The relationship between perfluoroalkyl compounds concentrations at ages 2, 4, and 6 years and thyroid function in early childhood : a prospective cohort study

Hwa Young Kim[1], Kyoung-Nam Kim[2], Young Ah Lee[2], Youn-Hee Lim[2], Johanna Inhyang Kim[3], Bung-Nyun Kim[2], Se-Young Oh[4], Yun-Chul Hong[2], Choong Ho Shin[2]
[1]Kangwon National University School of Medicine, Chuncheon, Korea, Republic of. [2]Seoul National University College of Medicine, Seoul, Korea, Republic of. [3]Seoul National University Bundang Hospital, Seoul, Korea, Republic of. [4]Kyung Hee University, Seoul, Korea, Republic of

OBJECTIVES

Perfluoroalkyl compounds (PFAS) have been suggested as potential thyroid disrupting chemicals. However, previous studies about the associations between PFAS and childhood thyroid function are scarce, and inconclusive. We evaluated the PFAS exposure in Korean preschool children, and investigated the temporal relationship with thyroid hormone concentration.

METHODS

Subjects

Total 660 children who visited the hospital at least once at 2, 4, or 6 years of age from the Environment and Development of Children (EDC) cohort study

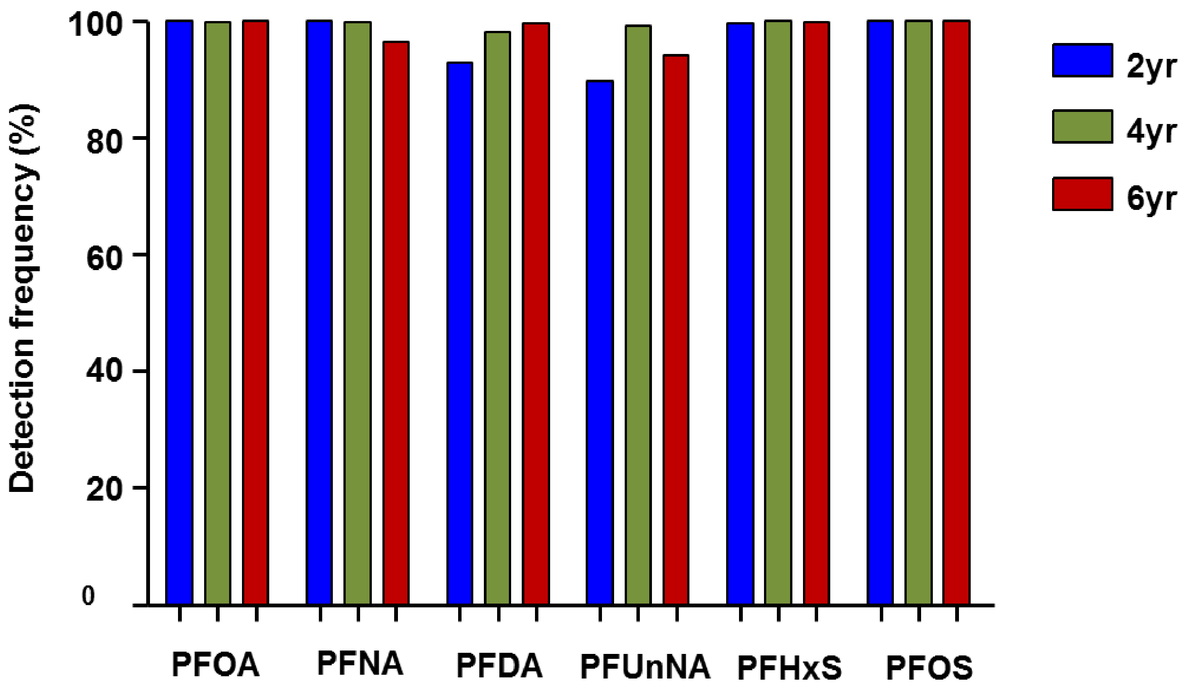
Exclusion criteria

Multiple births, missing data on thyroid function tests or PFAS measurements

Age (years)	Total	Exclusion		Final	Number of visits		
	(n)	Twin (n)	Missing data (n)	(n)	One (n)	Two (n)	Three (n)
2	425	42	2	**381**	55	57	269
4	645	63	13	**569**	38	262	260
6	574	51	12	**511**	0	242	269

RESULTS

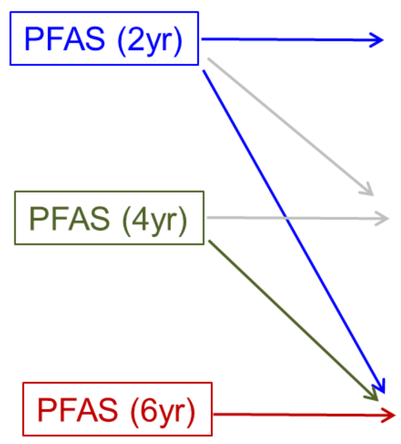
Detection frequencies of PFAS at ages 2, 4, and 6 years



Serum levels of perfluorooctanoic acid (PFOA), perfluorononanoic acid (PFNA), perfluorodecanoic acid (PFDA), perfluorohexane sulfonic acid (PFHxS), and perfluorooctane sulfonic acid (PFOS) were detected in >90% at all studied ages.

Relationship of serum PFAS concentrations with thyroid function

In boys



	TSH (2yr)	
	β	*P*
PFDA (2yr)	-0.087	0.049
PFOS (2yr)	-0.124	0.032

	fT4 (6yr)		T3 (6yr)		TSH (6yr)	
	β	*P*	β	*P*	β	*P*
PFNA (2yr)	0.025	0.009	0.03	0.035		
PFNA (4yr)			0.03	0.033		
PFNA (6yr)					-0.071	0.044
PFOA (6yr)	0.035	0.018				
PFOS (6yr)			0.041	0.025		

Covariates including age, BMI z-score and Iodine intake were included in the model.
TSH, thyroid stimulating hormone; fT4, free thyroxine; T3, triiodothyronine

Decreased TSH and increased FT4 or T3 levels were significantly associated with increasing PFAS concentrations **only in boys** and not in girls.

CONCLUSIONS

PFOS, PFOA, PFHxS, PFDA, and PFNA were consistently detected >90% in Korean children from ages 2, 4, to 6 years. Significant effect of PFAS on increased fT4 and T3 and decreased TSH levels was found among boys.

References

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2. Rappazzo KM, Coffman E, Hines EP 2017 Exposure to perfluorinated alkyl substances and health outcomes in children: a systematic review of the epidemiologic literature. Int J Environ Res Public Health 14:E691