PadII	Adult	Porer	Mulig funksjon:
Teg 3									



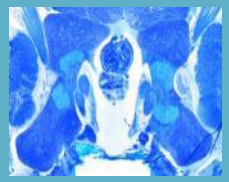




ModuLus – AP1

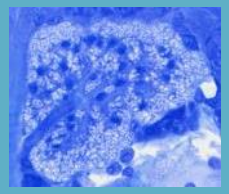
- Identifisere flere kjertelgen

Spyttkjertelen: Adulte lus → flere kandidater fra opprinnelig dataset

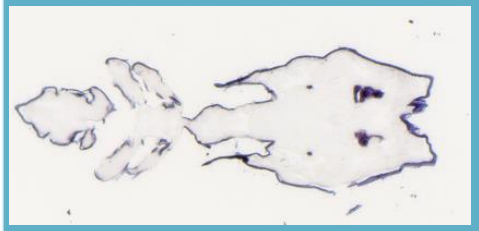


Kopepoditter → utnytter et regulatorisk gen

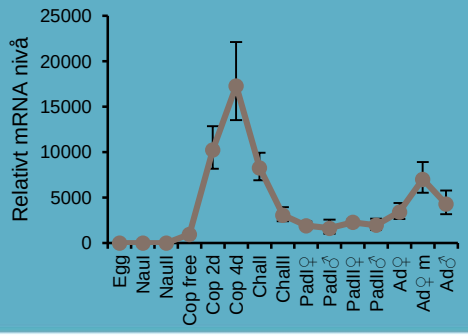
Tegmental type 3: Laserdisseksjon + RNAseq = identifikasjon av gen
Karakterisering og funksjonelle studier!



Karakterisering:



```
  1 atgtgaagag aaccctacaa aaaactaaaa
 31 gcgcttatgg atcgcaagcg taacattcgt
 61 ggaaaatcta cccttaccga ttcactcgtt
 91 gctggagaga ctcgtttcac tgacactcgt
121 aaatctactg ctatctctct tttcttcgag
151 ggagaaaacc aattcgagac ggttgaggtt
181 ttgatcaatt tgatcgattc acccggtcac
211 cttggtgtta ctgatggagc tctcgtcgtc
241 accgagactg tgctgcgtca ggctattgct
271 aagatggacc gtgcccttct cgaacttcaa
301 ttgaaaacat caaaaaaaaa aaaaaaaaaa
```



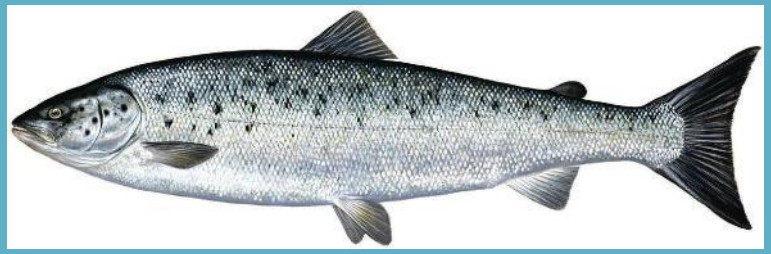
Funksjonelle studier

Ctr lus **KD lus**

ModuLus – AP1

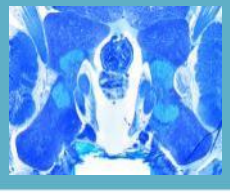
- Identifisere flere kjertelgen
- Se nærmere på immunmodulering
  - Hvilke gen reguleres (RNAseq)?
  - Hvilke celler moduleres av hva?

Atlantisk laks (mottakelig)



Pukkellaks (resistent)

Spyttkjertelen

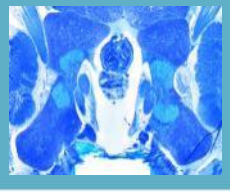


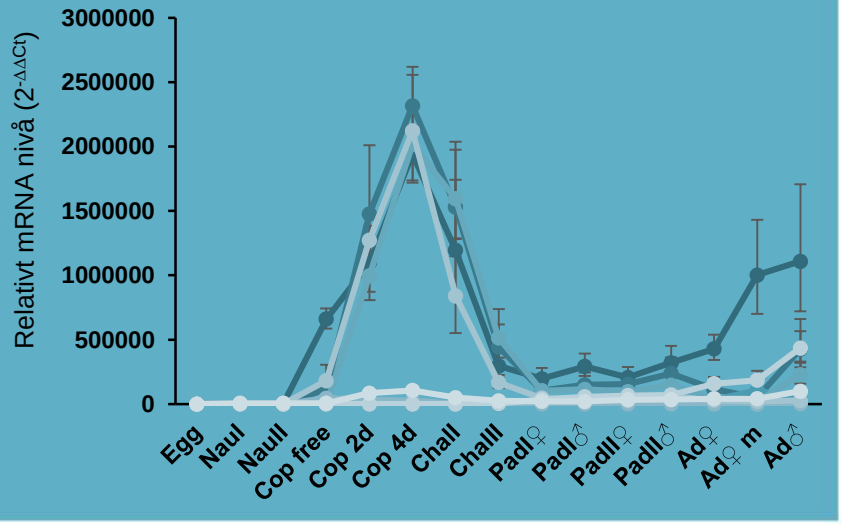
Coholaks (resistent)

ModuLus – AP1

- Identifisere flere kjertelgen
- Se nærmere på immunmodulering
  - Hvilke gen reguleres (RNAseq)?
  - Hvilke celler moduleres av hva?
- Hva induserer spyttproduksjonen?
  - Slim
  - Epitel

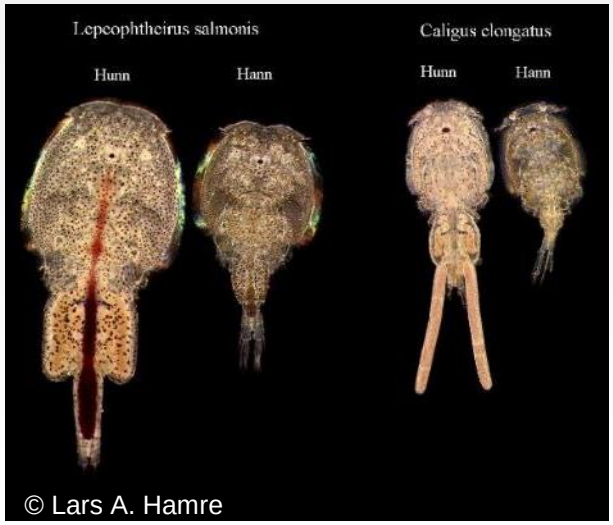
Spyttkjertelen





Caligus elongatus - skottelus

- Økt problem
- Smitter også rensefisk
- Irriterer laksen mer
- Lite visst om kjertlene



© Lars A. Hamre

kyst.no

Søk Kalender SalmonJobs Båtomtaler Kjøp abonnement Min Side Meny

Navn Teknologi Rensefisk Fartøy Miljø Forskning Lakselus Fiskehelse Økonomi og marked

Forside › Lakselus › Luseåret 2019 under lupen

Luseåret 2019 under lupen

Illustrasjonsfoto: Dr. Elvis Chikwati / Aquamedic

Utstyrsmangel, algekrise, utfordringer med skottelus og nye forebyggende tiltak mot lusepåslag. Dette var luseåret 2019.

Av Harrieth Lundberg

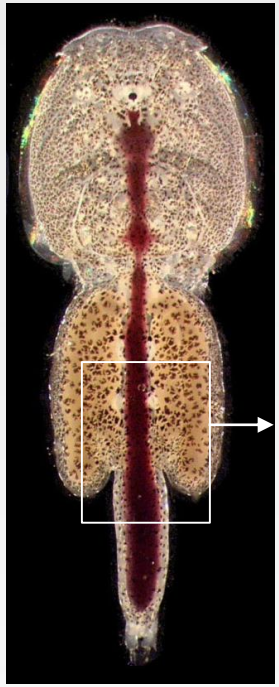
ModuLus – AP2

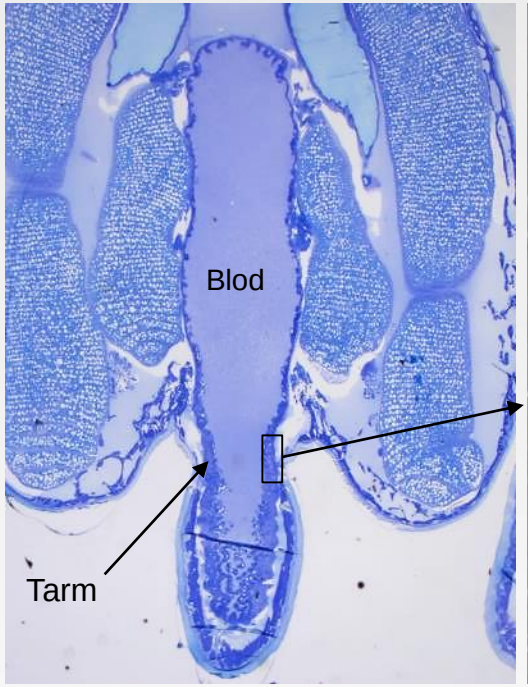
- Karakterisering av skotteluskjertler
  - Typer
  - Hva produseres og hva modulerer de?
- Koinfestasjon med lakselus
  - Generalisten versus spesialisten

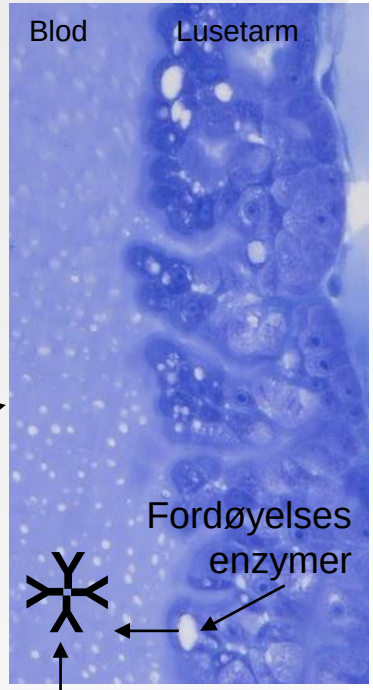
Lusens tarm og fordøyelse

I tarmlumen:
Hemolyse
Langtidslagring av protein

Proteiner brytes ned inni tarmcellene



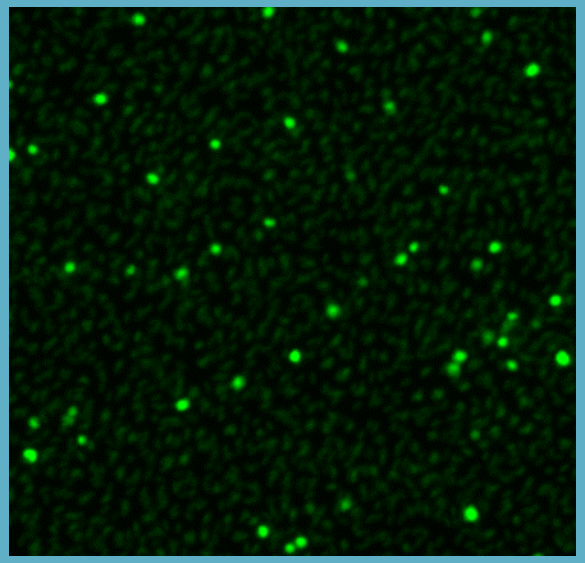


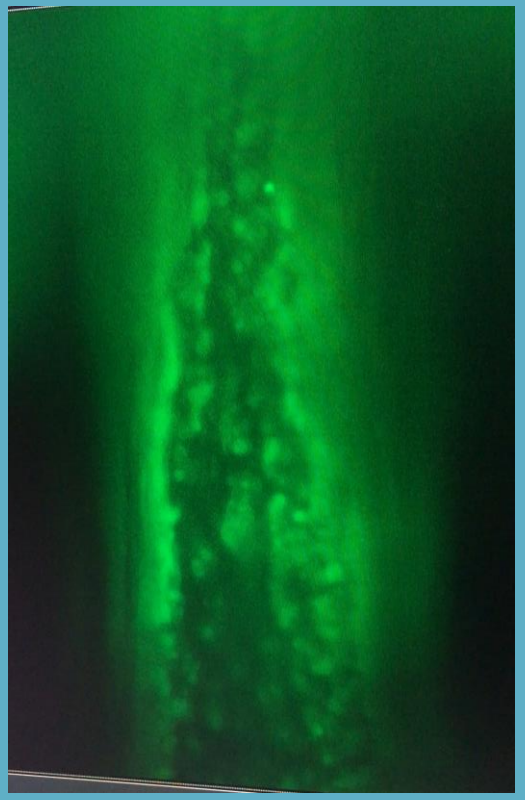


Proteiner brytes ned i tarmlumen

ModuLus – AP3

- Hvor lenge er antistoffer og immunceller fra laksens blod funksjonelle i lusens tarm etter inntak av et blodig måltid?
  - Celler
  - Antistoffer





ModuLus – outputs!

- Hva er den optimale vaksinekandidat?
  - Tarm eller kjertelproteiner
  - Strukturelle eller funksjonelle
- Nye vaksinekandidater?
- Grunnlag for andre profylaktiske metoder?
  - Avl
  - Genmodifisering (CRISPR)

Sea Lice Research Centre

ParaFishControl

Sussie Dalvin
Sindre Grotmol
Lars A. Hamre
Michael Dondrup
Christiane Eichner
Liv Sandlund
Kurt Buchmann
Louise v. G. Jørgensen
Frank Nilsen

UNIVERSITETET I BERGEN

FHF
FISKERI- OG HAVBRUKSNÆRINGENS FORSKNINGSFINANSIERING

ModuLus

Sindre Grotmol
Lars A. Hamre
Helena Midtbø
Sol Hollekim
Christiane Eichner
Gyri Teien Haugland
Gro Elin Bjerga (NORCE)
Frank Nilsen

Miljøfyrtårn®