

PFAS in Human Milk, Infant Formula, & Baby Food

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I have no conflicts of interest to disclose.



Breastfeeding is a highly personal choice

Fed is best

- Decision to breastfeed or bottle feed is an incredibly personal one
- Today, you may hear me make statements in support of breastfeeding, but please know that I respect and support every woman's decisions about how best to feed her baby

Milk Composition & Associated Benefits

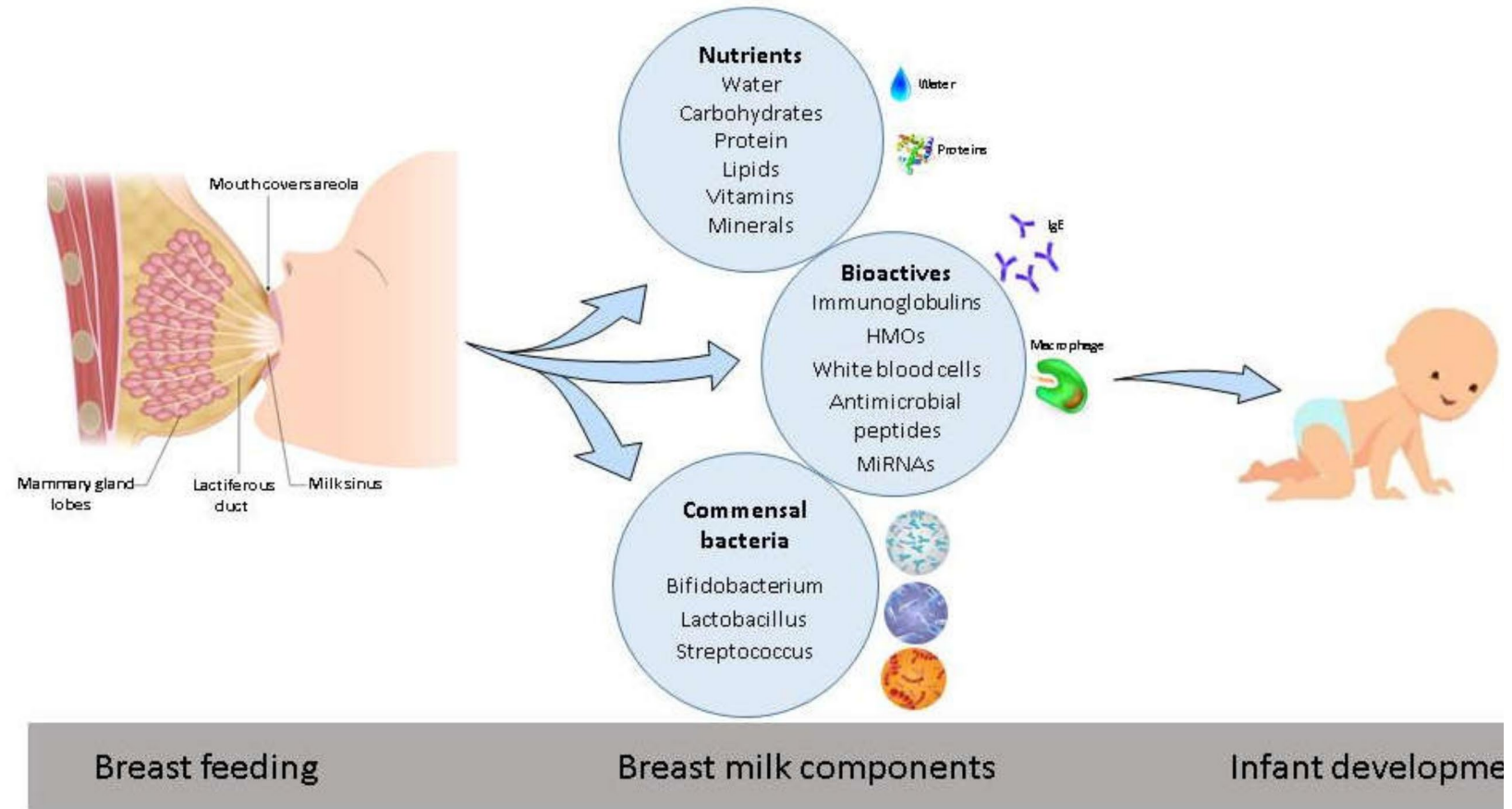
Human breast milk is the gold standard food for newborn infants

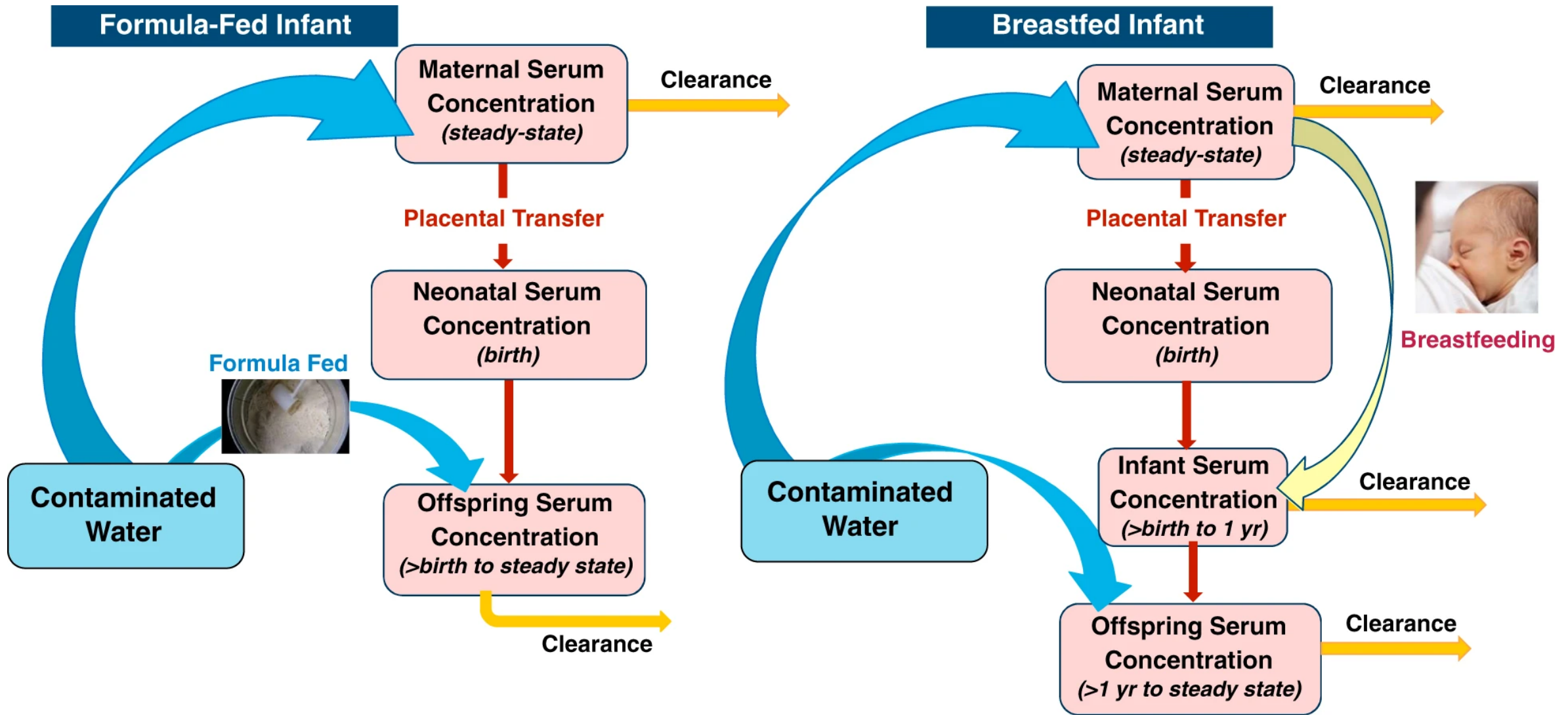
Composed of the correct amount of nutrients and bioactive compounds → complete nutrition

Beneficial bacteria to protect vulnerable immune systems

Benefits of breastfeeding for mom and baby

*Human milk represents a route of maternal excretion of PFAS and route of infant exposure**





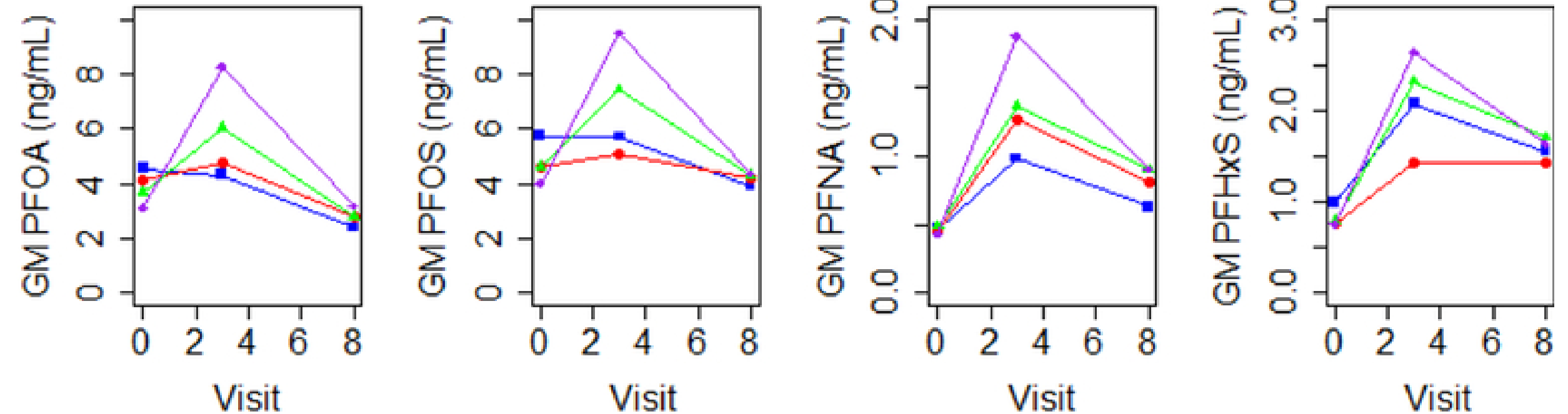
Conceptual representation of two exposure scenarios evaluated for a transgenerational toxicokinetic model used to derive Minnesota PFOA water guidance

PFOA

PFOS

PFNA

PFHxS



Number of months breastfeeding

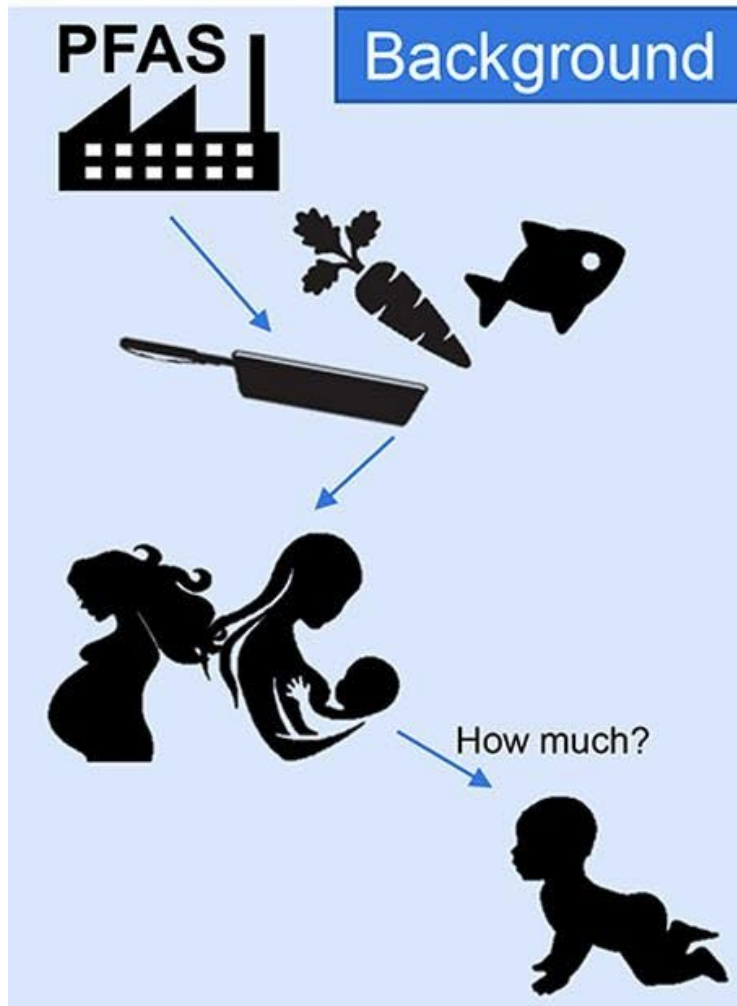
■ 0 (N=54) ● >0-3 (N=74) ▲ >3-12 (N=95) ◆ >12 (N=64)



Longitudinal Poly- and Perfluoroalkyl substances (PFAS) levels in Dutch infants

Inge A.L.P. van Beijsterveldt, Bertrand D. van Zelst, Sjoerd A.A. van den Berg, Kirsten S. de Fluiter, Manouk van der Steen, Anita C.S. Hokken-Koelega

Beijsterveldt et al. Environ In. 2022 Feb;160:107068.



Methods

Blood samples of 369 healthy infants at age 3 months and 2 years

Detailed child and maternal characteristics

PFAS by LC-ESI-MS/MS

Longitudinal infant plasma PFAS levels and its most important determinants

Outcome

PFAS plasma levels decrease only slightly during infancy

At age 3 months highest in first-born infants from older Caucasian mothers

Levels in exclusive breast fed infants 2-3x higher compared to formula fed infants

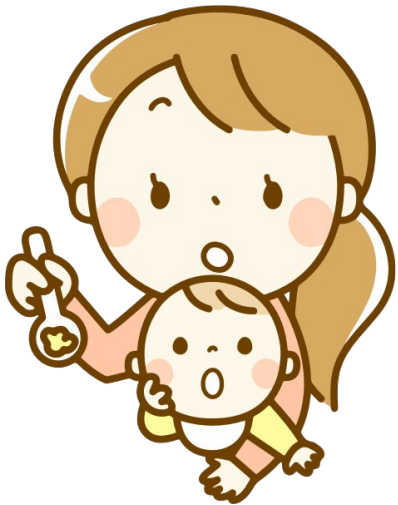
Conclusion

and **Most important determinants of PFAS exposure in early life**

What do infants eat if they are not breastfed?



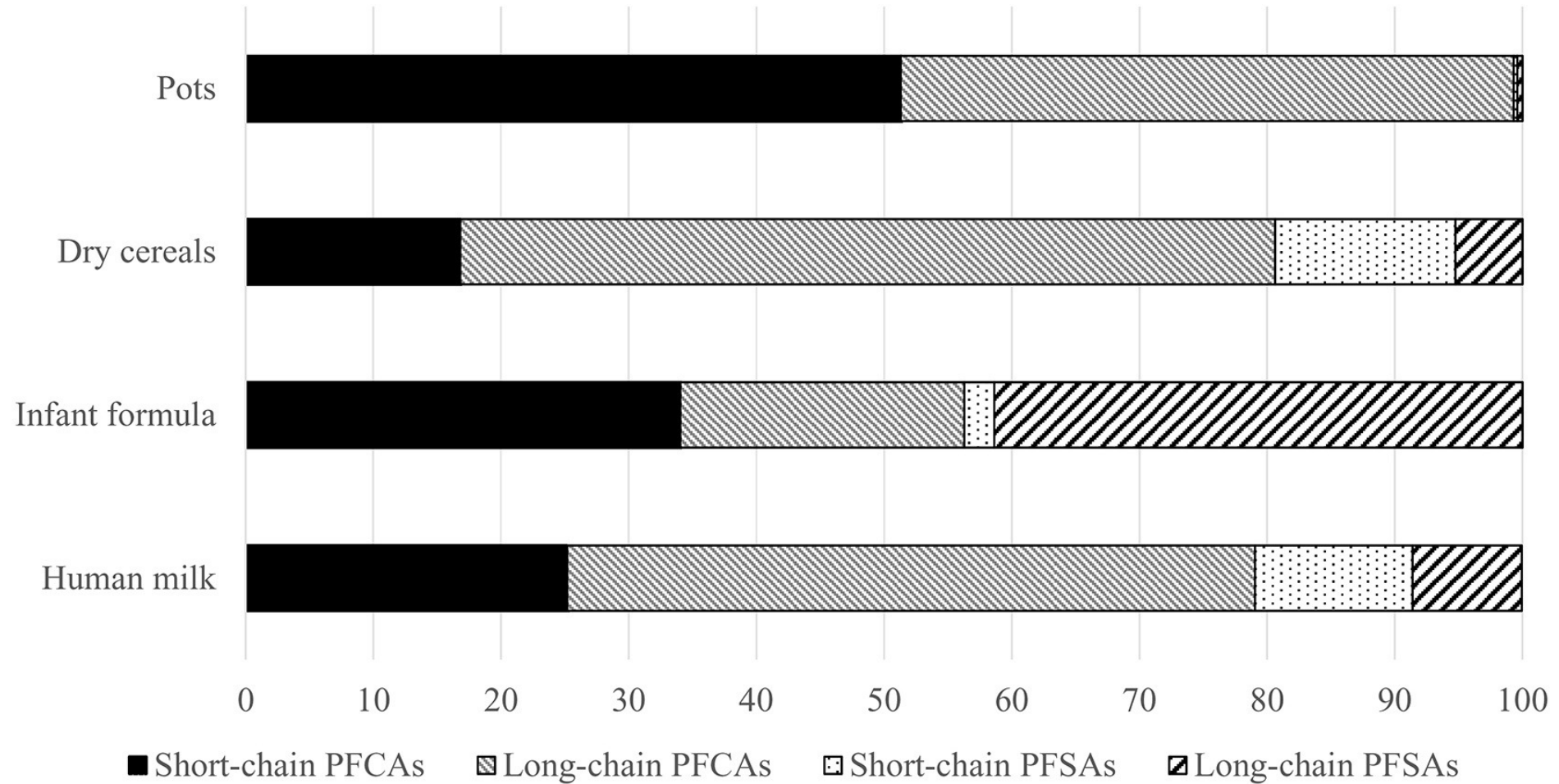
Formula is not guaranteed to be PFAS free (particularly if prepared with contaminated water)



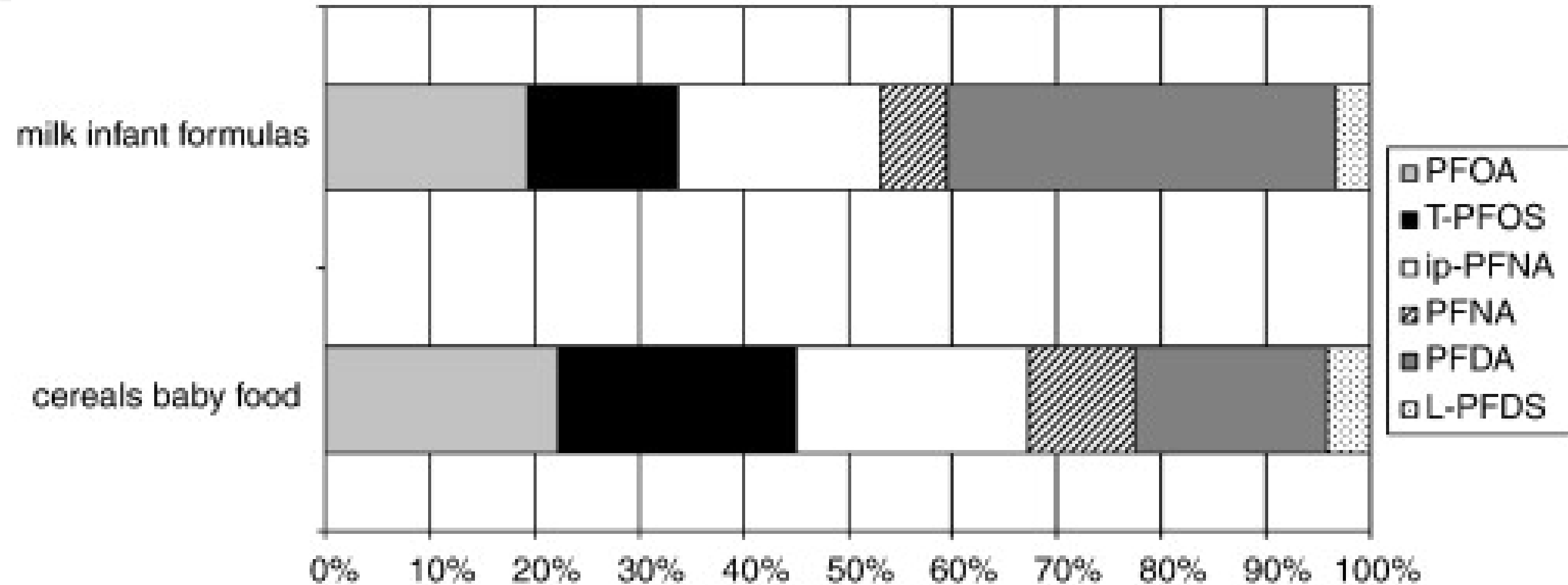
Infant cereals and other baby food may contain PFAS



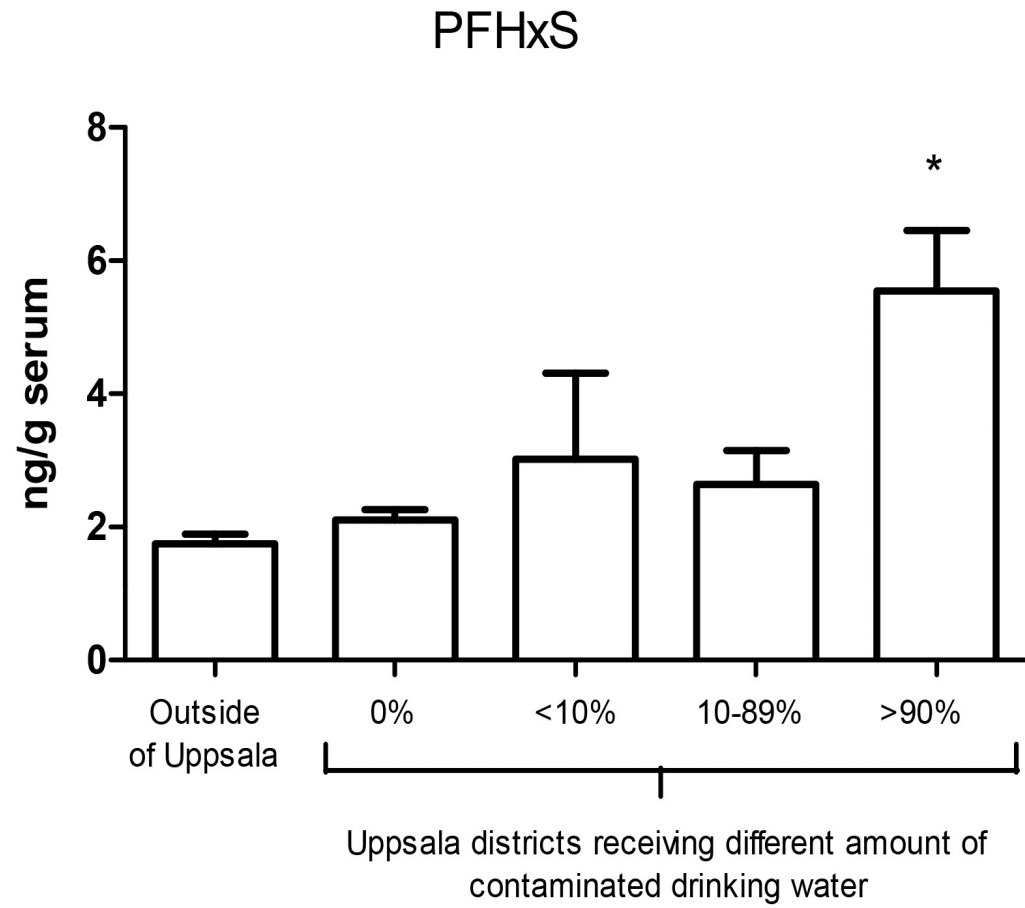
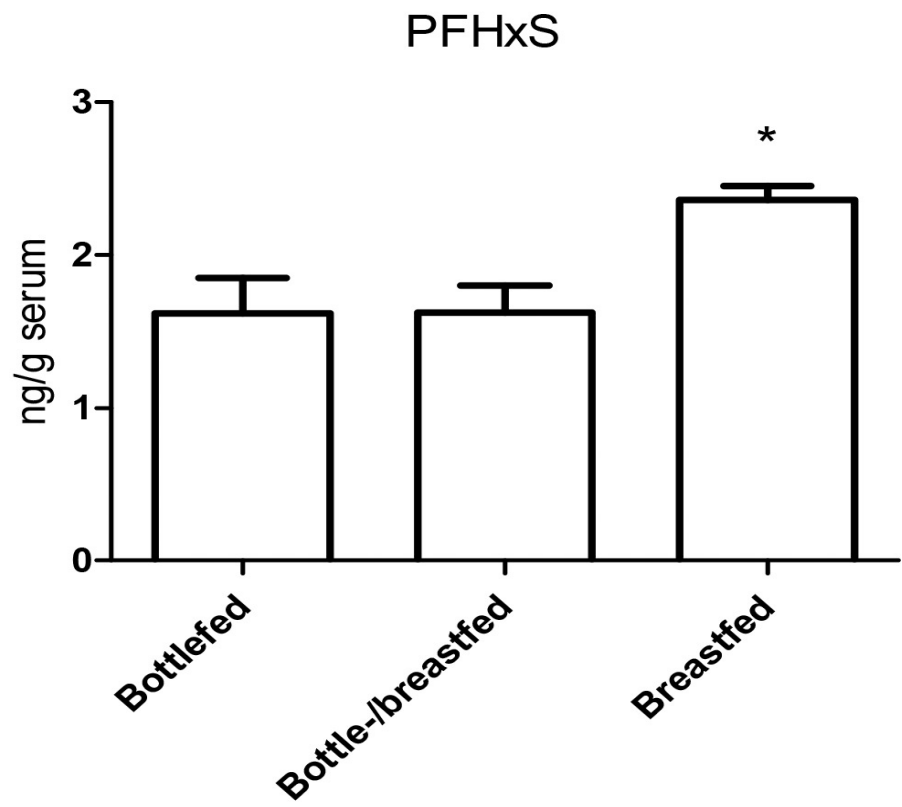
PFAS in early-life diet



PFAS in formulas and baby food

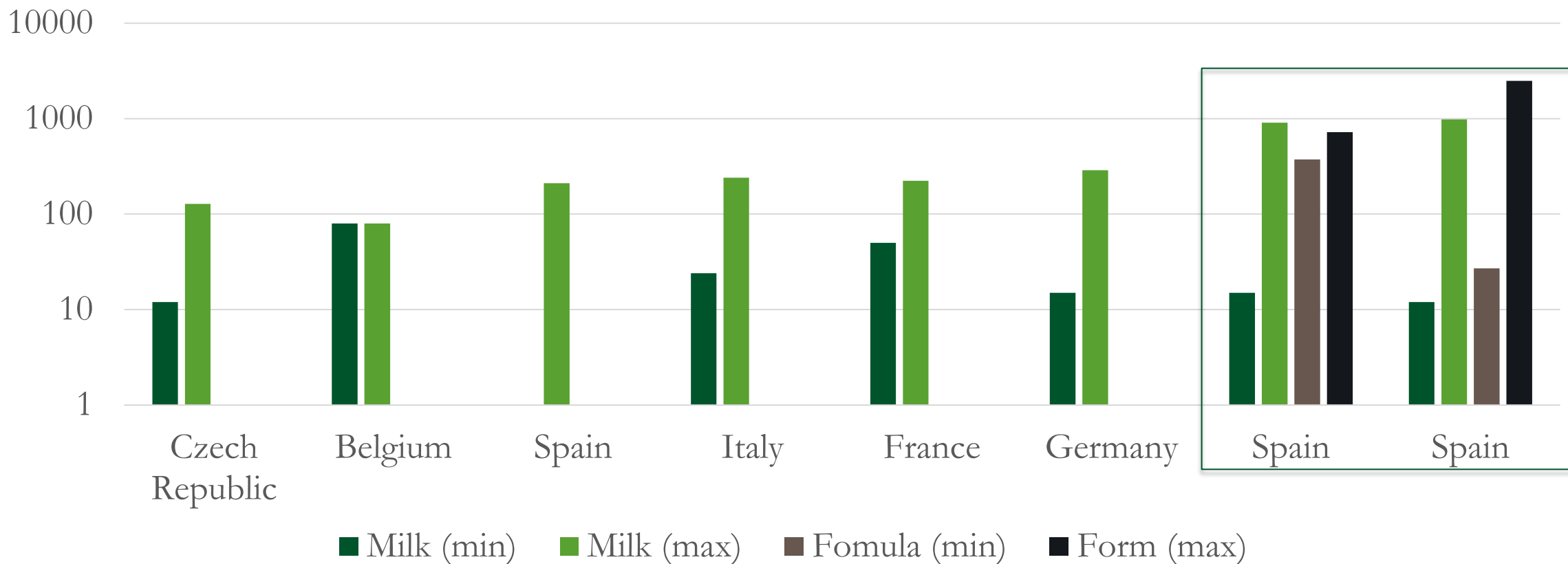


*Tested 3 brands of commercial milk infant formulas and 2 brands of cereals baby food

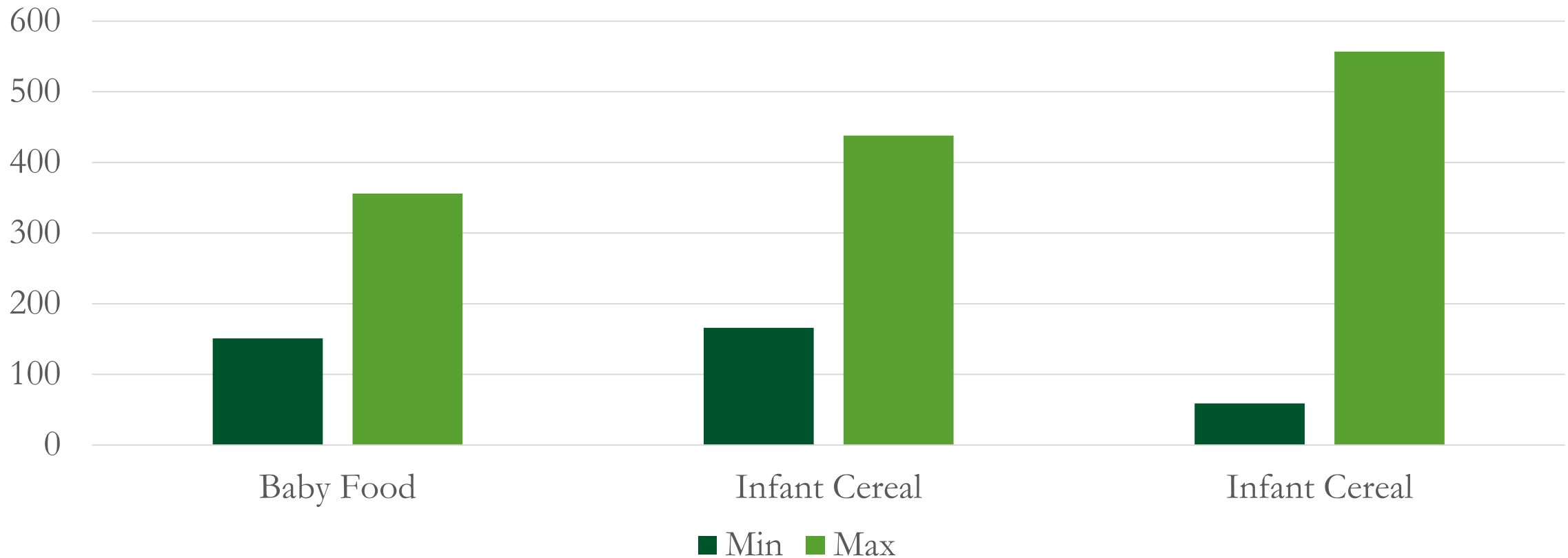


Concentrations (ng/g serum) of PFHxS ($n = 91$) in serum from breastfed 2–4-month-old infants (1996 to 1999), living in different drinking water districts in Uppsala County

PFOA (ng/L) measured in Human Milk and Infant Formula



PFOA (ng/kg) Baby Foods and Cereals



Important Considerations

- Breastfeeding is the ultimate complex mixture
 - Breastfeeding remains an optimal source of nutrition for baby's changing needs in early-life
 - Sparse studies of the influence of PFAS exposure from human milk on child health
 - Evidence from other persistent pollutants suggest that benefits of breastfeeding may still outweigh risks of exposure
- No one size fits all answer
 - Water contamination may influence both human milk and formula
 - Some baby cereals and food contain PFAS
 - Production chain and food packing may influence PFAS concentrations in formulas and baby food (not well investigated)
- Better decision tools for women living in PFAS contaminated communities are an urgent and critical public health need

Questions?

Thank you!

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