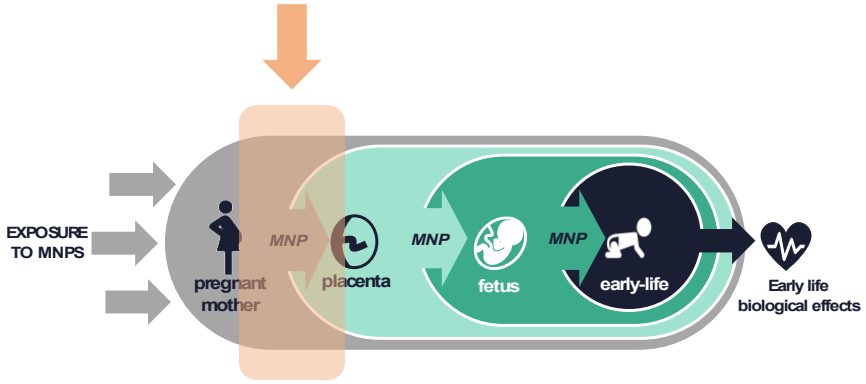
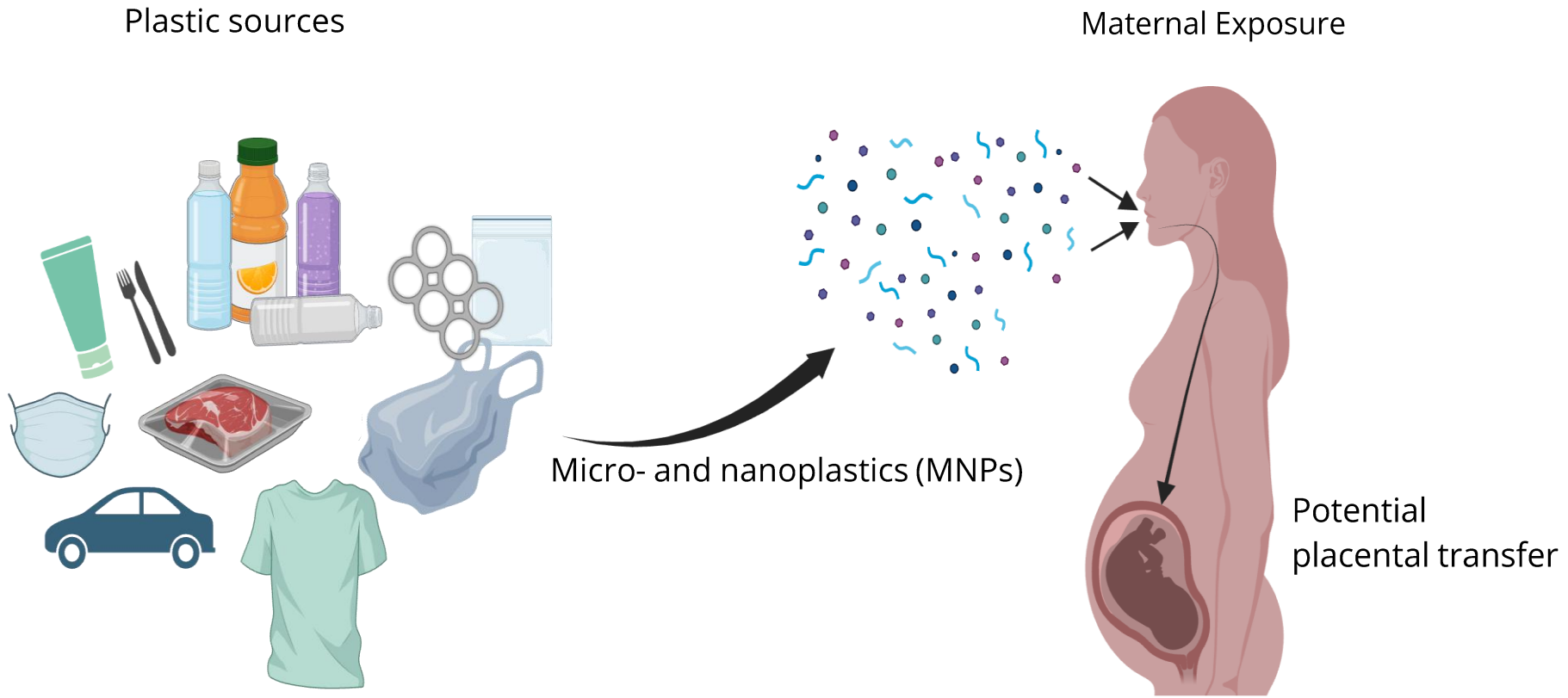



# Do MNPs cross the placental barrier and expose the fetus?

*Dr. Laurens Mandemaker, AURORA researcher, Utrecht University*

# Potential placental transfer



# Micro- and nanoplastics

- Reports emerged on their presence in placenta
  - Microplastics >10 micrometer
  - Py-GC MS studies reporting plastics in all placentas measured

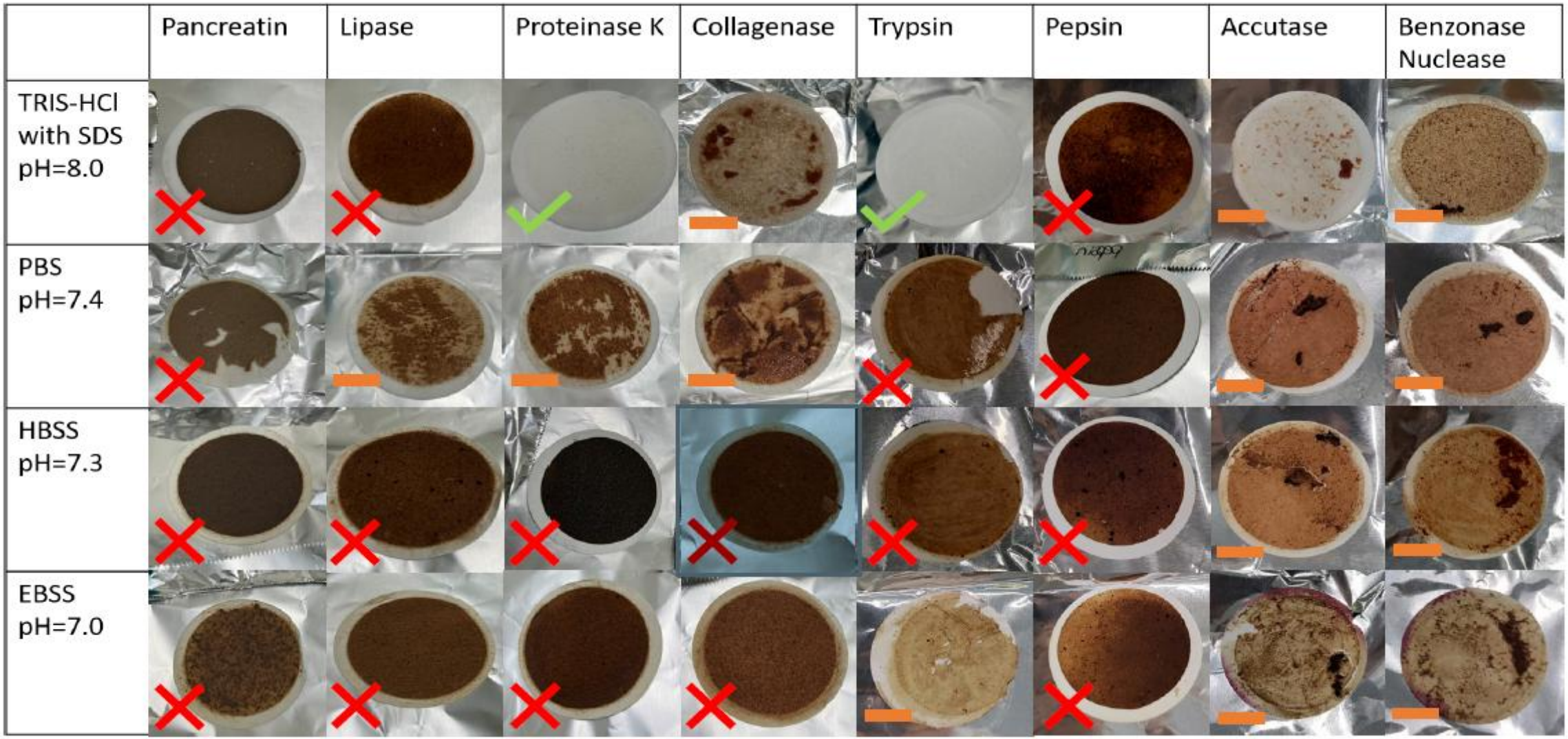
Do MNP reach the placenta, and fetus?

Do MNPs impair placental or fetal development?

1. Digestion of placental tissue
2. Placenta perfusion

[3] Regusa et al. ***Environ Int*** *2021, 146, 106274*
[4] Braun et al. **Pharmaceutics** *2021, 13, 921*
[5] Garcia et al. **Toxicol. Sci.** *2024, 199, 81*

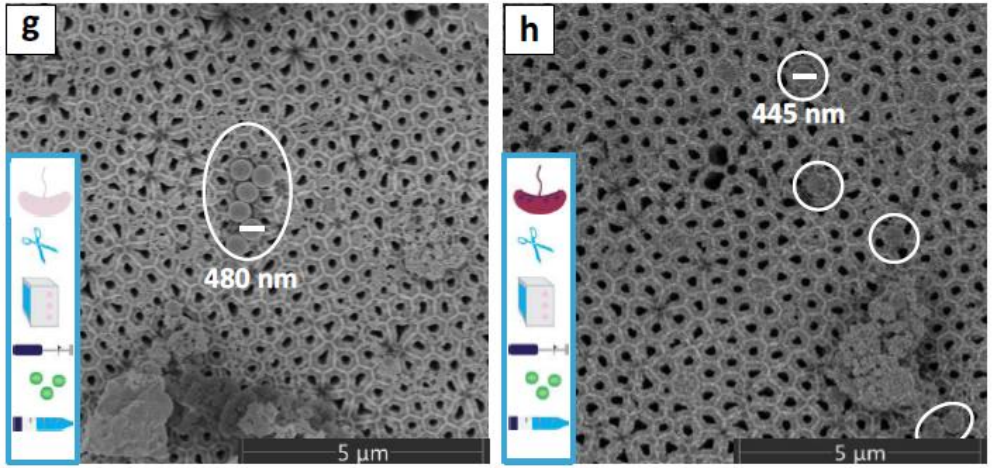
# Digestion protocol for MNP analysis from placentas

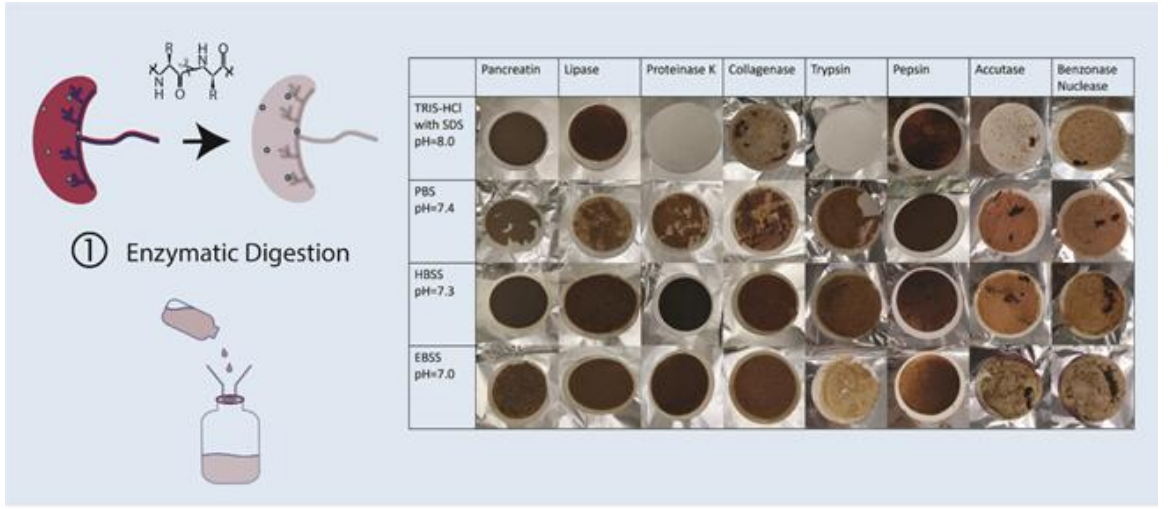


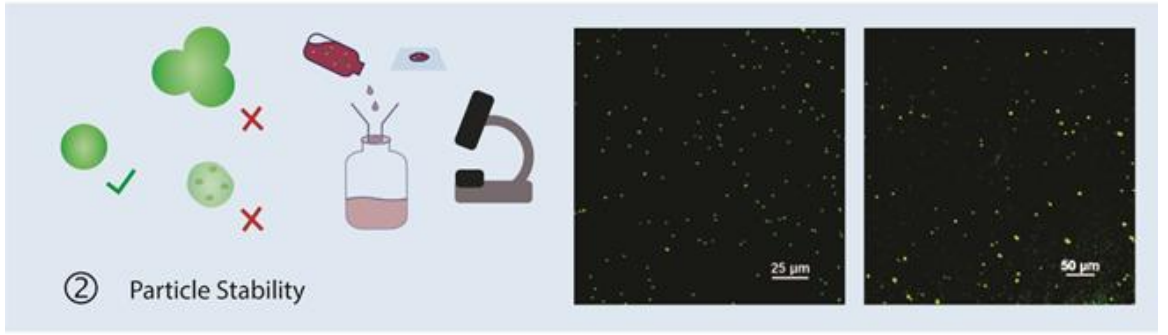
# Digestion for characterization

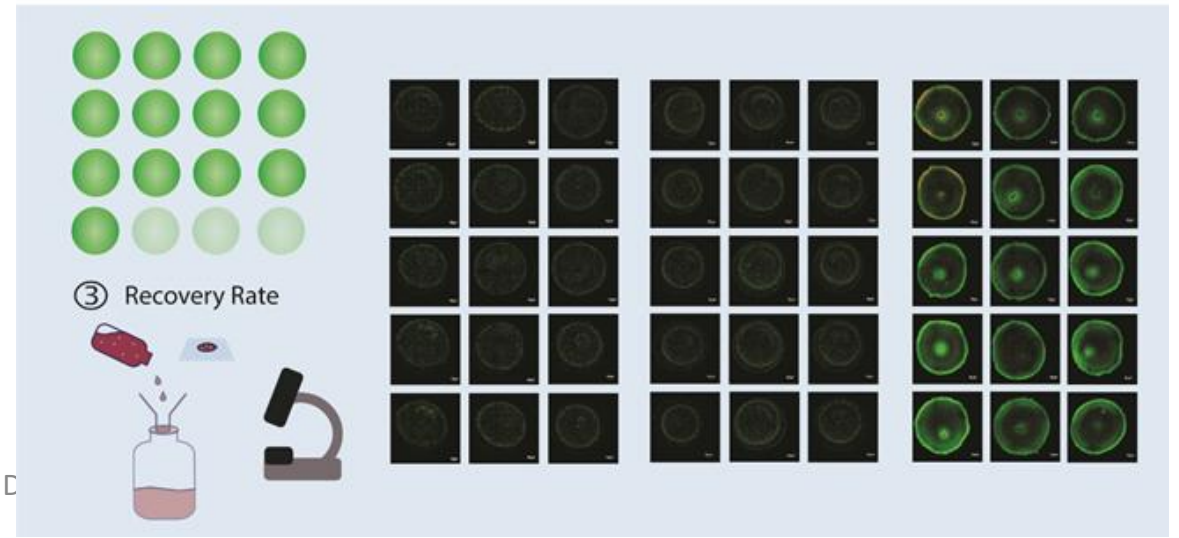
- Recovery rates determined to validate MNP fate

- Microscopy methods possible; for nano still challenging



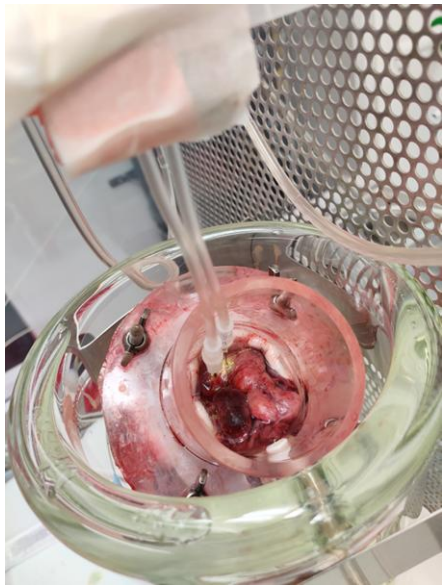



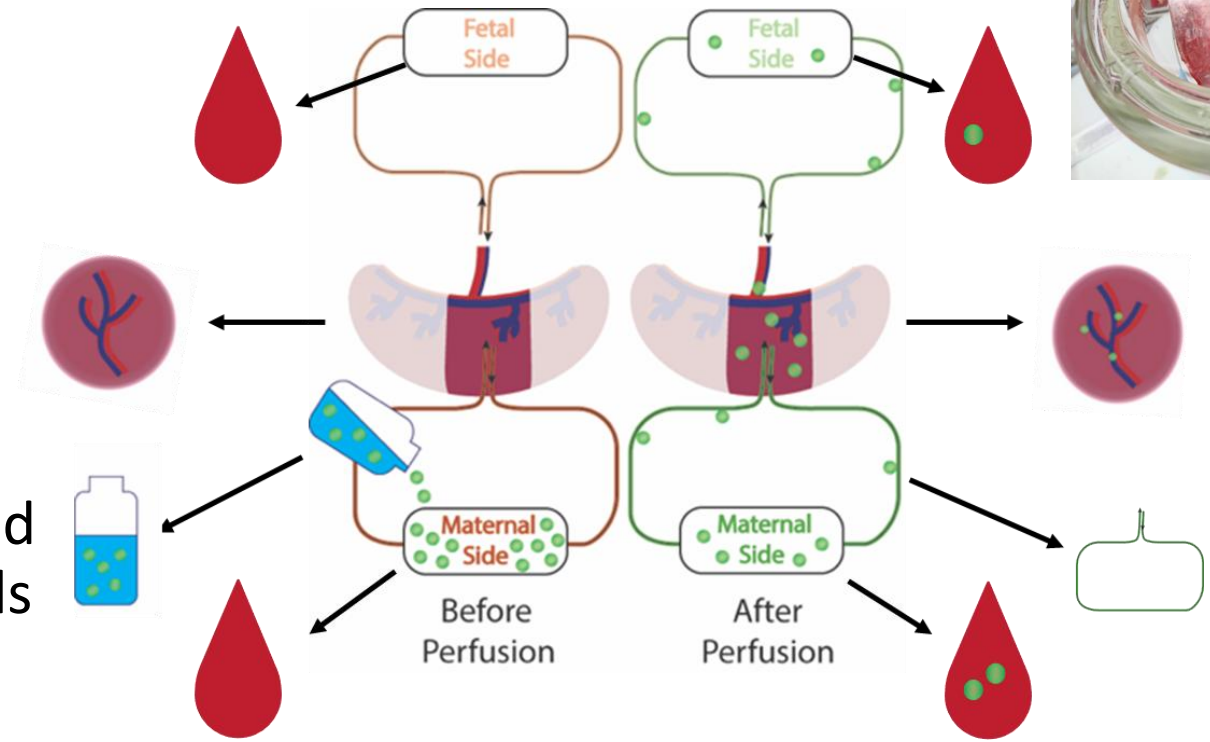



# Placenta perfusion studies

- Placenta perfused at UEF with fluorescent PS MNPs
- Transfer across placental barrier studied
- Measure MNP concentrations in tissue and in fetal and maternal liquids



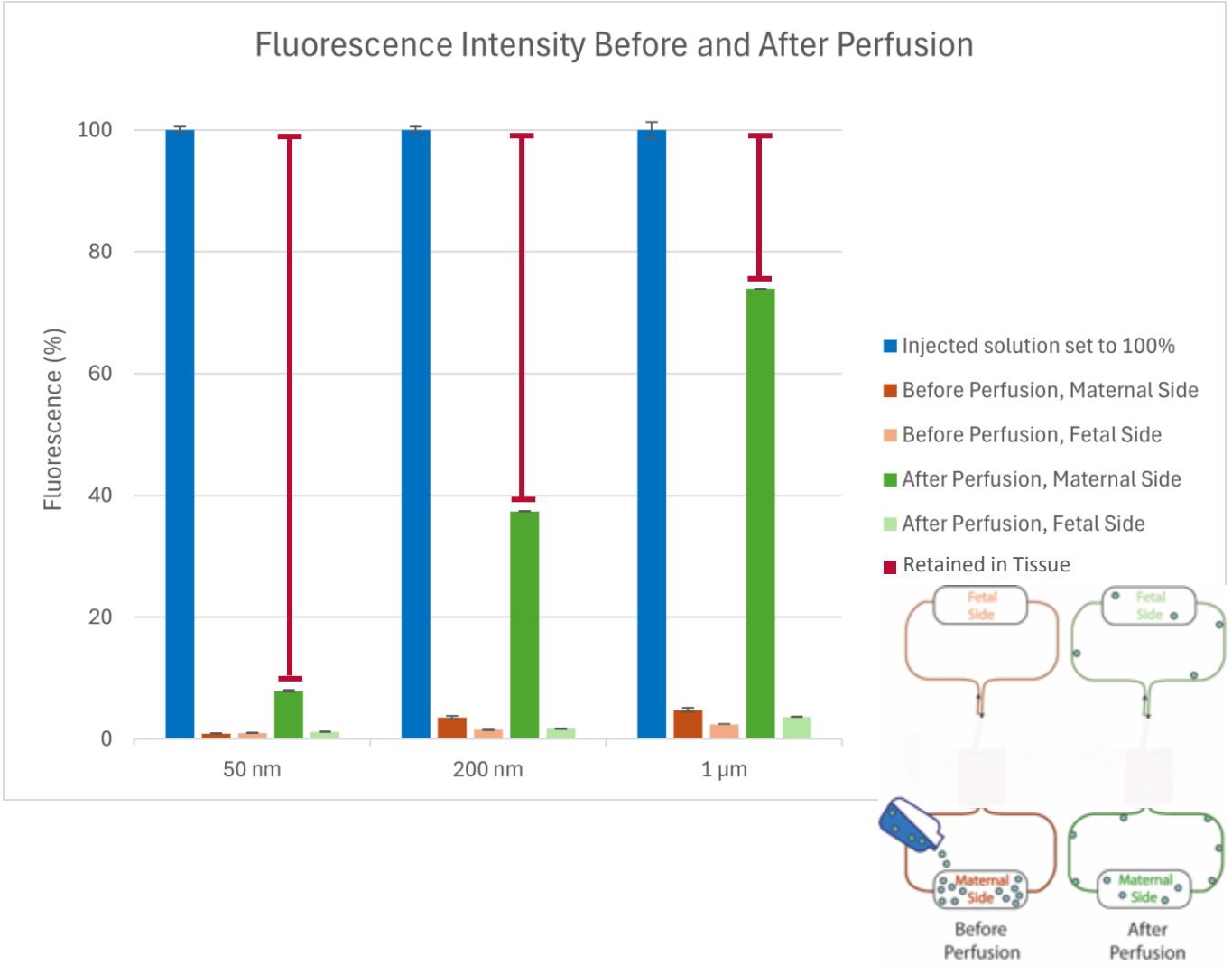


# MNP retention in placenta tissue

- Before perfusion, low fluorescence on both **maternal** and **fetal** side
- After perfusion, concentration has decreased on the **maternal** side; none or a very limited increase on **fetal** side (1 µm)

➢Retention in **tissue** or **tubing** is size-specific:

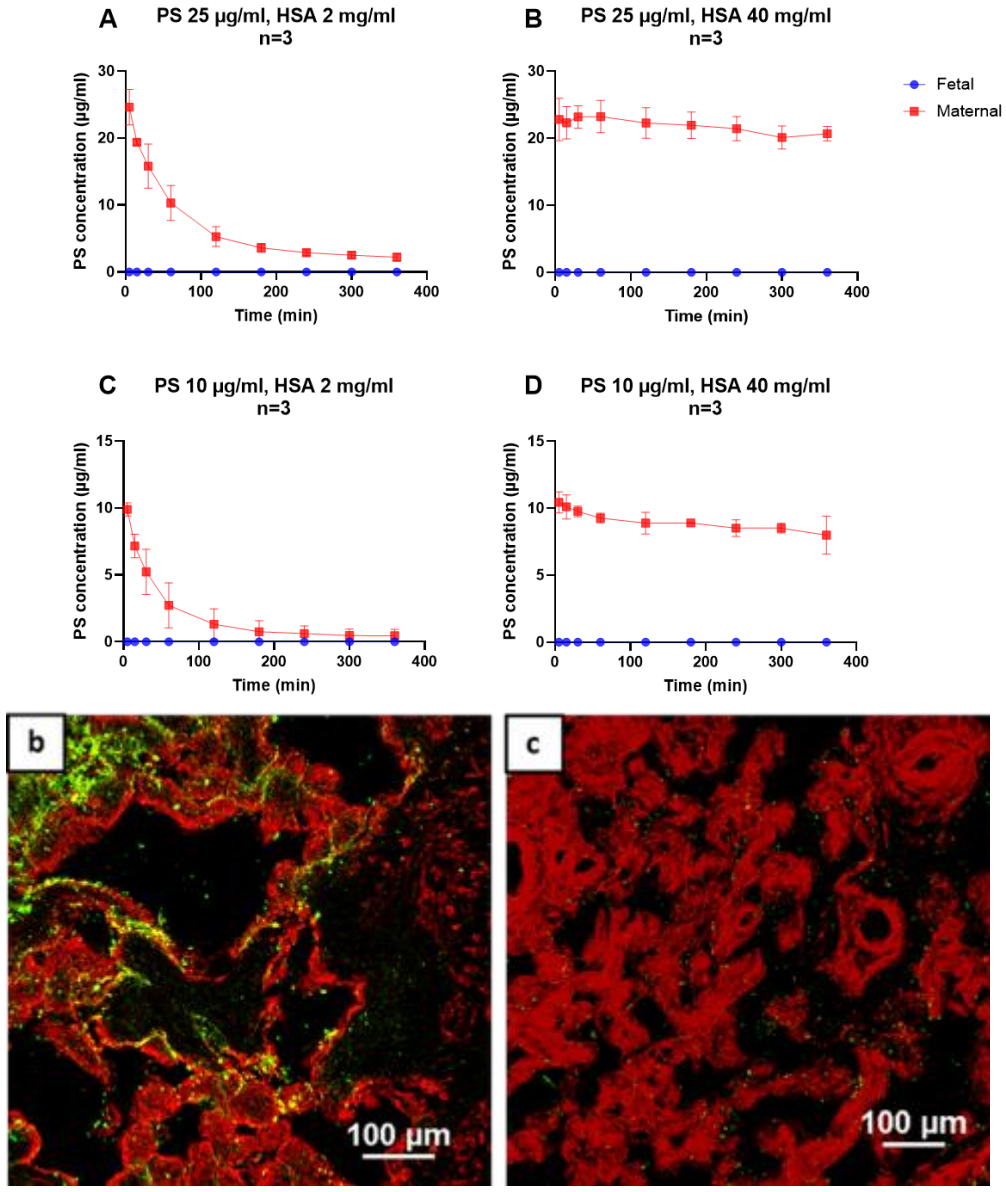
- 92% (50 nm)
- 63% (200 nm)
- 26% (1 µm)



# HSA plays a role

- HSA (albumin) affects clustering; less HSA led to more clustering, which accumulated around the villi.

- However, fetal transfer seemed uninfluenced by this (high HSA > more in maternal side)



# Summary & Impact

- Digestion protocols are vital to assess MNP concentrations in placenta
- Perfusion studies give valuable insights in MNP transfer, highlighting the complexity and dependance on e.g. size and media
- MNP transfer to placenta is minor, but present