

Where I came from....

DIOXIN

Tote Zone

In Baden-Württemberg sind höhere Dioxin-Konzentrationen nachgewiesen worden als in Seveso. Jahrelang haben Stuttgarter Behörden die Vergiftung des Bodens geduldet und verschwiegen.

Jürgen Rochlitz, 51, Abgeordneter der Grünen im Stuttgarter Landtag, ist schockiert: „Einfach Wahnsinn, was den Menschen in Maulach und auch in Rastatt zugemutet wurde.“

Maulach, ein Ortsteil der nordwürttembergischen Kreisstadt Crailsheim, steht gemeinsam mit dem nordbadischen Rastatt für die bisher bundesweit höchste Dioxin-Belastung des Bodens und der Luft. Parallelen zur Giftkatastrophe von Seveso seien, sagt Rochlitz, „nicht Panikmache, sondern plausibel“.



Dioxin-Opfer in Seveso*
Tausendstel Gramm wirken tödlich

also, weiß Rochlitz, „weit unter den Werten von Maulach und Rastatt“.

In Maulach waren letzten Monat Bodenproben entnommen und von dem Tübinger Professor („Dioxin-Papst“) Hanspaul Hagenmaier analysiert worden. Die Proben weisen als Spitzenergebnisse 996, 1326, 3250 und 29 039 ng/kg Gifte der Dioxin-Gruppe auf.

In Rastatt wiederum wurden mehrfach Dioxin-Werte von mehr als 1000 ng/kg gemessen, die Höchstmengen reichten bis zu 7926 ng/kg. In mindestens zehn Prozent der badischen Bodenproben wie auch bei Messungen in Maulach fand sich das spezielle Seveso-TCDD in einer Konzentration von 19 bis immerhin 465 ng/kg, also mehr als seinerzeit in der „toten Zone“ in Oberitalien.

Die unglaubliche Umweltvergiftung von den Behörden jahrelang igno-

My assigned task here

The Committee is interested in the following information:

- Overview of the work your team has undertaken nationally relating to dioxins and other persistent organic pollutants (POPs).
- Current research and most recent evidence on the effects of human and environmental exposure to POPs, specifically PFOS and PFOA.
- Current approaches to monitoring exposure to POPs and how this is evolving.

Overview of the work of our team (Q 1)

- Sources and exposure pathways of POPs (since early 90s)
- National Dioxin Program (2002 – 2004)
- Programs on flame retardants, pesticides, plasticisers
- Wastewater drug monitoring programs
- Work on perfluorinated chemicals (since about 2004)
(With Uni Oerebro, US-CDC, US-EPA, EU Programs; PhDs of Leisa Toms, Jack Thompson and Sarit Kaserzon; various ARC grants & other funding)

Overview of work on PFCs from our team

- Firefighting training grounds – source of PFCs (in future)

Overview of work on PFCs from our team

- Firefighting training grounds – source of PFCs (in future)
- PFCs are not removed in any conventional water treatment processes



Overview of work on PFCs from our team

- Firefighting training grounds – source of PFCs (in future)
- PFCs are not removed in any conventional water treatment processes
- **Wastewater streams a source for PFCs to the environment**



Overview of work on PFCs from our team

- Firefighting training grounds – source of PFCs (in future)
- PFCs are not removed in any conventional water treatment processes
- Wastewater streams a source for PFCs to the environment
- PFCs can be found at low levels in our drinking water



Overview of work on PFCs from our team

- Firefighting training grounds – source of PFCs (in future)
- PFCs are not removed in any conventional water treatment processes
- Wastewater streams a source for PFCs to the environment
- PFCs can be found at low levels in our drinking water
- PFCs can be found in water, sediments and biota worldwide including in Australia and
- We may assume that these chemicals can also be found in ALL humans. (Just a matter of analysis and detection limits).

¹Baduel et al. J. Haz. Mat. 2015, 49, 5838 ff

Thompson et al. Chemosphere 2011, 82, 9ff

Thompson et al. Chemosphere 2011, 83, 1320ff

Thompson et al. MPB, 2011, 62, 2869 & Gallen et al MPB 2014, 85, 597 ff

Kaerrman et al. ES&T 2006, 40, 3742; Toms et al. ES&T 2009, 43, 4194ff



Human Biomonitoring Program (commenced in 2002) (Q 3)



Pooling of surplus pathology samples

Age stratification – 6 age

0-4 years

5-15 years

16-30 years

31-45 years

46-60 years

>60 years

Sex stratification

males

females

12 Strata (6 age x 2 sex)

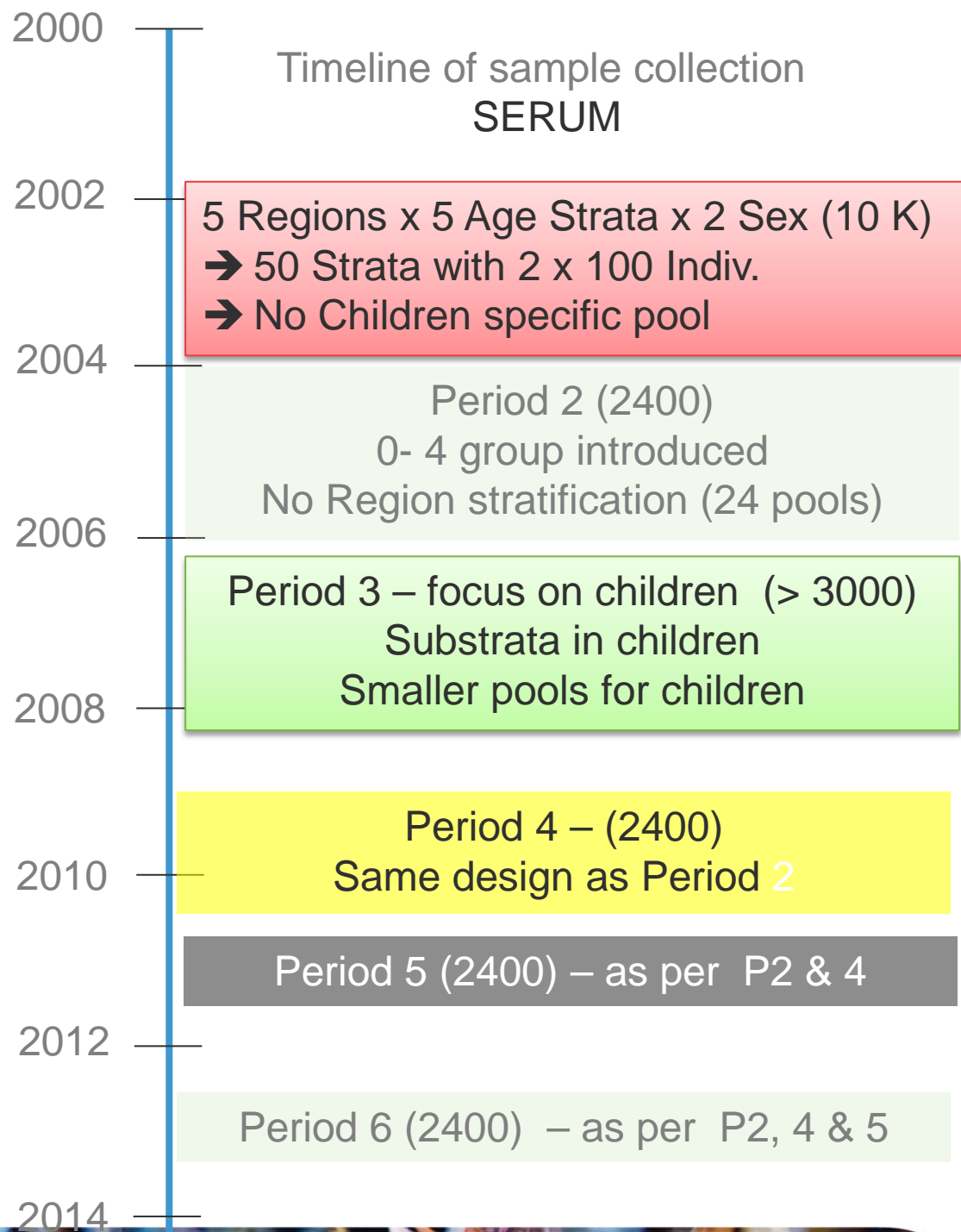
Each strata replicated

(typically) 100 samples in pool

→ **2400 - 10000 samples**

→ **in 24 – 100 pools**

Human Biomonitoring Program

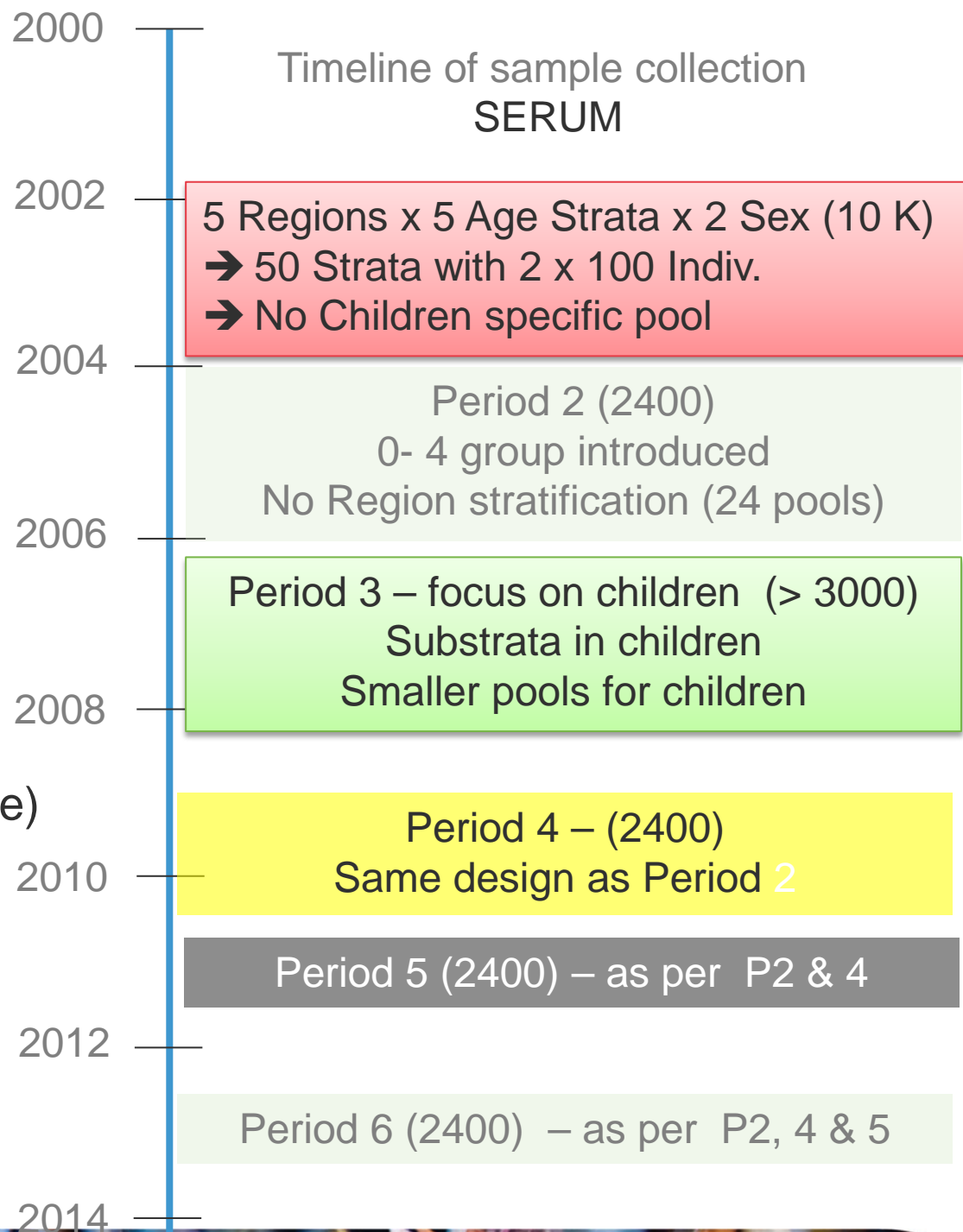


Human Biomonitoring Program

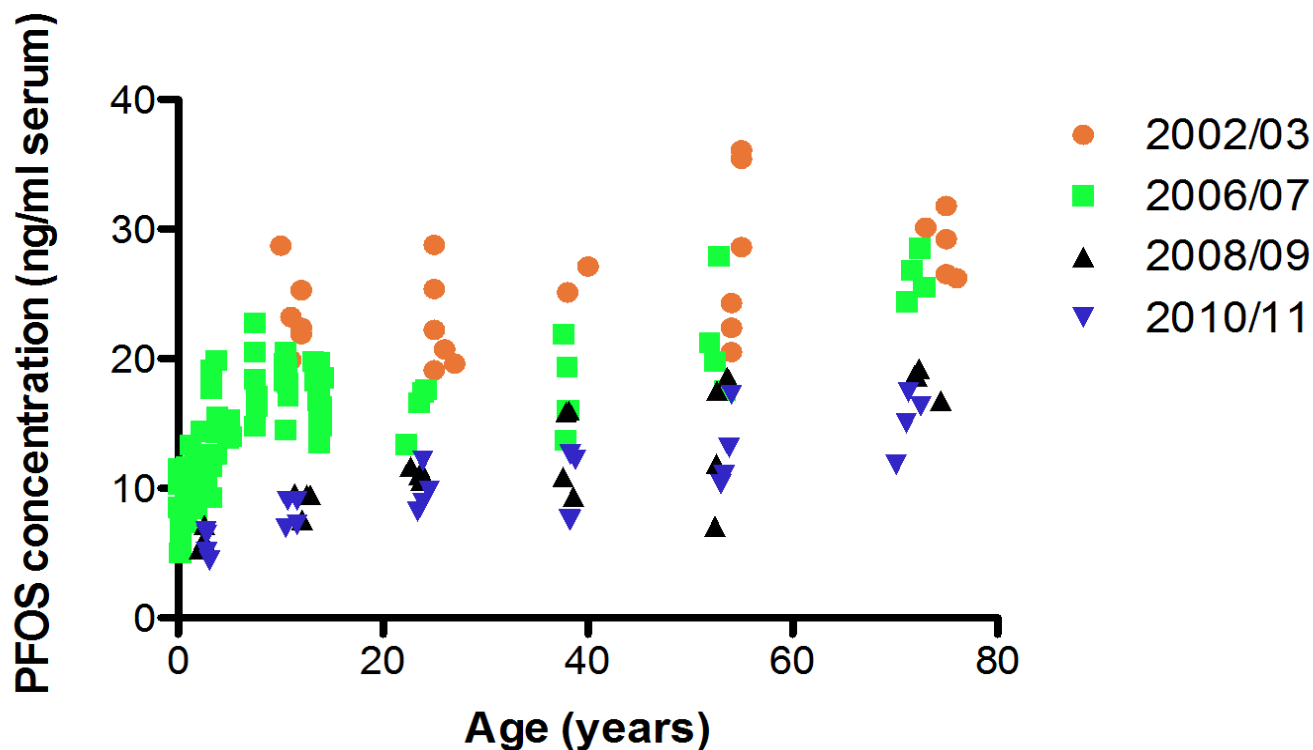
Mostly POPs (at least initially)

Collaboration with SNP, US-CDC and others

- Dioxin-like chemicals
- (other) PCBs
- Organochlorine pesticides
- Flame retardants (and HBCD)
- Perfluorinated chemicals
- Polychlorinated naphthalenes (in future)
- Since 2012 also urinary metabolites including plasticisers, OH-PAHs, and many other chemicals



PFOS decrease in Australian population!

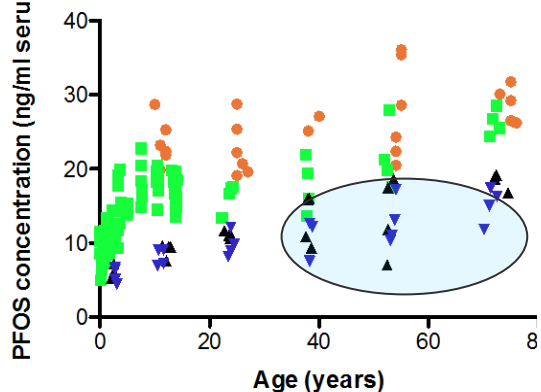


Serum PFOS by age group and time period 2002-2011

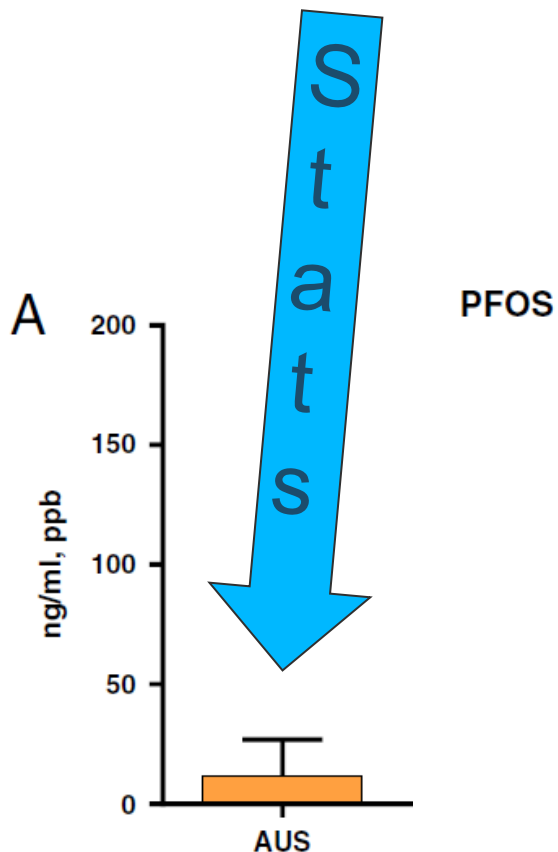
Toms, L.M., Heffernan, A., Hobson, P., Sjoedin, A., Calafat, A., Li, Z., Baduel, C., Gomez-Ramos, M.J., Thai, P., Chen, Y., Malisch, R., Mueller, J.F. Collection and analysis of chemical pollutants in pooled human media (milk, serum and urine) – 2011 – 2013. Report for the Department of the Environment.



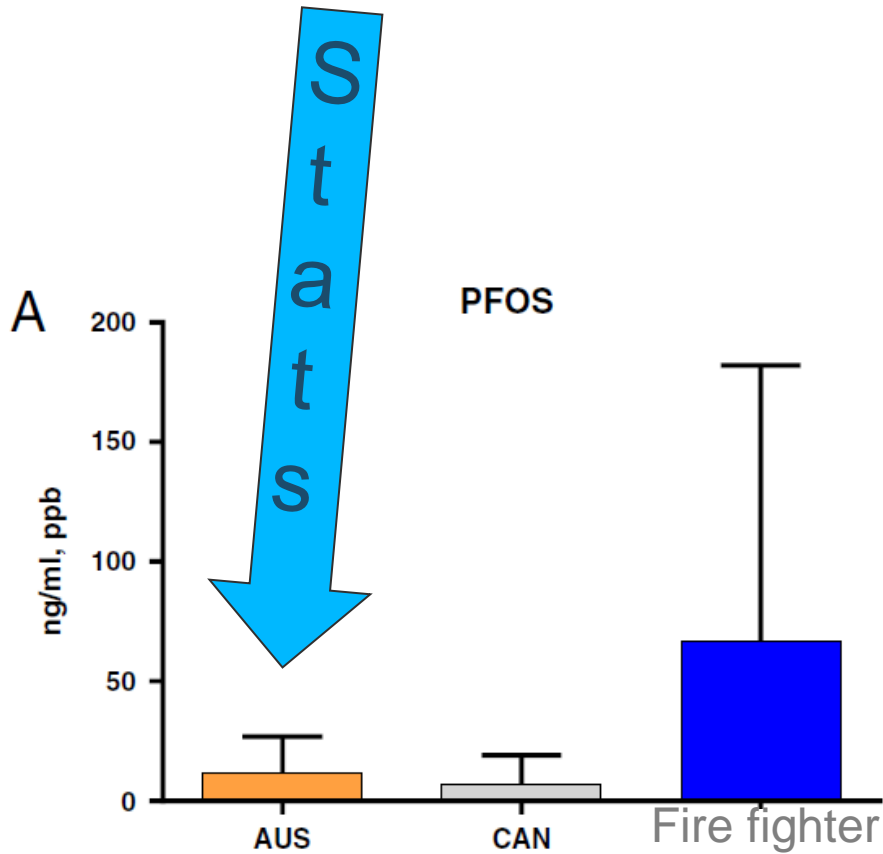
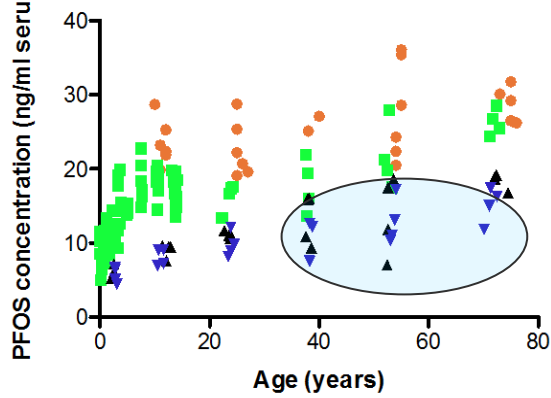
Comparing PFOS in pooled samples with an occupational exposed cohort



going from average levels to population range



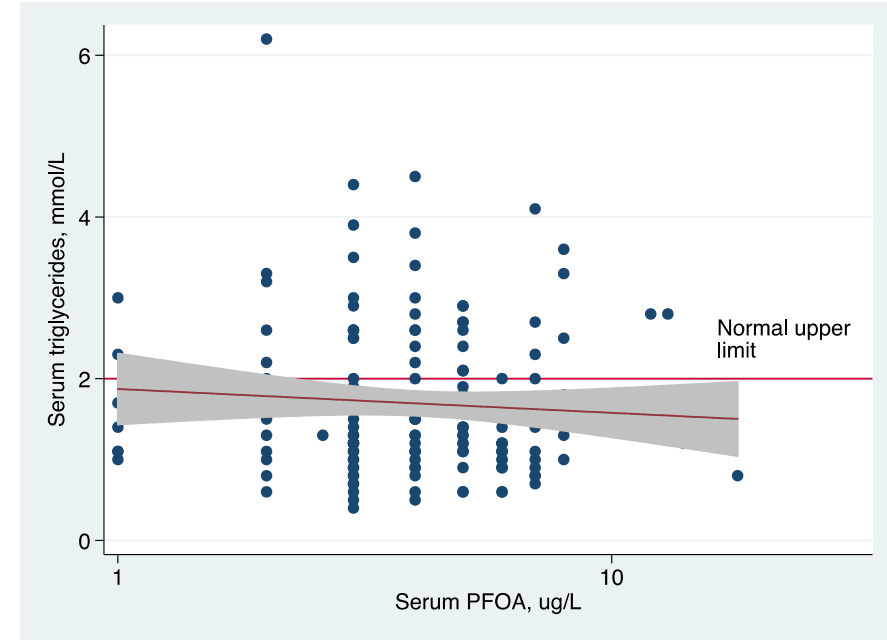
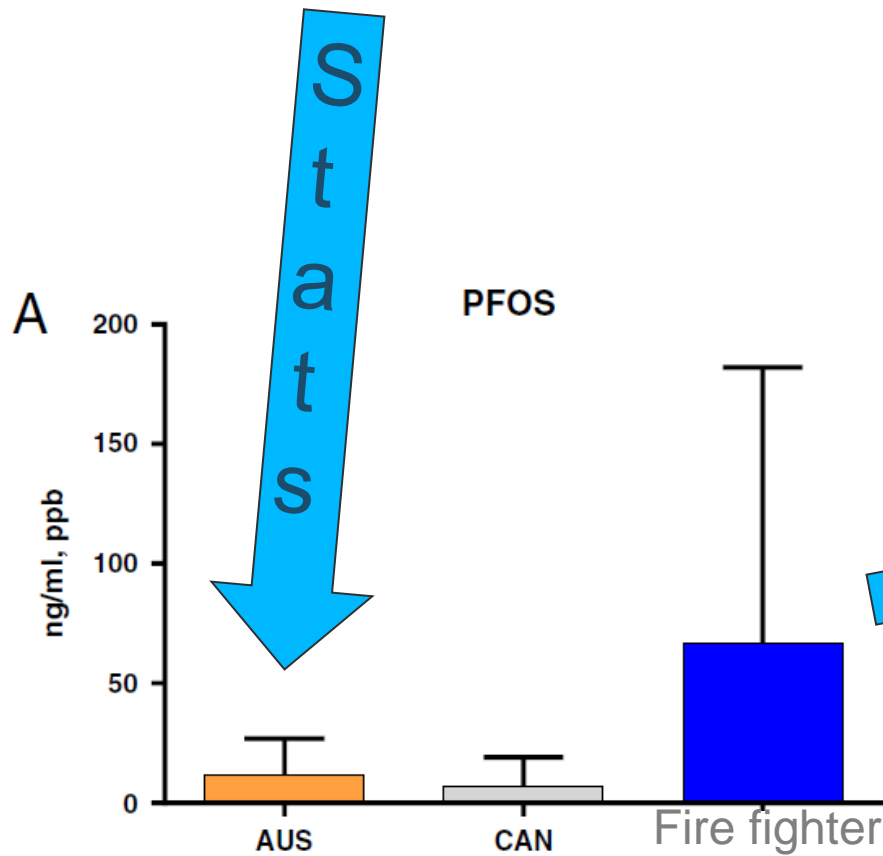
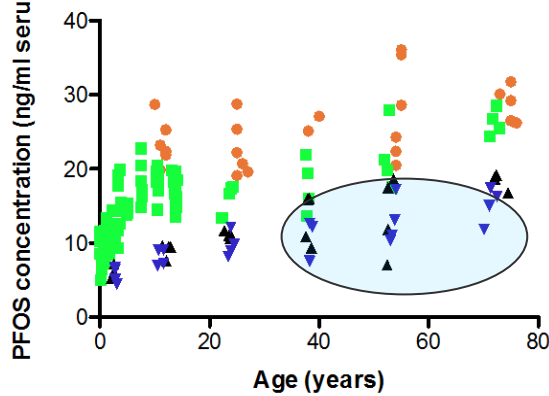
Comparing PFOS in pooled samples with an occupational exposed cohort



Toms et al. 2014 Report for DoE
Aylward et al. Environment International, 2014, 68, 127ff
Rotander et al. Environment International 2015, 82, 28ff



Comparing PFOS in pooled samples with an occupational exposed cohort (a bit about Q2 – Health effects)



No detected association between PFCs and biochemical parameters

Toms et al. Report for DoE 2014

Aylward et al. Environment International, 2014, 68, 127ff

Rotander et al. Environment International 2015, 82, 28ff





Exposure assessment (PFCs)

==> Measure blood concentration

→ Compare individuals/cohorts with general population

Effect assessment (PFCs)

Evaluate HEALTH endpoints associated with PFC exposure

→ Dose – response assessment





Exposure assessment (PFCs)

Good available data on expected exposure

Relative Small Reference Range

→ Easy task

Effect assessment (PFCs)

Few (well) established endpoints

- ALL NONSPECIFIC
- Relat. small effects observed - -
- Wide reference ranges (many sources of variability)

→ Requires large study to evaluate link to exposure (association)

Exposure

Risk

Effect

Exposure assessment (PFCs)

Good available data on expected exposure

Relatively Small Reference Range

→ the easy task

Effect assessment (PFCs)

Few (well) established endpoints

- ALL NONSPECIFIC
- Relat. small effects observed - -
- Wide reference range (many sources of variability)

→ Requires large study to evaluate link to exposure (association)

Thank-you very much

PFAS - Background - Summary

Epidemiology

(Occupational & general cohorts studied)

Possible correlations with

- ◆ increased serum lipids
- ◆ increased serum uric acid
- ◆ altered thyroid hormones
- ◆ thyroid disease
- ◆ osteoarthritis (in females)
- ◆ birth weight & gestational hypertension
- ◆ Testicular, bladder, kidney, prostate cancers

But...

- relatively few studies,
- many possible confounders,
- correlation is not causality,
- links potentially hidden by low statistical power

Toxicology - animal studies

- Liver toxicity
- Body weight loss
- Mortality
- Reproductive & developmental effects
- Peroxisome proliferation
- Tumors

Toxicology in vitro

- Inhibition of neuron growth
- Inhibition of inter cell communication
- Disruption of mitochondria

