PFAS AND PLACENTAL TOXICITY

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NORTH CAROLINA PFAS Testing Network

THE UNIVERSITY of NORTH CAROLINA at CHAPEL HILL

Human studies suggest PFAS exposure may...

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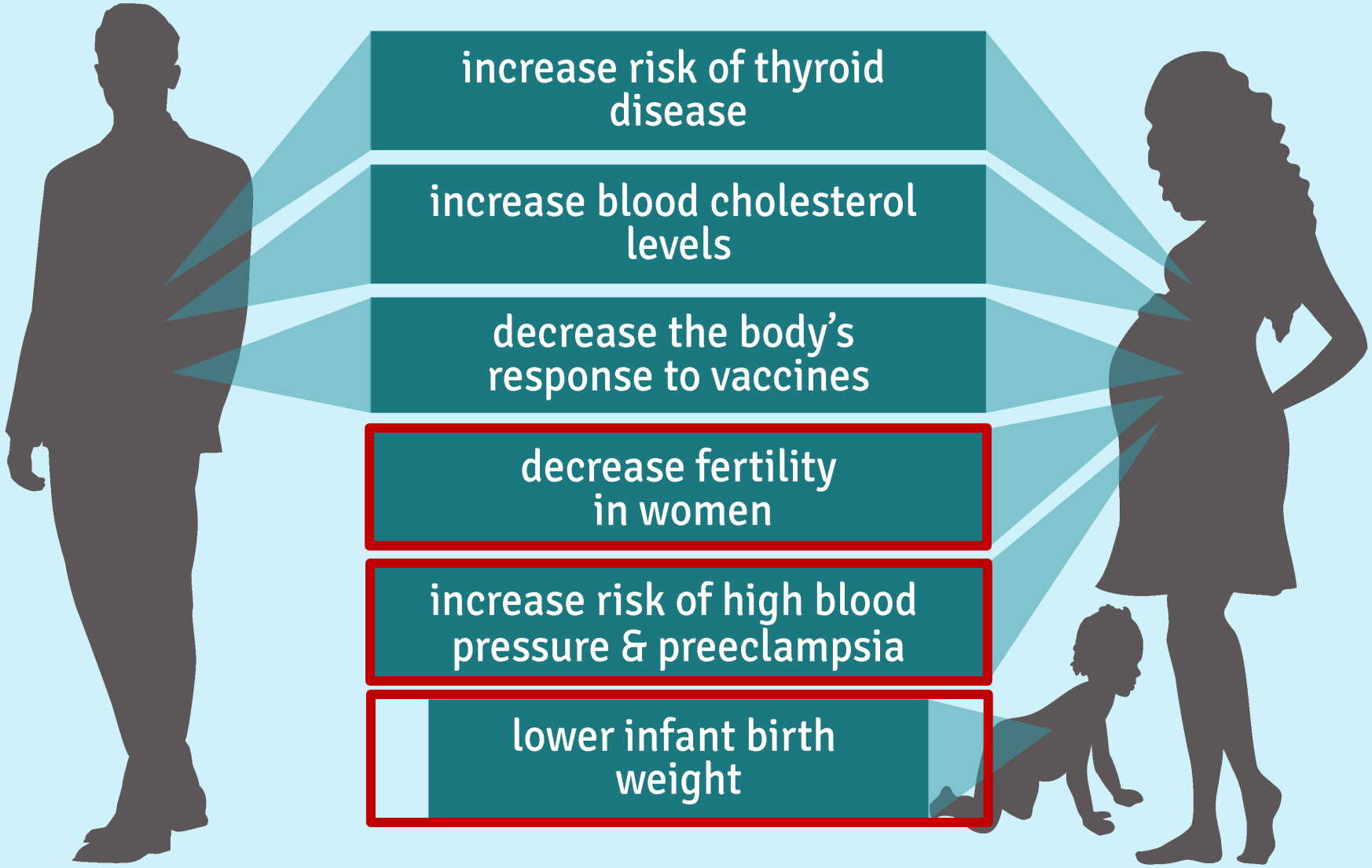

in adults

in children

in pregnant women

Information sourced from Agency for Toxic Substances and Disease Registry

Human studies suggest PFAS exposure may...

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increase risk of thyroid disease

increase blood cholesterol

Do PFAS in drinking water pose a risk to pregnant women and could they affect the health and function of her placenta?

decrease fertility in women

increase risk of high blood pressure & preeclampsia

lower infant birth weight

in adults

in children

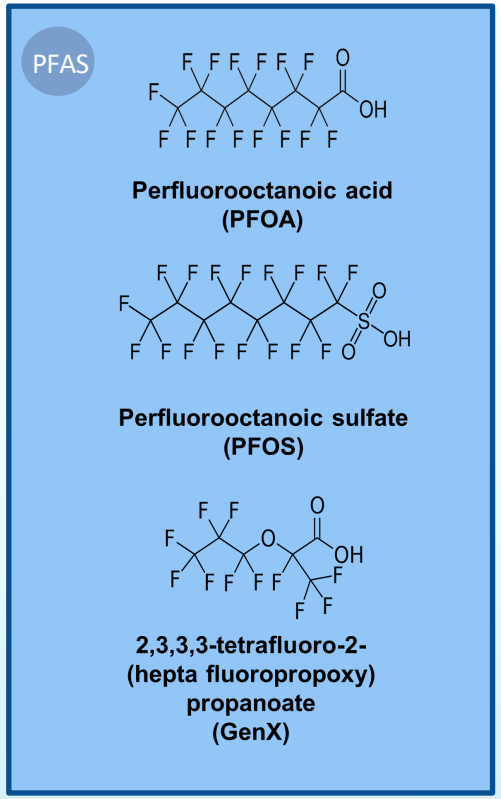
in pregnant women

Information sourced from Agency for Toxic Substances and Disease Registry

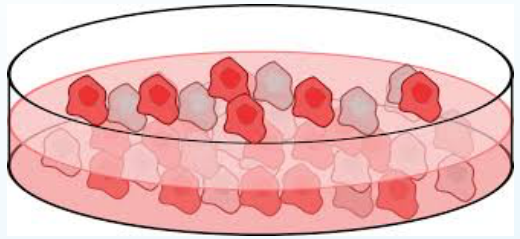
Do PFAS in drinking water pose a risk to pregnant women and could they affect the health and function of her placenta?

Human

What are the levels of PFAS in the placenta??

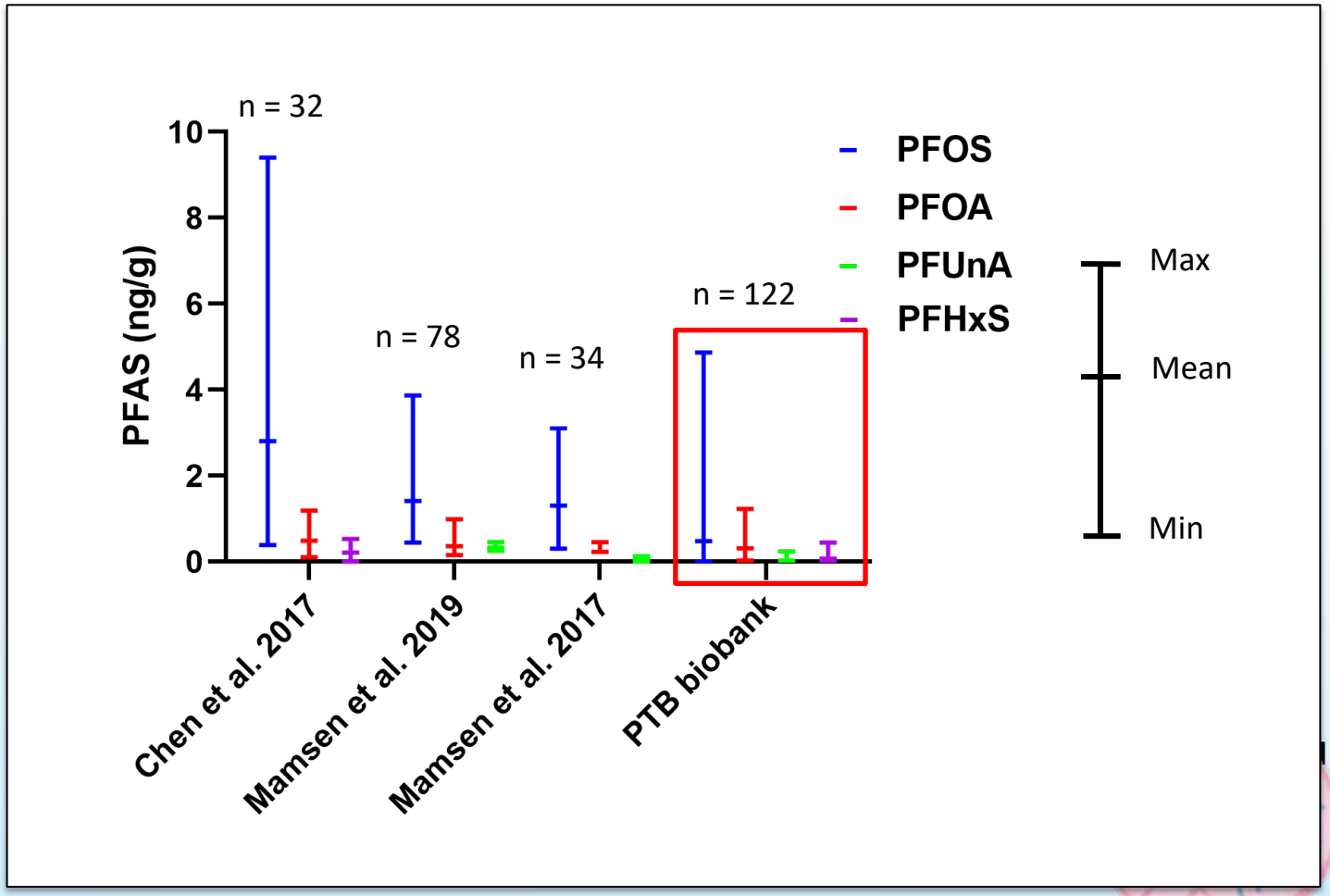


Cells



What is the effect of PFAS on placental health and function?

What are the levels of PFAS in the placenta?



PFAS results are presented as ng/g wet weight

Risk factors associated with elevated PFAS in PTB placenta

PFOS, PFHxS, PFHps, and PFUnA were investigated for associations with risk factors including:

- Maternal age
- Maternal smoking status
- Maternal race/ethnicity
- Child's gender
- Maternal pre-pregnancy BMI
- Maternal medical insurance
- Maternal education
- Marital status

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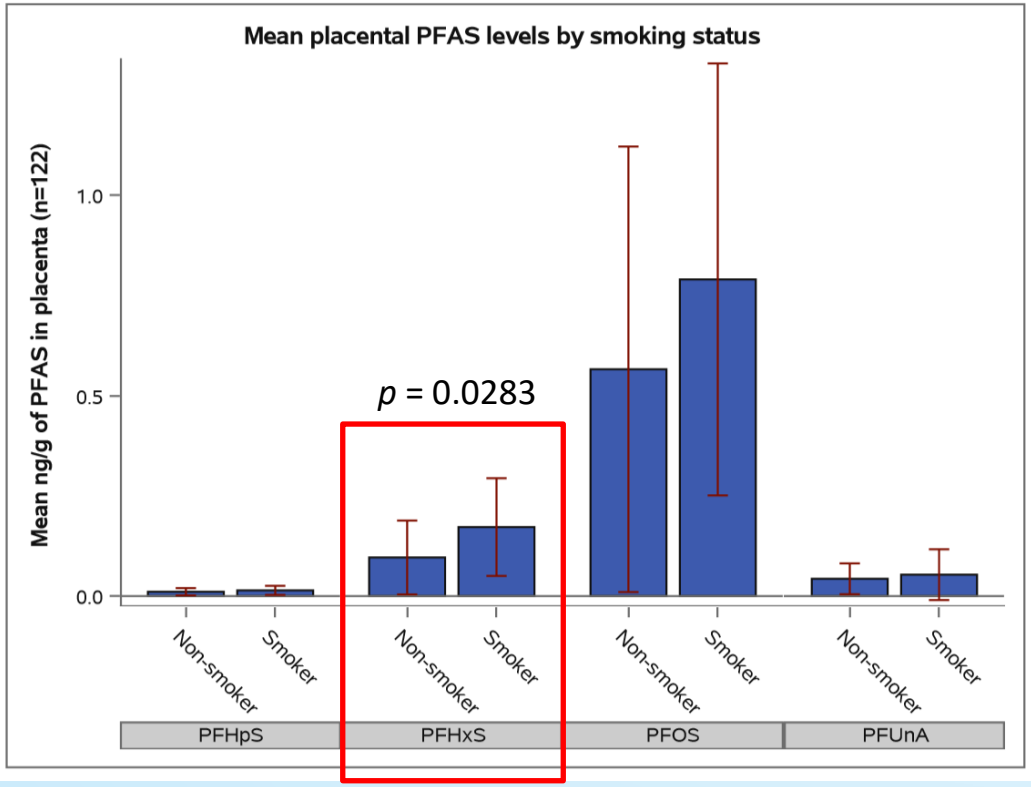
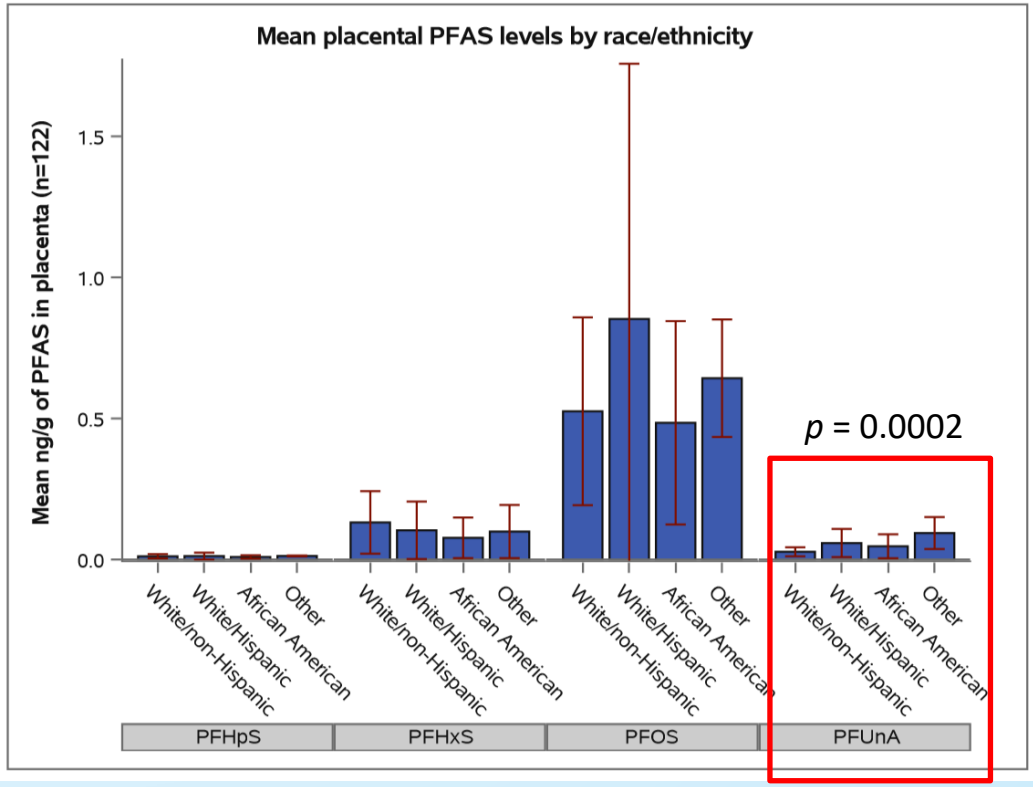




PFAS in relation to pregnancy outcomes and birth outcomes

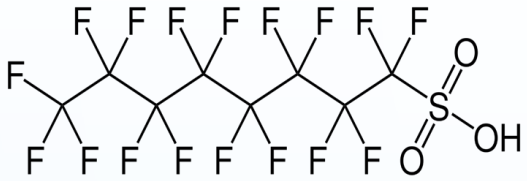
PFOS, PFHxS, PFHps, and PFUnA in relation to adverse outcomes:

- Preeclampsia
- Birthweight
- Gestational age at delivery

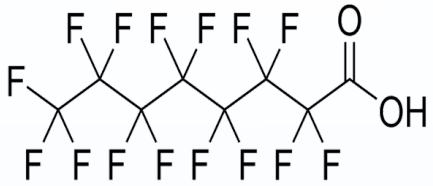
PFAS and adverse outcomes

No significant associations were observed between PFAS and any investigated adverse outcome for this study

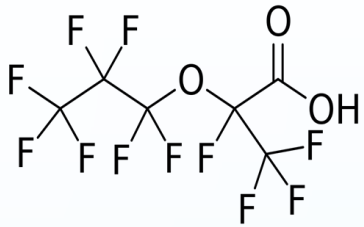
Examining the effects of PFAS in cell culture



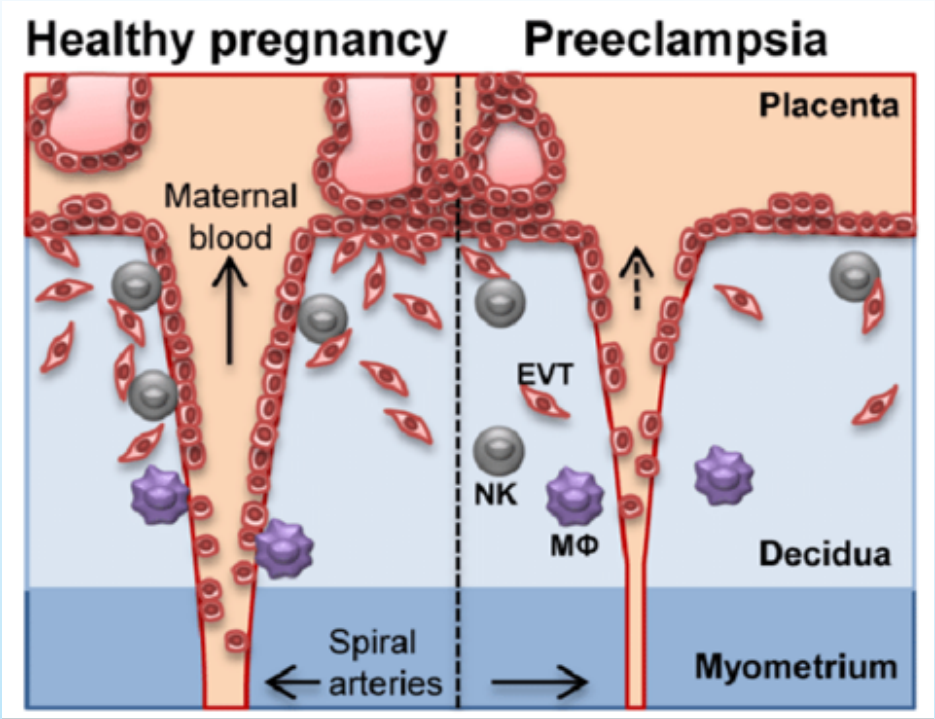
Perfluorooctanoic sulfate (PFOS)



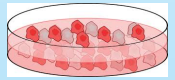
Perfluorooctanoic acid (PFOA)



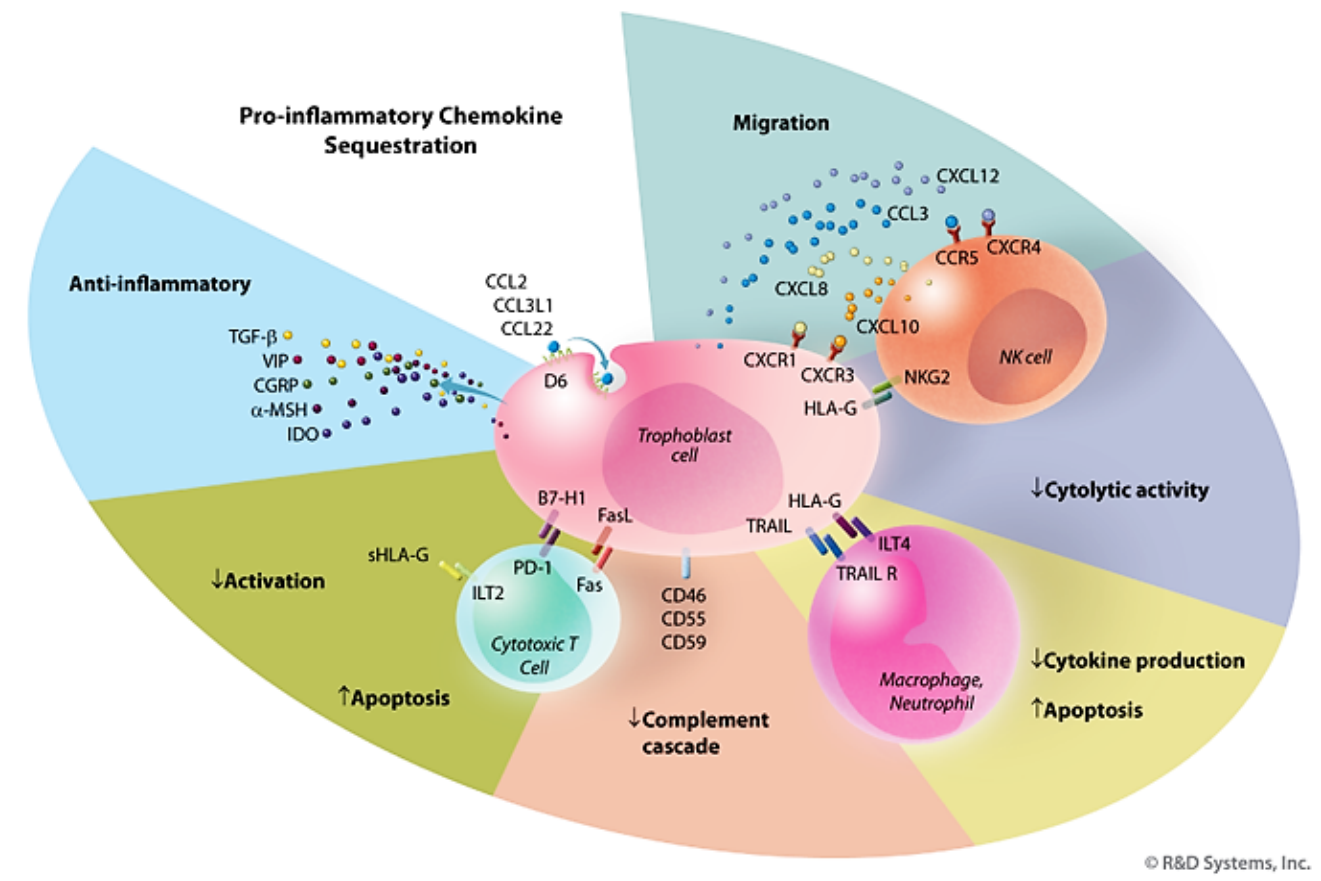
2,3,3,3-tetrafluoro-2-(hepta fluoropropoxy) propanoate (GenX)



- Late in the first trimester, cells of the placenta known as trophoblast cells migrate to invade and remodel the arteries of the uterine wall.
- Remodeling allows for increased blood flow to the placenta and growing fetus.
- When this migration and invasion of trophoblast is compromised, pregnancy complications develop like Preeclampsia.



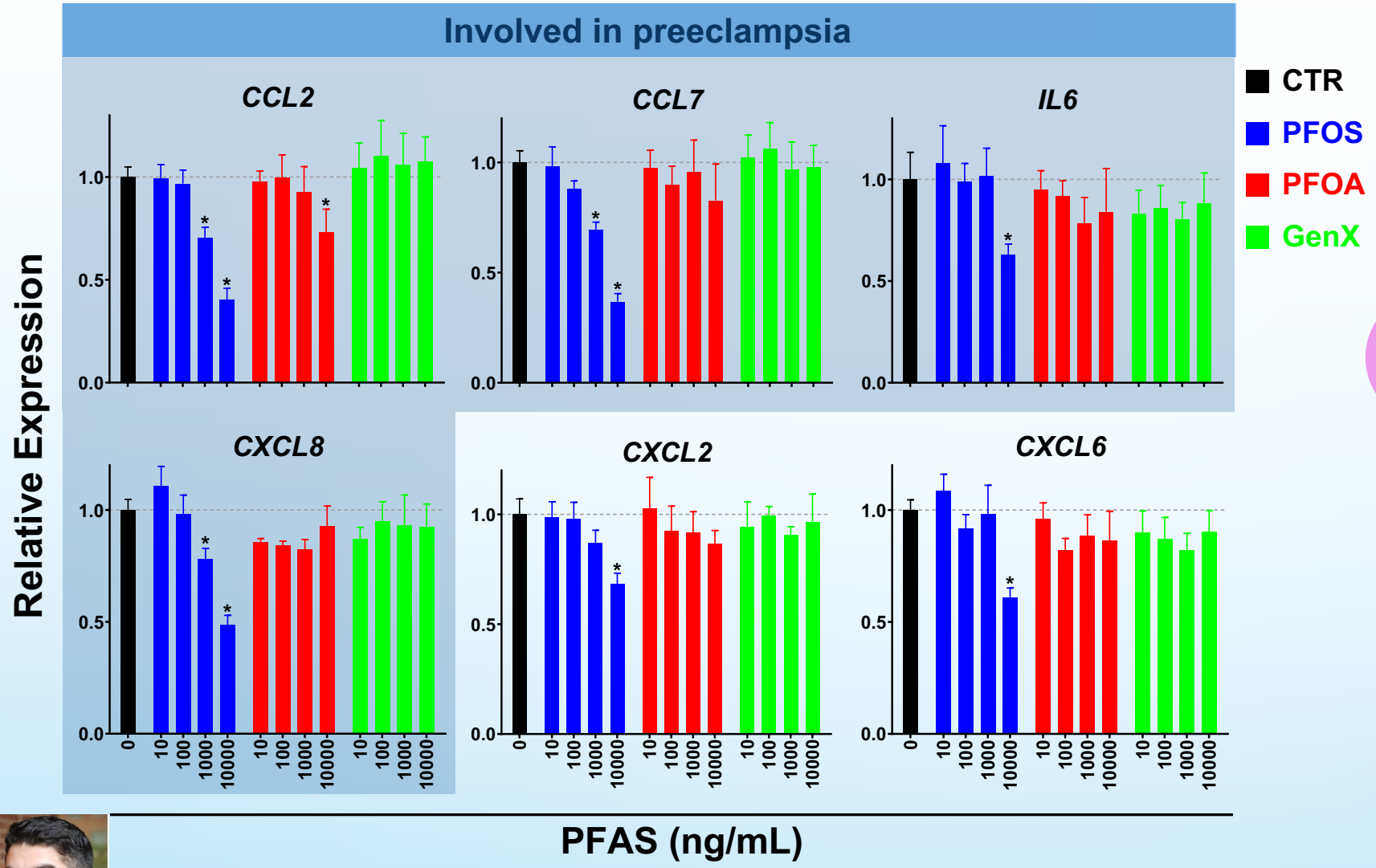
Immune regulation of trophoblast migration

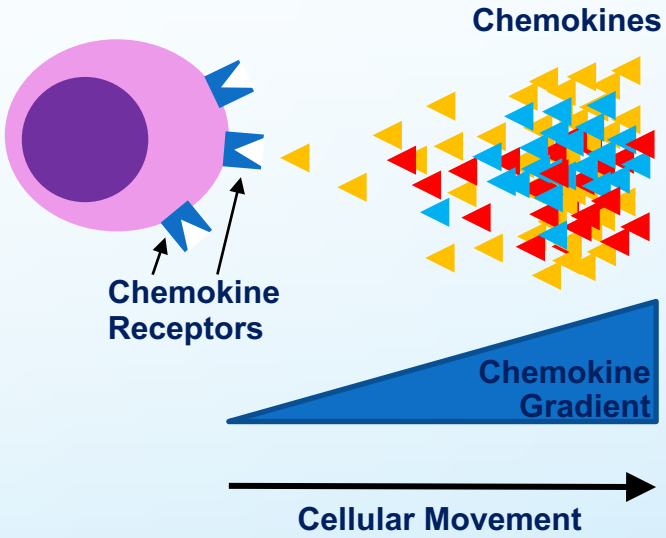


- Trophoblast-immune crosstalk
  - Prevents maternal immune cells from attacking fetal tissue
  - Protects fetus against pathogens
  - Controls trophoblast invasion/migration
- PFAS modulate immune signaling in other tissues

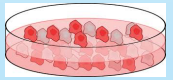
https://www.rndsystems.com/resources/articles/chemokines-pregnancy

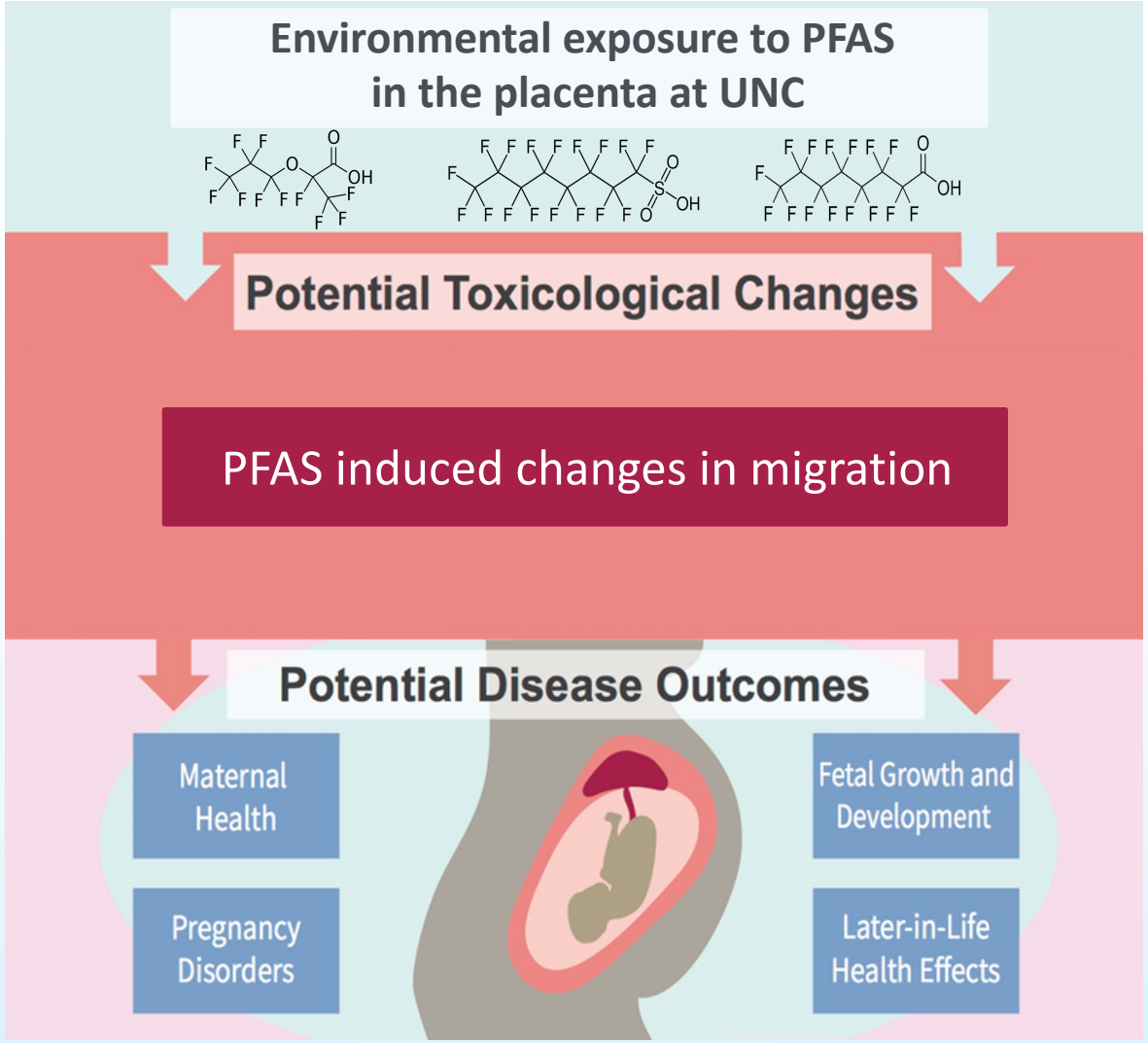
Chemokine expression





N = mean of 4 experiments
* p < .05 compared to control




Environmental exposure to PFAS in the placenta at UNC
Potential Toxicological Changes
PFAS induced changes in migration
Potential Disease Outcomes
Maternal Health
Pregnancy Disorders
Fetal Growth and Development
Later-in-Life Health Effects

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