

# PFAS/2023/04 Annex B

## In this guide

### [In this guide](#)

1. [Introduction, Background and Literature search - PFAS/2023/04](#)
2. [In vivo thyroid toxicity studies - PFAS/2023/04](#)
3. [Summary of results - PFAS/2023/04](#)
4. [Discussion - PFAS/2023/04](#)
5. [List of Abbreviations - PFAS/2023/04](#)
6. [References - PFAS/2023/04](#)
7. [PFAS/2023/04 - Annex A](#)
8. [PFAS/2023/04 - Annex B](#)
9. [PFAS/2023/04 - Annex C](#)

## Per- and polyfluoroalkyl substances: evaluation of thyroid effects

### Literature search

#### Search terms

1. Search terms presented in the EFSA opinion were replicated for the searches.

### Scopus (search terms in all fields)

(TITLE-ABS-KEY (perfluoro\* OR pfos OR pfoa OR pfas OR 'fluorotelomer alcohol' AND TITLE-ABS-KEY (toxicity OR toxi\* OR acute OR subacute OR subchronic OR chronic OR mutagen\* OR carcino\* OR reprotox\* OR nephrotox\* OR neurotox\* OR hepatotox\* OR immune OR immuno\* OR 'developmental tox\*' OR thyroid OR endocri\* OR endocrine OR estrogen OR oestrogen OR fertility OR tumour OR

tumor OR gestat\* OR lactat\* OR 'DNA damage' OR mortality OR adverse OR 'adverse effect' OR 'blood lipid\*' OR 'serum lipid\*' OR PPAR OR 'ex vivo' OR 'in vitro' OR 'in vivo' OR exvivo OR invitro OR invivo OR cell\* OR tissue\* OR rodent\* OR mouse OR animal\* OR rat\* OR mice OR rabbit\* OR dog\* OR monkey\* OR 'experimental animal\*' OR 'lab\* animal\*' OR 'lab\* animal\*' AND ( EXCLUDE ( SUBJAREA , "CHEM" ) OR EXCLUDE ( SUBJAREA , "MATE" ) OR EXCLUDE ( SUBJAREA , "CENG" ) OR EXCLUDE ( SUBJAREA , "ENGI" ) OR EXCLUDE ( SUBJAREA , "PHYS" ) OR EXCLUDE ( SUBJAREA , "COMP" ) OR EXCLUDE ( SUBJAREA , "EART" ) OR EXCLUDE ( SUBJAREA , "ENER" ) OR EXCLUDE ( SUBJAREA , "SOCI" ) OR EXCLUDE ( SUBJAREA , "ECON" ) OR EXCLUDE ( SUBJAREA , "BUSI" ) OR EXCLUDE ( SUBJAREA , "ARTS" ) ) AND ( LIMIT-TO ( DOCTYPE , "ar" ) OR LIMIT-TO ( DOCTYPE , "re" ) ) AND ( LIMIT-TO ( LANGUAGE , "English" ) OR EXCLUDE ( LANGUAGE , "Russian" ) OR EXCLUDE ( LANGUAGE , "Spanish" ) ) AND ( EXCLUDE ( LANGUAGE , "Italian" ) ) AND ( EXCLUDE ( SUBJAREA , "MATH" ) ): 5449

## PubMed (search terms in title and abstract)

((("perfluoro\*" [Title/Abstract] OR "pfos" [Title/Abstract] OR "pfoa" [Title/Abstract] OR "pfas" [Title/Abstract] OR "fluorotelomer alcohol" [Title/Abstract] AND "toxi\*" [Title/Abstract] OR "acute" [Title/Abstract] OR "subacute" [Title/Abstract] OR "subchronic" [Title/Abstract] OR "chronic" [Title/Abstract] OR "mutagen\*" [Title/Abstract] OR "carcino\*" [Title/Abstract] OR "reprotox\*" [Title/Abstract] OR "nephrotox\*" [Title/Abstract] OR "neurotox\*" [Title/Abstract] OR "hepatotox\*" [Title/Abstract] OR "immune" [Title/Abstract] OR "immuno\*" [Title/Abstract] OR "developmental tox\*" [Title/Abstract] OR "thyroid" [Title/Abstract] OR "endocri\*" [Title/Abstract] OR "endocrine" [Title/Abstract] OR "estrogen" [Title/Abstract] OR "oestrogen" [Title/Abstract] OR "fertility" [Title/Abstract] OR "tumour" [Title/Abstract] OR "tumor" [Title/Abstract] OR "gestat\*" [Title/Abstract] OR "lactat\*" [Title/Abstract] OR "DNA damage" [Title/Abstract] OR "mortality" [Title/Abstract] OR "adverse" [Title/Abstract] OR "adverse effect" OR "blood lipid" [Title/Abstract] OR "serum lipid\*" [Title/Abstract] OR "PPAR" [Title/Abstract] OR "ex vivo" [Title/Abstract] OR "in vitro" [Title/Abstract] OR "in vivo" [Title/Abstract] OR "exvivo" [Title/Abstract] OR "invitro" [Title/Abstract] OR "invivo" [Title/Abstract] OR "cell\*" [Title/Abstract] OR "tissue\*" [Title/Abstract] OR "rodent\*" [Title/Abstract] OR "mouse" [Title/Abstract] OR "animal\*" [Title/Abstract] OR "rat\*" [Title/Abstract] OR "mice" [Title/Abstract] OR "rabbit\*" [Title/Abstract] OR "dog\*" [Title/Abstract] OR "monkey\*" [Title/Abstract] OR "experimental animal\*" [Title/Abstract] OR "lab\* animal\*" [Title/Abstract] OR "lab\* animal\*" [Title/Abstract] AND (English[Filter]))): 2569

2. Data from both searches were combined and duplicates removed giving a total of 3397 papers.
3. To identify papers on specific endpoints key words were used to search in all fields in Endnote. Key words included, but were not limited to,
  - Thyro,
  - TSH,
  - T3,
  - T4,
  - Thyroxine,
  - Triiodothyronine,
  - Hypertrophy,
  - Thyroid stimulating hormone.

## Inclusion and exclusion criteria

4. Generic inclusion criteria and exclusion criteria were applied to the data retrieved (Table 19).

**Table 19. Generic inclusion and exclusion criteria used during primary screening of titles**

Inclusion Criteria	Exclusion criteria
Articles in English language.	Articles in other languages
Peer reviewed publications.	Expert opinions by authoritative bodies commentaries, editorials and letters to the editor.
	PhD Theses.
	Extended abstracts, conference proceeding.

Relevant reviews.	Studies not reporting original results, including comments, letters or editorials
	Papers without an abstract.
Papers concerning toxicological effects.	Papers concerned only with methodology.
	Studies in other species such as fish, birds, foxes, frogs, bears, chickens.
Studies in humans, rats, mice, rabbits, dogs or monkeys.	Transgenic animals.
	In vitro studies.
	Human (epidemiology) studies.
Any experimental animal study, all ages, male and females.	None.
Oral (feeding, gavage and drinking water studies),	
Inhalation studies,	
Dermal studies,	None.
Subcutaneous injection (s.c.),	
Intraperitoneal injection (i.p.),	
Intramuscular injection (i.m.).	
Any PFAS.	Mixtures of PFAS.