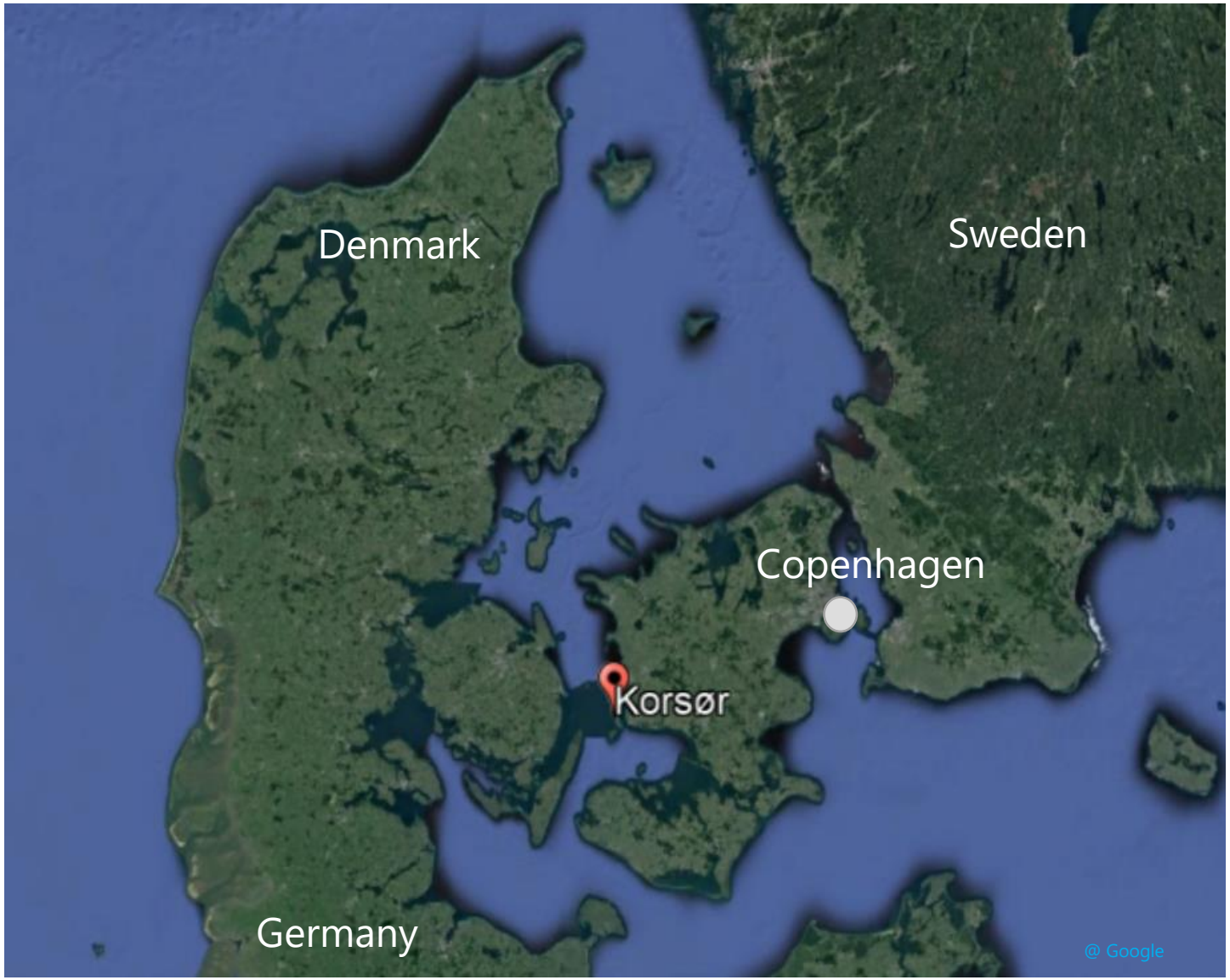
PFAS exposure of a local human population by cattle meat The Korsør case ("Ground zero" in Denmark)

Søren Dyreborg, NIRAS

Location:

Korsør, Denmark



Location – RESC (Rescue and Safety Center – "Firefighting training site")

Rescue and Safety Center – "Firefighting training site"

Photo from :
https://www.miljoeogressourcer.dk/testsite/11

PFOS-bombe: Forurening af grundvand 61.500 gange over grænseværdi

PFOS – Bomb: Concentration exceeds threshold values 61.500


10 KORSØR SEKTION 1

Sjællandske · LØRDAG 6. FEBRUAR 2021

Gigantiske giftmængder er fundet på brandskolen

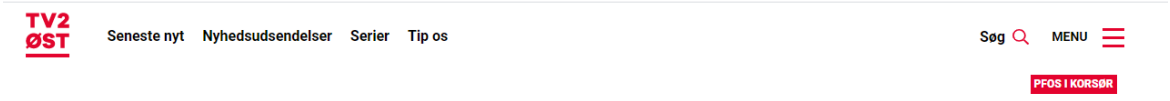
UDSLIP: Kilden til forureningen fra

De gigantiske giftmængder oplyser kommunen om i

Akut giftigt

Tidligere har Jane Hansen

Hugh amounts of PFOS found at fire training school


TV2 ØST Seneste nyt Nyhedsudsendelser Serier Tip os Søg MENU

PFOS I KORSØR

Nedslående melding til PFOS-ofre: - Det er de højeste tal, vi har set i Danmark

Depressing message to the PFOS victims: “these are the highest numbers we have seen in Denmark”


Sjællandske · ONSDAG 10. FEBRUAR 2021 9

Korsørs drikkevand er omgivet af PFOS - nu tages der prøver

Drinking water surrounded by PFOS


KORSØR SEKTION 1

Sjællandske · LØRDAG 27. MARTS 2021 11

Toårig mystisk syg efter at have spist PFOS-forgiftet kalvekød

Two-year-old mysteriously ill after eating PFOS-contaminated meat


Allotment garden
Firefighting Training Site
§3 protected Meadow
Ditch
Ditch
To Korsør Nor

Soil contamination – sum of 4 PFAS

(PFOS, PFOA, PFNA and PFHxS, criteria : 10 µg/kg dw)

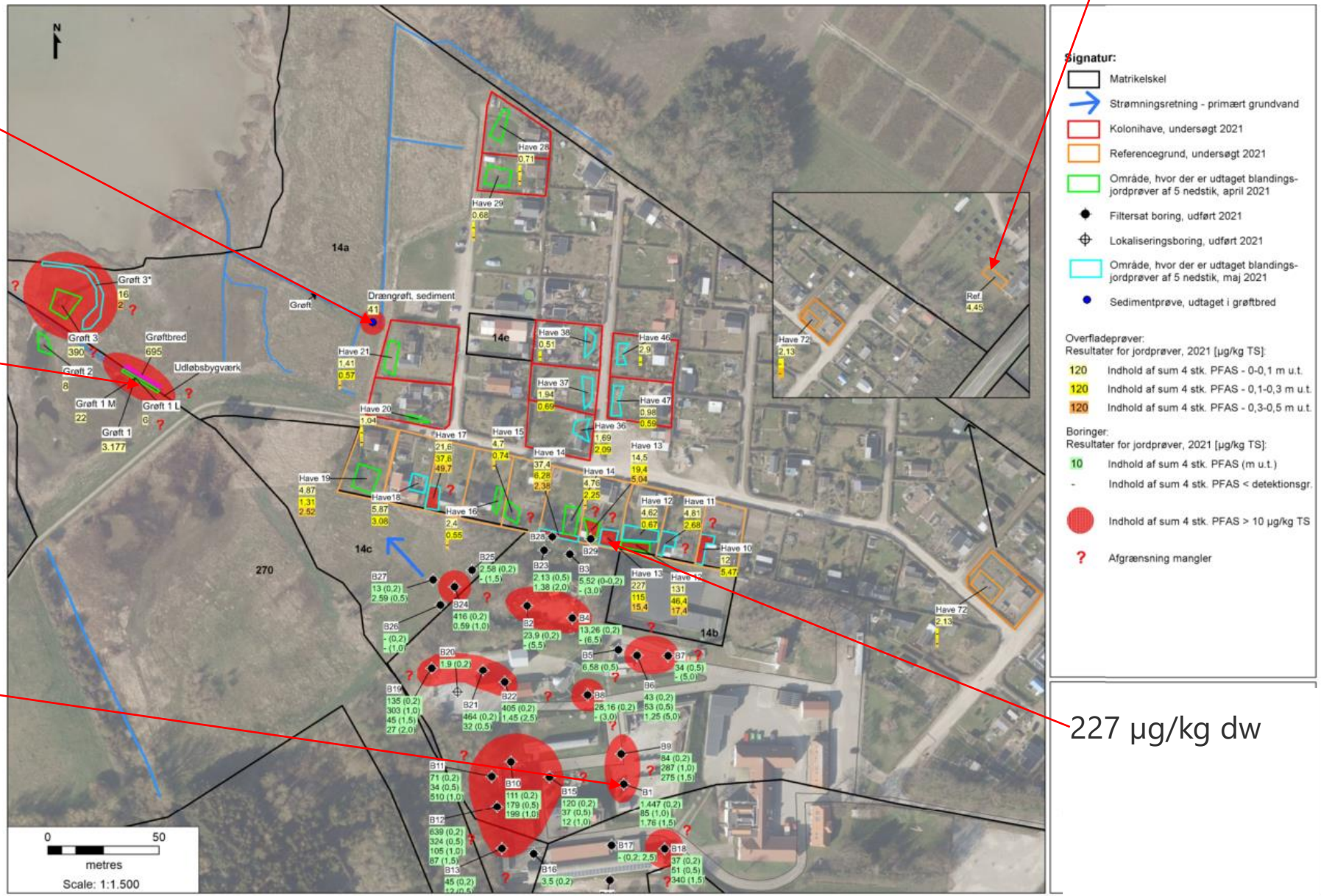
4,45 µg/kg dw

41 µg/kg dw

3.177 µg/kg dw

1.447 µg/kg dw

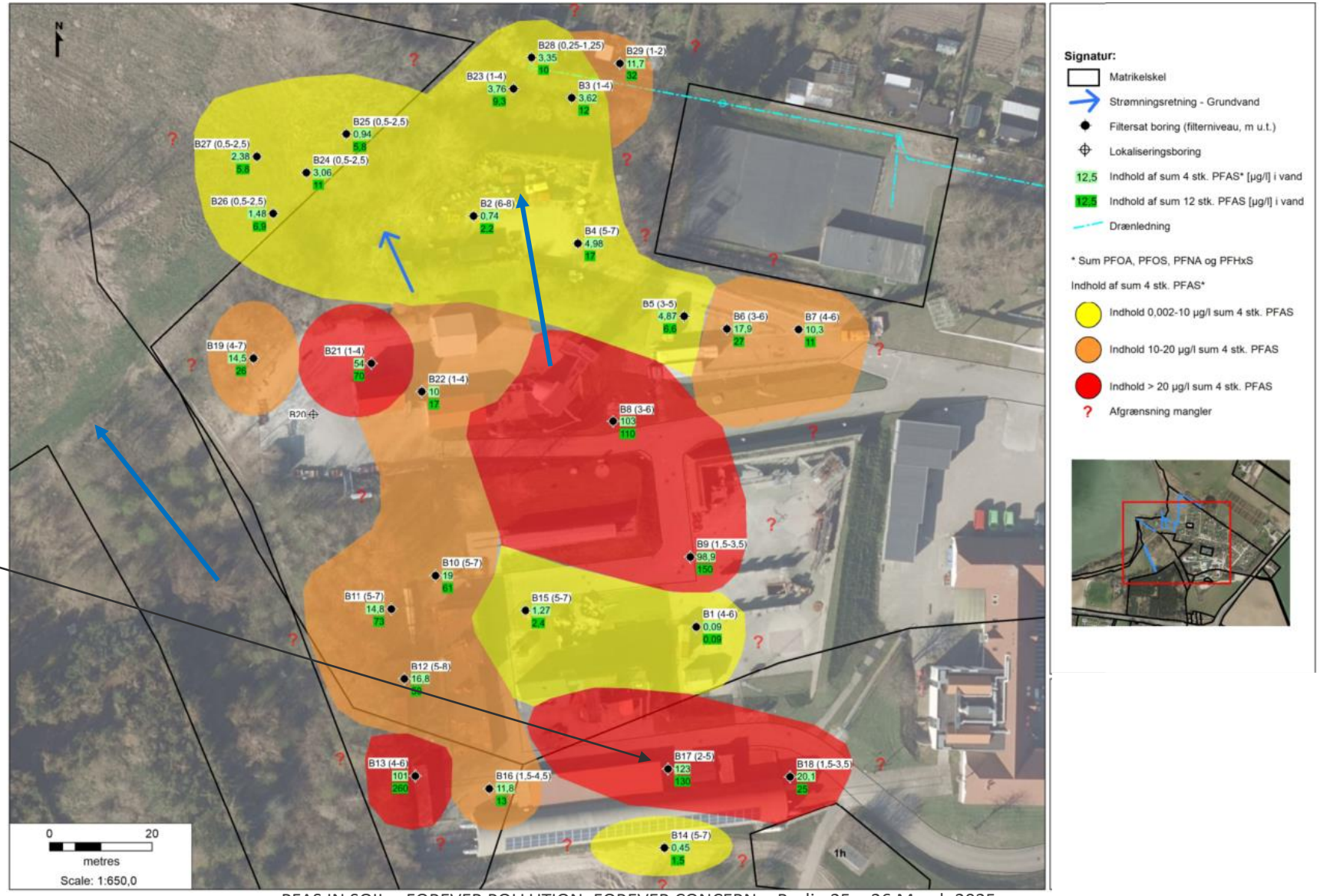
227 µg/kg dw



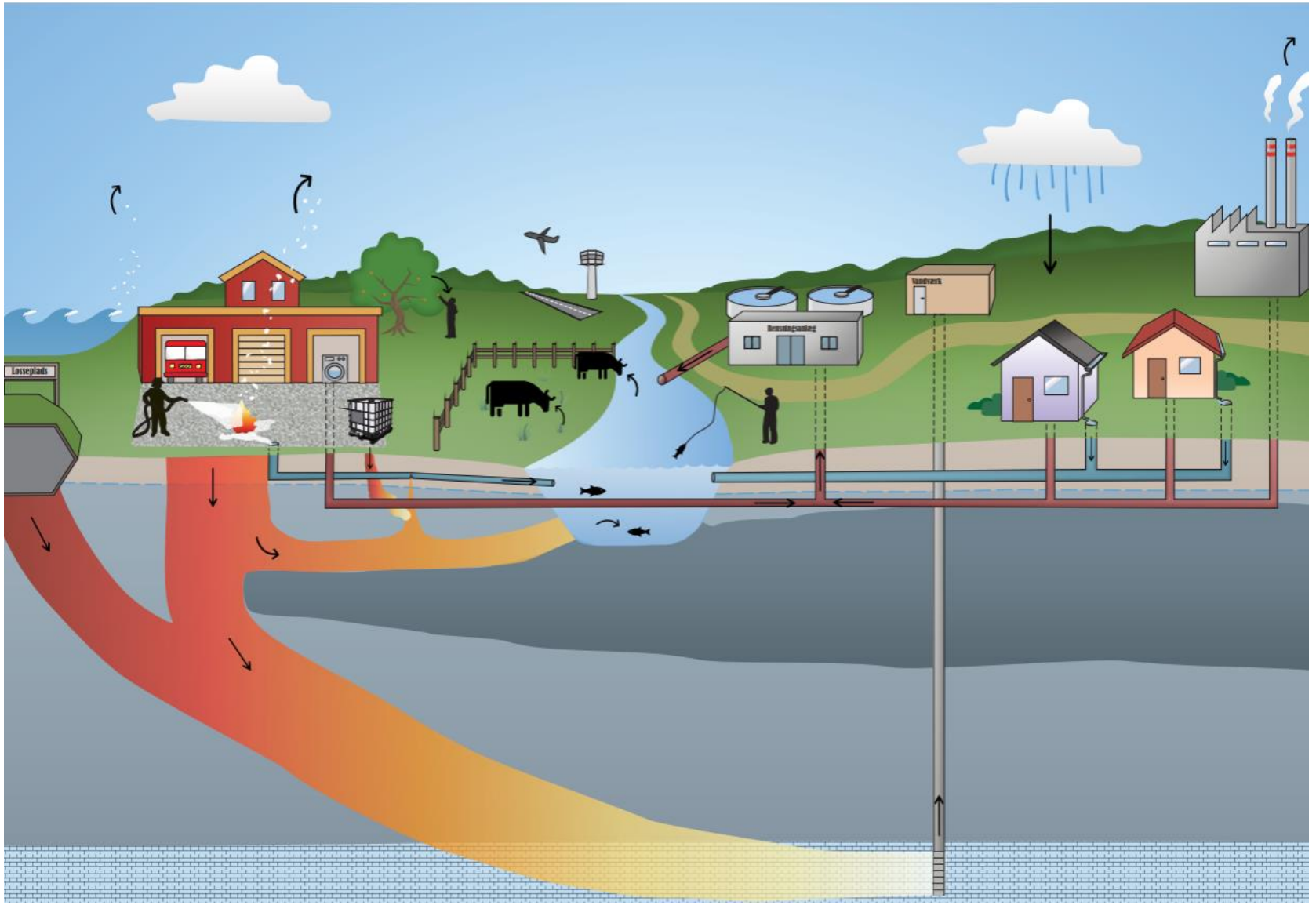
Groundwater contamination – sum of 4 PFAS

(PFOS, PFOA, PFNA and PFHxS, criteria: 0,002 µg/l)

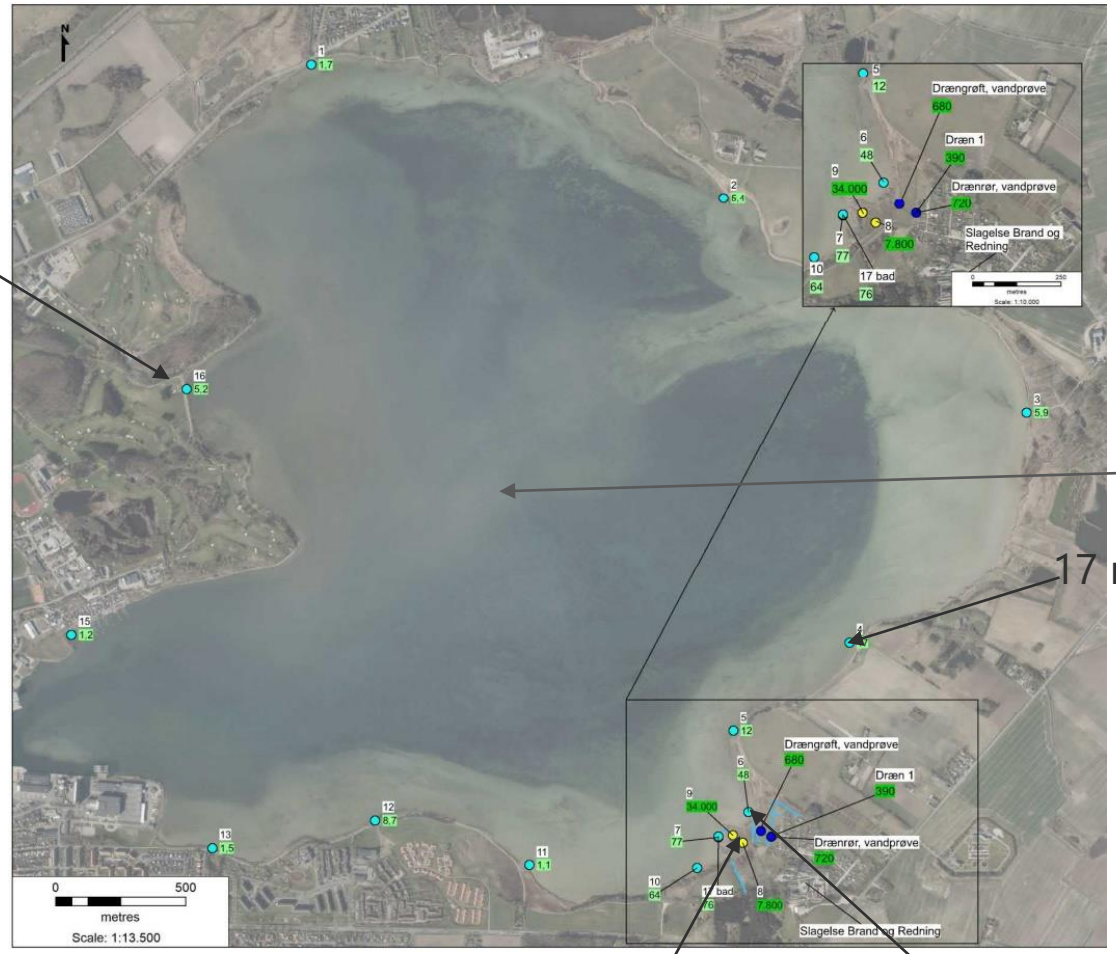
123 µg/l
(PFAS 4)



Conceptual model



Aquatic animals – PFOS



5,2 ng/l

17 ng/l

34.000 ng/l

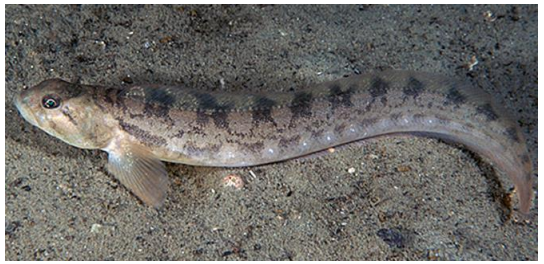
48 ng/l

Prawns

0,7-2,8 ng PFOS/g

Sticklebacks (”Hundestejle”)

2,2-9,0 ng PFOS/g



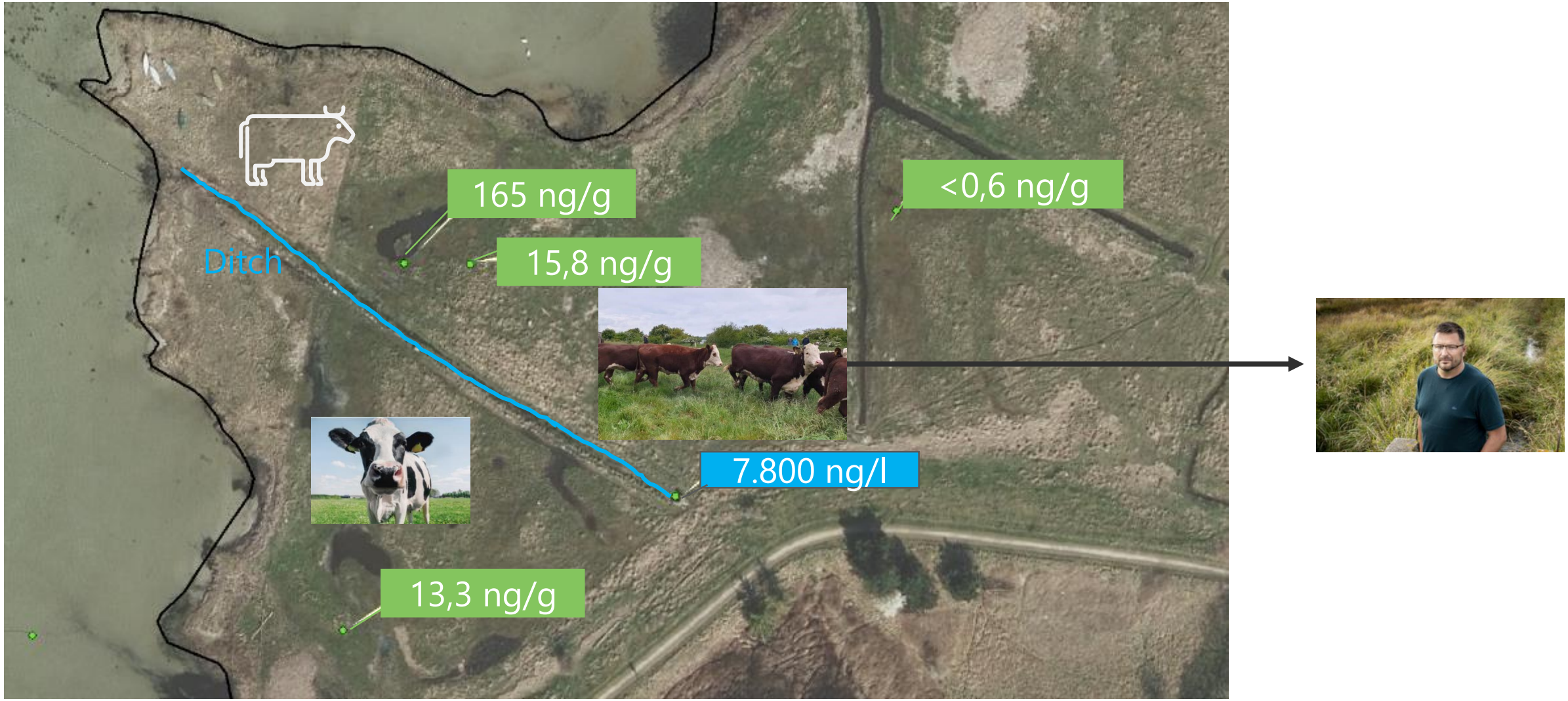
Trachinus (”Fjæssing”)

1,1-6,0 ng PFOS/g

Brill (”fladfisk”)

1,3 ng PFOS/g

Grass samples (PFOS) - Meadow Problems with grazing cattle



PFOS in meat from cattle

The Danish Veterinary and Food Administration finds high levels of PFOS in meat from cattle from Korsør Nor

Yderligere tre prøver af kød fra kalve, der har græsset nær brandskolen ved Korsør Nor, indeholder niveauer af PFOS, som giver anledning til sundhedsmæssig bekymring. Kødet bør ikke spises, lyder anbefalingen fra Fødevarestyrelsen.

Pressemeddelelse, Publiceret: 18. maj 2021

Har du kød fra kalve, der har græsset på engene omkring Korsør Brandskole liggende derhjemme i fryseren, skal du smide kødet ud. Det fastslår Fødevarestyrelsen efter nye prøver af kød fra tre kalve fra den lokale Kogræsserforening ved Korsør Nor. Stoffet stammer fra brandslukningsskum anvendt på den lokale brandskole, og er gennem tiden spredt til områderne via regnvand og lokale vandløb.

Indholdet af PFOS i de tre prøver af kalvekød er på hhv. 156, 189 og 230 nanogram pr. gram kød. En tidligere prøve af kød havde indhold på [illegible] pr. gram kød. DTU Fødevareinstituttet har vurderet, at dette niveau i kød kan have en væsentlig sundhedsmæssig risiko, hvis man spiser det.

Fødevarestyrelsen forventer at kunne fremlægge resultater for fisk fanget i Korsør Nor i midten af juni. Tidligere på måneden viste analyser af grøntsager fra kolonihaver i området ikke målbare indhold.

<u>Criteria, soil:</u>

Sum of 4 (inkl. PFOS) : 10 µg/kg dw = 10 ng/g dw

<u>Tolerable weekly intake</u> (TWI, EU, sep. 2020):
Sum - 4 (incl. PFOS) : 4,4 ng/kg (bodyweight)/week

70 kg person : intake 308 ng/week

i.e., approx. 2 g meat a week (normal intake 196 g/week)

The Danish Veterinary and Food Administration has assessed that this level in meat may pose a significant health risk if consumed.

PFOS in blood

TV2 ØST Seneste nyt Nyhedsudsendelser Serier Tip os Søg MENU

PFOS I KORSØR

Nedslående melding til PFOS-ofre: - Det er de højeste tal, vi har set i Danmark

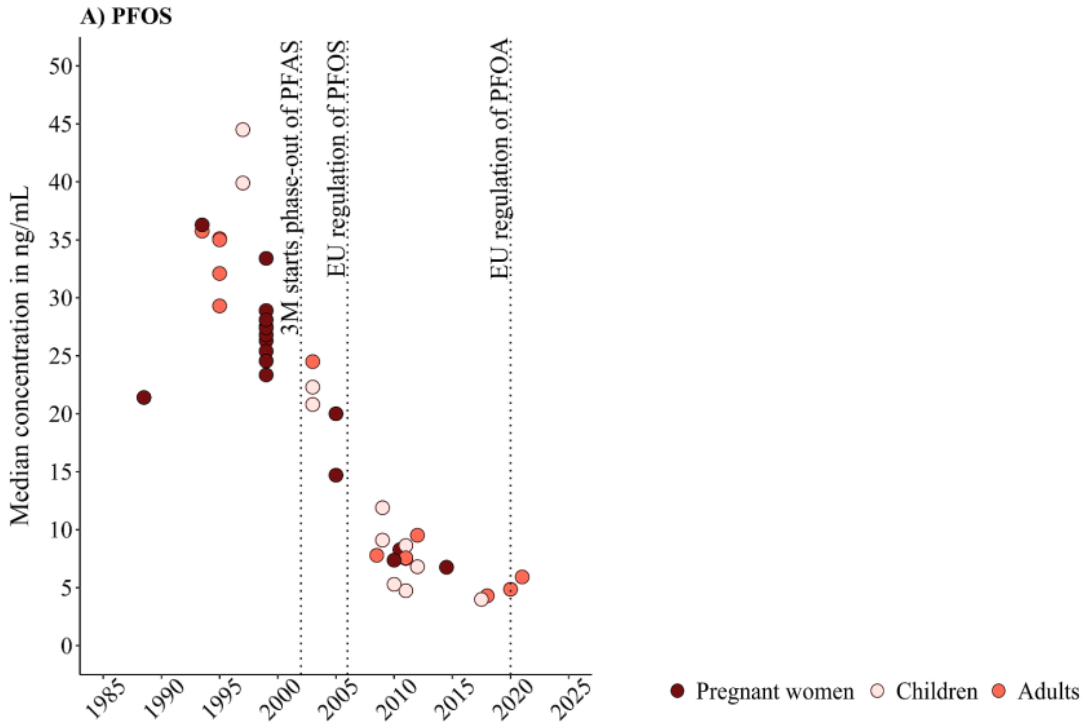
"It's the highest numbers we have seen in Denmark"

187 citizens

Interval : 1 – 553 ng/ml

Average : 43 ng/ml

(Groundwater criteria : 0,002 ng/ml)



Review based on 27 reports (only DK data)

Hull et al. Environmental Research 237 (2023) 117036

Trail

With the permission from Ann Christine Lyngberg, from Arbejds- og Socialmedicinsk Afdeling, Holbæk Sygehus

Criteria:

Age > 18 years
Level of PFOS > 21 ng/ml

45 participants, divided into 2 groups

Medicine: lower high cholesterol levels in the blood (anion exchange resin)

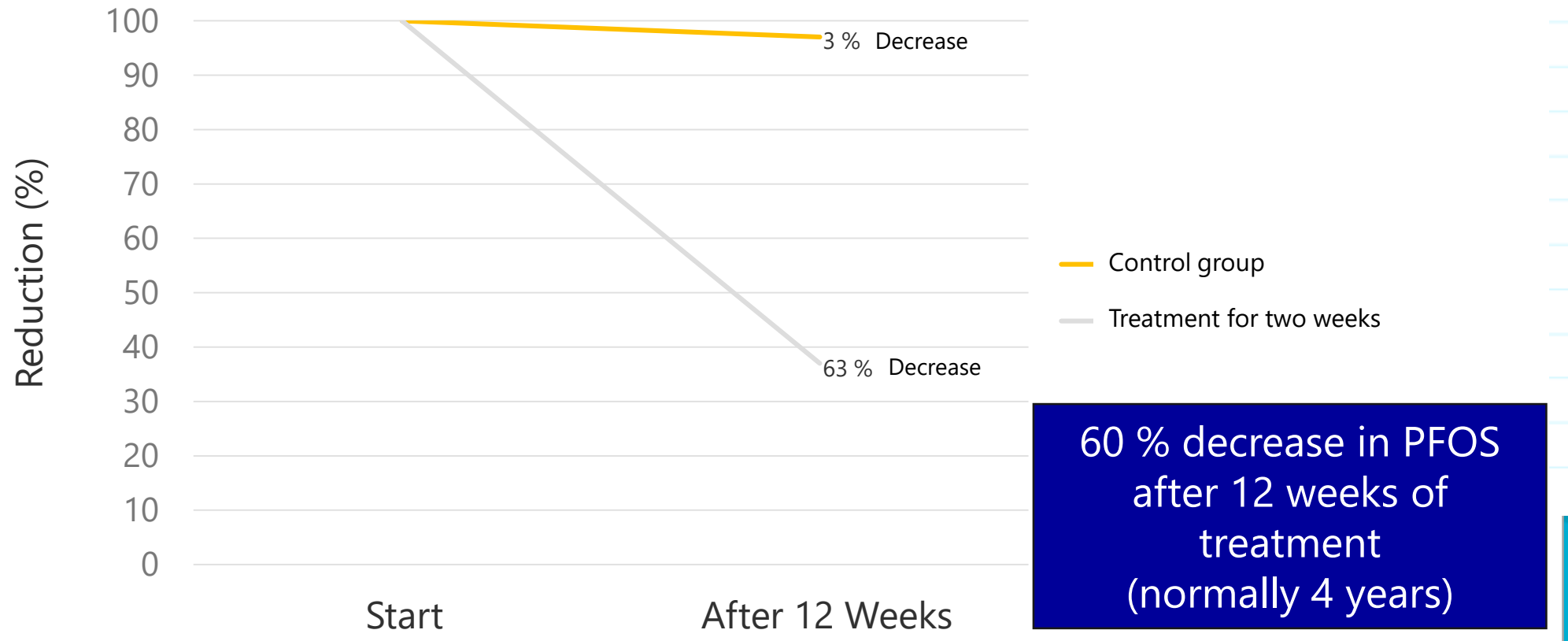
Duration : 12 weeks

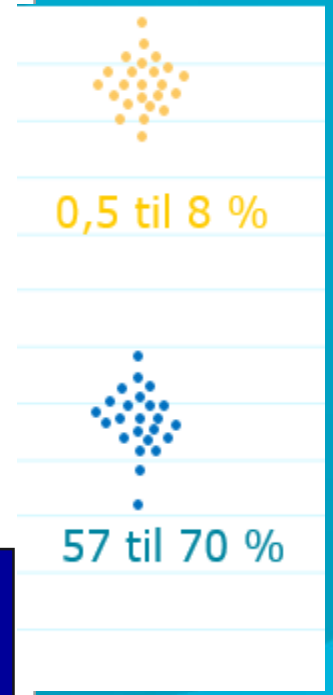
Ref. Substantial decrease of PFAS with anion exchange resin treatment – A clinical cross-over trial. Environ Int. 2024 Feb. Møller et al.

Results

REGION SJÆLLAND
HOLBÆK SYGEHUS
– vi er til for dig

Change in concentration of PFOS in blood samples (serum)



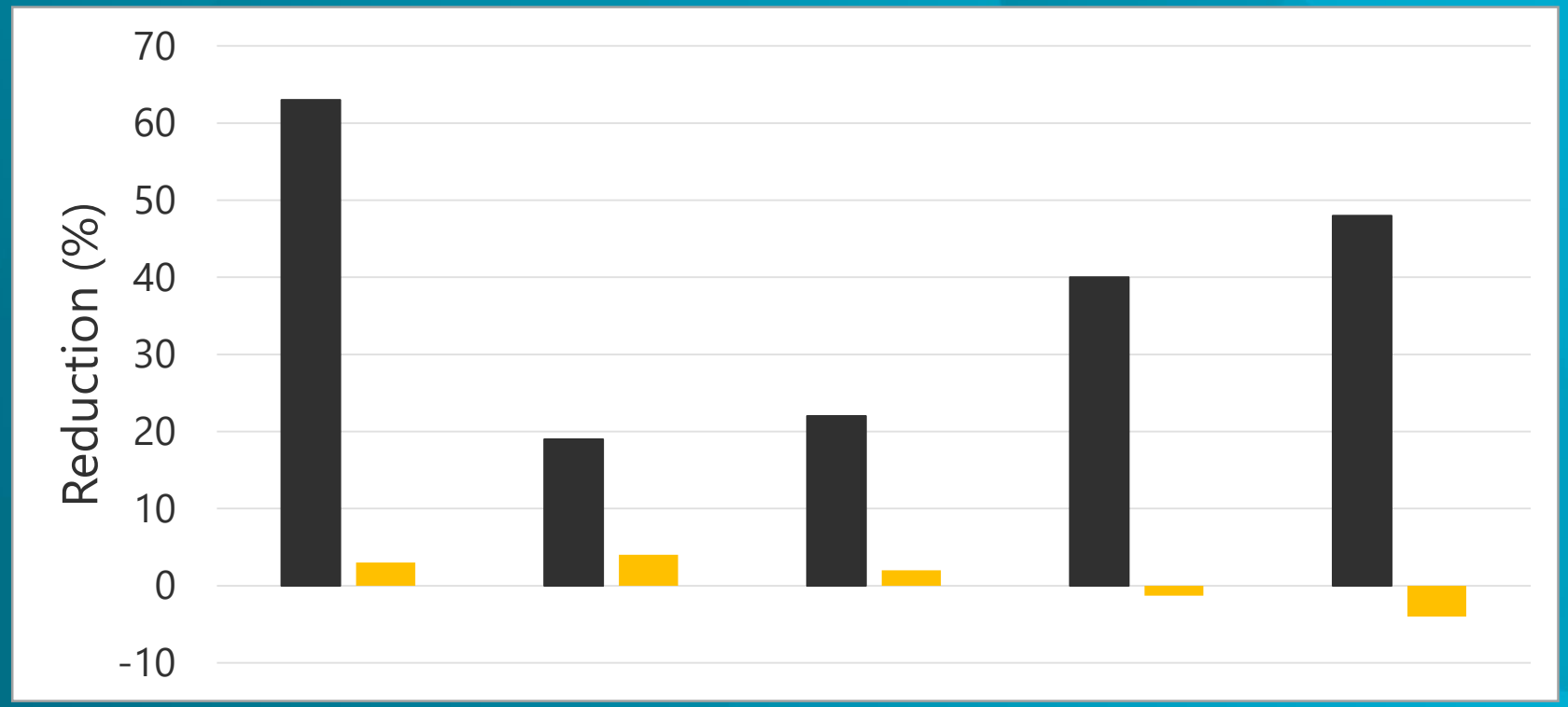


60 % decrease in PFOS after 12 weeks of treatment (normally 4 years)

45 participants

Ref. Substantial decrease of PFAS with anion exchange resin treatment – A clinical cross-over trial. Environ Int. 2024 Feb. Møller et al.

Results for other PFAS



	PFOS	PFHxS	PFOA	PFNA	PFDA
Effect of treatment	60 %	15 %	20 %	40 %	48 %

Ref. Substantial decrease of PFAS with anion exchange resin treatment – A clinical cross-over trial. Environ Int. 2024 Feb. Møller et al.

Take home message

- The fire training site is NOT an industrial site where PFAS has been produced
- The normal use of foam containing PFOS on firefighting training site caused in extensive contamination of soil, groundwater and surface water. Aquatic animals was also exposed.
- Due to unfortunate circumstances, where cows grazed and drank contaminated water, meat was contaminated with PFAS
- Human being was exposed due to the eating of contaminated meat
- Regarding the use of medicine (statements from Ann Christine Lyngberg):
  - *"Be aware that our study alone does not provide sufficient knowledge to offer treatment to people who have been extraordinarily exposed to PFAS. Therefore, we do not offer this treatment in Denmark and, when asked for advice, we advise against treating people based on the current knowledge"*
  - *" However, there is one particular group of patients where it might be worth considering offering the treatment, even though it is off-label: women who have been extraordinarily exposed to PFAS and who wish to become pregnant in the near future. For these women, treatment could mean that they do not pass on large amounts of PFAS to their future children"*

Project partners and more information

Rescue and Safety Center (https://resc.dk/en/resc-home/). National test site since 2023

Slagelse Municipality (https://www.slagelse.dk/da/service-og-selvbetjening/bolig-og-byggeri/vand-og-kloak/spildevand/pfos-forurening-i-korsoer/)

https://www.regionsjaelland.dk/klima-og-miljoe/jordforurening/viden-om-pfas (in Danish)

https://www.niras.com/

Danish PFAS Taskforce established by the Danish EPA (https://mst.dk/erhverv/sikker-kemi/kemikalier/fokus-paa-saerlige-stoffer/pfas/videnstaskforce-for-pfas)

NEW: Contribution of different exposure pathways to the total human exposure to PFAS. March 2025: https://www2.mst.dk/Udgiv/publications/2025/03/978-87-7038-727-9.pdf (in English)

NEW : Danish PFAS Research Center : Coming Soon ☺

Knowledge centre for the Danish regions (https://www.miljoeogressourcer.dk/testsite/11)

EU Horizon project: https://aragorn-horizon.eu/

For further questions:

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