Supplemental Material

Systematic Evidence Map for Over One Hundred and Fifty Per- and Polyfluoroalkyl Substances (PFAS)

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Additional File- Excel Document
DeDuper

DeDuper is a tool developed by ICF, freely available to clients by request, that incorporates machine learning to identify and reconcile duplicate references in multiple database search results. The DeDuper tool uses a two-phase approach to identify duplicates: 1) locates duplicates using automated logic, and 2) employs machine learning to predict likely duplicates which are then verified manually.

ICF automated the deduplication process by applying a novel pipeline of deduplication algorithms. Deduplication is performed in two phases and can be evaluated for precision (proportion of true positives within all records predicted to be duplicates) and recall (i.e., sensitivity, the proportion of true positives within all records that were actual duplicates). Phase 1 prioritizes precision, by defining a set of exact match rules that operate on a limited set of fields in standard bibliographic citation files (lower-case title, publication year, first author, and starting page). The second phase of the pipeline uses machine learning to flag predicted matches as duplicates for removal and entity resolution on Research Information Systems (RIS) files; this phase is designed to maximize recall by applying algorithms to more comprehensively detect the remaining duplicates. The algorithms (i) intelligently limit the number of record comparisons to ensure speedy performances, and (ii) apply machine learning and fuzzy comparisons to learn and apply user tolerance for differences in select fields that are not exact matches (e.g., title, author names, and publication year).

This tool utilizes the Python Dedupe package to compare references field by field to identify pairs that have the highest likelihood of being a duplicate record. During training, the program:

- Groups records based on editing distance across specific fields (i.e., affine gap distance).
- Proposes grouped records as duplicates to the user for verification and changes the relative weights of various features of each entry based on the user’s response.
- Identifies the probability of duplication based on the distance between each record cluster after sufficient testing and allows for a more conservative or a more aggressive deduplication process based on threshold probabilities.

For rapid processing, ICF created a large training dataset from deduplication efforts on previous projects that save the user the need for training the model for each new run.

The algorithms underlying DeDuper - and its application in a case study involving a literature search related to dioctyl phthalate (DINP) - were presented at the 2019 Society of Toxicology (SOT) meeting (Magnuson, 2019). In this case study, ICF applied DeDuper to a set of 30,000 references in which duplicates had been previously identified manually. Phase 1 achieved a precision of 100%, although recall was limited at 76%. Phase 2 achieved a recall of 99% with a 48% precision. After accounting for manual review to remove false positives from the machine-identified duplicates pile, the combined pipeline realized an 82% efficiency gain. ICF normalized these results based on maximum possible efficiency gains (which depends on the proportion of duplicate groups in the original dataset) to estimate a specificity of 85%.

Distiller Literature Inventory SOP for PFAS 150 (abbreviated)

Part 1: Data Extraction

**Step 1: View list of studies.** To view the list of studies, go to Review -> Level 3 -> Health Literature Inventory Extraction form. Alternatively, you can access the list from the assessment home page. Under Level 3, click on “Unreviewed” to access the list of studies that have not been extracted yet.
Step 2: Select a study for extraction. Select a study by clicking on it, and a new tab will open.

Once the new tab opens, search the RefID at [https://heronet.epa.gov/heronet/index.cfm/search](https://heronet.epa.gov/heronet/index.cfm/search) and download the PDF.

Step 3: Data extraction – Part 1

Step 3a: Enter Author information. Use the format specified in the Distiller form.

Reference (short format), e.g. Smith, 1978, Smith and Jones, 1978 or Smith et al, 1978 (for more than 3 authors).

Step 3b: Select all supplemental tags that apply

Step 3c: Select other PFAS chemicals that were evaluated but not included in our screening

Step 3d: Select “No” for the QC question if you are doing the primary extraction

Select “No” to indicate that you are doing the initial data extraction. If you find during your review that the study does not meet PECO criteria, it should not be extracted. Select “study is not PECO-relevant: update full-text screening tags” to indicate that the study needs to be retagged at the full text review level.

Step 4: Data extraction – Part 2

Step 4a: Add a subform

To begin extracting data, click on ‘Add’ and a subform will appear. You are now ready to enter information into the form.

Step 4b: Enter evidence type. This is a dropdown menu – human, animal, or PBPK

Evidence Type

*human for epidemiological data; animal for studies conducted in animals

Note: For this project, select “human (abbreviated extraction)” for human.

Step 4c: Select chemical form. This is a dropdown menu of the preferred names of each chemical.
Refer to the **Master List** in Teams for their synonyms.

**Chemical form**

Select the preferred name of the chemical. Please refer to the chemical list in Teams for the list of synonyms.

[Select an Answer]

**Permanently add an answer to this question**

The next questions about study design will differ depending on whether the study is in humans or animals.
**Human studies (abbreviated form):**

**Step 4d (Human): Enter sex, population, and study design.** Select sex, population, and study design from dropdown menus. Please refer to Appendix 1 for guidance in selecting the study design.

*Sex*

In most case studies that include males and females can be marked as “both” and sex-specific differences in response described in the “Doses or exposure levels associated with findings” question below.

[Select an Answer]

*Population*

[Select an Answer]

*Study design (human)*

[Select an Answer]

**Step 4e (Human): Exposure measurement.** Enter information on the exposure measurement as prompted in the Distiller form.

*Exposure measurement*

- [ ] biomonitoring
- [ ] air
- [ ] food
- [ ] drinking water
- [ ] occupational (use in cases where exposure is based on factors such as job function, place in building where people worked)
- [ ] direct administration - oral

**Step 4f (Human): Select health outcome.** See Appendix 2 for what kind of endpoints are grouped under which health outcomes. Please create a separate form for each outcome. See Step 6 on how to clone a form.

*Health outcomes (Abbreviated Human Health Extraction - no endpoints)*

Form should be completed for one health outcome; form can be cloned for studies that assess more than one health outcome.

[Select an Answer]
**Animal studies (abbreviated):**

**Step 4d (Animal): Enter study design.** This is a drop-down menu.

Note: If a study presents multiple experiments with different exposure durations, e.g. subchronic and chronic, these experiments need to be entered in separate forms. Please indicate which experiment you are referring to in the comment box. Also, see instructions below to clone the form.

**Study design (animal)**

*Form should be completed for each study design presented in a study: form can be cloned for studies that assess more than one study design.*

- acute (24 hours)

“Developmental” includes F0 and F1 data from one generation repro/developmental study designs.

“Multigenerational” includes repro/developmental studies that span two generations and beyond.

Both developmental and multigenerational study designs will have a free text box where you will indicate the generation (F0, F1, etc).

**Step 4e: Enter the route, species, sex, and health outcomes**

**Route**

- Select an Answer

**Species**

- Select an Answer

**Sex**

- Select an Answer

**Health outcomes (Abbreviated Animal Extraction - no endpoints)**

*Form should be completed for one health outcome; form can be cloned for studies that assess more than one health outcome.*

- Select an Answer

**Comments**

For most studies this field will be blank. However, if there are multiple experiments, please indicate which one you are referring to in this form.

- ...

Note: See Appendix 2 for what kind of endpoints are grouped under which health outcomes.

**Step 5: Click ‘Submit’** when you have completed the form. This will save the subform. Note: If you are done with all your subforms, you must also click ‘Submit’ at the top of the page (see Step 8).

**Step 6: Cloning the form.** If you have more than one study design or health outcome, you can ‘clone’ the form to avoid having to reenter the study design information (although all outcome information will need to be deleted and reentered in the cloned form). To do this, select the form you
want to clone and click “Clone” near the top of the page. Alternatively, you can start a new blank form by clicking “Add”.

2. Subforms

   Add  Edit  Delete  Clone  New Row

   **Step 7: Editing the form:** If you need to change information or edit a form you have completed, you can click on the arrow within a form to edit.

   **Step 8: At the top of the page, click ‘Submit’.** Note: If you don’t do this, the study will remain as ‘reviewed, but unsubmitted’, which means it is still incomplete.
Table S1: Categorization for grouping endpoints under health outcomes

| Health Effect Category | Examples of Relevant Endpoints | Notes |
|------------------------|--------------------------------|-------|
| **Systemic Effects**   | • Body weight (not reproductive/developmental)  
                        • Mortality, survival, or LD50s  
                        • Growth curve  
                        • Clinical observations (e.g. lethargy; oral discharge) | • Clinical chemistry endpoints are under Hepatic or Hematologic  
                                                                  • Maternal body weights are under Reproductive  
                                                                  • Pup body weight endpoints are under Developmental  
                                                                  • Pathology (including gross lesions) is organ-specific |
| **Carcinogenicity**    | • Tumors  
                        • Precancerous lesions (e.g., dysplasia) |       |
| **Cardiovascular Effects** | • Heart weight  
                            • Heart, artery, and vein histopathology  
                            • Blood pressure  
                            • Serum cholesterols and lipids | • Other blood measures are under Hepatic, Immune, or Hematologic |
| **Dermal Effects**     | • Skin sensitivity  
                        • Skin histopathology |       |
| **Developmental Effects** | • Pup viability/survival, or other birth parameters  
                            • Pup weight or growth (into adulthood if developmental exposure)  
                            • Developmental landmarks (e.g. eye opening) not including markers for other organ/system-specific toxicities  
                            • Skeletal, visceral, or gross abnormalities in fetuses/pups | • Histopathology and markers of development specific to other systems are organ/system-specific (e.g., vaginal opening is under Female Reproductive; tests of sensory maturation are under Nervous System) |
| **Endocrine Effects**  | • Thyroid/adrenal weight  
                        • Thyroid/adrenal histopathology  
                        • Hormonal measures in any tissue or blood (non-reproductive)  
                        • Stress-related factors in blood (e.g., glucocorticoids or other adrenal markers) | • Reproductive hormones are under Reproductive |
| **Gastrointestinal Effects** | • Stomach and intestine weight  
                            • Stomach and intestine histopathology |       |
| **Hematologic Effects** | • Corpuscular volume  
                        • Red blood cells  
                        • Serum hematocrit or hemoglobin  
                        • Serum platelets or reticulocytes | • White blood cell counts and globulin are under Immune  
                                                                  • Serum lipids are under Cardiovascular |
| Health Effect Category | Examples of Relevant Endpoints | Notes |
|------------------------|--------------------------------|-------|
|                       | • Serum biochemical measures (sodium, calcium, phosphorus)  
|                       | • Blood coagulation markers   |       |
| Market Effects         |                               |       |
|                       | • Liver weight                |       |
|                       | • Liver histopathology        |       |
|                       | • Liver tissue enzyme activity (e.g., catalase) or protein/DNA content |       |
|                       | • Liver enzymes (ALT; AST)    |       |
|                       | • Liver biochemical markers (albumin; glycogen)  
|                       | • Liver tissue lipids (triglycerides, cholesterol) |       |
|                       |                               | Serum liver markers are under Hepatic |
|                         |                               | Serum lipids are under Cardiovascular |
|                         |                               | Biochemical markers such as albumin or glucose are under Hematological |
|                         |                               | Liver tissue cytokines are under immune |
|                         |                               | Serum glucose is under Metabolic |
| Immune Effects         | • Host resistance             |       |
|                       | • Allergic, autoimmune or infectious disease |       |
|                       | • Hypersensitivity            |       |
|                       | • Lymphocyte phenotyping or proliferation |       |
|                       | • Lymphoid tissue weight, histopathology, cell counts |       |
|                       | • Immune functional assays (e.g. antibody production, natural killer cell function, delayed-type hypersensitivity [DTH], mixed leukocyte reaction [MLR], cytotoxic T lymphocyte [CTL], phagocytosis or bacterial killing by monocytes) |       |
|                       | • Immune responses in the respiratory system (includes asthma) |       |
|                       | • White blood cell counts     |       |
|                       | • Serum immunological factors or cytokines |       |
|                       | • Immune cell counts or immune-specific cytokines in non-lymphoid tissues |       |
|                       | • Bone marrow histopathology and cell counts |       |
|                       |                               | Red blood cells are under Hematological |
|                       |                               | Non-immune measures of pulmonary function are under Respiratory |
| Metabolic Effects      | • Pancreatic effects relevant to diabetes |       |
|                       | • Induced-obesity or BMI      |       |
|                       | • Free fatty acids            |       |
|                       | • Serum glucose or insulin, or other measures related to diabetes |       |
| Health Effect Category               | Examples of Relevant Endpoints                                                                 | Notes                                                                                                                                                                                                 |
|-------------------------------------|-------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Musculoskeletal/Connective Tissue   | • Bone weight and histopathology<br>• Muscular histopathology                                   |                                                                                                                                                                                                      |
| Neurological Effects                | • Brain weight<br>• Brain histopathology<br>• Nervous system histopathology<br>• Behavioral measures (including FOB and cage-side observations) |                                                                                                                                                                                                      |
| Ocular Effects                      | • Eye histopathology<br>• Vision changes<br>• Eye irritation                                  |                                                                                                                                                                                                      |
| Renal Effects                       | • Kidney weight<br>• Kidney histopathology<br>• Bladder weight and histopathology<br>• Urinary measures (e.g., protein; volume; pH; specific gravity) |                                                                                                                                                                                                      |
| Reproductive Effects                | • Dam health, body weight, food consumption<br>• Reproductive organ weight<br>• Reproductive organ histopathology<br>• Markers of sexual differentiation or maturation (e.g., preputial separation in males; vaginal opening or estrous cycling in females)<br>• Mating parameters (e.g., success; mount latency)<br>• Sperm parameters (e.g., counts; motility)<br>• Reproductive hormones | • Birth parameters (e.g., litter size; resorptions; implantations; viability) are under Developmental<br>[NOTE: if data indicate altered birth parameters are likely attributable to female fertility, these data may be discussed under Female Reproductive] |
| Respiratory Effects                 | • Lung weight and histopathology<br>• Nasal cavity histopathology                               |                                                                                                                                                                                                      |
| Study Design   | Description                                                                                                                                 |
|---------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| Cross-sectional | Exposure and outcome are examined at the same point in time in a defined study population. Cannot determine if exposure came before or after outcome. |
| Cohort        | A group of people is examined over time to observe a health outcome. Everyone belongs to the same population (e.g., general U.S. population; an occupational group; cancer survivors). All cohort studies (prospective or retrospective) consider exposure data from before the occurrence of the health outcome. |
| Case-control  | Cases (people with the health outcome) and controls (people without the health outcome) are selected at the start of a study. Exposure is determined and compared between the two groups. A case-control study can be nested within a cohort. |
| Ecological    | The unit of observation is at the group level (e.g., zip code; census tract), rather than the individual level. Ecological studies are often used to measure prevalence and incidence of disease. Cannot make inferences about an individual’s risk based on an ecological study. |
| Controlled Trial | Exposure is assigned to subject and then outcome is measured.                                                                                                                                 |
Table S3. Inventory of HAWC data pivot visuals by chemical in this SEM.

| PFAS DTXSID | Health Category | HAWC URL |
|-------------|-----------------|----------|
| 6:2 Fluorotelomer Alcohol DTXSID5044572 | Literature Tag Tree | [https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-62-fluorotelomer-alcohol-dtxsid5044572/](https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-62-fluorotelomer-alcohol-dtxsid5044572/) |
| Cardiovascular and Hematologic (Reproductive/Developmental Studies) | [https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-6-62-fluorotelomer-alcohol-and-cardio-repro/](https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-6-62-fluorotelomer-alcohol-and-cardio-repro/) |
| Cardiovascular and Hematologic (Subchronic Studies) | [https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-5-62-fluorotelomer-alcohol-and-cardio-sc/](https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-5-62-fluorotelomer-alcohol-and-cardio-sc/) |
| Developmental (Offspring) | [https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-2-62-fluorotelomer-alcohol-and-development/](https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-2-62-fluorotelomer-alcohol-and-development/) |
| Developmental*(Offspring; Multiple Chemicals) | [https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/Main-Report_Offspring-Abnorm_Oral/](https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/Main-Report_Offspring-Abnorm_Oral/) |
| Developmental (Pregnancy Outcomes) | [https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-1-62-fluorotelomer-alcohol-and-development/](https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-1-62-fluorotelomer-alcohol-and-development/) |
| Endocrine and Gastrointestinal | [https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-8-62-fluorotelomer-alcohol-and-endocrine-an/](https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-8-62-fluorotelomer-alcohol-and-endocrine-an/) |
| Hematologic*(Oral Studies) | [https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/Main-Report_62_FA_Hematologic_Oral/](https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/Main-Report_62_FA_Hematologic_Oral/) |
| Hepatic | [https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-7-62-fluorotelomer-alcohol-and-hepatic-eff/](https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-7-62-fluorotelomer-alcohol-and-hepatic-eff/) |
| Category                                                                 | URL                                                                 |
|------------------------------------------------------------------------|----------------------------------------------------------------------|
| Hepatic<sup>+</sup> (Weight; Multiple Chemicals)                        | [https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/Main-Report_Hepatic_Weight_Oral/](https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/Main-Report_Hepatic_Weight_Oral/) |
| Immune                                                                | [https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure9_62-fluorotelomer-alcohol-and-immune/](https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure9_62-fluorotelomer-alcohol-and-immune/) |
| Multi-system, Musculoskeletal, and Ocular                              | [https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/fig13_62-fluorotelomer-alcohol-and-other-health/](https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/fig13_62-fluorotelomer-alcohol-and-other-health/) |
| Nervous, Respiratory, and Urinary                                     | [https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure10_62-fluorotelomer-alcohol-and-nerv-resp/](https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure10_62-fluorotelomer-alcohol-and-nerv-resp/) |
| Reproductive (Female or Combined)                                     | [https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure4-62-fluorotelomer-alcohol-and-female-repro/](https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure4-62-fluorotelomer-alcohol-and-female-repro/) |
| Reproductive (Male)                                                   | [https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure3-62-fluorotelomer-alcohol-and-male-repro/](https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure3-62-fluorotelomer-alcohol-and-male-repro/) |
| Whole Body (Reproductive/Developmental Studies)                       | [https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure12-62-fluorotelomer-alcohol-and-whole-body/](https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure12-62-fluorotelomer-alcohol-and-whole-body/) |
| Whole Body (Subchronic Studies)                                       | [https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure11-62-fluorotelomer-alcohol-and-whole-body/](https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure11-62-fluorotelomer-alcohol-and-whole-body/) |
| 6:2 Fluorotelomer Methacrylate DTXSID3047558                          | [https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-62-fluorotelomer-methacrylate-dtxsid30475/](https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-62-fluorotelomer-methacrylate-dtxsid30475/) |
| Literature Tag Tree                                                   | [https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-62-fluorotelomer-methacrylate-dtxsid30475/](https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-62-fluorotelomer-methacrylate-dtxsid30475/) |
| Chemical Name | Effect | Literature Tag Tree |
|---------------|--------|---------------------|
| 6:2 Fluorotelomer Sulfonic Acid DTXSID6067331 | Developmental<sup>α</sup> (Offspring; Multiple Chemicals) | [Link](https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/Main-Report_Offspring-Abnorm_Oral/) |
| | Developmental, Gastrointestinal, Reproductive, Urinary, and Whole Body | [Link](https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure14_fluorotelomer-methacrylate-and-health/) |
| | Hepatic<sup>α</sup> (Weight; Multiple Chemicals) | [Link](https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/Main-Report_Hepatic_Weight_Oral/) |
| | Literature Tag Tree | [Link](https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-62-fluorotelomer-sulfonic-acid-dtxsid6067/) |
| | Cardiovascular and Hematologic | [Link](https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-17-62-fluorotelomer-sulfonic-acid-and-cardi/) |
| | Developmental | [Link](https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-15-62-fluorotelomer-sulfonic-acid-and-devel/) |
| | Endocrine, Hepatic, Immune, Nervous, and Urinary | [Link](https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-18-62-fluorotelomer-sulfonic-acid-and-other/) |
| | Multi-system and Whole Body | [Link](https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-19-62-fluorotelomer-sulfonic-acid-and-whole/) |
| | Reproductive | [Link](https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-16-62-fluorotelomer-sulfonic-acid-and-repro/) |
| 8:2 Fluorotelomer Alcohol DTXSID7029904 | Literature Tag Tree | [Link](https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-82-fluorotelomer-alcohol-dtxsid7029904/) |
| System                                                                 | Link                                                                 |
|----------------------------------------------------------------------|----------------------------------------------------------------------|
| Cardiovascular, Dermal, Musculoskeletal, and Ocular                  | https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-26-82-fluorotelomer-alcohol-and-cardiovascular/ |
| Development                                                          | https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-20-82-fluorotelomer-alcohol-and-development/     |
| Endocrine and Gastrointestinal                                       | https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-25-82-fluorotelomer-alcohol-and-endocrine-a/        |
| Hematologic                                                          | https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-22-82-fluorotelomer-alcohol-and-hematologic/        |
| Hepatic and Immune                                                   | https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-24-82-fluorotelomer-alcohol-and-hepatic-and/          |
| Multi-system and Whole Body                                          | https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-27-82-fluorotelomer-alcohol-and-multi-syste/         |
| Nervous, Respiratory, and Urinary                                    | https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-23-82-fluorotelomer-alcohol-and-nervous-res/       |
| Reproductive                                                         | https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-21-82-fluorotelomer-alcohol-and-reproductive/       |
| 1-Butanesulfonic acid, 1,1,2,2,3,3,4,4,4-nonafluoro-, salt with sulphonium, dimethylphenyl DTXSID90881840 | https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-1-butanesulfonic-acid-112233444-nonafluor/          |
| Literature Tag Tree                                                  | https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-1-butanesulfonic-acid-112233444-nonafluor/          |
| Chemical Name                          | Literature Tag Tree                                                                 | Web Link                                                                 |
|---------------------------------------|--------------------------------------------------------------------------------------|--------------------------------------------------------------------------|
| 1-Hexene, 3,3,4,4,5,5,6,6,6-nonafluoro-, polymer with ethene and 1,1,2,2-tetrafluoroethene | Literature Tag Tree                                                                 | [https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-1-hexene-334455666-nonafluoro-polymer-eth/](https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-1-hexene-334455666-nonafluoro-polymer-eth/) |
| 1H,1H,2H-Perfluorocyclopentane         | Literature Tag Tree                                                                 | [https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-1-h1h2h-perfluorocyclopentane-dtxsid508802/](https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-1-h1h2h-perfluorocyclopentane-dtxsid508802/) |
| 1H,1H,5H-Perfluoropentanol             | Literature Tag Tree                                                                 | [https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-1-h1h5h-perfluoropentanol-dtxsid0059879/](https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-1-h1h5h-perfluoropentanol-dtxsid0059879/) |
| 2-Chloro-1,1,1,2-Tetrafluoroethane     | Literature Tag Tree                                                                 | [https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-2-chloro-1112-tetrafluoroethane-dtxsid702/](https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-2-chloro-1112-tetrafluoroethane-dtxsid702/) |
| Cardiovascular, Dermal, Musculoskeletal, and Ocular | Literature Tag Tree                                                                 | [https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-36-2-chloro-1112-tetrafluoroethane-and-card/](https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-36-2-chloro-1112-tetrafluoroethane-and-card/) |
| Developmental                         | Literature Tag Tree                                                                 | [https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-28-2-chloro-1112-tetrafluoroethane-and-dev/](https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-28-2-chloro-1112-tetrafluoroethane-and-dev/) |
| Endocrine and Gastrointestinal        | Literature Tag Tree                                                                 | [https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-35-2-chloro-1112-tetrafluoroethane-and-endo/](https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-35-2-chloro-1112-tetrafluoroethane-and-endo/) |
| Hematologic                           | Literature Tag Tree                                                                 | [https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-30-2-chloro-1112-tetrafluoroethane-and-hema/](https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-30-2-chloro-1112-tetrafluoroethane-and-hema/) |
| Hepatic                               | Literature Tag Tree                                                                 | [https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-33-2-chloro-1112-tetrafluoroethane-and-hepa/](https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-33-2-chloro-1112-tetrafluoroethane-and-hepa/) |
| Condition                          | Reference                                                                 |
|-----------------------------------|---------------------------------------------------------------------------|
| Immune                            | https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-34-2-chloro-1112-tetrafluoroethane-and-immu/ |
| Multi-system                      | https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-37-2-chloro-1112-tetrafluoroethane-and-mult/ |
| Nervous and Respiratory           | https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-31-2-chloro-1112-tetrafluoroethane-and-nerv/ |
| Reproductive                      | https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-29-2-chloro-1112-tetrafluoroethane-and-deve/ |
| Urinary                           | https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-32-2-chloro-1112-tetrafluoroethane-and-urin/ |
| Whole Body                        | https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-38-2-chloro-1112-tetrafluoroethane-and-whol/ |
| 3,3,4,4,5,5,6,6,6-Nonafluorohexene | Literature Tag Tree                                                        |
| DTXSID6047575                     | https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-334455666-nonafluorohexene-dtxsid6047575/ |
| Developmental, Hepatic, Reproduc-  | https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-69-334455666-nonafluorohexene-and-health-ef/ |
| tive, and Whole Body              | (Reproductive/Developmental Studies)                                       |
| Endocrine, Hematologic, Hepatic,  | https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-68-334455666-nonafluorohexene-and-health/ |
| Immune, Ocular, Urinary, Multi-    | System, and Whole Body                                                    |
| system, and Whole Body (Subchronic | Studies)                                                                  |
| Studies)                          |                                                                          |
| Chemical Name                                                                 | Literature Tag Tree                                                                 | Data Link                                                                 |
|------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------|
| 3-Methoxyperfluoro(2-methylpentane) DTXSID20881338                           | Literature Tag Tree                                                                 | [https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-3-methoxyperfluoro2-methylpentane-dtxsid2/](https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-3-methoxyperfluoro2-methylpentane-dtxsid2/) |
| Bis(2-hydroxyethyl)ammonium perfluorobutanesulfonate DTXSID1072052           | Literature Tag Tree                                                                 | [https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-bis2-hydroxyethylammonium-perfluorobutane/](https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-bis2-hydroxyethylammonium-perfluorobutane/) |
| Dodecafluoroheptanol DTXSID9059832                                            | Literature Tag Tree                                                                 | [https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-dodecafluoroheptanol-dtxsid9059832/](https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-dodecafluoroheptanol-dtxsid9059832/) |
| Methyl perfluoro(3-(1-ethenyloxypropan-2-yloxy)propanoate) DTXSID8044969    | Literature Tag Tree                                                                 | [https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-methyl-perfluoro3-1-ethenyloxypropan-2-yl/](https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-methyl-perfluoro3-1-ethenyloxypropan-2-yl/) |
| N-Ethyl-N-(2-hydroxyethyl)perfluorooctanesulfonamide DTXSID6027426           | Literature Tag Tree                                                                 | [https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-n-ethyl-n-2-hydroxyethylperfluorooctanesu/](https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-n-ethyl-n-2-hydroxyethylperfluorooctanesu/) |
| N-Ethylperfluorooctanesulfonamide DTXSID1032646                                | Literature Tag Tree                                                                 | [https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-n-ethylperfluorooctanesulfonamide-dtxsid1/](https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-n-ethylperfluorooctanesulfonamide-dtxsid1/) |
| N-Methyl-N-(2-hydroxyethyl)perfluorooctanesulfonamide DTXSID7027831           | Literature Tag Tree                                                                 | [https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-n-methyl-n-2-hydroxyethylperfluorooctanes/](https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-n-methyl-n-2-hydroxyethylperfluorooctanes/) |

Developmental, Reproductive, and Whole Body

https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/fig66_n-etfoseetfosemeforeal-and-healtheffects/

Whole Body

https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/fig67_n-ethylperfluorooctanesulfonamide-and-health/

Cardiovascular and Hematologic

https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-71_n-methyl-n-2-hydroxyethylperfluorooctane/
| System Description                                      | Link                                                                 |
|---------------------------------------------------------|----------------------------------------------------------------------|
| Dermal, Multi-system, Musculoskeletal, Ocular, and Whole Body | [https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-76-n-methyl-n-2-hydroxyethylperfluoroctane/](https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-76-n-methyl-n-2-hydroxyethylperfluoroctane/) |
| Endocrine and Gastrointestinal                          | [https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-72-n-methyl-n-2-hydroxyethylperfluoroctane/](https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-72-n-methyl-n-2-hydroxyethylperfluoroctane/) |
| Hepatic                                                 | [https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-73-n-methyl-n-2-hydroxyethylperfluoroctane/](https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-73-n-methyl-n-2-hydroxyethylperfluoroctane/) |
| Immune                                                  | [https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-74-n-methyl-n-2-hydroxyethylperfluoroctane/](https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-74-n-methyl-n-2-hydroxyethylperfluoroctane/) |
| Nervous, Respiratory, and Urinary                      | [https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-75-n-methyl-n-2-hydroxyethylperfluoroctane/](https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-75-n-methyl-n-2-hydroxyethylperfluoroctane/) |
| Reproductive                                            | [https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-70-n-methyl-n-2-hydroxyethylperfluoroctane/](https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-70-n-methyl-n-2-hydroxyethylperfluoroctane/) |
| Perfluamine DTXSID9059834                               | Literature Tag Tree [https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-perfluamine-dtxsid9059834/](https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-perfluamine-dtxsid9059834/) |
| Perfluoro(N-methylmorpholine) DTXSID7059933             | Literature Tag Tree [https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-perfluoron-methylmorpholine-dtxsid7059933/](https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-perfluoron-methylmorpholine-dtxsid7059933/) |
| Hematologic, Ocular, Multi-system, and Whole Body       | [https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure54_perfluoron-methylmorpholine-and-health/](https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure54_perfluoron-methylmorpholine-and-health/) |
| Perfluoro(propyl vinyl ether) DTXSID0061826             | Literature Tag Tree [https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-perfluoropropyl-vinyl-ether-dtxsid0061826/](https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-perfluoropropyl-vinyl-ether-dtxsid0061826/) |
| Category                                      | URL                                                                 |
|----------------------------------------------|----------------------------------------------------------------------|
| Cardiovascular and Hematologic               | [https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-56-perfluoropropyl-vinyl-ether-and-health/](https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-56-perfluoropropyl-vinyl-ether-and-health/) |
| Dermal, Ocular, and Musculoskeletal          | [https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-59-perfluoropropyl-vinyl-ether-and-dermal-o/](https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-59-perfluoropropyl-vinyl-ether-and-dermal-o/) |
| Developmental and Reproductive              | [https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-55-perfluoropropyl-vinyl-ether-and-reproduc/](https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-55-perfluoropropyl-vinyl-ether-and-reproduc/) |
| Endocrine and Gastrointestinal              | [https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-57-perfluoropropyl-vinyl-ether-and-endocrin/](https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-57-perfluoropropyl-vinyl-ether-and-endocrin/) |
| Hepatic, Immune, Nervous, Respiratory, and Urinary | [https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-58-perfluoropropyl-vinyl-ether-and-health-e/](https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-58-perfluoropropyl-vinyl-ether-and-health-e/) |
| **Perfluoro-1,3-dimethylcyclohexane**        | Literature Tag Tree                                                   | [https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-perfluoro-13-dimethylcyclohexane-dtxsid00/](https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-perfluoro-13-dimethylcyclohexane-dtxsid00/) |
| **Perfluoro-1-iodohexane**                   | Literature Tag Tree                                                   | [https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-perfluoro-1-iodohexane-dtxsid70/](https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-perfluoro-1-iodohexane-dtxsid70/) |
| **Perfluoro-2,5-dimethyl-3,6-dioxanonanoic acid** | Literature Tag Tree                                                   | [https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-perfluoro-25-dimethyl-36-dioxanonanoic-ac/](https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-perfluoro-25-dimethyl-36-dioxanonanoic-ac/) |
| **Perfluoro-3-(1H-perfluoroethoxy)propane**  | Literature Tag Tree                                                   | [https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-perfluoro-3-1h-perfluoroethoxypropane-dtx/](https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-perfluoro-3-1h-perfluoroethoxypropane-dtx/) |
| **Perfluorobutanesulfonyl fluoride**         | Literature Tag Tree                                                   | [https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-perfluorobutanesulfonyl-fluoride-dtxsid20/](https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-perfluorobutanesulfonyl-fluoride-dtxsid20/) |
| Chemical Name                                      | Literature Tag Tree                                                                 | Links                                                                 |
|---------------------------------------------------|--------------------------------------------------------------------------------------|----------------------------------------------------------------------|
| Perfluorocyclohexanecarbonyl fluoride              | Literature Tag Tree                                                                 | [hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-perfluorocyclohexanecarbonyl-fluoride-dtx/](https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-perfluorocyclohexanecarbonyl-fluoride-dtx/) |
| Perfluoroheptanesulfonate                         | Literature Tag Tree                                                                 | [hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-perfluoroheptanesulfonate-dtxsid20892505/](https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-perfluoroheptanesulfonate-dtxsid20892505/) |
| Perfluoroheptanesulfonic acid                     | Literature Tag Tree                                                                 | [hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-perfluoroheptanesulfonic-acid-dtxsid8059920/](https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-perfluoroheptanesulfonic-acid-dtxsid8059920/) |
| Perfluoroheptanoic acid                           | Literature Tag Tree                                                                 | [hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-perfluoroheptanoic-acid-dtxsid1037303/](https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-perfluoroheptanoic-acid-dtxsid1037303/) |
| Perfluoro-3-methoxypropanoic acid                 | Literature Tag Tree                                                                 | [hawcprd.epa.gov/summary/visual/assessment/100500085/PFAS-150-Perfluoro-3-methoxypropa-dtxsid70191136/](https://hawcprd.epa.gov/summary/visual/assessment/100500085/PFAS-150-Perfluoro-3-methoxypropa-dtxsid70191136/) |
| Perfluoro(4-methoxybutanoic acid)                 | Literature Tag Tree                                                                 | [hawcprd.epa.gov/summary/visual/assessment/100500085/PFAS-150-Perfluoro4-methoxybutanoic-dtxsid60500450/](https://hawcprd.epa.gov/summary/visual/assessment/100500085/PFAS-150-Perfluoro4-methoxybutanoic-dtxsid60500450/) |
|                                                  | Immune                                                                               | [hawcprd.epa.gov/summary/data-pivot/assessment/100500085/Figure-77-NEW-PFMOBA-and-PFMOPrA-Immune/](https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/Figure-77-NEW-PFMOBA-and-PFMOPrA-Immune/) |
|                                                  | Cardiovascular, Hepatic, Nervous, Respiratory, Urinary, Whole Body                    | [hawcprd.epa.gov/summary/data-pivot/assessment/100500085/Figure-78-NEW-PFMOBA-and-PFMOPrA-and-Non-Immune/](https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/Figure-78-NEW-PFMOBA-and-PFMOPrA-and-Non-Immune/) |
| Substance                         | Literature Tag Tree                                                                 | URL                                                                 |
|----------------------------------|--------------------------------------------------------------------------------------|----------------------------------------------------------------------|
| Perfluoromethylcyclopentane      | Literature Tag Tree                                                                  | https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-perfluoromethylcyclopentane-dtxsid7061982/ |
| DTXSID7061982                    |                                                                                      |                                                                      |
| Perfluorooctanesulfonamide       | Literature Tag Tree                                                                  | https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-perfluorooctanesulfonamide-dtxsid3038939/ |
| DTXSID3038939                    |                                                                                      |                                                                      |
| Perfluorooctanesulfonyl fluoride  | Literature Tag Tree                                                                  | https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-perfluorooctanesulfonyl-fluoride-dtxsid50/ |
| DTXSID5027140                    |                                                                                      |                                                                      |
| Perfluoropentanoic acid          | Literature Tag Tree                                                                  | https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-perfluoropentanoic-acid-dtxsid6062599/ |
| DTXSID6062599                    |                                                                                      |                                                                      |
| Perfluoropropanoic acid          | Literature Tag Tree                                                                  | https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-perfluoropropanoic-acid-dtxsid8059970/ |
| DTXSID8059970                    |                                                                                      |                                                                      |
| Perfluorotetradecanoic acid      | Literature Tag Tree                                                                  | https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-perfluorotetradecanoic-acid-dtxsid3059921/ |
| DTXSID3059921                    |                                                                                      |                                                                      |
| Perfluorotridecanoic acid        | Literature Tag Tree                                                                  | https://hawcprd.epa.gov/summary/ddata-pivot/assessment/100500085/NEW-PFTA-and-All-System-Effects/PFTrDA-and-All-System-Effec |
| DTXSID90868151                   |                                                                                      |                                                                      |
| Perfluoroundecanoic Acid         | Literature Tag Tree                                                                  | https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-perfluoroundecanoic-acid-dtxsid8047553/ |
| DTXSID8047553                    |                                                                                      |                                                                      |
| System                                      | URL                                                                 |
|---------------------------------------------|---------------------------------------------------------------------|
| Cardiovascular and Hematologic              | [https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-61-perfluoroundecanoic-acid-and-cardiovascular](https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-61-perfluoroundecanoic-acid-and-cardiovascular) |
| Developmental and Reproductive              | [https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-60-perfluoroundecanoic-acid-and-reproductive](https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-60-perfluoroundecanoic-acid-and-reproductive) |
| Endocrine and Gastrointestinal              | [https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-62-perfluoroundecanoic-acid-and-endocrine-a](https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-62-perfluoroundecanoic-acid-and-endocrine-a) |
| Hepatic and Urinary                         | [https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-63-perfluoroundecanoic-acid-and-hepatic-and](https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-63-perfluoroundecanoic-acid-and-hepatic-and) |
| Immune, Nervous, and Respiratory            | [https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-64-perfluoroundecanoic-acid-and-immune-nerv](https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-64-perfluoroundecanoic-acid-and-immune-nerv) |
| Multi-system, Musculoskeletal, and Whole Body| [https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-65-perfluoroundecanoic-acid-and-other-heal](https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-65-perfluoroundecanoic-acid-and-other-heal) |
| Propanoic acid, 3-[1-difluoro[(trifluoroethenyl)oxy]methyl]-1,2,2,2-tetrafluoroethoxy]... | [https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-propanoic-acid-3-1-difluorotrifluoroethen](https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-propanoic-acid-3-1-difluorotrifluoroethen) |
| Sodium perfluorodecanesulfonate              | [https://hawcprd.epa.gov/summary/visual/assessment/100500085/PFAS-150-Sodium-perfluorodecanesulfonate-DTXSID60892443/](https://hawcprd.epa.gov/summary/visual/assessment/100500085/PFAS-150-Sodium-perfluorodecanesulfonate-DTXSID60892443/) |
| Tetrabutylphosphonium perfluorobutanesulfonate | [https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-tetrabutylphosphonium-perfluorobutanesulfonate](https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-tetrabutylphosphonium-perfluorobutanesulfonate) |
| Chemical Name                        | Literature Tag Tree                                                                 |
|-------------------------------------|--------------------------------------------------------------------------------------|
| Tetraethylammonium perfluorooctanesulfonate DTXSID5069128 | [Link](https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-tetraethylammonium-perfluorooctanesulfonate) |
| Trichloro((perfluorohexyl)ethyl)silane DTXSID50229163 | [Link](https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-trichloroperoxfluorohexylethylsilane-dtxsid/) |
| Triethoxy((perfluorohexyl)ethyl)silane DTXSID1074915 | [Link](https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-triethoxyperfluorohexylethylsilane-dtxsid/) |

**Developmental and Reproductive**
- [Link](https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-51-triethoxyperfluorohexylethylsilane-and-r/)

**Endocrine, Hematologic, Hepatic, Immune, Nervous, Ocular, Respiratory, and Urinary**
- [Link](https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-52-triethoxyperfluorohexylethylsilane-and-o/)

| Chemical Name | Literature Tag Tree                                                                 |
|---------------|--------------------------------------------------------------------------------------|
| Trifluoroacetic Acid DTXSID9041578 | [Link](https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-trifluoroacetic-acid-dtxsid9041578/) |

**Cardiovascular and Hematologic (Females or Combined)**
- [Link](https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-42-trifluoroacetic-acid-and-cardiovascular/)

**Cardiovascular and Hematologic (Males)**
- [Link](https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-41-trifluoroacetic-acid-and-cardiovascular/)

**Dermal, Ocular, and Musculoskeletal**
- [Link](https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-49-trifluoroacetic-acid-and-dermal-ocular-a/)
| Category                                      | Link                                                                 |
|----------------------------------------------|----------------------------------------------------------------------|
| Developmental                                | https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-39-trifluoroacetic-acid-and-developmental-e/ |
| Developmental †                              | https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/Main-Report_Offspring-Abnorm_Oral/ |
| Endocrine                                    | https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-45-trifluoroacetic-acid-and-endocrine-effec/ |
| Gastrointestinal                             | https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-46-trifluoroacetic-acid-and-gastrointestinal/ |
| Hepatic †                                    | https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-43-trifluoroacetic-acid-and-hepatic-effects/ |
| Hepatic † (Weight; Multiple Chemicals)       | https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/Main-Report_Hepatic_Weight_Oral/ |
| Immune, Nervous, and Respiratory             | https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-44-trifluoroacetic-acid-and-immune-nervous/ |
| Reproductive                                 | https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-40-trifluoroacetic-acid-and-reproductive-ef/ |
| Urinary (Reproductive/Developmental Studies) | https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure-48-trifluoroacetic-acid-and-urinary-effects/ |
| **Trifluoromethanesulfonic Acid**  
DTXSID2044397 | **Literture Tag Tree** | https://hawcprd.epa.gov/summary/visual/assessment/100500085/pfas-150-trifluoromethanesulfonic-acid-dtxsid20443/ |
|-------------|---------------------------------|--------------------------------------------------|
| **Developmental, Multi-system, Reproductive, and Whole Body** | | https://hawcprd.epa.gov/summary/data-pivot/assessment/100500085/figure53_trifluoromethanesulfonic-acid-and-health/ |

*These visuals are also included as figures in the manuscript*
References

1. Magnuson K, Cawley, M, Reilly D, Varghese A. Improving efficiency of systematic review through machine learning for automated record deduplication and text analytics for iterative keyword streamlining. Society of Toxicology 57th Annual Meeting and ToxExpo; March 11-15; San Antonio, Texas. 2018. https://hero.epa.gov/hero/index.cfm/reference/details/reference_id/7415521

2. Williams AJ, Grulke CM, Edwards J, McEachran AD, Mansouri K, Baker NC, Patlewicz G, Shah I, Wambaugh JF, Judson RS et al. The CompTox Chemistry Dashboard: A community data resource for environmental chemistry. J Cheminform. 2017; 9(1):61. https://doi.org/10.1186/s13321-017-0247-6