Human health impacts of PFAS exposure

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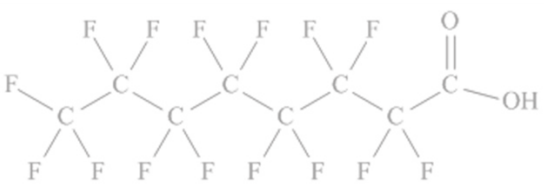
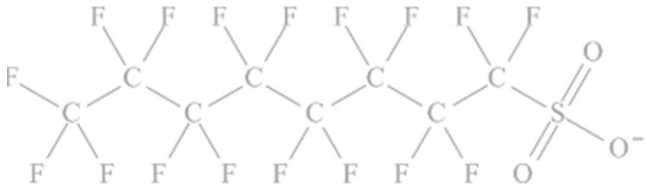
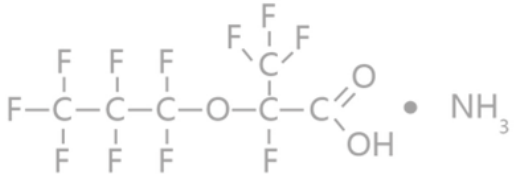


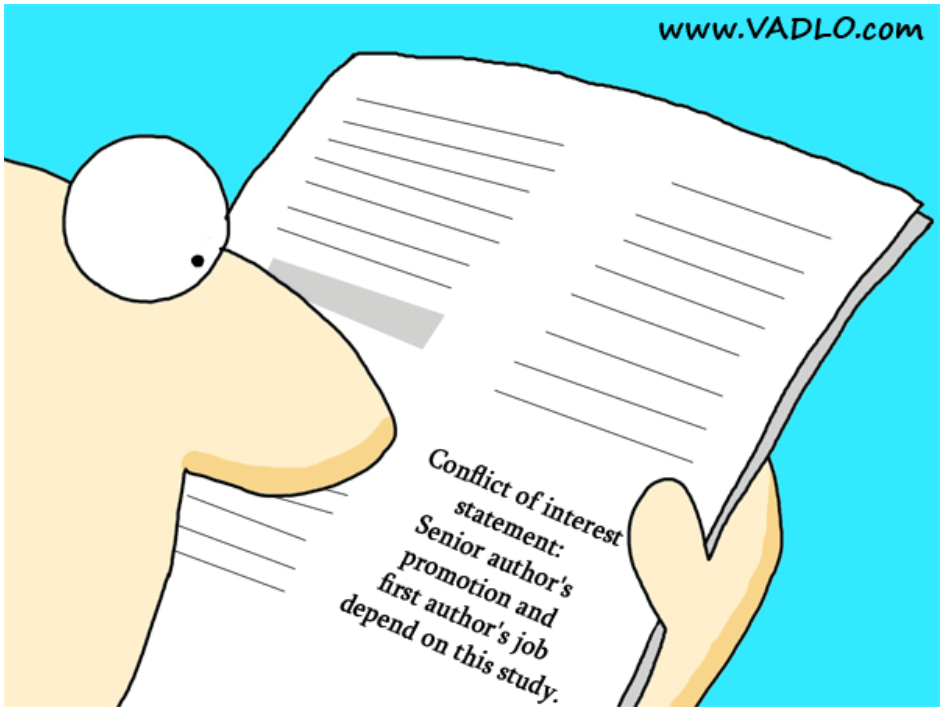


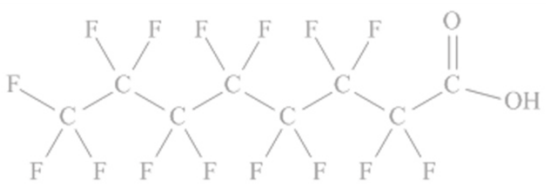


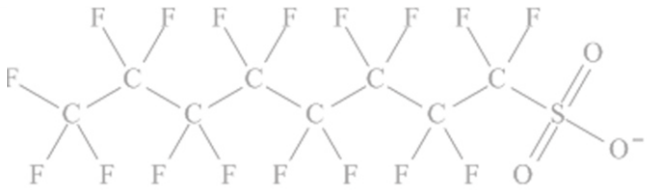
Potential bias

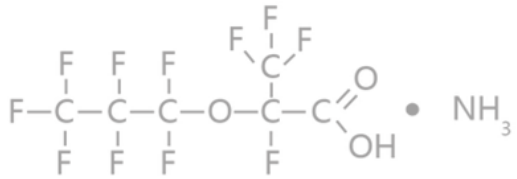
I currently am funded to study immune system effects of PFAS.

I have spoken publicly about my understanding of PFAS toxicity, serve/have served as a plaintiff's expert witness, and advocate for the need to protect the public from their exposures to PFAS.









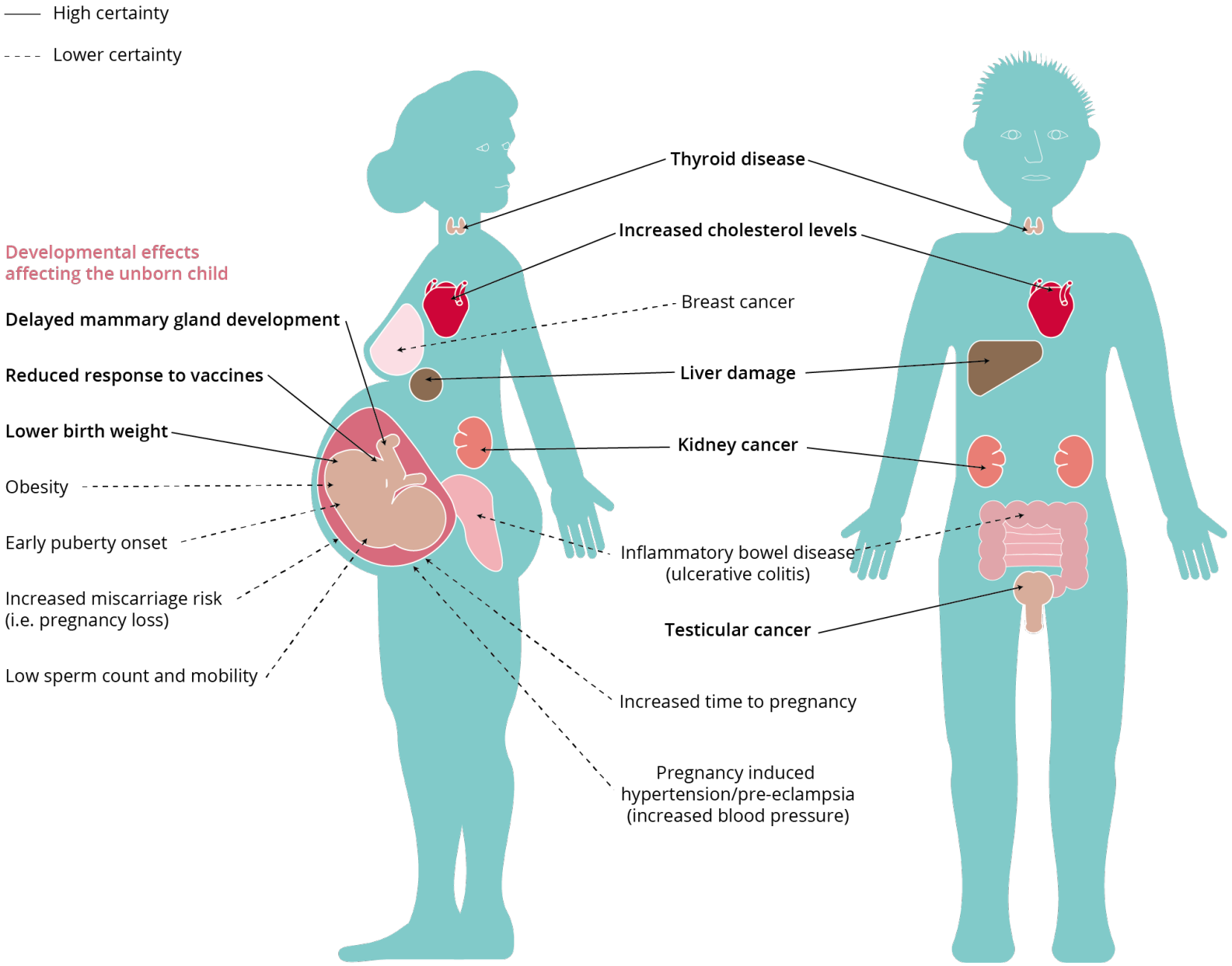
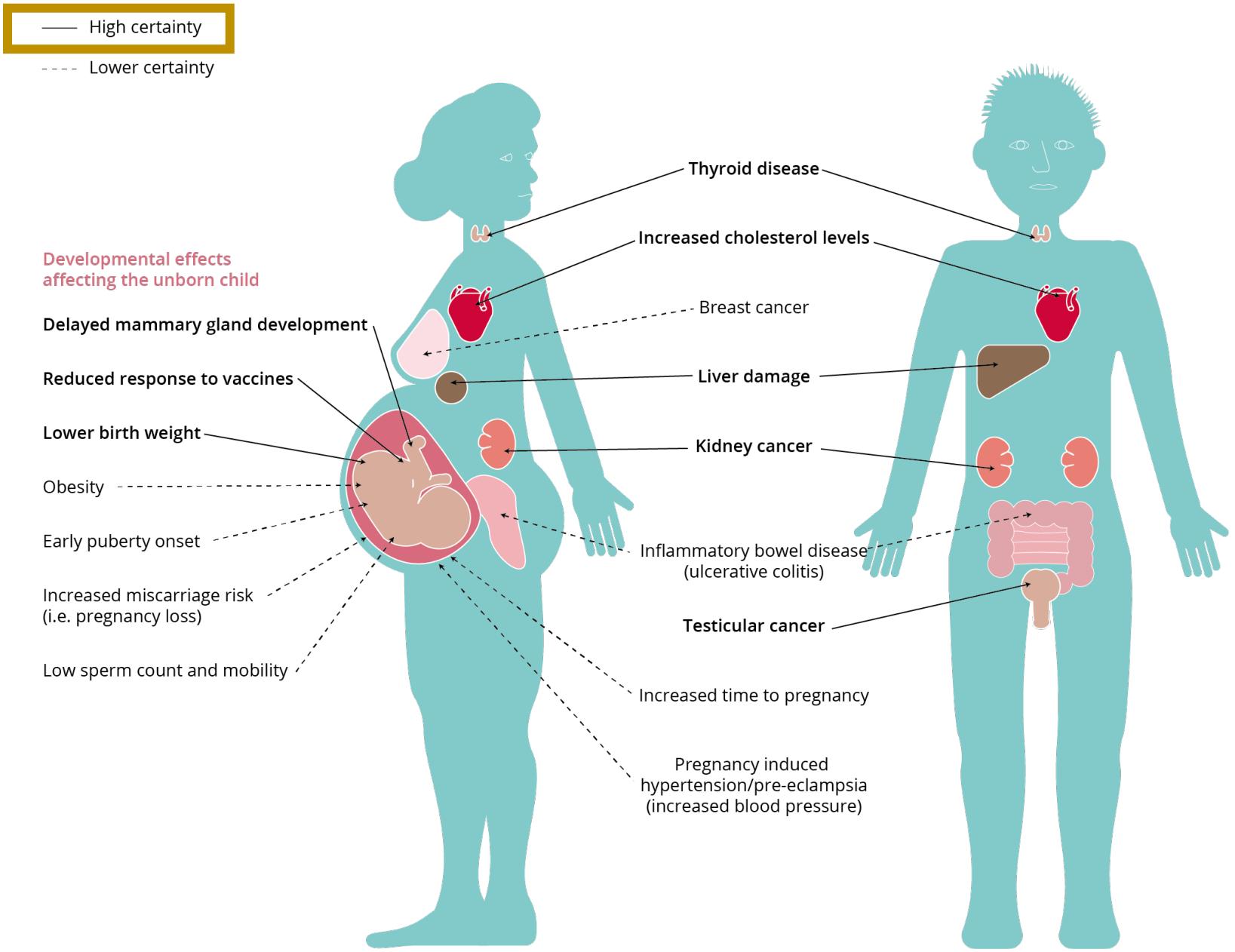


Image source: https://www.eea.europa.eu/publications/emerging-chemical-risks-in-europe



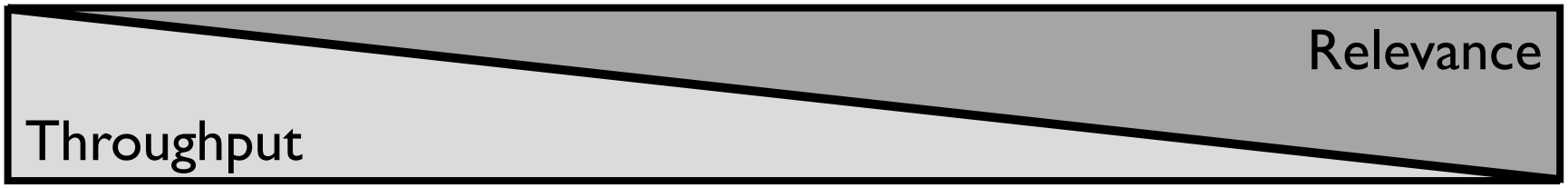
Why are certain health outcomes "high certainty"?

Image source: https://www.eea.europa.eu/publications/emerging-chemical-risks-in-europe

***In vitro* tools**
(Cells in a dish)
--Pros: Cheap, fast
--Cons: Less relevant

***In vivo* models**
(Whole animals)
--Pros: More relevant, similar to people
--Cons: Expensive, time consuming, ethical considerations

Human population
(Exposed people)
--Pros: Most relevant
--Cons: Exposure (usually) occurred, confounding, can't always determine causation

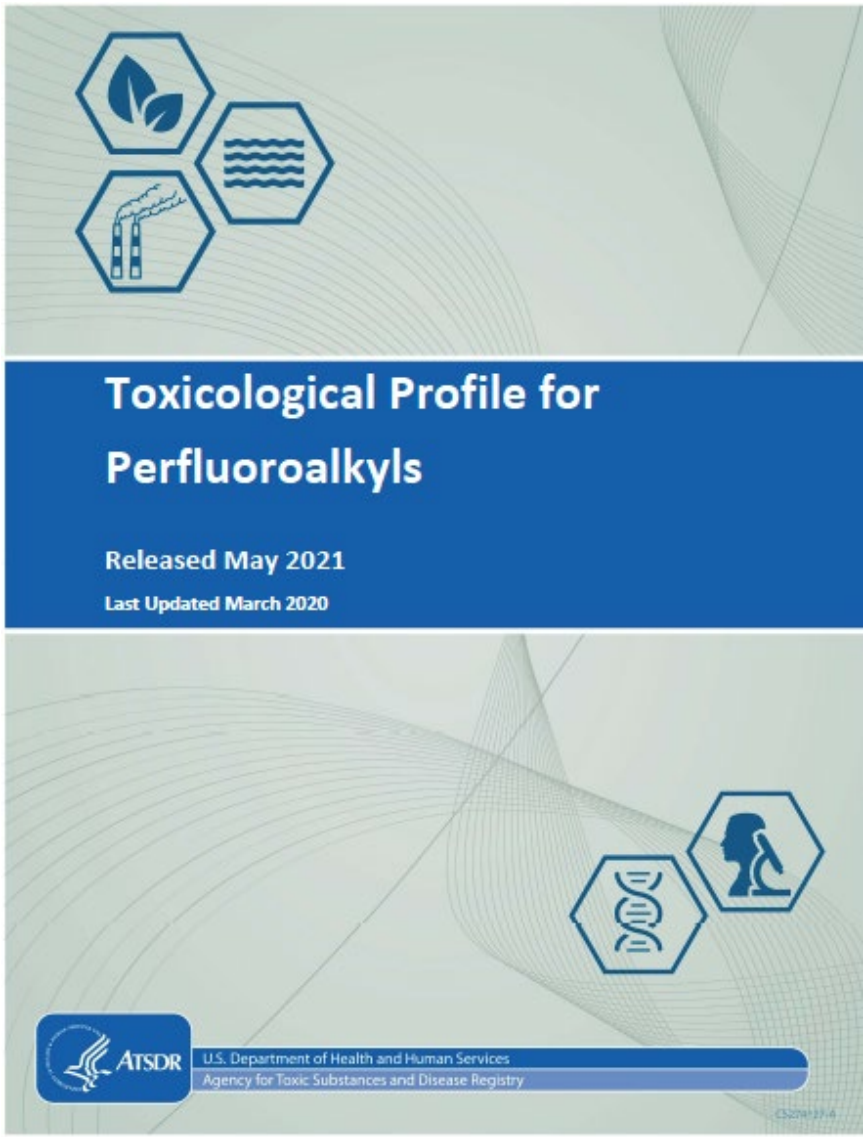


"High certainty" includes reliability of studies, replicability across different studies, agreement among types of data, and lots of data from many different types of studies.

Image idea from: Dr. J. Bangma


... so we'll be talking with Dr. Jenkins of the National Institute of Health about the results of his 3-year study. And then for a different take we'll talk to Roger here, who I understand has reached the opposite conclusion just by sitting on his couch and speculating.

Agency for Toxic Substances and Disease Registry (ATSDR)

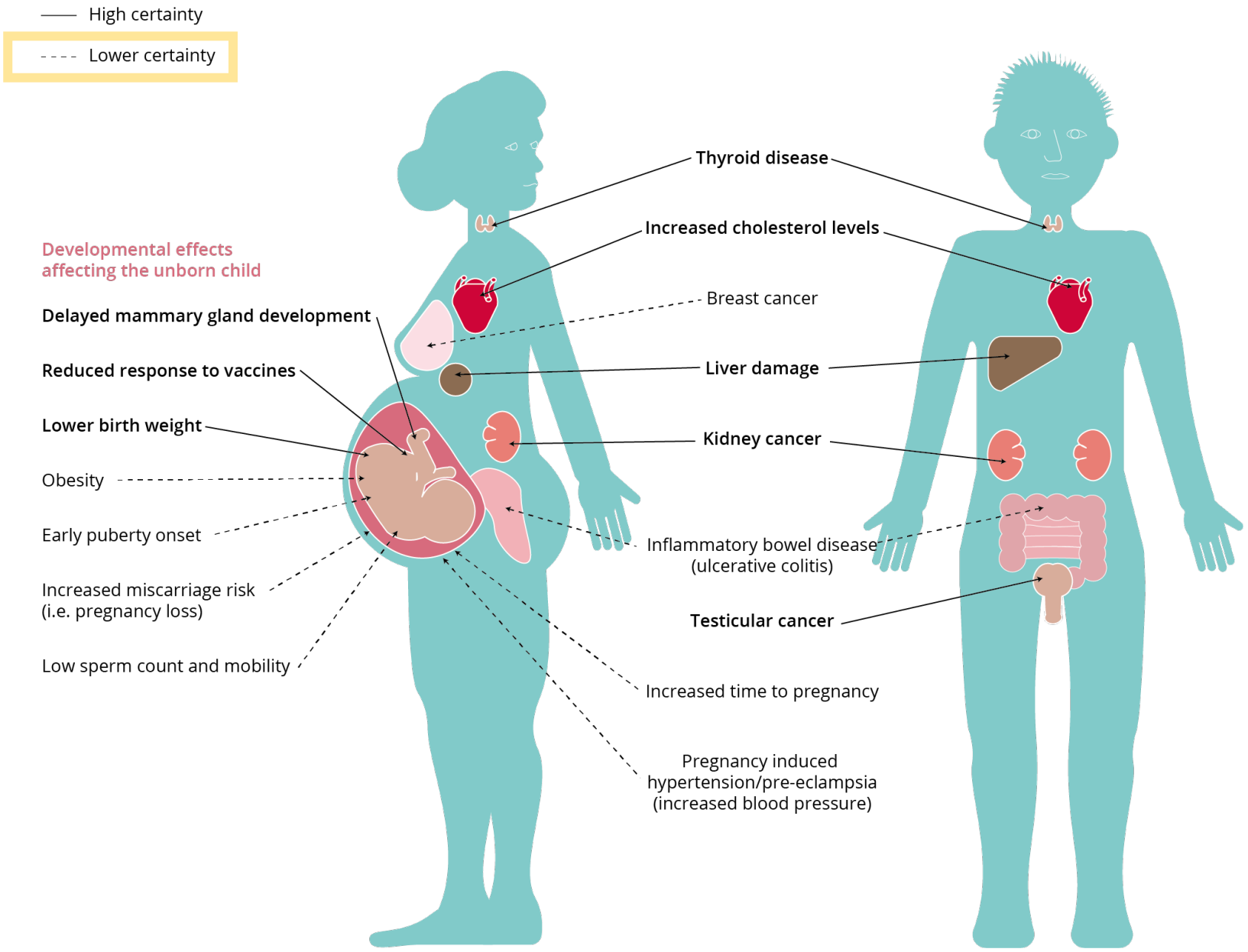


Epidemiological links:

- Pregnancy-induced hypertension/pre-eclampsia (PFOA, PFOS)
- Increases in serum liver enzymes (PFOA, PFOS, PFHxS)
- Increases in serum lipids, i.e., total cholesterol and low-density lipoprotein (PFOA, PFOS, PFNA, PFDA)
- Decreased antibody response to vaccines (PFOA, PFOS, PFHxS, PFDA)
- Small decreases in birth weight (PFOA, PFOS)
- Some cancers (PFOA, PFOS)

Toxicological links:

- Liver toxicity
- Developmental toxicity
- Immunotoxicity



Why are certain health outcomes "lower certainty"?

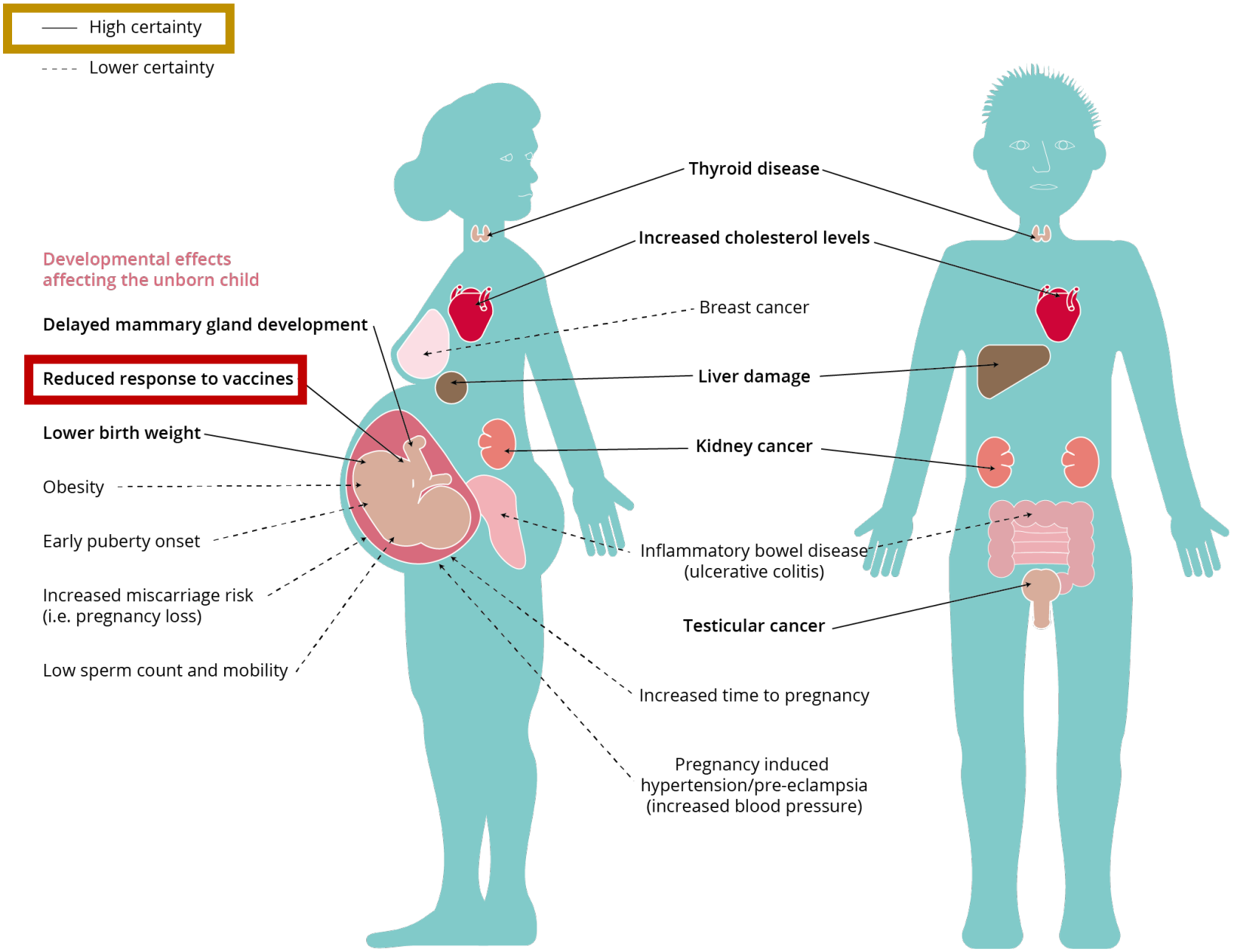
Image source: https://www.eea.europa.eu/publications/emerging-chemical-risks-in-europe

"Lower certainty" includes high risk of bias in studies, lack of replicability across different studies, disagreement among types of data, negative findings, and/or *lack of data from many different types of studies*.

Almost 10,000 individual PFAS chemicals

Only a handful have been well-studied epidemiologically and toxicologically.

But the vast majority of PFAS are persistent. Persistence leads to continued exposure and an increased probability of health impacts.

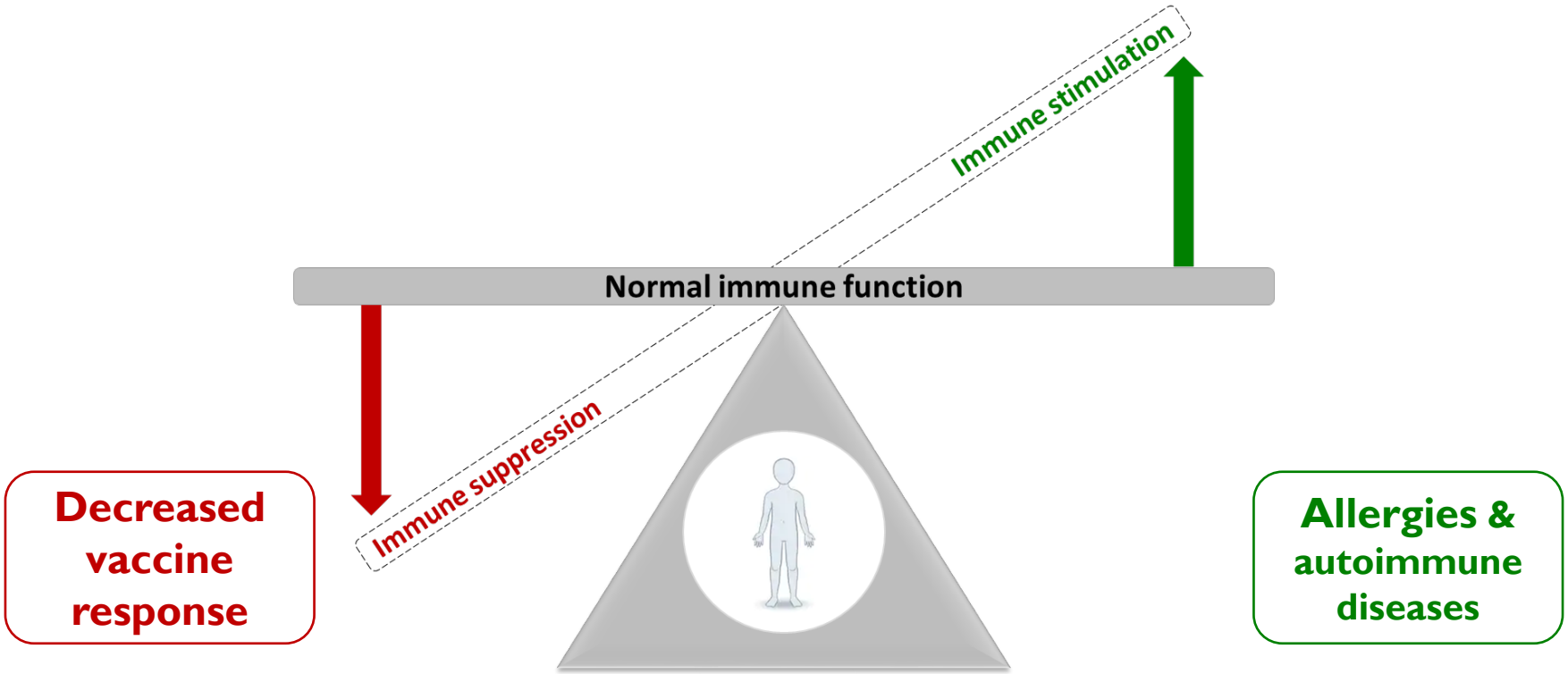


Immune suppression is a health impact with high certainty.

Image source: https://www.eea.europa.eu/publications/emerging-chemical-risks-in-europe

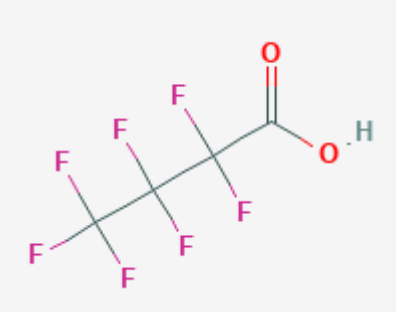
Immune suppression:

- PFOA and PFOS – strong evidence from studies of people and experimental animals.
- PFHxS, PFDA, PFNA, PFUA, PFDoA – some evidence from studies of people.



What about links between PFAS and COVID?

Patients with higher PFBA concentrations in their blood had COVID infections that required longer hospital stays or worse infections.



This is PFBA

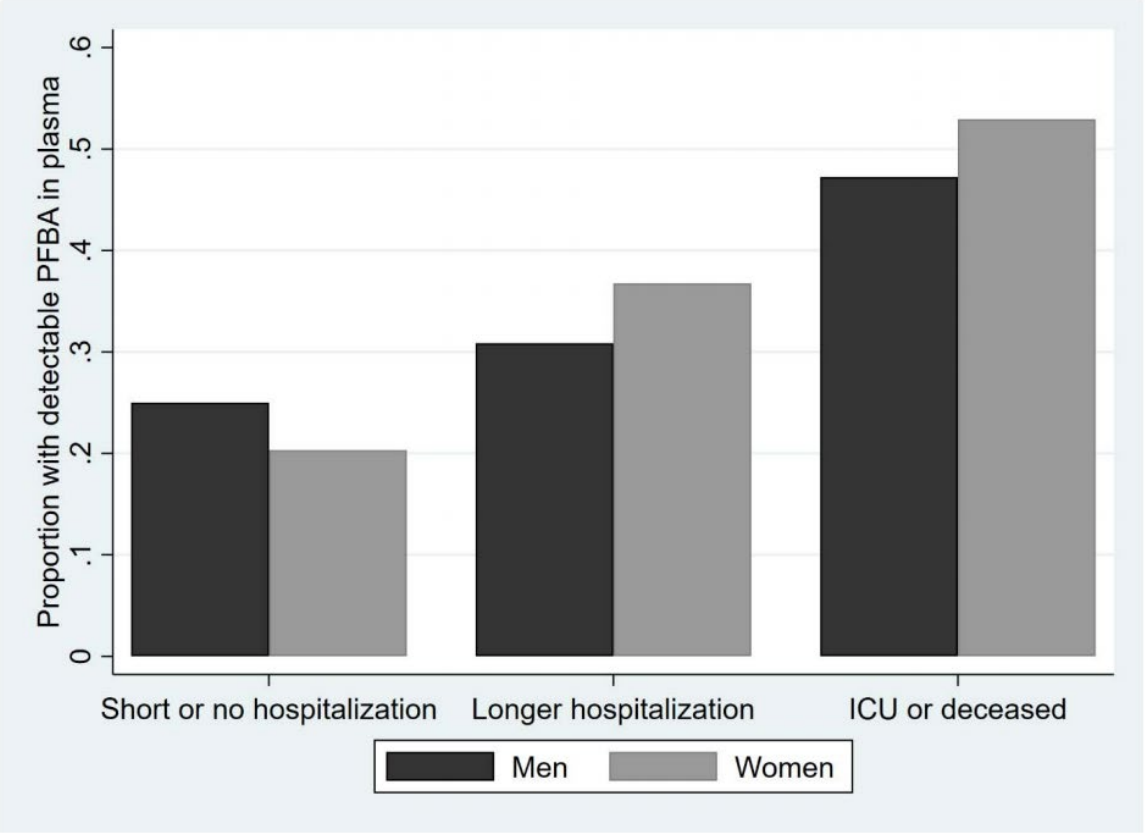


Image from : PubChem; Data from: Grandjean et al., 2020

What about links between PFAS and COVID?

PFOA and PFOS as well as other PFAS suppress vaccine responses. Suppression of the adaptive immune system can increase the RISK of a poor vaccine response.

PFAS and COVID

At least one PFAS (PFBA) has been linked to more severe COVID infections. No studies have reported on PFAS exposure and responses to the COVID vaccine.

Bottom line:

There is a risk of more severe COVID or a reduced response to a COVID vaccine, but it has not yet been evaluated.

Vaccinations are still recommended!

Sources of DeWitt laboratory funding for PFAS:

- North Carolina Policy Collaboratory & NC General Assembly
- US EPA/Oregon State University (83948101)
- NIEHS/NC State University (1 P42 ES031009-01)
- NC State University Center for Human Health and the Environment
- Brody Brothers Endowment

GLOBAL PFAS SCIENCE PANEL

International collaborators:
https://www.pfassciencepanel.org

Thank you image from shutterstock.com