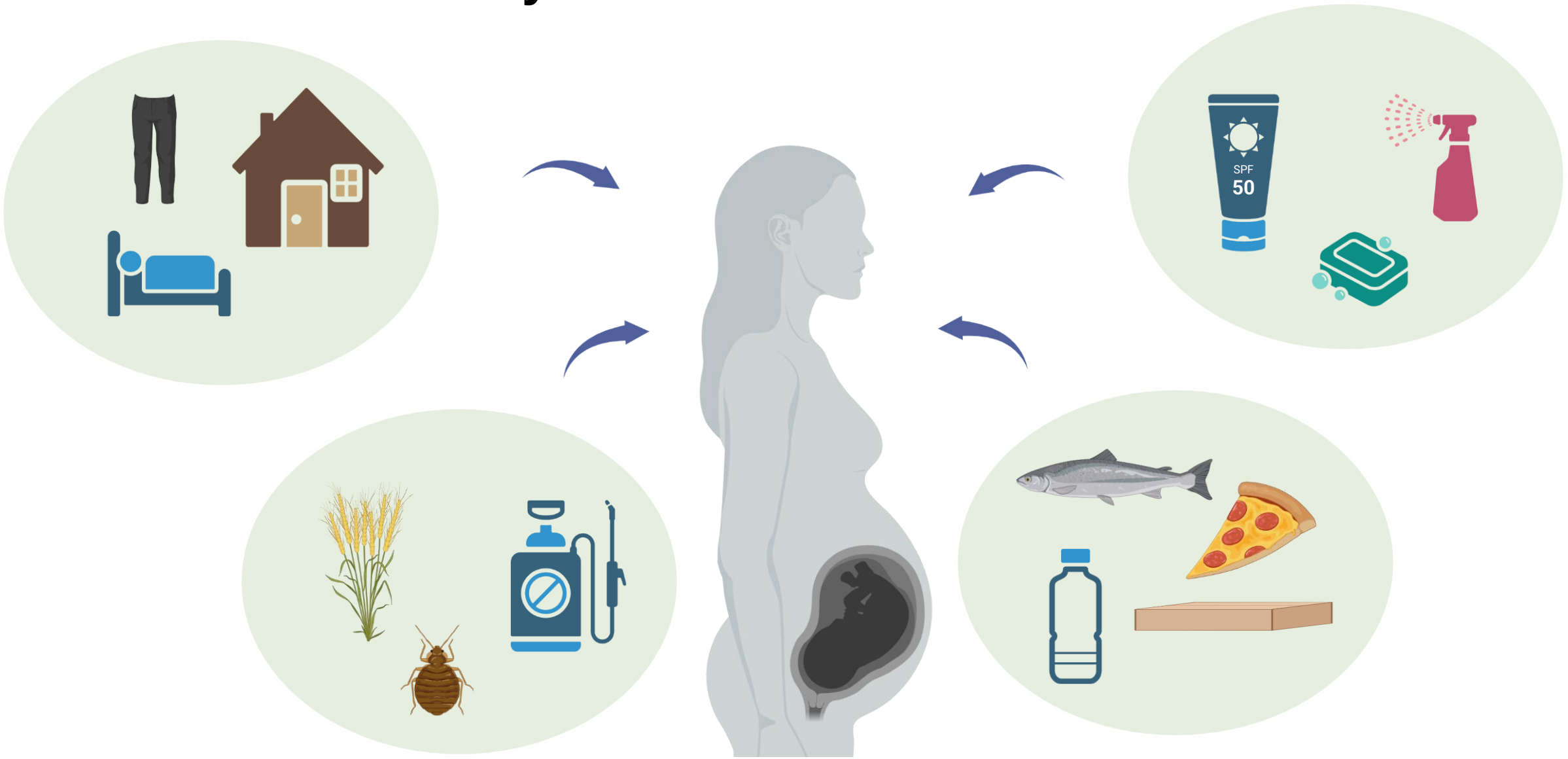

DTU

Center for Hormonforstyrrende Stoffer

Thyreoideaforstyrrelser og effekter på hjernens udvikling

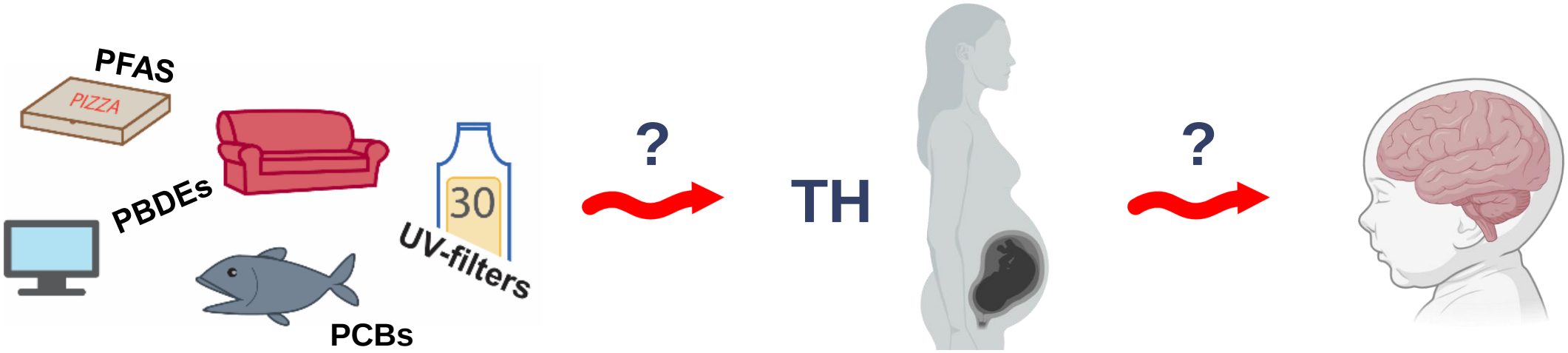
Louise Ramhøj, Seniorforsker, louram@food.dtu.dk
Forskningsgruppen for Molekylær- og Reproduktionstoksikologi, Danmarks Tekniske Universitet

Hormonforstyrrende stoffer



Figures created with www.biorender.com

Kan TH-forstyrrende stoffer påvirke hjernens udvikling i mennesker?



Figures created with www.biorender.com

Agenda

- Populationseffekter
- Hormonforstyrrelser
- Hvad kan der ske i hjernen?
  - Cellemigration
  - Celledifferentiering
- Opsamling

Kan TH-forstyrrende stoffer påvirke hjernens udvikling i mennesker?

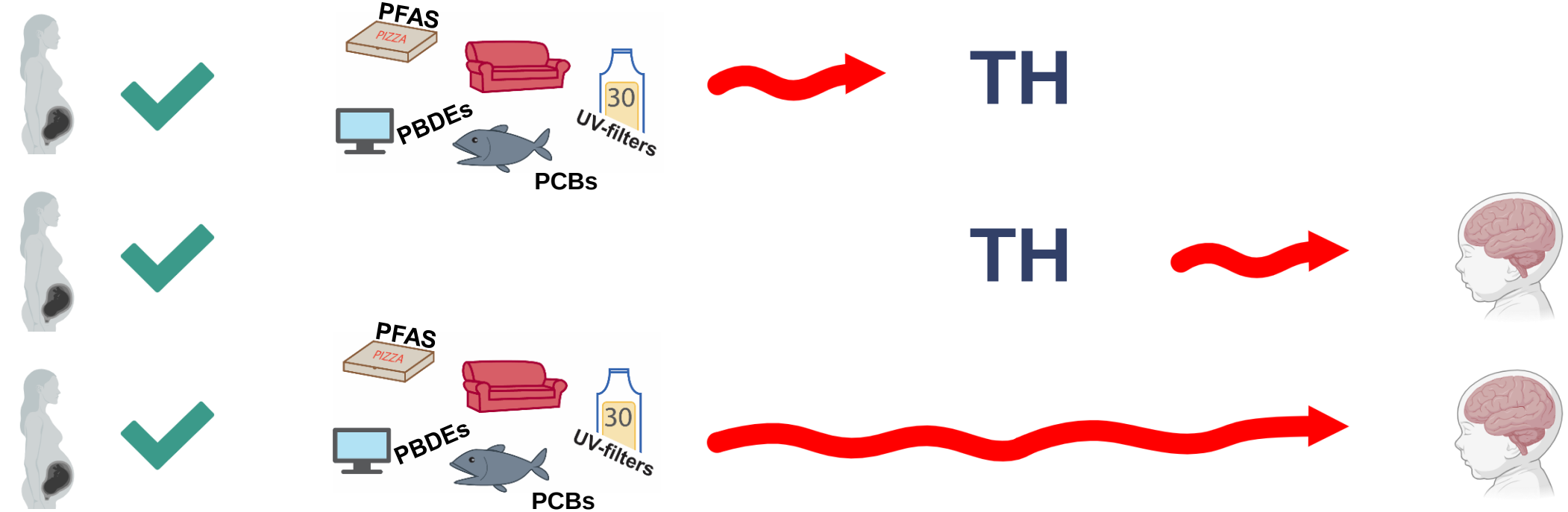
Kausalitet?

Figures created with www.biorender.com

Kan TH-forstyrrende stoffer påvirke hjernens udvikling i mennesker?

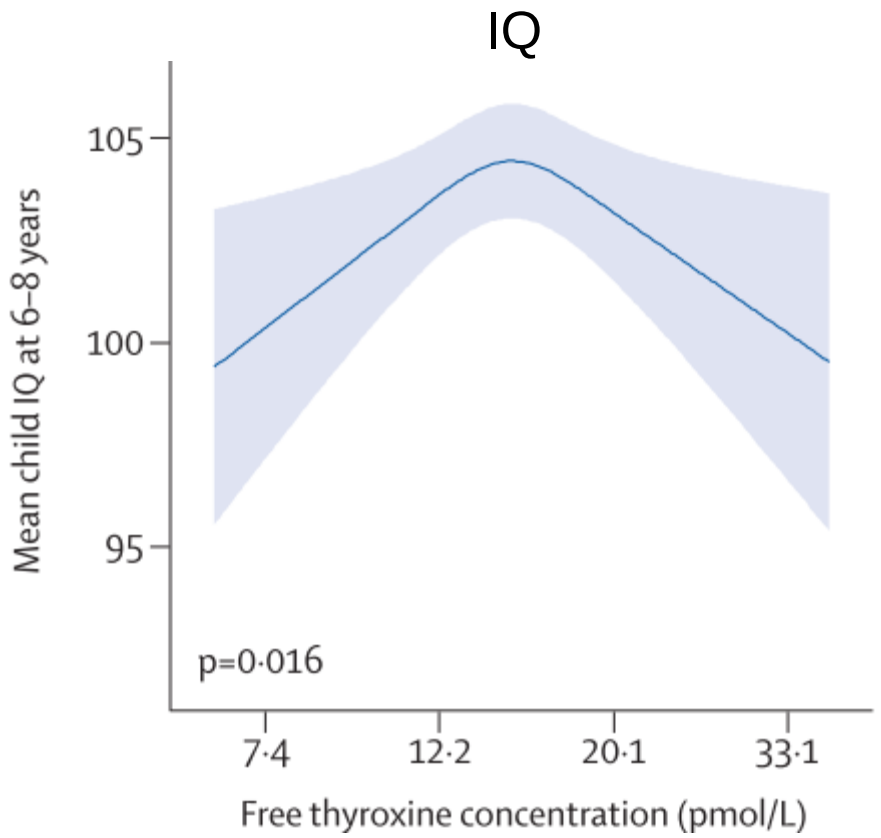
Kausalitet?

Sammenhænge



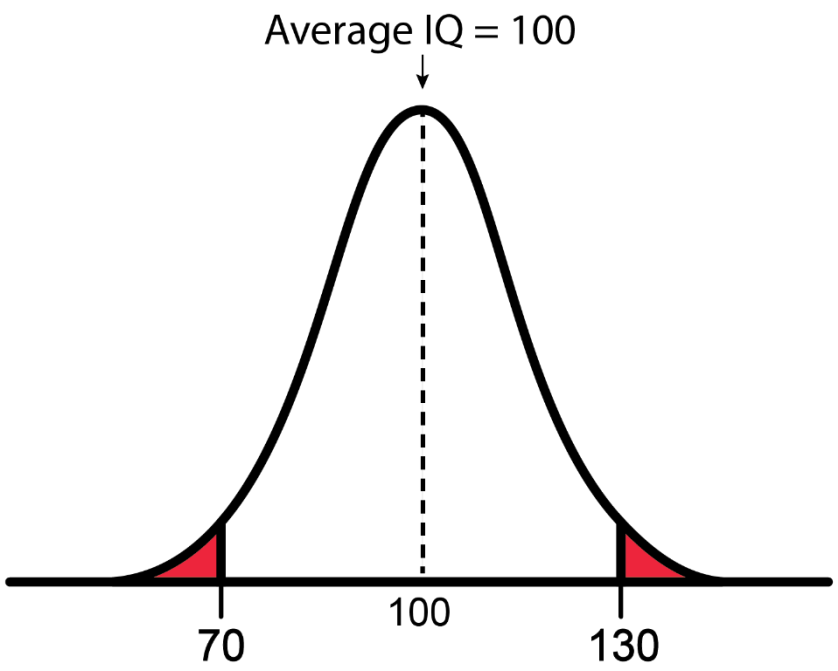
Figures created with www.biorender.com

Sammenhæng imellem mors T4 under graviditeten og barnets IQ



Korevaar et al., 2016

Ændringer på befolkningsniveau



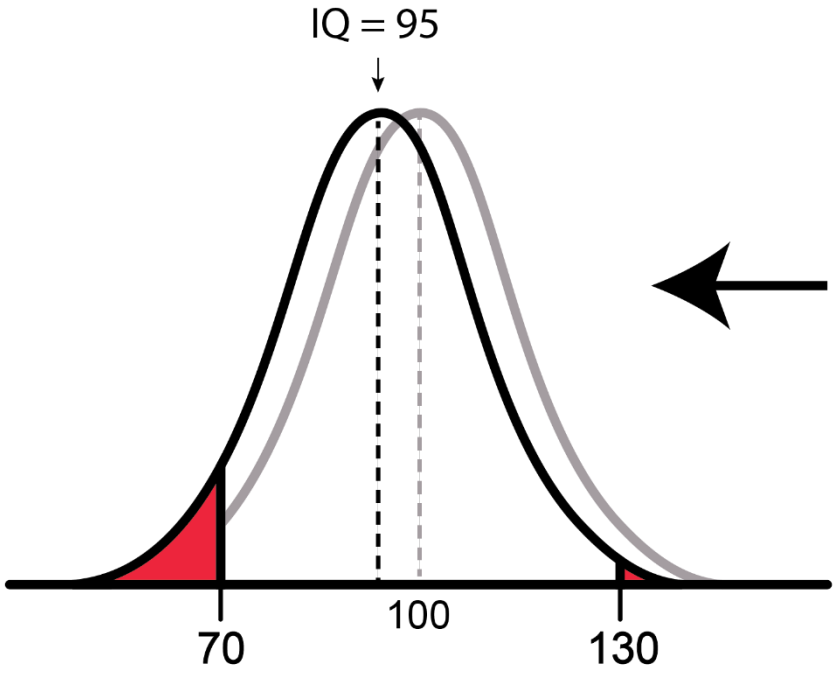
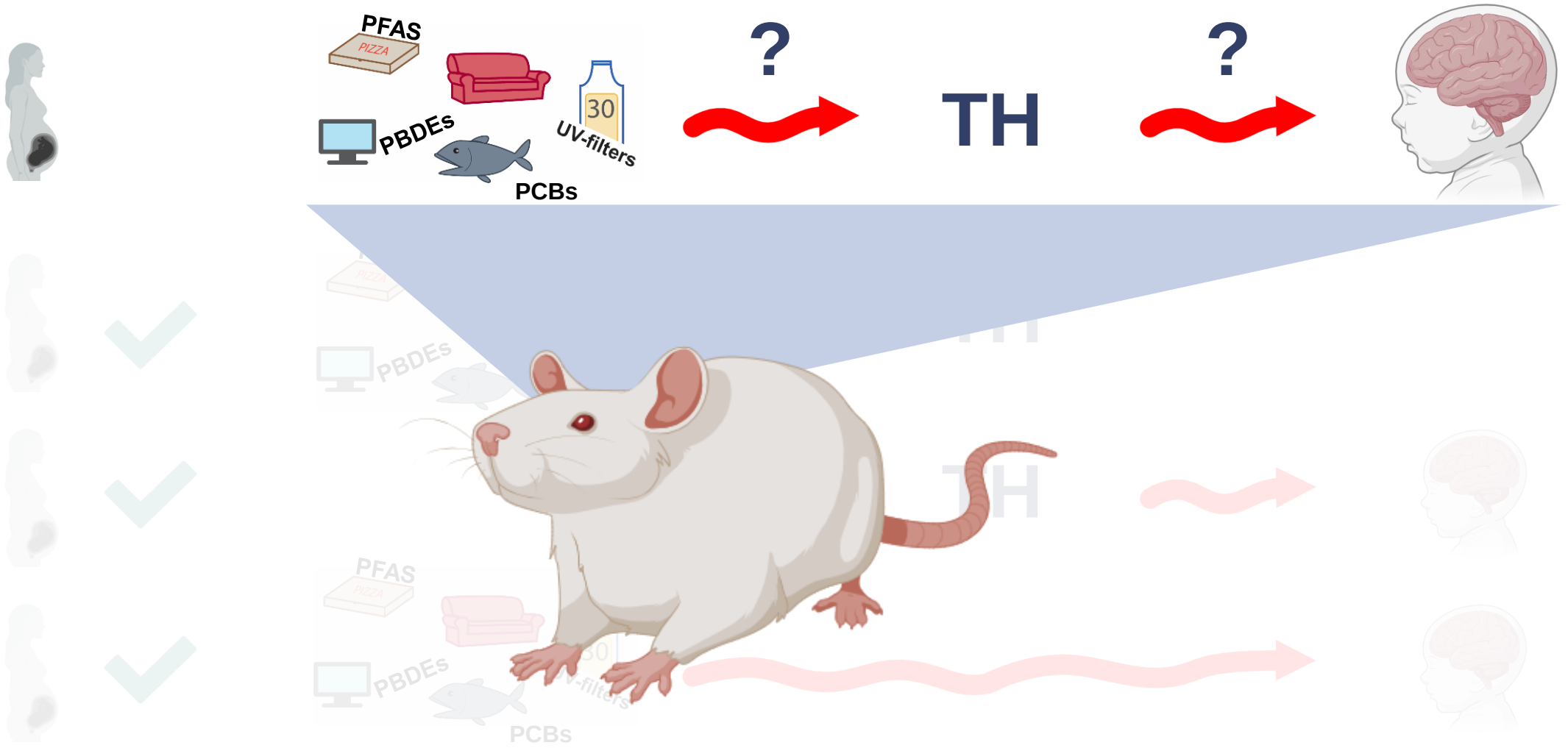


Figure not drawn to scale

Kan TH-forstyrrende stoffer påvirke hjernens udvikling i mennesker?

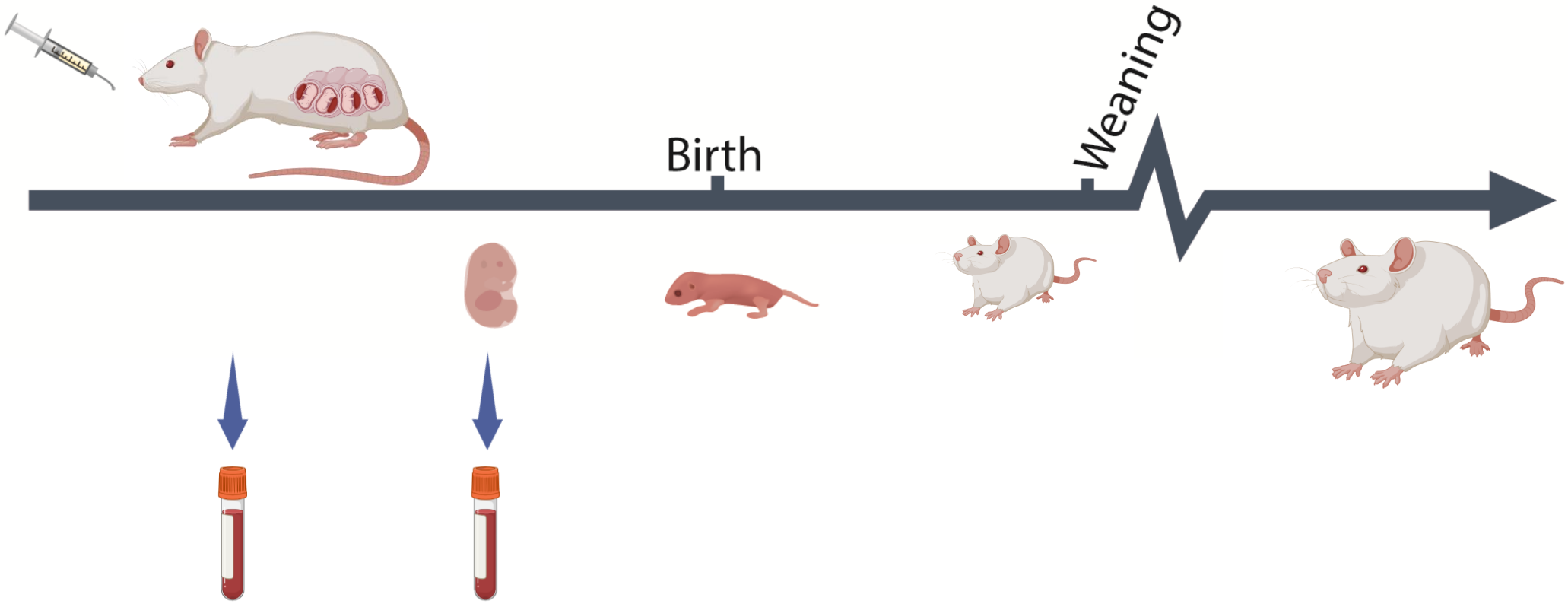
Kausalitet?



Figures created with www.biorender.com

Testning for TH-forstyrrende effekter

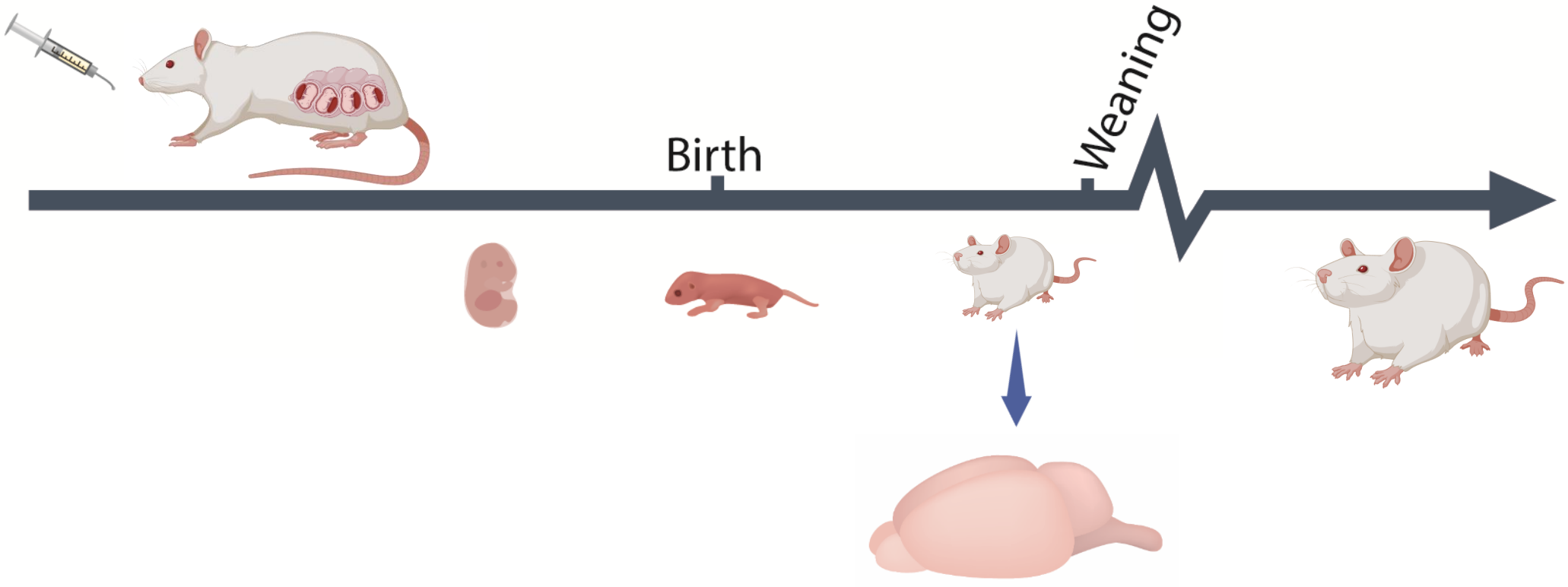
Majsolie (Kontrol) eller kemikalie



Figures created with www.biorender.com

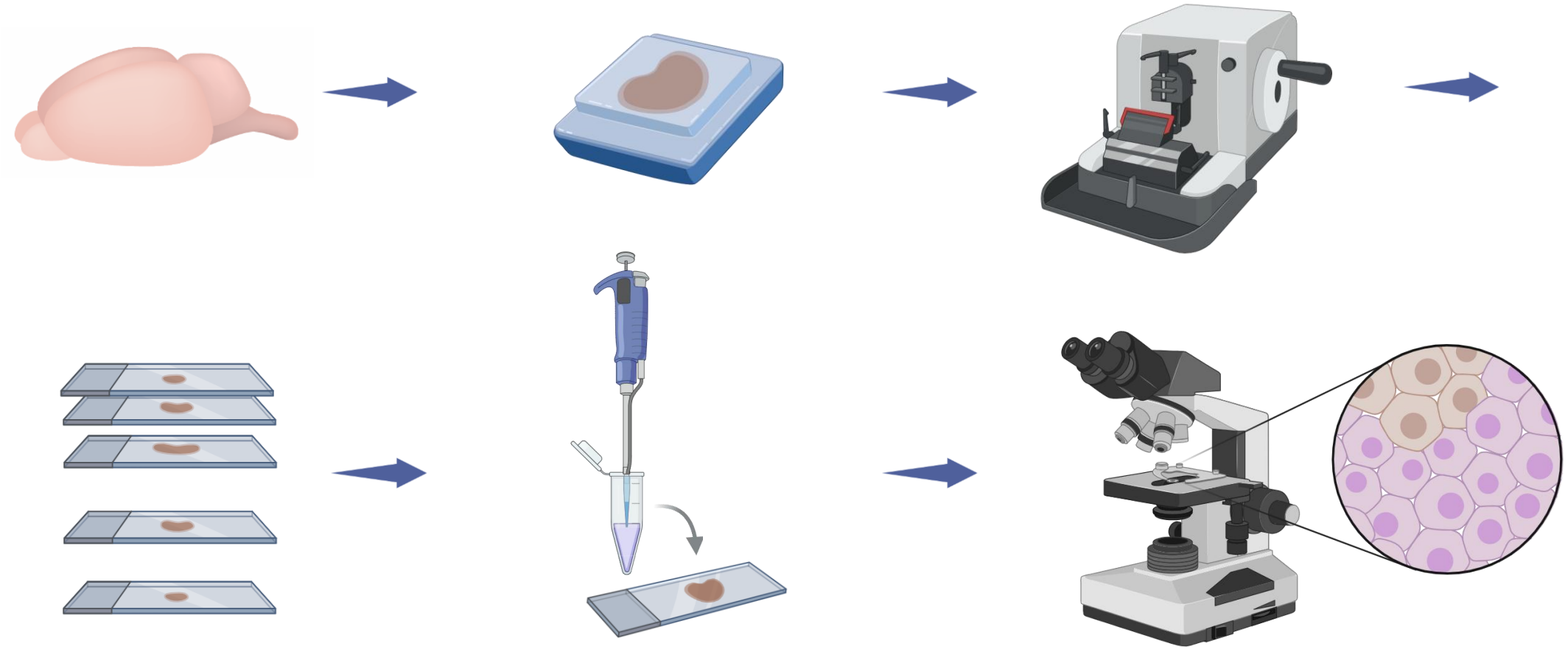
Testning for TH-forstyrrende effekter

Majsolie (Kontrol) eller Kemikalie



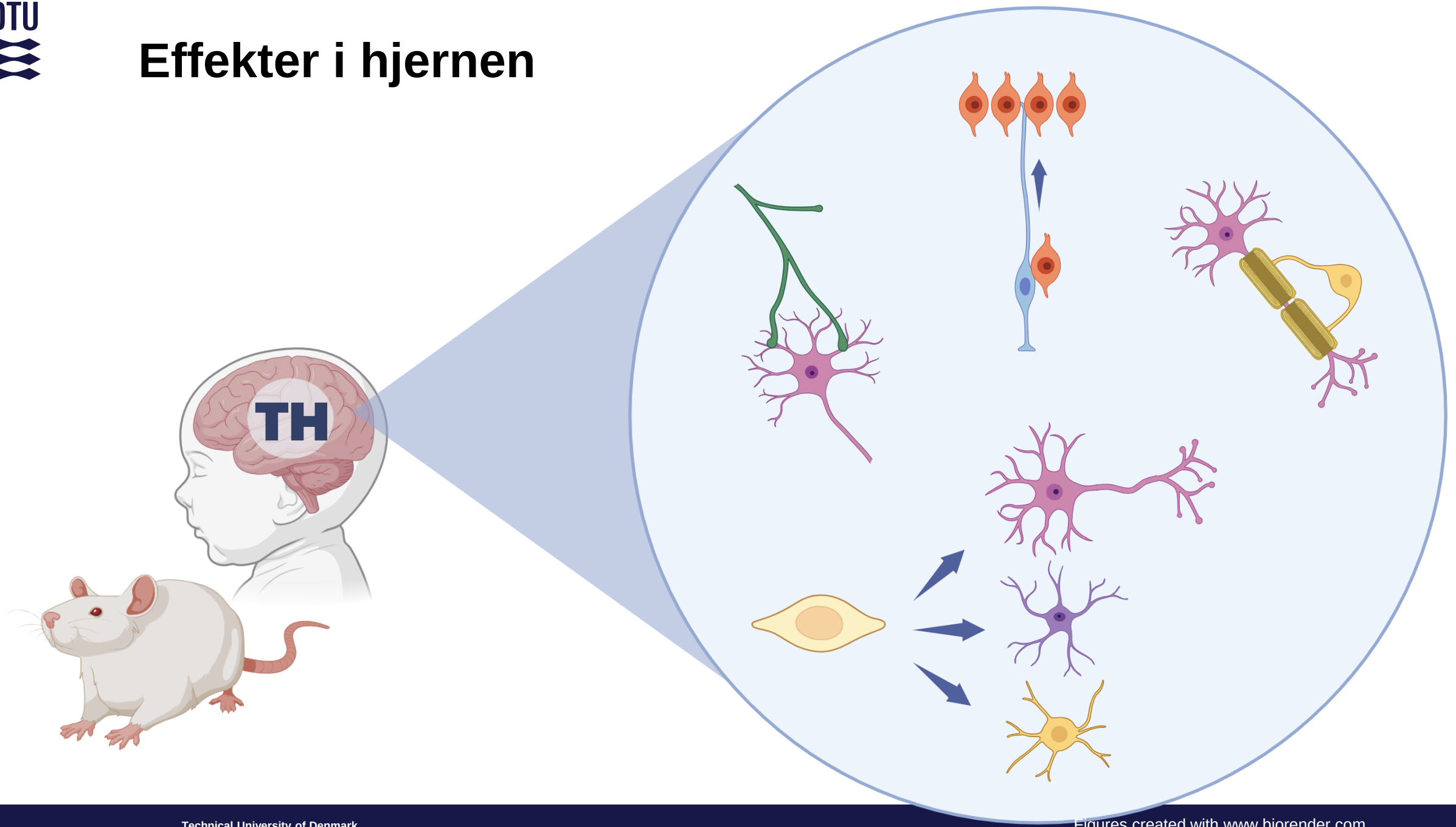
Figures created with www.biorender.com

Vævssnit til mikroskopi



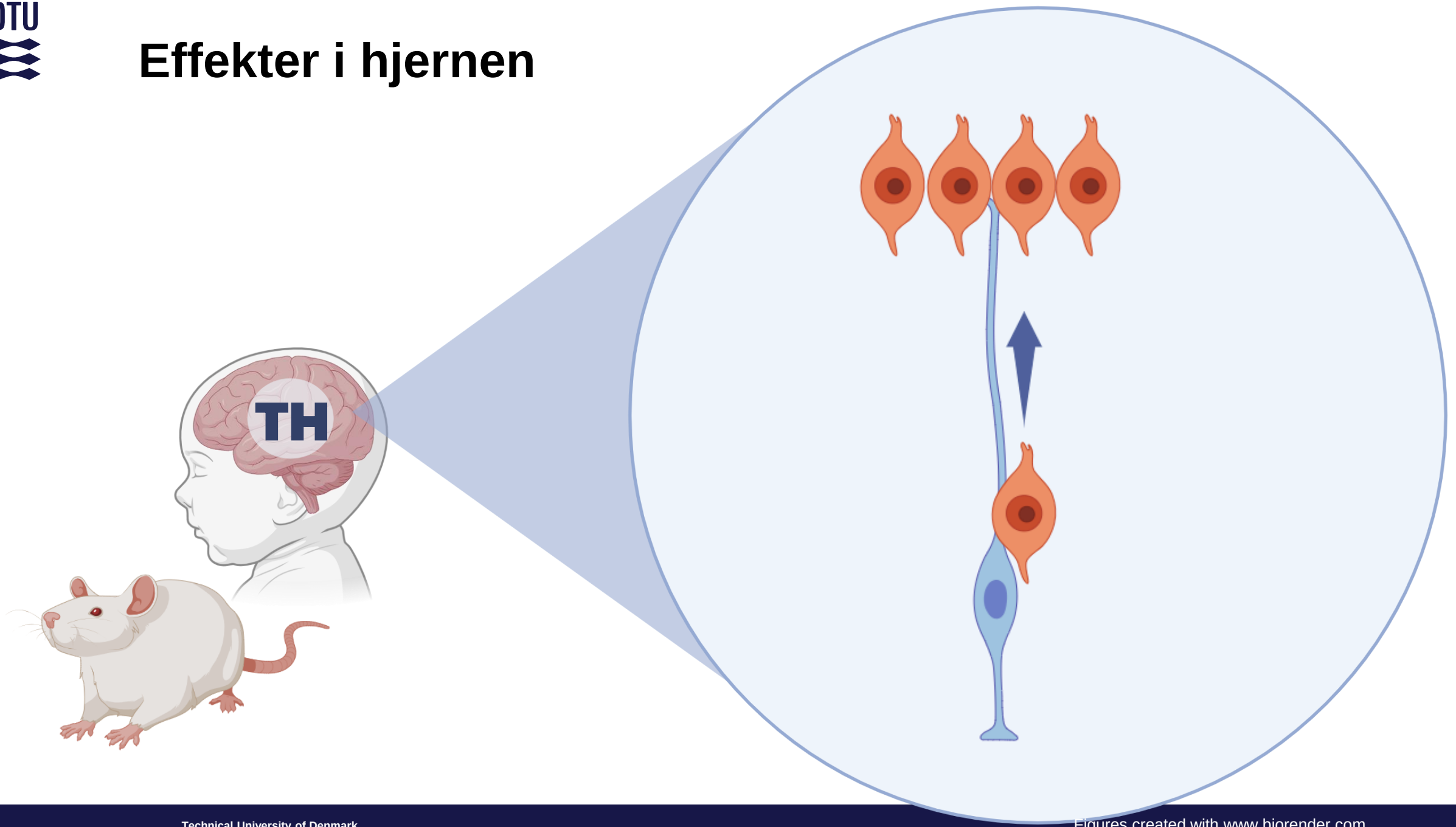
Figures created with www.biorender.com

Effekter i hjernen



Figures created with www.biorender.com

Effekter i hjernen



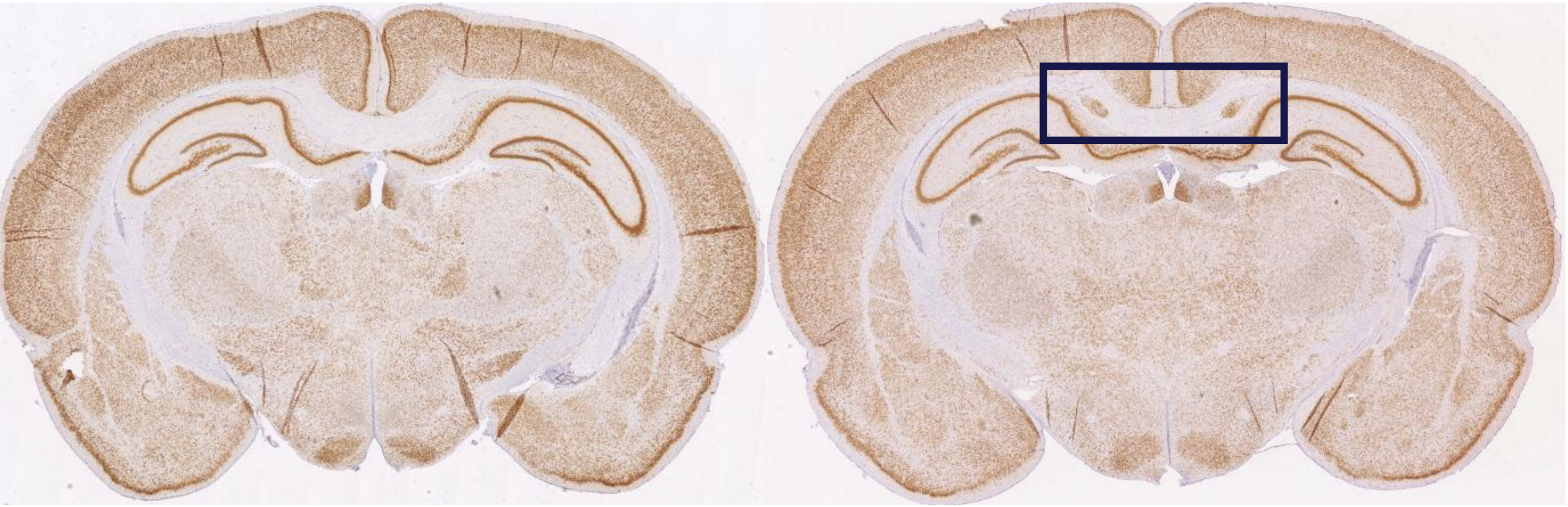
Figures created with www.biorender.com

Migrationsfejl - Periventrikulær Heterotopi

NeuN

Control
PD 16 brain

Hypothyroid
PD 16 brain



5 mm

Neuronal migration error

Heterotopia linked to seizures and epilepsy in humans

Structural malformation = Adverse effect

A downstream marker of T4 levels during development

Migrationsfejl - Periventrikulær Heterotopi

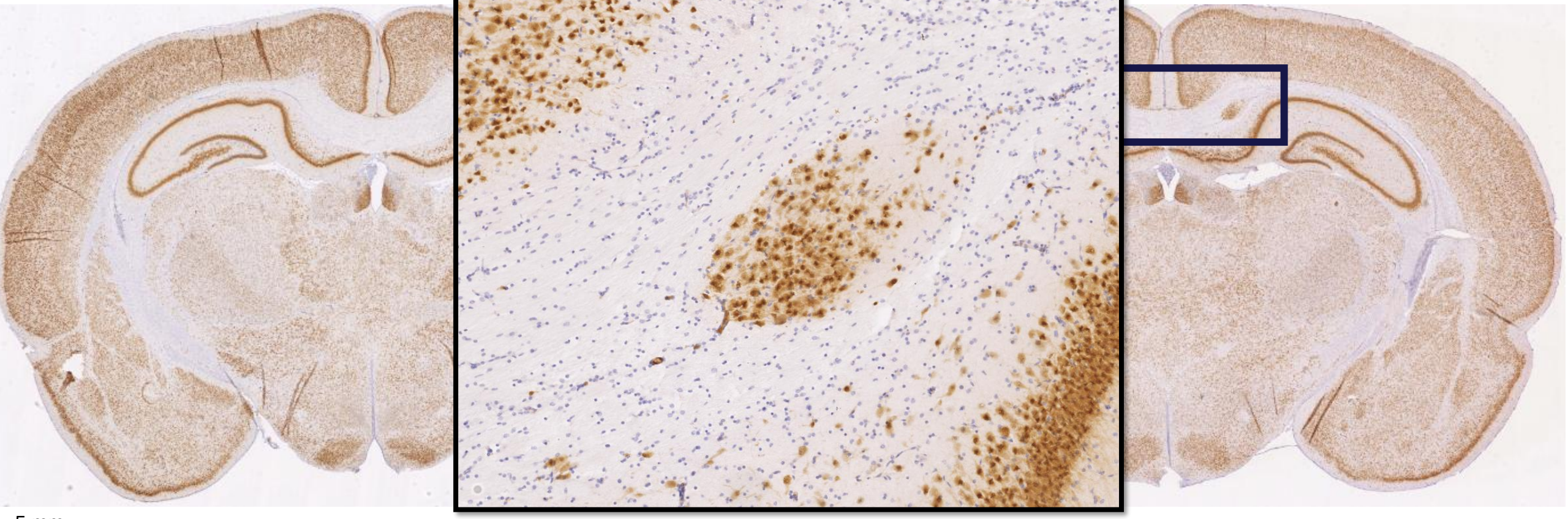
Control

PD 16 brain

othyroid

16 brain

NeuN



5 mm

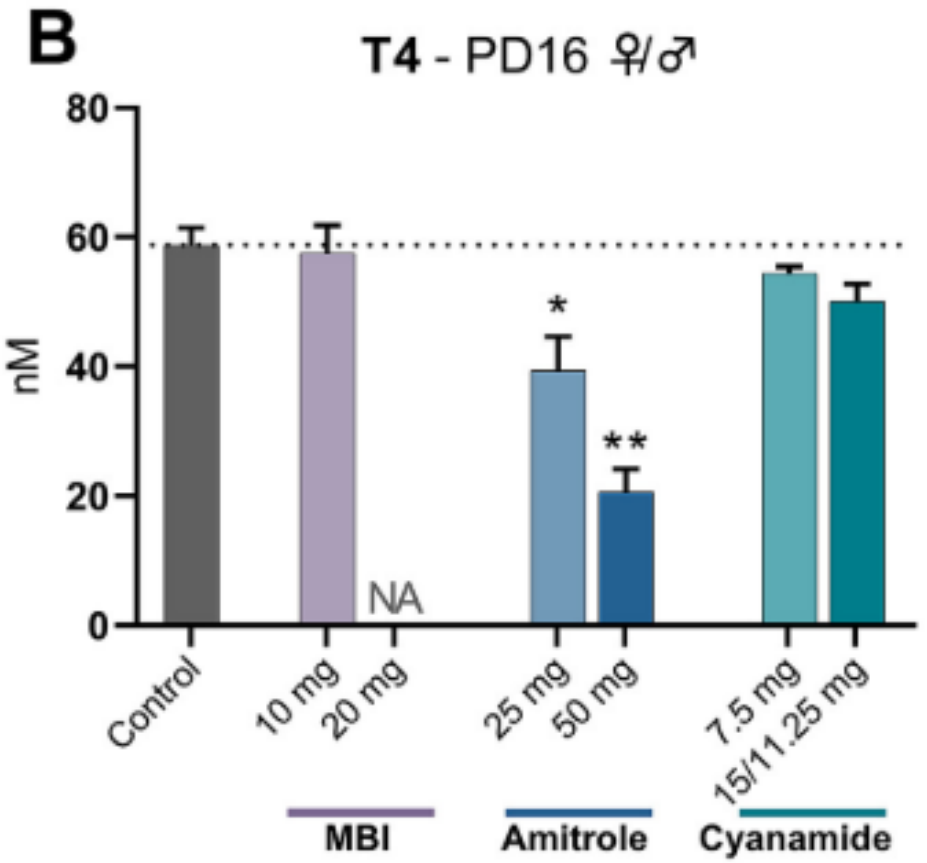
Neuronal migration error

Heterotopia linked to seizures and epilepsy in humans

Structural malformation = Adverse effect

A downstream marker of T4 levels during development

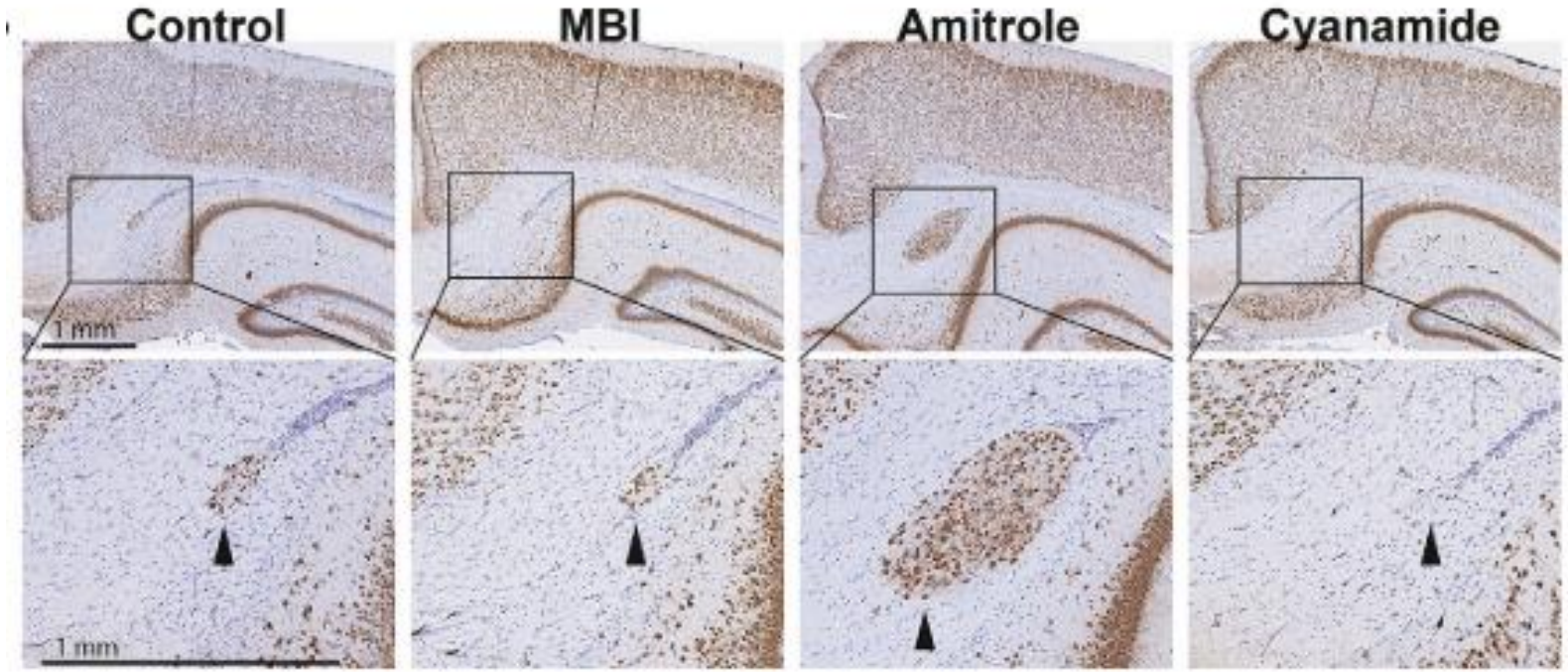
Pesticider og heterotopier?



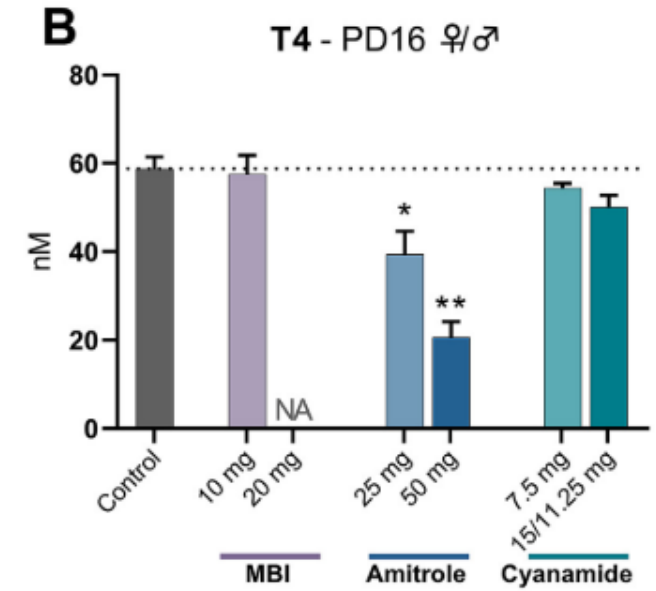
Ramhøj et al., 2021

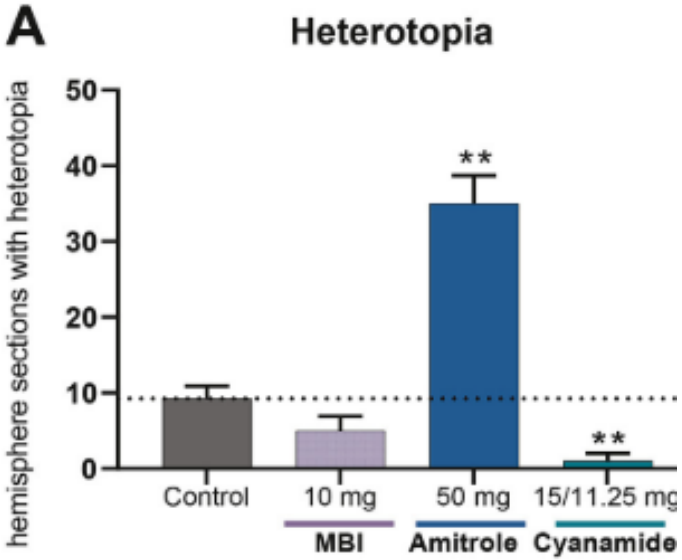
Pesticider og heterotopier?

Ja – når TH har været lav nok



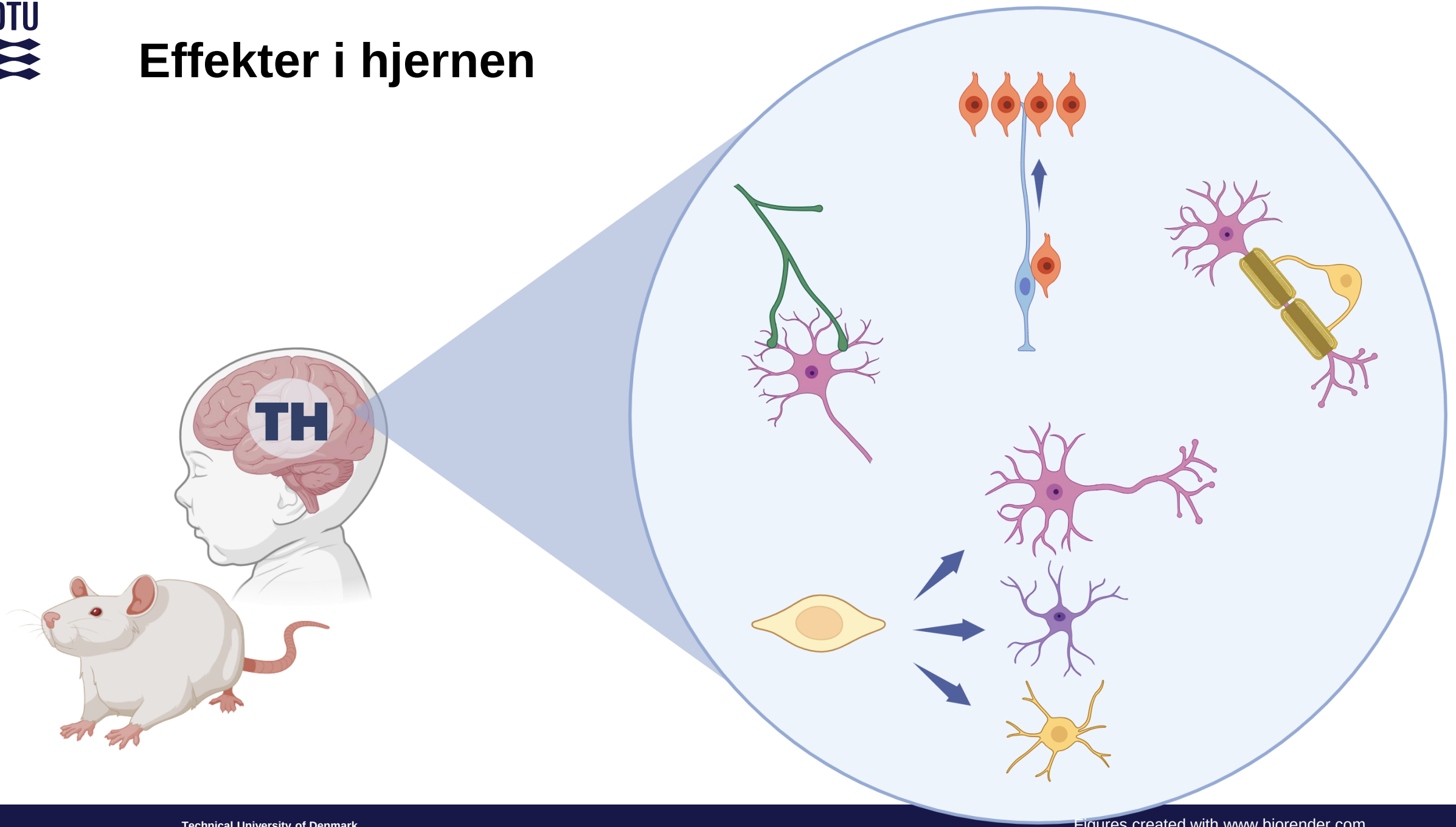
NeuN





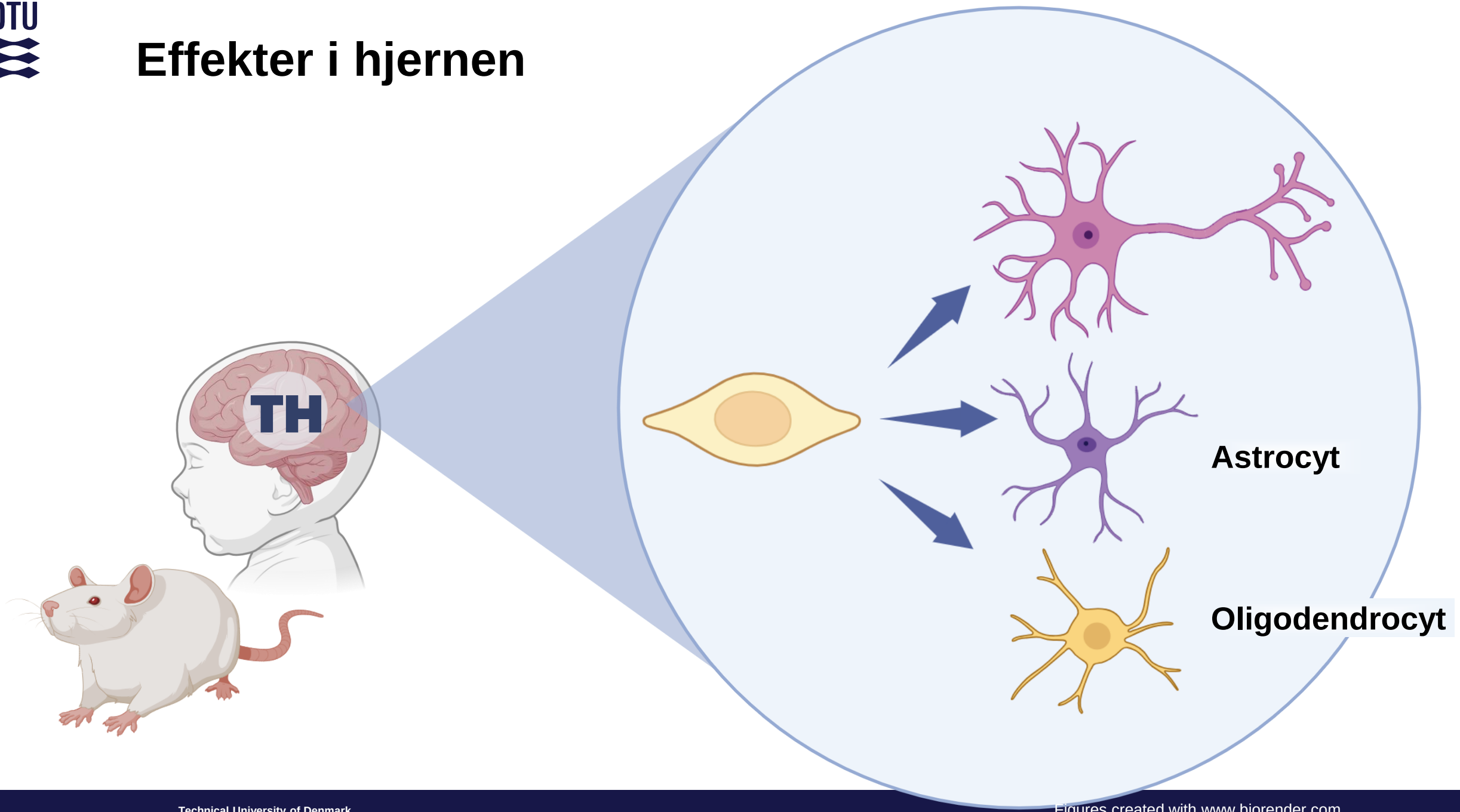
Ramhøj et al., 2021

Effekter i hjernen



Figures created with www.biorender.com

Effekter i hjernen

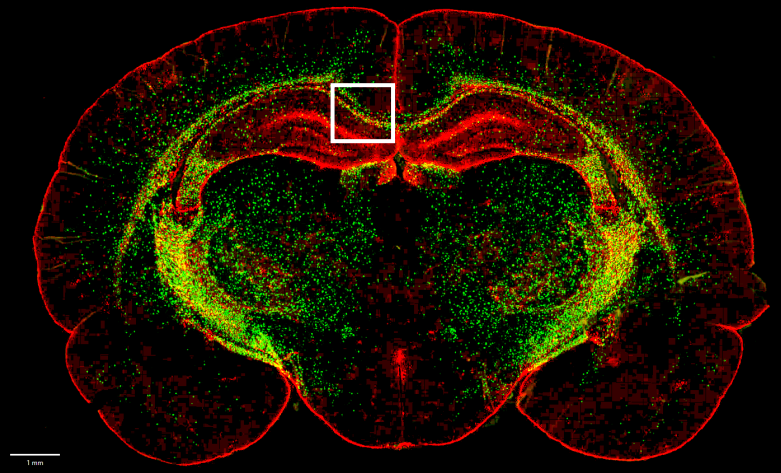


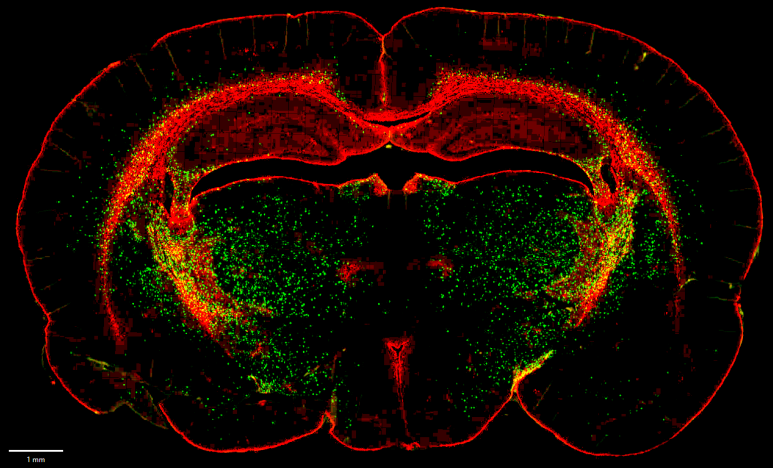
Figures created with www.biorender.com

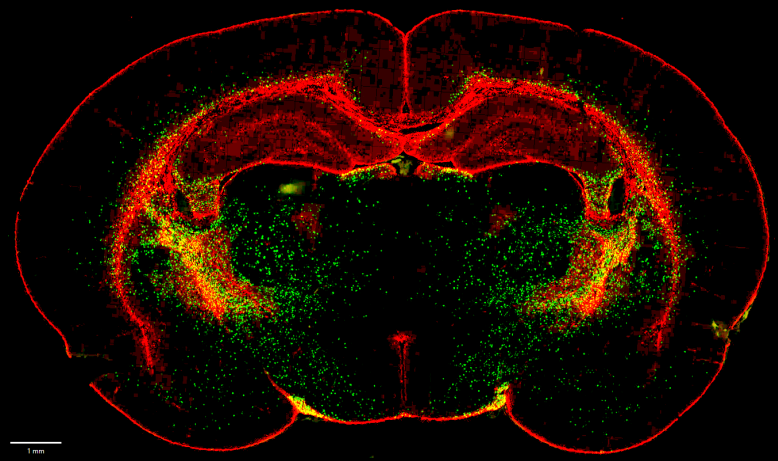
Kontrol

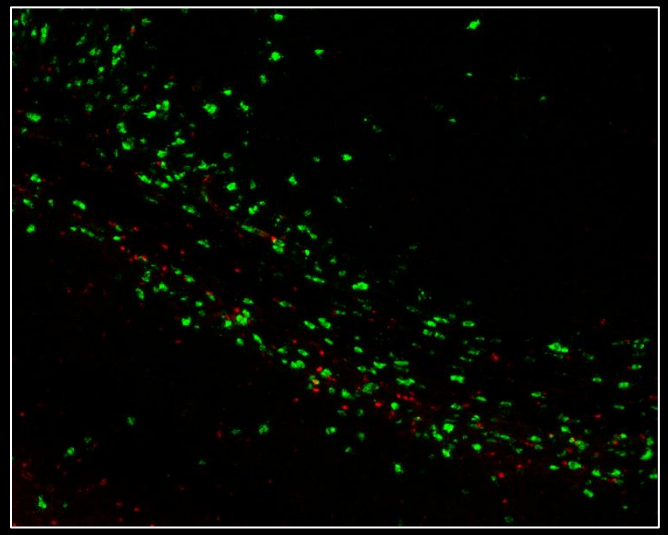
MMI

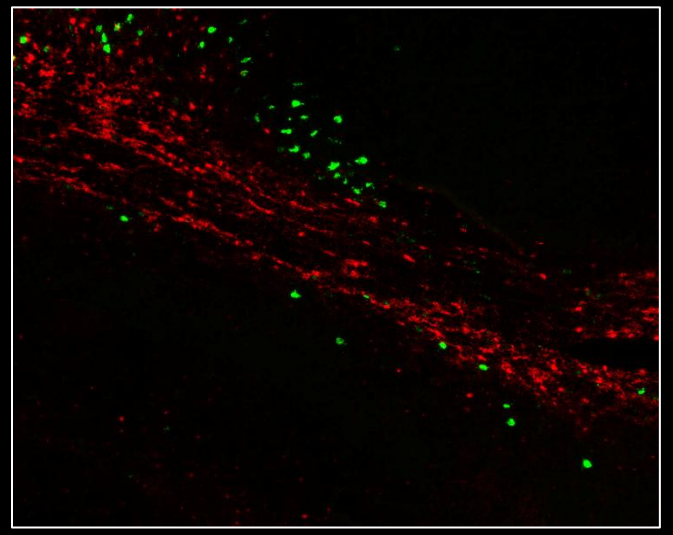
Amitrol

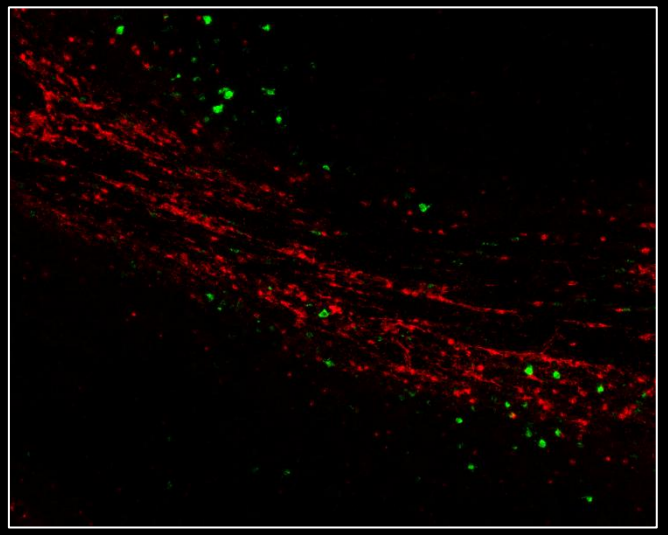








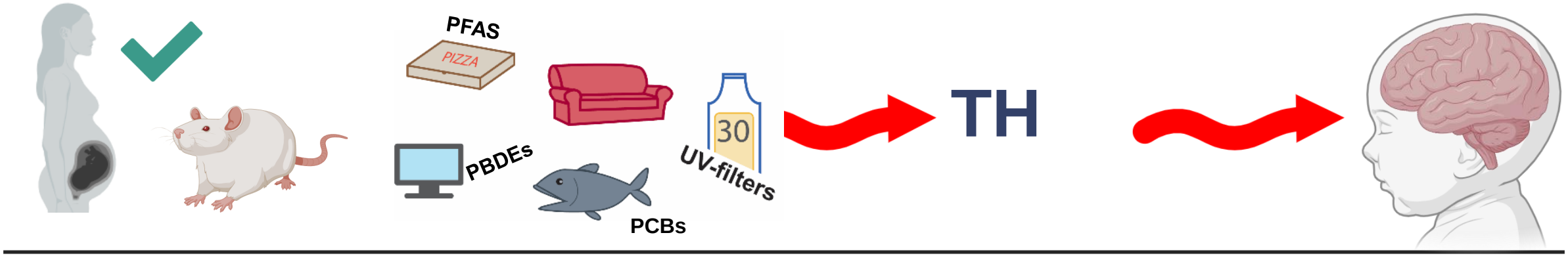




Mag Oligodendrocytter

Gfap Astrocytter

Kan TH-forstyrrende stoffer påvirke hjernens udvikling i mennesker?



Sammenhænge

Figures created with www.biorender.com

Konklusioner

- Mennesker er følsomme over for TH-forstyrrelser der kan påvirke hjernens udvikling
- Vi kan blive klogere på effekter i mennesker ved at undersøge dyr
- Forbedret identifikation og testing af kemikalier kan medvirke til bedre regulering af brugen af hormonforstyrrende stoffer

Tak

DTU
Marta Axelstad
Terje Svingen
Jacob Ardenkjær-Skinnerup
Marie Berg
Nichlas Davidsen
+ rest of MolReproTox research group

Uni. Rennes/INSERM
Frédéric Chalmel + Lab

US EPA
Mary Gilbert + Lab
Jermaine Ford + Lab

Charité
Josef Köhrle + Lab
Caroline Frädrich

Ministry of Environment of Denmark
Environmental Protection Agency

European Commission

athena

Danish Veterinary and Food Administration

Center for Hormonforstyrrende Stoffer

Tak