U.S. National Library of Medicine

Environmental Health and Toxicology Information Program

TOXNET® & Beyond

Using the National Library of Medicine® Environmental Health and Toxicology Portal

Specialized Information Services
National Library of Medicine
8600 Rockville Pike
Bethesda, Maryland 20894
www.nlm.nih.gov
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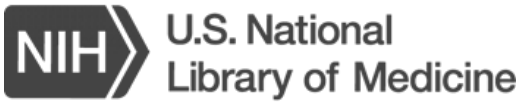

TOXNET & Beyond

Using the National Library of Medicine®
Environmental Health & Toxicology Portal

Updated October 2014

Disclaimer

Every effort has been made to ensure that the screen graphics and the exercises in this document are up to date and accurate. However, because of the frequency of Web updates, they may have changed.

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Preface

Our lives are filled with chemical exposures. How do we discover more about these chemicals for ourselves and our organization? The National Library of Medicine® (NLM) Environmental Health and Toxicology Portal provides access to numerous databases that can help you explore environmental chemicals and risks. *TOXNET and Beyond: Using the National Library of Medicine Environmental Health and Toxicology Portal* conveys the fundamentals of searching the NLM Toxicology Data Network (TOXNET®) system of databases in chemistry, environmental health, toxicology, and related fields. In addition to TOXNET, the course will highlight various resources available through the Environmental Health and Toxicology Portal.

The NLM Toxicology Information Program was created in 1967 to serve as the Federal Government's centralized resource for environmental health and toxicology information. Throughout history, the effects and importance of poisons and exposure to toxic substances have been recognized. A history of congressional legislation and events contributed to the creation of the initial Toxicology and Environmental Health Information Program (TEHIP). Eventually, the program grew into what is now the NLM Environmental Health and Toxicology Program which is offered through an online portal.

Historical Timeline

- Poisons and occupational risks recognized throughout time
- Brooklyn Papyrus (Egypt) (380–343 B.C.) — describes snake and scorpion bites
- Mithridates the Great (1st Century B.C.) — experimented with poisons looking for a universal antidote
- Paracelsus (1493–1541), Father of Toxicology — "The dose makes the poison."
- Bernardino Ramazzini (17th Century) — De Morbis Artificum Diatriba (Diseases of Workers)
- Harvey W. Wiley's Poison Squad (1903)
- The Jungle (1906) Upton Sinclair — lack of hygiene in the meat-packing industry
- Federal Food and Drugs Act (1906) — prohibited adulterated or misbranded items
- Federal Food, Drug, and Cosmetic Act (1938) — enhanced safety requirements for drugs
- Drug Amendments (1962) — effectiveness required for drugs

- *Silent Spring* (1962) Rachel Carson — sparked public awareness about hazards of synthetic chemicals
- President's Science Advisory Committee (1966) — "Report on the Handling of Toxicological Information"
- NLM Toxicology Information Program (TIP) created (1967) to serve as the Federal Government's centralized resource for environmental health and toxicology information
- Situated within the NLM Division of Specialized Information Services (SIS)

Table of Contents

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Where to Start

Use this guide to identify relevant TOXNET and other NLM resources based on your role.

- **Emergency Responders**
  - **CHEMM**
  - **REMM**
  - **WISER**
  - **DIMRC**
- **Health Care Professionals**
  - **REMM**
  - **HSDB**
  - **LactMed**
  - **TOXLINE**
  - **LiverTox**
  - **Drug Information Portal**
  - **CHEMM**
- **The Public**
  - **Household Products Database**
  - **Tox Town**
  - **TOXMAP**
  - **TRI**
- **Public Health Professionals**
  - **TOXMAP**
  - **Haz-Map**
  - **HSDB**
  - **TOXLINE**
  - **Enviro-Health Links**
  - **Disaster Web Bibliographies**
- **Researchers & Scientists**
  - **TOXNET**
  - **TOXLINE**
  - **HSDB**
  - **ChemIDplus**
  - **LiverTox**
  - PillBox
- **Students & Educators**
  - Environmental Health Student Portal
  - **Tox Town**
  - ToxMystery
  - Toxicology Tutorials
  - **HPD**
  - **TOXMAP**
  - **TRI**
  - GeneEd
- **Toxicologists**
  - **TOXNET**
  - **ALTBIB**
  - **CHEMM**
  - **Drug Information Portal**
  - **Enviro-Health Links**
  - IUPAC Glossary of Terms
  - **LiverTox**
  - **REMM**
  - **TOXMAP & TRI**
  - Toxicology Tutorials
  - **WISER**
- **Advocacy Groups**
  - **TOXMAP**
  - **TRI**
  - **HSDB**
  - **Tox Town**
  - **Enviro-Health Links**

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Section 1: Introduction

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Course Overview

Purpose

The purpose of this training is to familiarize participants with reliable online environmental health and toxicology information from the National Library of Medicine® (NLM) and other reliable sources. Skills and knowledge acquired in this training class will enable participants to access, utilize, and refer others to environmental health and toxicology information.

Objectives

After completing this course, participants will be able to:

- Identify quality, accurate, and authoritative online resources pertaining to environmental health, toxicology, and related medical information
- Demonstrate the ability to perform strategic search techniques to find relevant online information
- Apply the skills and knowledge obtained in this class to their organization's environmental health and toxicology information needs

NLM Online Resources Covered in this Class

The following resources will be covered with time for hands-on practice:

- **ChemIDplus®**—access to structure and nomenclature authority databases for the identification of chemical substances cited in NLM databases
- **Hazardous Substances Data Bank (HSDB®)**—comprehensive, peer-reviewed toxicological data for more than 5,000 chemicals
- **Toxicology Literature Online (TOXLINE®)**—a bibliographic toxicology database covering more than 4 million bibliographic citations
- **Alternatives to Animal Testing (ALTBIB®)**—a bibliographic collection of resources for alternatives to the use of live vertebrates in biomedical research and testing
- **Developmental and Reproductive Toxicology Database (DART®)**—a bibliographic database containing more than 200,000 references to literature published since 1965
- **Drugs and Lactation Database (LactMed®)**—a database of more than 900 drugs and other chemicals to which breastfeeding mothers may be exposed
- **Chemical Carcinogenesis Research Information System (CCRIS)**—scientifically evaluated and fully referenced data on more than 9,000 chemicals

- **Carcinogenic Potency Database (CPDB)**—analyses of the results of 6,540 chronic, long-term animal cancer tests, conducted in support of cancer risk assessments for humans, on more than 1,500 chemicals
- **Genetic Toxicology Data Bank (GENE-TOX)**—genetic toxicology test data on more than 3,000 chemicals resulting from expert peer review of the open scientific literature
- **Comparative Toxicogenomics Database (CTD)**—curated scientific data describing relationships between chemicals, genes, and human diseases
- **Integrated Risk Information System (IRIS)**—carcinogenic and non-carcinogenic information on more than 500 chemicals
- **International Toxicity Estimates for Risk (ITER)**—side-by-side comparisons of international risk assessment information on more than 600 chemicals with links to source documentation
- **Toxics Release Inventory (TRI)**—information on annual environmental releases of more than 650 toxic chemicals by US facilities from the US Environmental Protection Agency (EPA)
- **TOXMAP®**—a Geographic Information System that uses maps of the United States to help users visually explore TRI and Superfund data
- **Household Products Database**—human health effects information on more than 14,000 brand-name consumer products
- **Haz-Map®**—an occupational toxicology database that links job tasks to occupational diseases and their symptoms
- **Enviro-Health Links**—selected links to Internet resources on environmental health and toxicology issues of special interest
- **Tox Town®**—an interactive guide to commonly encountered toxic substances and environmental health risks
- **Drug Information Portal**—current drug information for more than 53,000 drugs with links to additional online resources with potential drug information
- **LiverTox**—information about drug-induced liver injury caused by prescription and nonprescription drugs, herbals, and dietary supplements
- **Chemical Hazards Emergency Medical Management (CHEMM)**—guidance on quick chemical identification, acute patient guidelines, and initial event activities
- **Radiation Emergency Medical Management (REMM)**—guidance on clinical diagnosis and treatment during mass casualty radiological/nuclear events, primarily for physicians, but usable to those without formal radiation medicine expertise
- **Wireless Information System for Emergency Responders (WISER®)**—provides a wide range of information on hazardous substances, including substance identification support, physical characteristics, human health information, and containment and suppression advice

- **Disaster Information Management Research Center (DIMRC)**—health information resources and informatics research related to disasters of natural, accidental, or deliberate design

Environmental Health & Toxicology Portal

The National Library of Medicine (NLM) **Environmental Health and Toxicology Portal** provides a starting point for seeking reliable information on environmental health, toxicology, hazardous chemicals, and toxic releases.

sis.nlm.nih.gov/enviro.html

Browse the easy-to-navigate site by topic or audience. Explore related resources using the **A to Z Index of Resources.** The **Other Professional Resources** include database descriptions, fact sheets, list of NLM databases, and electronic resources. All TOXNET databases can be searched from this page.

Staying Connected

NLM-Tox-Enviro-Health-L Listserv

- Keep informed about new and noteworthy environmental health and toxicology resources, services, and outreach activities from the NLM Division of Specialized Information Services (SIS)

  sis.nlm.nih.gov/enviro/envirolistserv.html

Follow us on Twitter

- Follow Twitter to receive the latest information on NLM Environmental Health and Toxicology

  twitter.com/NLM_SIS

News Updates

- News from the NLM Division of Specialized Information Services

  sis.nlm.nih.gov/news.html

NLM Mobile

NLM Mobile is a Web-based application designed to run on mobile devices and is an authoritative guide to all NLM mobile sites and apps. The site allows browsing by type, device, or tags.

Additional Resources

For further information, review these additional resources:

- Getting the Most from SIS's Environmental Health and Toxicology Resources
  sis.nlm.nih.gov/getthemostfromsis.html

- NLM Environmental Health and Toxicology Resources Quick Tour
  sis.nlm.nih.gov/enviro/captivate/tehipoverview.htm

- Publications and Reference Materials
  sis.nlm.nih.gov/enviro/enviropubs.html

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Section 2: Toxicology Data Network (TOXNET®)

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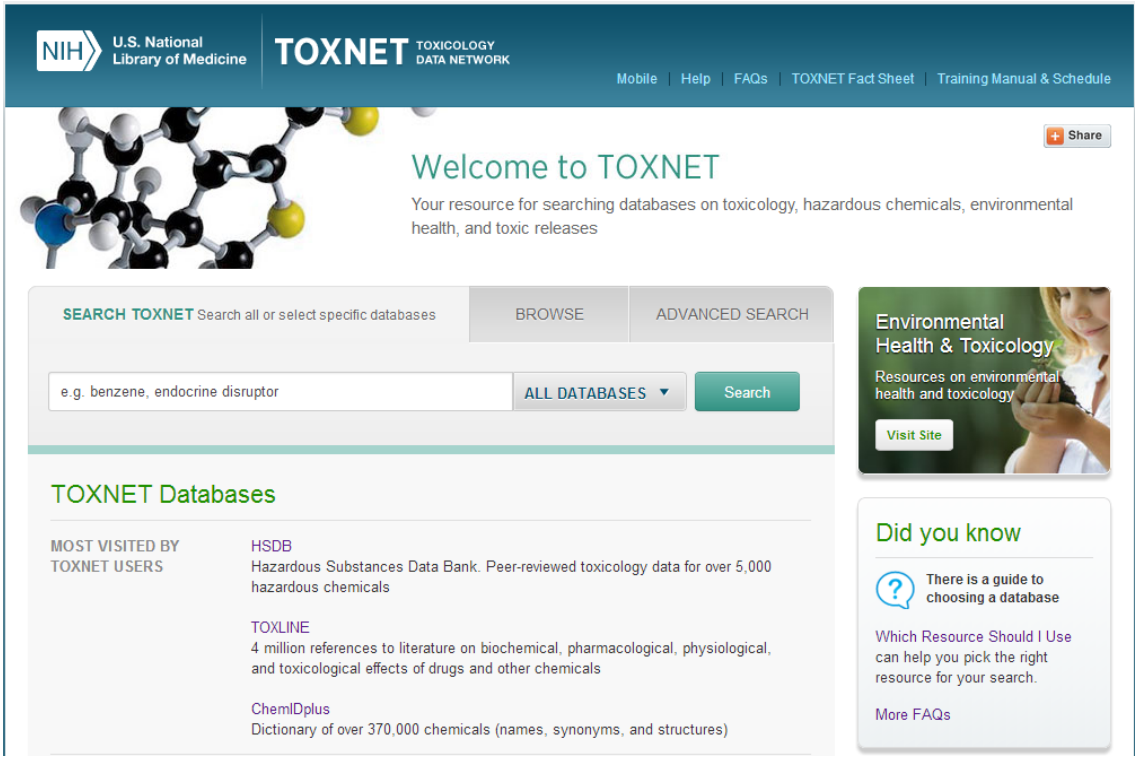
TOXNET® Overview

The National Library of Medicine® (NLM) **TOXNET** (Toxicology Data Network) is a free, Web-based system of databases on environmental health, toxicology, hazardous chemicals, toxic releases, chemical nomenclatures, and specialty areas such as occupational health and consumer products.



toxnet.nlm.nih.gov

Types of information in the TOXNET databases include:

- Specific chemicals, mixtures, and products
- Unknown chemicals
- Special toxic effects of chemicals in humans and/or animals

The TOXNET Databases section of the page lists all the databases that make up TOXNET, along with a brief description of each. Click on a database name for a full description of the database, a link to the fact sheet, a sample record, and more information.

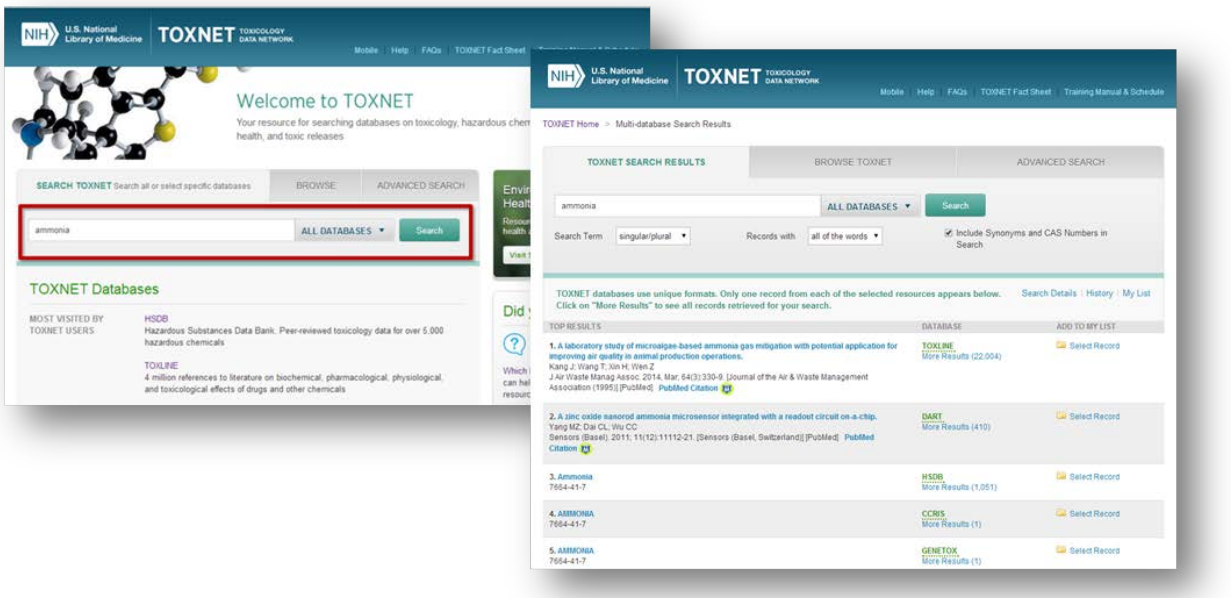
The TOXNET Databases

The TOXNET databases covered in this course can be grouped in the following categories:

- Chemical Information—ChemIDplus®, HSDB®, TOXLINE®, and ALTBIB®
- Reproductive Health—DART® and LactMed®
- Carcinogenesis Research—CCRIS and CPDB (both are archived, no longer updated)
- Genetics and Genomics—GENE-TOX (archived, no longer updated) and CTD
- Risk Assessment—IRIS and ITER
- Environmental Health—TRI, TOXMAP®, Household Products, Haz-Map®, Enviro-Health Links, and Tox Town®
- Drugs—Drug Information Portal and LiverTox
- Emergencies and Disasters—CHEMM, REMM, WISER, and DIMRC

TOXNET Basic Searching

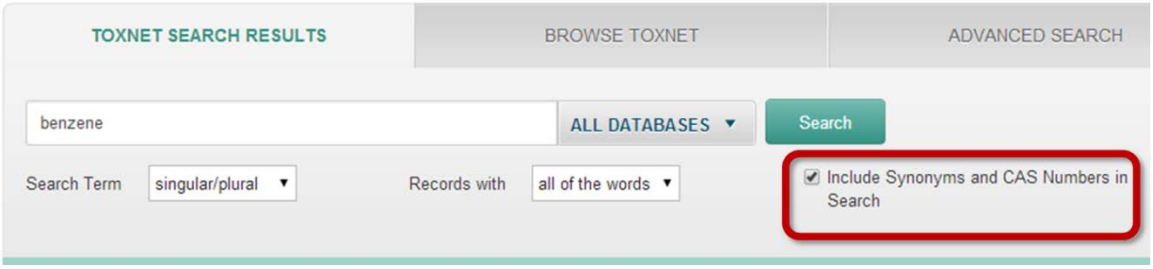
From the TOXNET homepage, all TOXNET databases can be searched simultaneously. Results will be displayed as links to the databases in which the search term(s) were found—and the number of records in each—under the headings: References from the Biomedical Literature (TOXLINE and DART) and Chemical, Environmental Health and Toxicological Data (all others).



Entering search term(s)—Enter any combination of words, chemical names, and numbers, including Chemical Abstracts Service (CAS) Registry Numbers®. Common **stop words** such as **a**, **an**, **and**, **for**, **the**, and **it** will not be searched. When searching for terms other than chemicals, the system automatically searches for singular and plural forms of the term(s) entered.

Searching specific database(s) —Select one or more databases from the drop-down menu next to the **Search** button to perform a basic search in the selected database(s).

Synonym searching—By default the system will search for the exact name, synonyms, and CAS number as derived from ChemIDplus. On the Search Results screen, uncheck the **Include Synonyms and CAS Numbers in Search** option to search only for the exact chemical term or CAS Registry Number entered. In LactMed, the CAS number refers to the parent compound (i.e., not the salt form).



Truncation—The asterisk (*) is the right-handed truncation symbol for any number of characters.

Phrase searching—Search phrases with quotation marks.

Boolean searching—Use the logical operators **AND**, **OR**, and **NOT** to limit a search of two or more terms to specific criteria. In searches with combinations of these operators, **AND** takes precedence, followed by **NOT** and then **OR**. This default precedence may be overridden with the use of parentheses, which may also be nested (i.e., parentheses within parentheses).

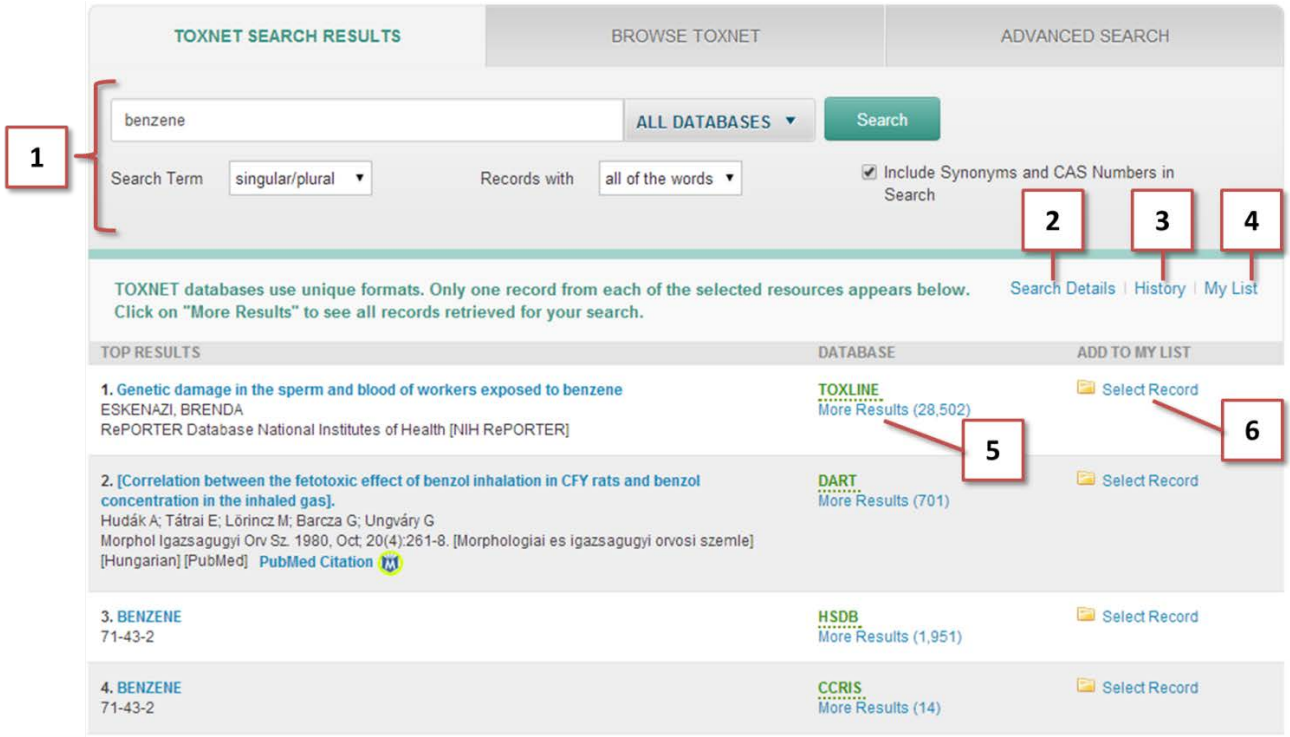
- **Pulmonary AND edema**—retrieves all records with the two words appearing together.
- **Liver OR kidney**—retrieves all records containing either of these words (or both of them).
- **Carcinoma NOT squamous**—retrieves records from which one or more terms have been excluded.

Browse—This feature provides a scannable index of all terms beginning with the search term entered and the number of records for each term. In the databases, selectable items indexed are **All Words**, **CAS Registry Number**, and **Chemical Name**. In the Toxicology Literature databases, selectable items indexed are **All Words**, **MeSH® Headings/Keywords**, **Authors**, and **CAS Registry Number**.

Search Results Screen

Options on the Search Results screen allow users to:

1. **Modify Search**—use the fields at the top of the screen to make changes or perform a new search
2. **Search Details**—summarizes the strategy used by TOXNET to perform the search
3. **History**—view earlier search result sets or combine these sets if they are within the same database
4. **My List**—access your list of saved records (when you click the **Select Record** link next to a record, the record is added to this list)
5. **More Results**—display additional results from the specified database (only one record is initially displayed in the list)
6. **Select Record**—save the item to your list for displaying, sorting, and downloading

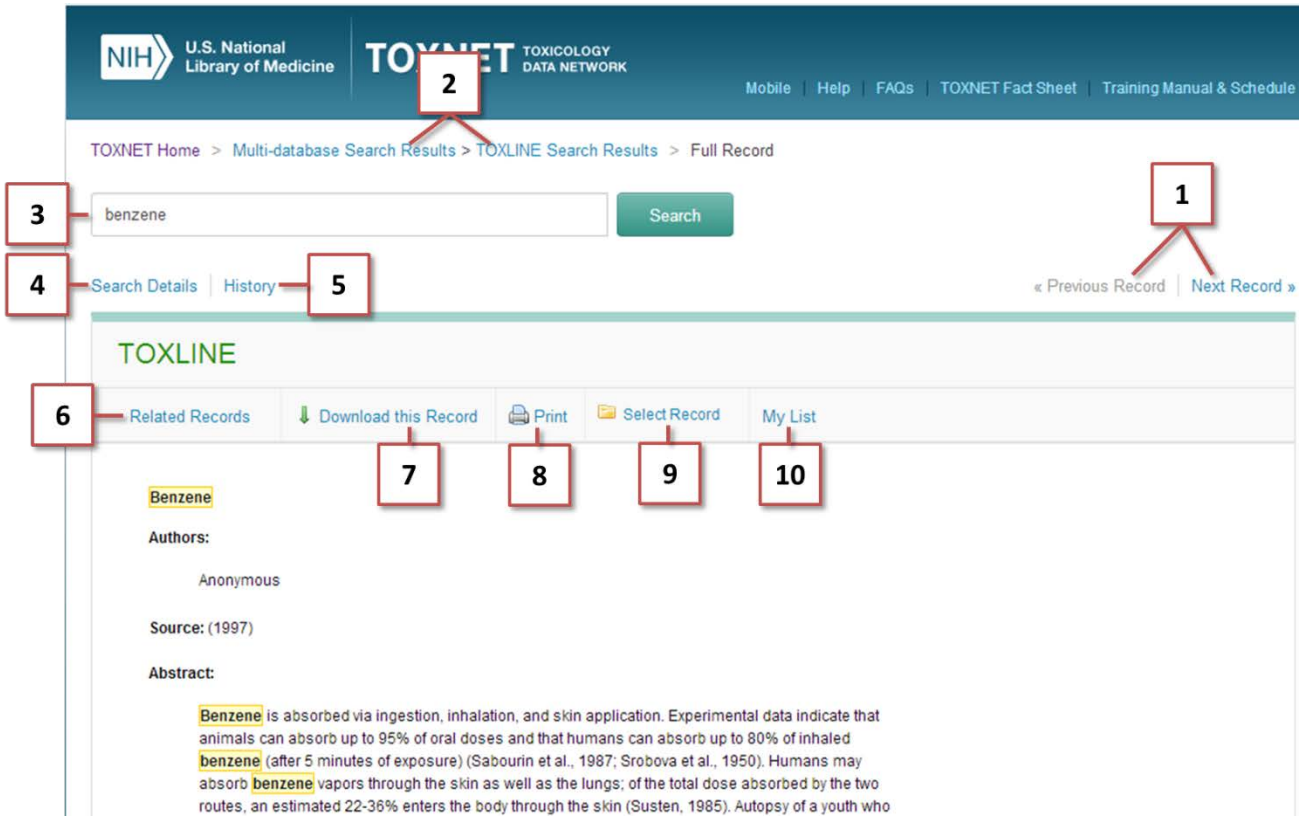


- **Download Records**—save the complete list of records, either in brief, full, abstract, or tagged format (this option only appears after selecting **More Results** for a database)

Record Display Screen

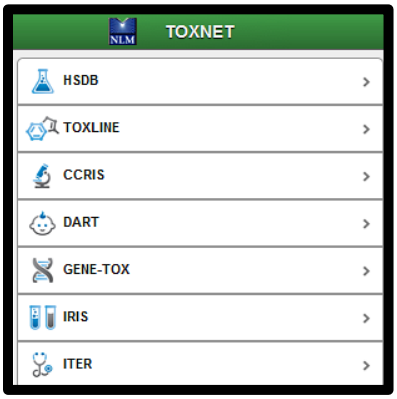
Options when displaying a record allow users to:

1. Go to the **Previous Record** or **Next Record** in the search results
2. Go back to the **Search Results** screen
3. Modify the search or perform a new basic search in the same database
4. View **Search Details** (the algorithm used by TOXNET to perform the search)
5. Display search **History**
6. Display links to **Related Records** containing information on the substance
7. **Download** the record or portions of the record
8. **Print** the record
9. **Select Record** and add it to your list
10. View your list of selected records (**My List**)



TOXNET Mobile

A mobile-friendly version of the TOXNET Web site is available at **toxnet.nlm.nih.gov/pda**. TOXNET Mobile automatically adapts to the size of your device or browser window.



Section 3: Chemical Information and Research

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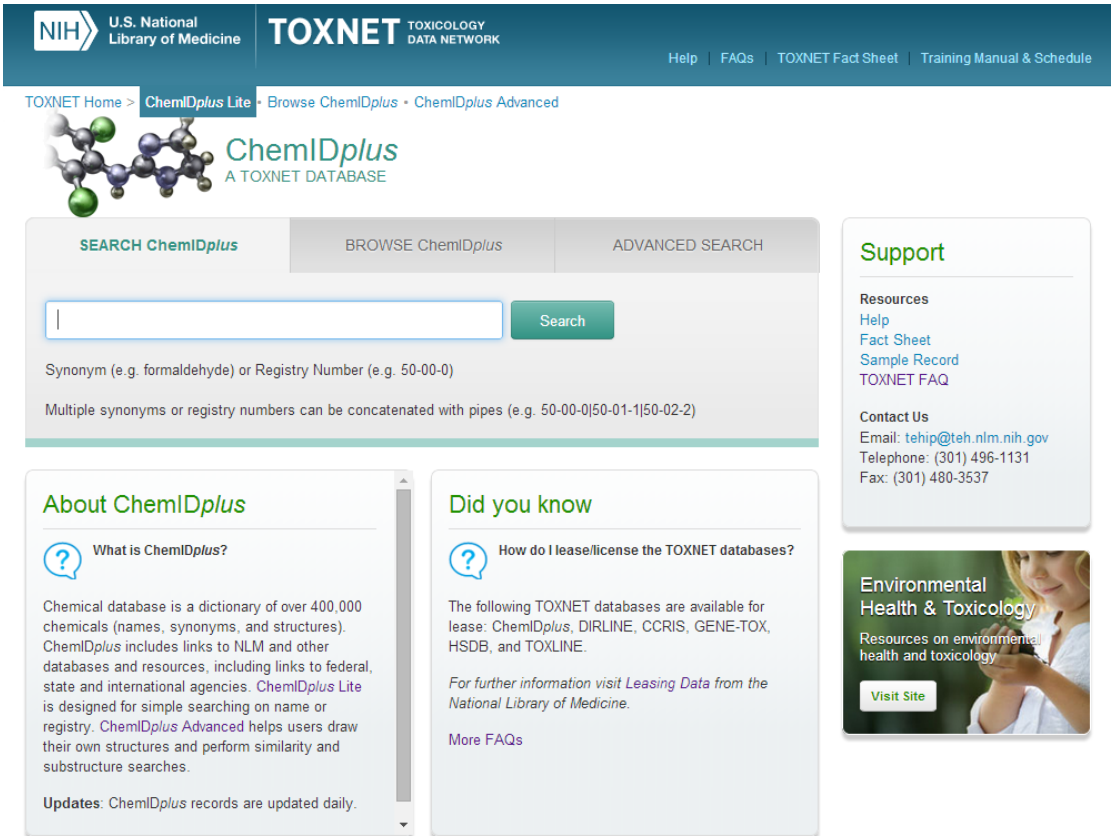
ChemIDplus®

ChemIDplus is a free, Web-based search system that provides access to structure and nomenclature authority files used for the identification of chemical substances cited in the National Library of Medicine® (NLM) databases. It also provides structure searching and direct links to many biomedical resources at NLM and on the Internet for chemicals of interest. It contains more than 400,000 chemical records, including calculated, interactive, three-dimensional structure models for more than 300,000 chemicals and 645,000 variations.

Each record in ChemIDplus represents a single chemical or substance. Records can be displayed in either a summary or full-record view. A "browse" option allows quick "starts with" searches of a variety of data and A-Z index of chemical names.

The ChemIDplus database has two different applications: **ChemIDplus Lite** (for basic searching) and **ChemIDplus Advanced** (for more experienced users). ChemIDplus is mobile-friendly, supporting Apple iOS and Android devices.



chem.sis.nlm.nih.gov/chemidplus/chemidlite.jsp

Content

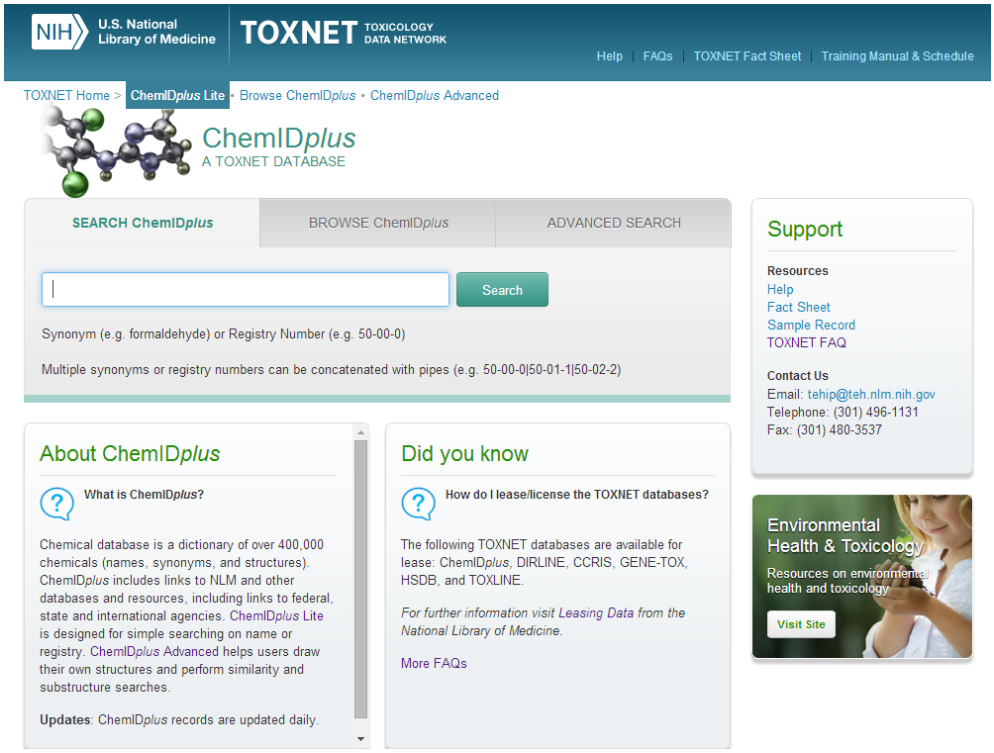
Information in the ChemIDplus database includes:

- Systematic, generic, and trade names
- Synonyms
- Chemical Abstract Service (CAS) Registry Numbers
- Molecular formulas
- Classification codes
- Chemical structures (ChemIDplus Advanced)

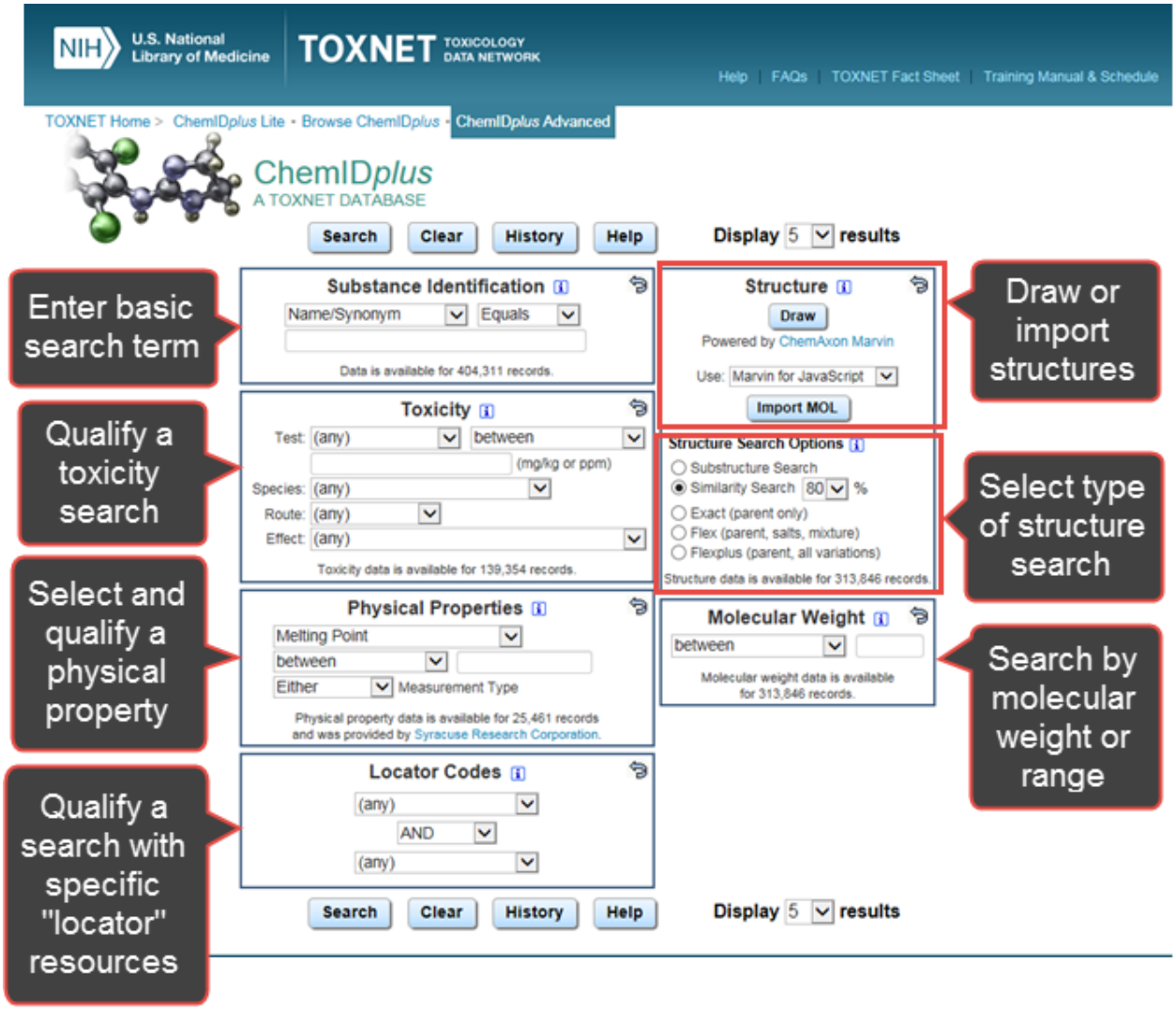
Searching ChemIDplus

Search ChemIDplus by name, synonym, CAS Registry Number, molecular formula, classification code, locator code, structure, toxicity, and/or physical properties within two distinct applications:

- **ChemIDplus Lite** (ChemIDplus homepage) is designed for simple searching on name or registry number to retrieve basic information about a chemical and provide locator links to other resources. It does not require special software applets or plugins. The Lite version displays structures, but does not allow drawing or searching on structures.



- **ChemIDplus Advanced** (see below) is designed for more advanced searching on any combination of name, registry number, molecular formula, classification code, locator code, toxicity, physical property, structure, or molecular weight. In addition, ChemIDplus Advanced allows users to draw their own structures and perform similarity and substructure searches.

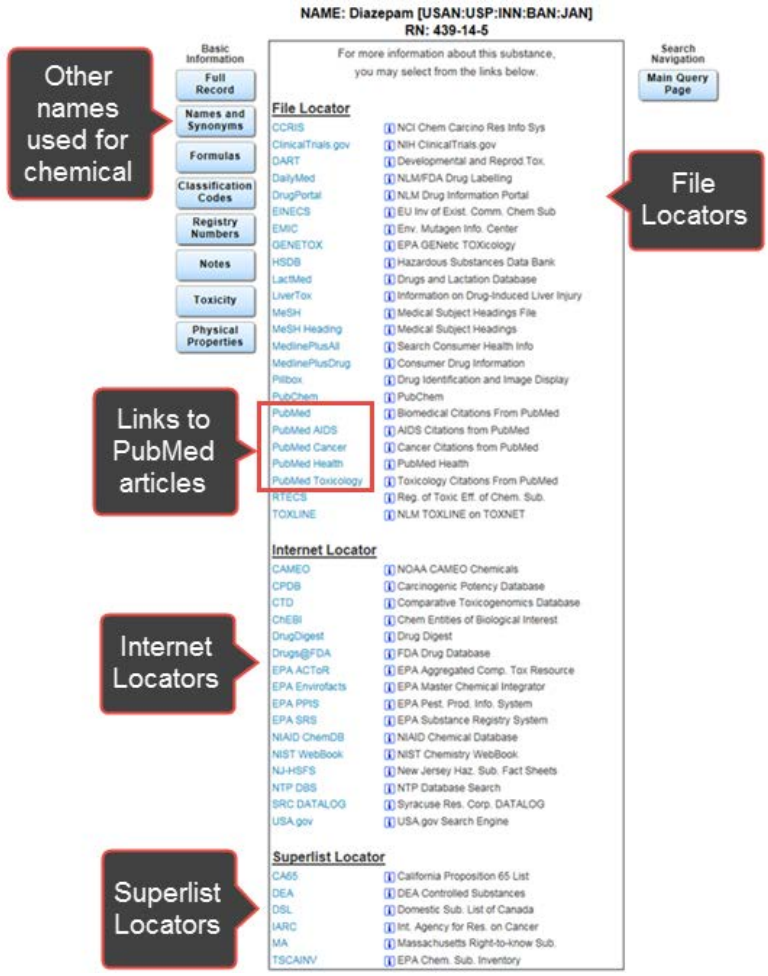


Search Results

The ChemIDplus Lite system displays the record with basic information for the chemical, including links to additional information. If multiple records were retrieved, a list of other names used for the chemical would be shown. Following is the ChemIDplus Lite record for diazepam. Use buttons on the left to retrieve categories of detailed information such as Names & Synonyms, Formulas, Classification Codes, Registry Numbers, and Notes. In the center of the page, lists of "locators" provide links to other resources in three categories:

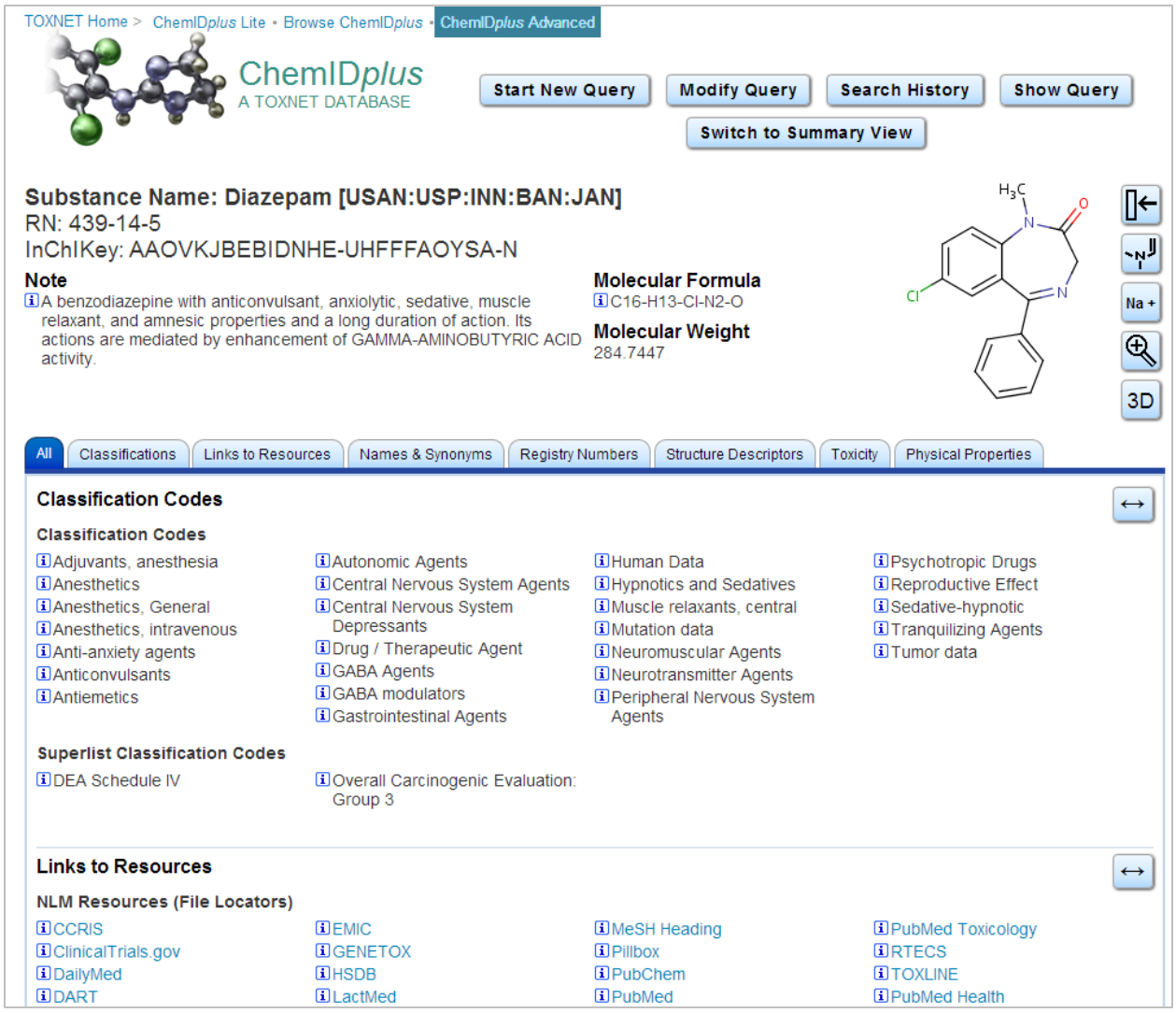
- **File Locators**—point to a set of NLM-associated databases
- **Internet Locators**—point to a set of resources with biomedical data of interest for the chemical
- **Superlist Locators**—point to a set of regulatory and scientific lists that contain information about the chemical

ChemIDplus Lite Record for Diazepam



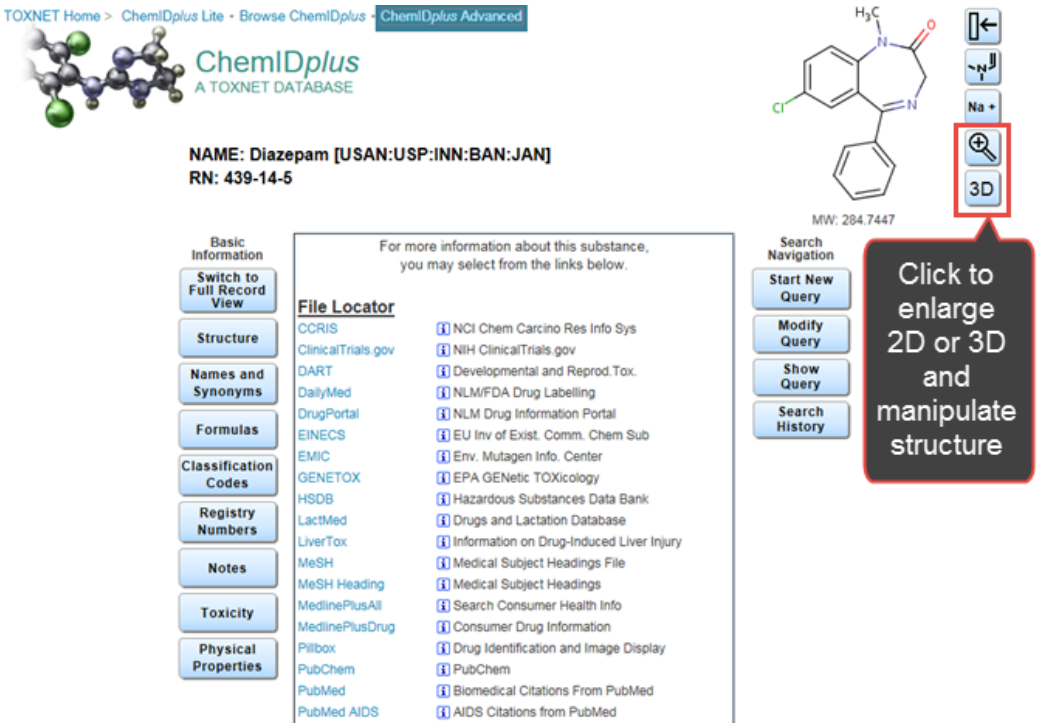
By default, the ChemIDplus Advanced record shows the full record with all information displayed. You can use the tabs to limit information to just show Classifications, Links to Resources, Names & Synonyms, Registry Numbers, Structure Descriptors, Toxicity, or Physical Properties.

ChemIDplus Advanced Record, Full Record View for Diazepam



Clicking the **Switch to Summary View** button at the top of the record will display a summary of the record. This view shows the same locator lists and basic information as the ChemIDplus Lite record, with the addition of structures including structure navigation buttons.

ChemIDplus Advanced Record, Summary View for Diazepam



Additional Resources

For further information, review these additional resources:

- ChemIDplus Fact Sheet
  nlm.nih.gov/pubs/factsheets/chemidplusfs.html

- ChemIDplus Help
  chem.sis.nlm.nih.gov/chemidplus/html/help.jsp

ChemIDplus Search Exercises

 Go to **toxnet.nlm.nih.gov**.
 Click ChemIDplus.

Exercise 1: Use ChemIDplus to answer the following questions about trifluralin.

1a. What is trifluralin and what is it used for?

Suggested Solution:

Type	**trifluralin** in the Search box
Click	**Search**
Click	the **Notes** button to the left
Review	the information provided for a definition and uses of trifluralin
Scroll	to the top and click the **Close (Return to Summary View)** button

1b. How many PubMed citations do you retrieve?

Suggested Solution (continued):

Review	the other NLM databases under File Locator that contain information on the chemical
Click	the **PubMed** link
Note	the number of results returned on PubMed
Close	the **PubMed** tab to return to ChemIDplus

1c. Do any household products contain trifluralin?

Suggested Solution (continued):

Click	the **Household Products** link
Review	the information provided to determine if any household products contain this ingredient
Close	the **Household Products Database** tab to return to ChemIDplus

1d. Do any US companies still produce herbicides that contain trifluralin?

Suggested Solution (continued):

Select	**EPA PPIS** in the Internet Locator section
Select	**About Us > Search PPIS** in the navigation bar at the top of the page
Type	**trifluralin** in the Active Ingredient field
Click	**Search PPIS**
Review	the information provided to determine if any US companies still produce herbicides containing trifluralin
Close	the tab and return to ChemIDplus

1e. Is trifluralin on the EPA Clean Air List (CAA1)?

Suggested Solution (continued):

Click	**CAA1** under Superlist Locator
Review	the toxicology information provided by EPA
Close	the tab and return to ChemIDplus

1f. Where can you find the full list of original air pollutants from EPA?

Suggested Solution (continued):

Click	the **i** button (ⓘ) next to **EPA Toxic Air Pollutants** (CAA1)
	As part of the Clean Air Act, EPA provides data on toxic air pollutants.
Click	the link in the pop-up window to access the full list of the original air pollutants from EPA
Close	the pop-up window
Scroll	to the top of the page
Click	the **Main Query Page** button at the right to prepare for a new search

Exercise 2: Use the Browse feature to research chemicals that start with "hexachloro."

2a. How many results are found for names that begin with "hexachloro?"

Suggested Solution:

Select	the **BROWSE ChemIDplus** tab at the top of the ChemIDplus homepage
Select	**Name** from the Browse drop-down menu

Type	**hexachloro** in the starts with text field
Review	the results to determine the number of names that begin with "hexachloro"

2b. What is hexachlorodiphenyl ether used for? What are the adverse effects in animals and humans? What are the occupational exposure assessment values?

Suggested Solution (continued):

Select	**hexachlorod** in the search results
Select	**hexachlorodiphenyl ether**
Click	the **Haz-Map** link under NLM Resources (File Locators)
Use	the information in Haz-Map to determine the use of this chemical, any adverse effects in animals and humans, and the occupational exposure assessment values
Close	the Haz-Map tab or window

Exercise 3: Find the xylene record in ChemIDplus and use its structure to do substructure and 70% similarity searches, respectively. How many structures are in each category?

Suggested Solution:

Click	the **ChemIDplus Advanced** tab
Type	**xylene** in the Substance Identification search box
Click	**Search** and review the information retrieved
Click	the **Transfer Structure** button ( ) at the right
Select	the **Substructure Search** radio button in the Structure box to the right
Click	**Search**
Review	the results obtained, making note of the number of results
Click	the **Modify Query** button to the left of the search results
Select	**70%** from the Similarity Search drop-down menu under Structure Search Options on the right side of the page
Click	**Search** and review the information retrieved

Scenario – Research Data

Dr. Stein is conducting research and has a need to examine the toxic effects of chemicals produced in high volumes in mice. Dr. Stein would like to focus on extremely toxic chemicals and chemicals with occupational health data available.

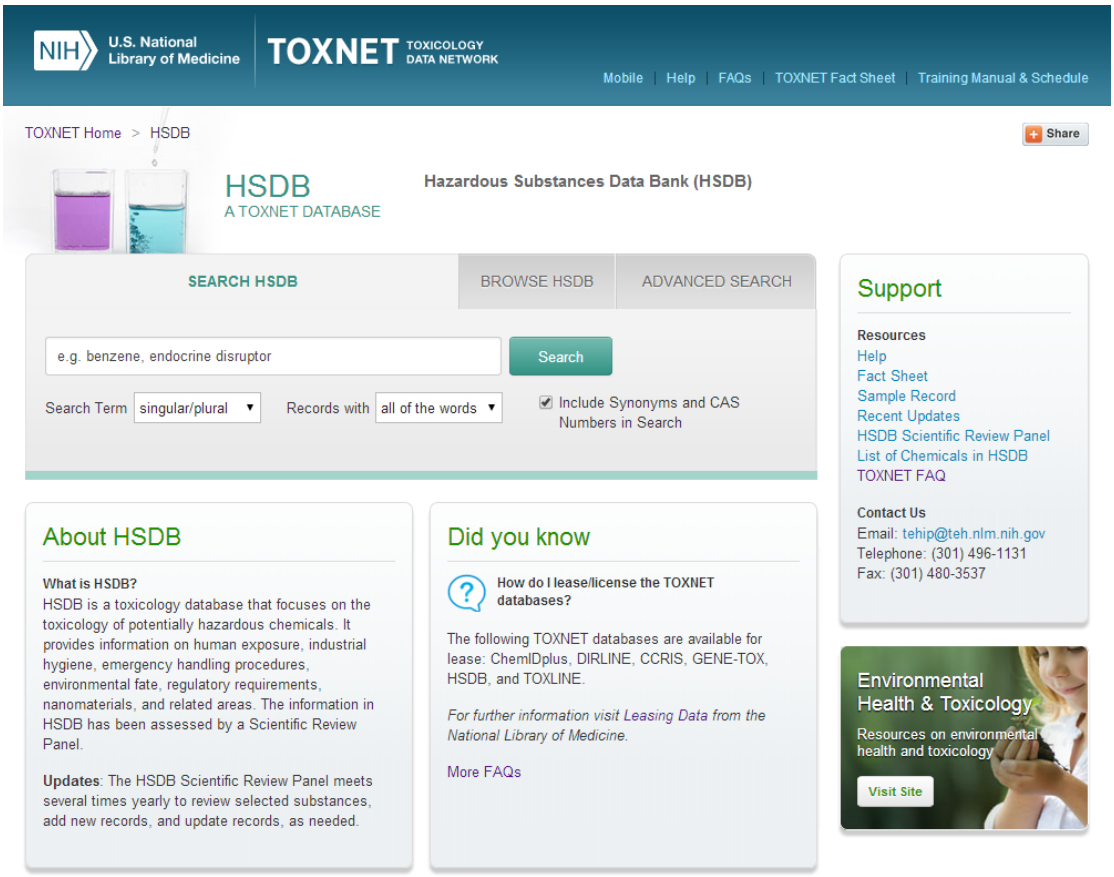
Search ChemIDplus Advanced to form a list of chemicals and view some of the effects listed in literature. Enter toxicity criteria for extremely toxic chemicals. Qualify the type of chemical by using Locator Codes. View the effects in the toxicity table.

Suggested Solution:

Click	the **Advanced Search** tab
Select	**LD50** from the Test drop-down menu under the **Toxicity** input area
Select	**less than** from the second drop-down menu beside **Test**
Type	**50** in the (mg/kg or ppm) box under **Test**
Select	**mouse** from the Species: drop-down menu
Select	**oral** from the Route: drop-down menu
Select	**EPA HPVIS** from the first drop-down menu under the **Locator Codes** search box
	The EPA HPVIS locator is the resource for High Production Volume Chemical Information System from the US Environmental Protection Agency (EPA).
Select	**AND** from the second drop-down menu under **Locator Codes**
Select	**Haz-Map** from the last drop-down menu under **Locator Codes**
Click	**Search** and view the list of results
Select	a record to confirm search criteria
	Search terms are in a red font in the Toxicity table and **Haz-Map** is listed under the **NLM Resources (File Locators).**
Click	the **Toxicity** tab at the top of the page
View	the **Effect** column

Hazardous Substance Database (HSDB®)

HSDB (Hazardous Substances Data Bank) contains comprehensive toxicology data on more than 5,000 chemicals, organized into individual records. The average record is about 25 printed pages. Content is peer-reviewed by the Scientific Review Panel, a committee of experts in the major subject areas within the data bank's scope. HSDB is enhanced with information on human exposure, industrial hygiene, emergency handling procedures, environmental fate, regulatory requirements, and related areas.



toxnet.nlm.nih.gov/newtoxnet/hsdb.htm

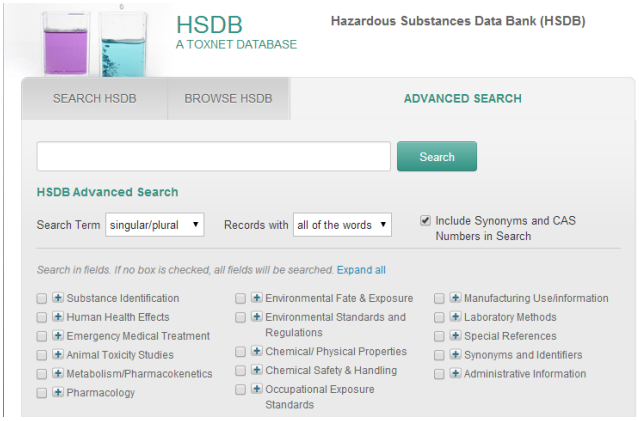
Searching HSDB

Search HSDB by chemical or other name, chemical name fragment, Chemical Abstracts Service (CAS) Registry Number, and/or subject terms (basic searching). By default, the system searches for synonyms and CAS numbers of chemicals.

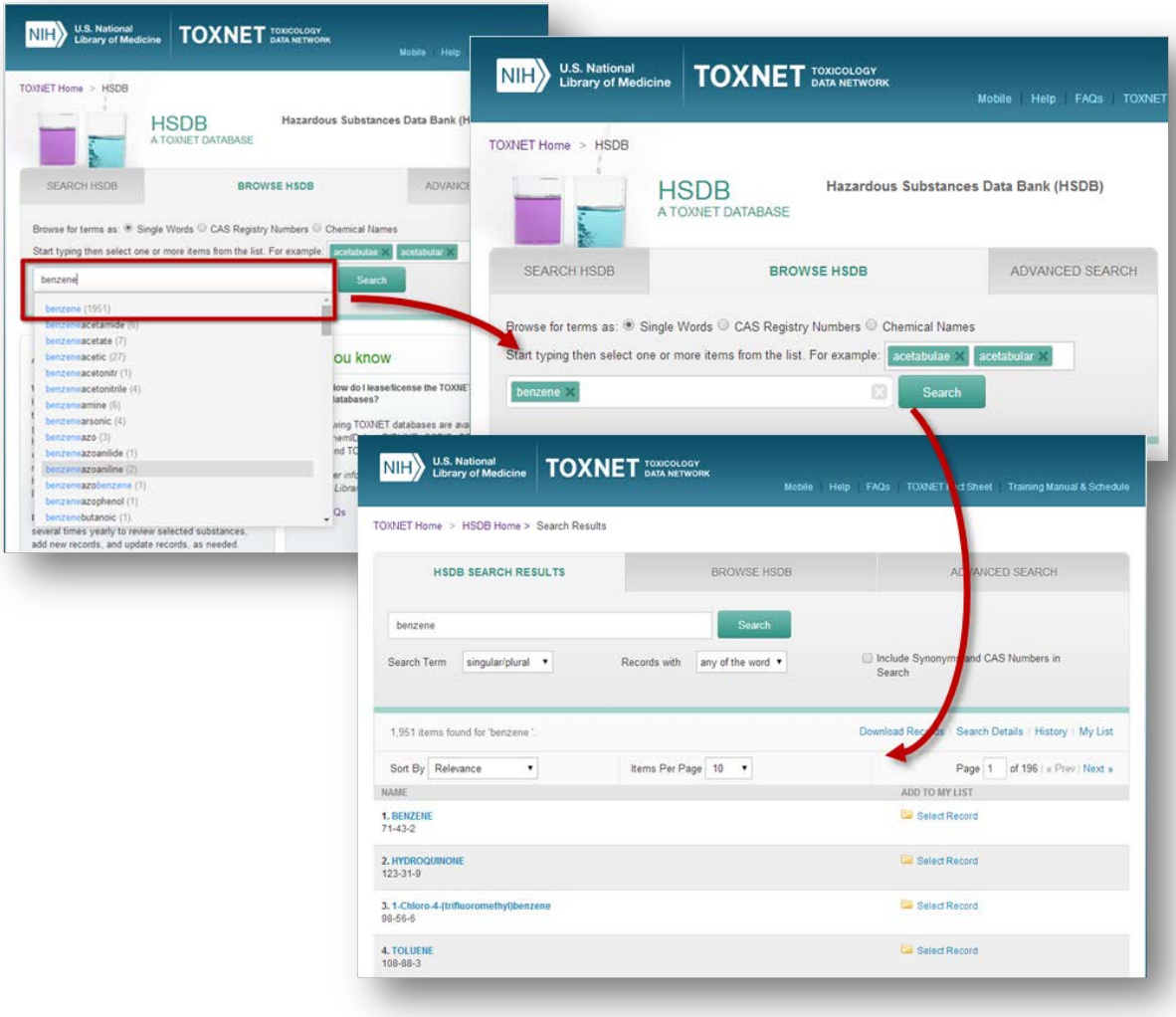
Use truncation (*), Boolean operators (AND, OR, NOT), phrase searching, nested parentheses, limits, and index browsing to refine the search results.

Click the **Advanced Search** tab to search:

- Exact words, singular and plural forms, or word variants
- All the words, any of the words, or as a phrase
- In specific fields or categories of fields (see “HSDB Search Fields” in this section)



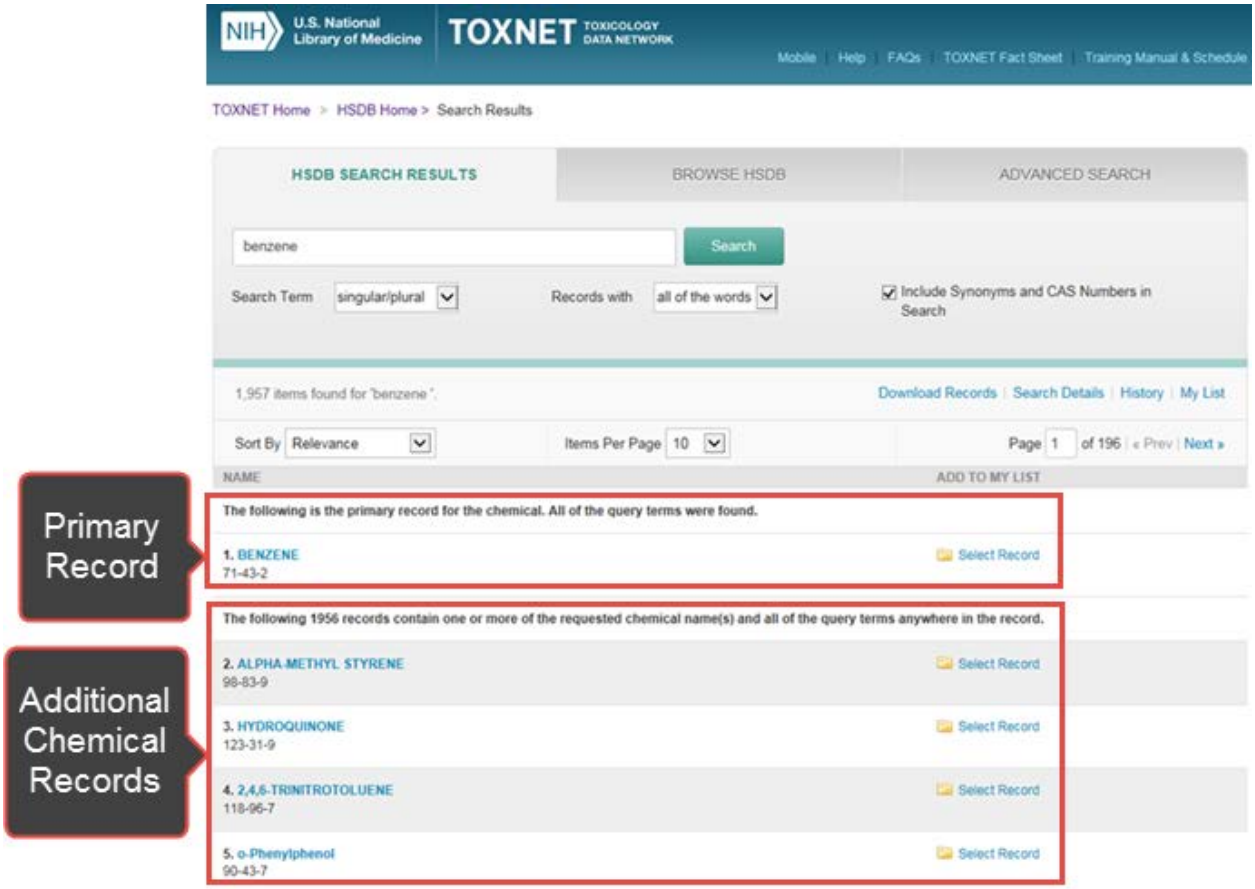
Click the **Browse HSDB** tab to search a list of index terms related to the search term entered and the number of records containing that term. Select the record(s) to be viewed by clicking the appropriate term in the drop-down list and clicking **Search**.



Search Results

The initial retrieval is displayed as a list of substance names in blue and their CAS Registry Numbers®. Substances are listed in **relevancy ranked order**. Relevancy ranking is based on the number of individual search terms occurring in a document, the number of times each search term occurs in a document, the rarity of the search terms within the database, and the nearness of search terms to each other. Records containing combinations of search terms tend to be ranked higher than records with isolated occurrences of search terms.

When searching for a chemical, the initial matching chemical record (the **Primary Record**) may be followed by additional chemical records that contain the chemical name or search term entered.

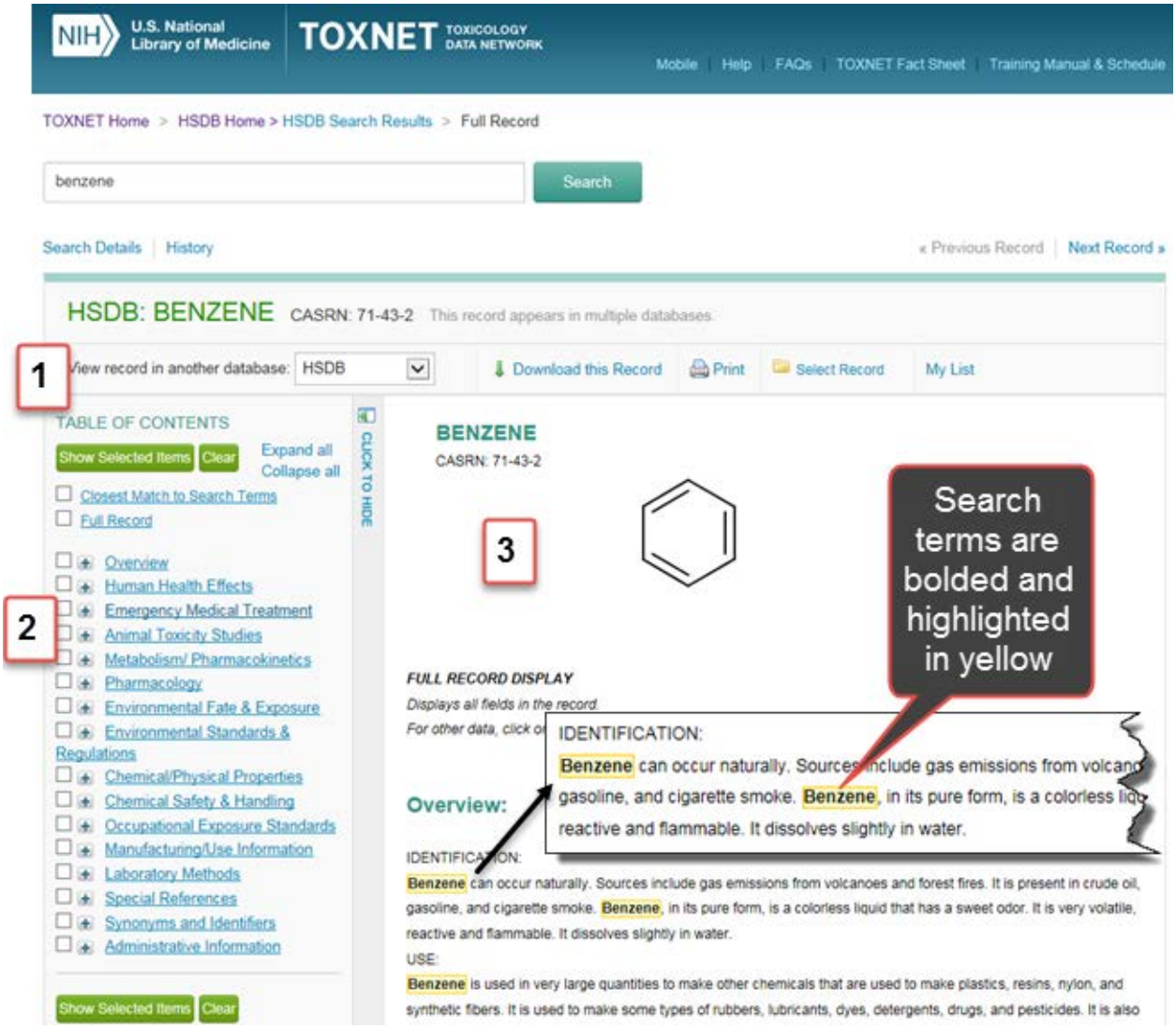


If the primary record is selected, the system displays the **Human Health Effects**. An additional chemical record, or if the search was for a term other than a chemical, the system will display the sections of the record best matching the query terms (**Closest Match to Search Terms**), those where the chemical search term(s) appears with greatest frequency.

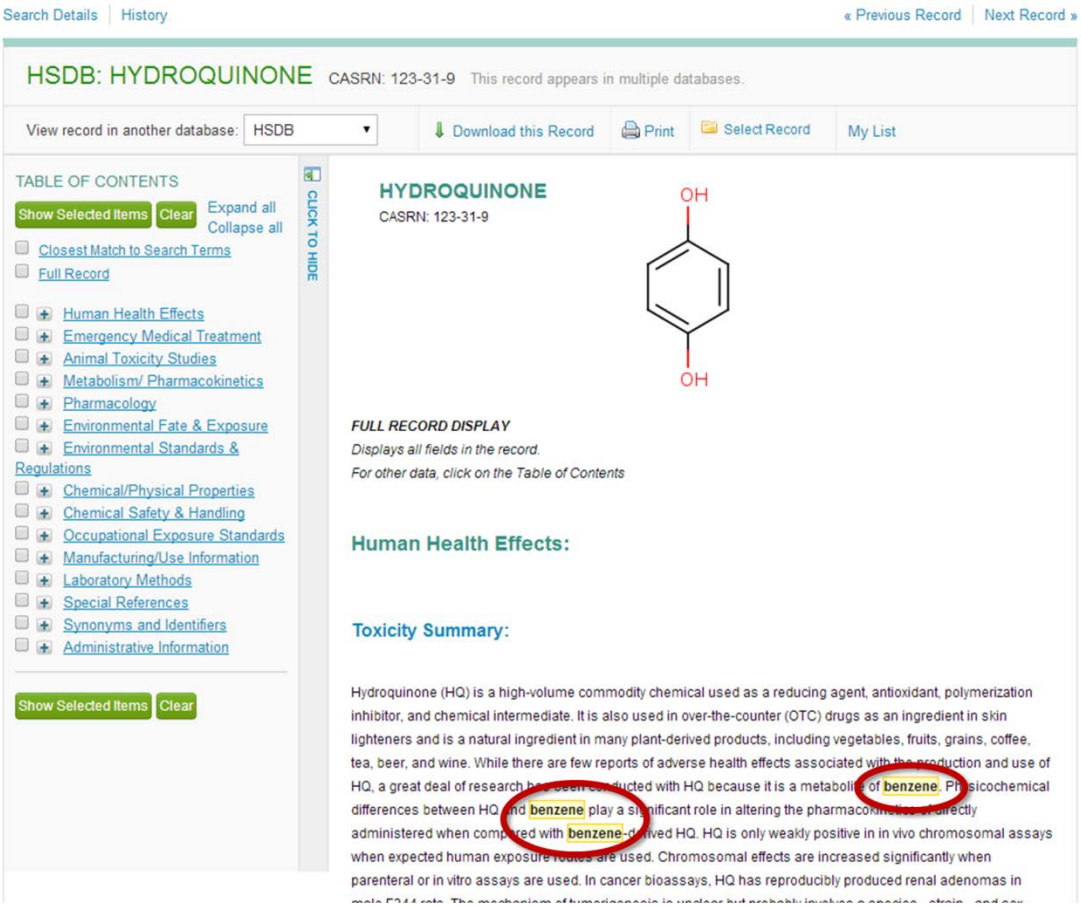
Click on a substance name on the search results screen to retrieve the record for that substance. The **Record** screen is organized into three sections:

1. Navigation buttons at the top of the record allow you to **View record in another database** (NLM databases), **Download Record**, **Print** the record, **Select Record** (adding it to your list), and view your list of selected records (**My List**).
2. A **Table of Contents** in the left frame allows users to choose categories and fields for display.
3. Chemical data is shown in the right frame. Search term(s) are highlighted in yellow.

Primary Record



Additional Chemical Record



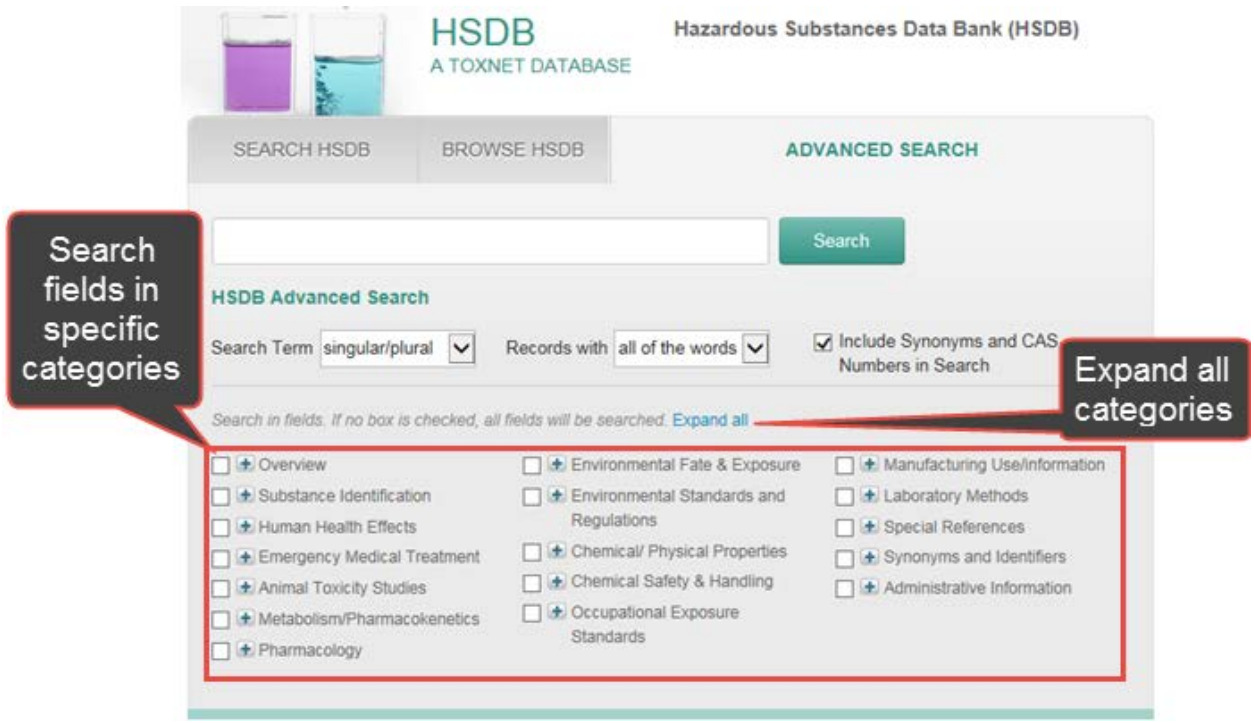
Additional Resources

For further information, review these additional resources:

- HSDB Skill Kit
  nlm.nih.gov/pubs/techbull/ma07/ma07_hsdb_skill_kit.html
- HSDB Animated Tutorial
  sis.nlm.nih.gov/enviro/captivate/basicsearchinghsdb_skin.swf
- TOXNET Help Text – HSDB
  toxnet.nlm.nih.gov/help/HSDBhelp.htm

HSDB® Search Fields

The Advanced Search tab allows users to specify a particular field or category of fields to search. By default, the system will search all fields in all categories. To see all fields within a specific category, click the "+" beside that category.



Expanded Categories (All Fields)

Substance Identification
- Chemical Names
- CAS Registry Number
- Overview

Human Health Effects
- Toxicity Summary
- Evidence for Carcinogenicity
- Human Toxicity Excerpts
- Human Toxicity Values
- Skin, Eye, and Respiratory Irritations
- Drug Warnings
- Medical Surveillance
- Populations at Special Risk
- Probable Routes of Human Exposure
- Body Burden
- Average Daily Intake
- Reported Fatal Dose

Emergency Medical Treatment
- Emergency Medical Treatment
- Antidote and Emergency Treatment

Animal Toxicity Studies
- Toxicity Summary
- Evidence for Carcinogenicity
- Non-Human Toxicity Excerpts
- Ecotoxicity Excerpts
- National Toxicology Program Studies
- Non-Human Toxicity Values
- Ecotoxicity Values
- Ongoing Test Status
- TSCA Test Submissions

Metabolism / Pharmacokinetics
- Metabolism/Metabolites
- Absorption, Distribution & Excretion
- Biological Half-Life
- Mechanism of Action
- Interactions

Pharmacology
- Therapeutic Uses
- Drug Warnings
- Interactions
- Drug Idiosyncrasies
- Drug Tolerance
- Reported Fatal Dose
- Maximum Drug Dose
- Bionecessity

Environmental Fate & Exposure
- Environmental Fate/Exposure Summary
- Probable Routes of Human Exposure
- Body Burden
- Average Daily Intake
- Natural Pollution Sources
- Artificial Pollution Sources
- Environmental Fate
- Environmental Biodegradation
- Environmental Abiotic Degradation
- Environmental Bioconcentration
- Soil Adsorption/Mobility
- Volatilization from Water/Soil
- Environmental Water Concentrations
- Effluent Concentrations
- Sediment/Soil Concentrations
- Atmospheric Concentrations
- Food Survey Values
- Plant Concentrations
- Fish/Seafood Concentrations
- Animal Concentrations
- Milk Concentrations
- Other Environmental Concentrations

Environmental Standards & Regulations
- FIFRA Requirements
- Acceptable Daily Intakes
- TSCA Requirements
- CERCLA Reportable Quantities
- RCRA Requirements
- Atmospheric Standards
- Clean Water Act Requirements
- Federal Drinking Water Standards
- Federal Drinking Water Guidelines
- State Drinking Water Standards
- State Drinking Water Guidelines
- Soil Standards
- FDA Requirements
- Allowable Tolerances

Chemical/Physical Properties
- Molecular Formula
- Molecular Weight
- Color/Form
- Odor
- Taste
- Boiling Point
- Melting Point
- Corrosivity
- Critical Temperature & Pressure
- Density/Specific Gravity
- Dissociation Constants
- Heat of Combustion
- Heat of Vaporization
- Octanol/Water Partition Coefficient
- pH
- Solubilities
- Spectral Properties
- Surface Tension
- Vapor Density
- Vapor Pressure
- Relative Evaporation Rate
- Viscosity
- Other Chemical/Physical Properties

Chemical Safety & Handling
- Hazards Summary
- DOT Emergency Guidelines
- Globally Harmonized System (GHS)
- Odor Threshold
- Skin, Eye and Respiratory Irritations
- Fire Potential
- NFPA Hazard Classification
- Flammable Limits
- Flash Point
- Autoignition Temperature
- Fire Fighting Procedures
- Toxic Combustion Products
- Firefighting Hazards
- Explosive Limits & Potential
- Hazardous Reactivities & Incompatibilities
- Hazardous Decomposition
- Hazardous Polymerization
- Other Hazardous Reaction
- Immediately Dangerous to Life or Health
- Protective Equipment & Clothing
- Preventive Measures
- Stability/Shelf Life
- Shipment Methods and Regulations
- Storage Conditions
- Cleanup Methods
- Disposal Methods

- Radiation Limits & Potential

Occupational Exposure Standards
- OSHA Standards
- Threshold Limit Values
- NIOSH Recommendations
- Immediately Dangerous to Life or Health
- Other Standards Regulations and Guidelines

Manufacturing Use / Information
- Major Uses
- Manufacturers
- Methods of Manufacturing
- General Manufacturing Information
- Formulations/Preparations
- Impurities
- Consumption Patterns
- U. S. Production
- U. S. Import
- U. S. Exports

Laboratory Methods
- Clinical Laboratory Methods
- Analytic Laboratory Methods
- Sampling Procedures

Special References
- Special Reports
- History and Incidents

Synonyms and Identifiers
- Related HSDB Records
- Synonyms
- Associated Chemicals
- Formulations/Preparations
- Shipping Name/Number DOT/UN/NA/IMO
- Standard Transportation Number
- EPA Hazardous Waste Number
- Wiswesser Line Notation
- RTECS Number

Administrative Information
- Hazardous Substances Databank Number
- Last Review Date

HSDB Search Exercises

Exercises

Go to **toxnet.nlm.nih.gov**.

Click **HSDB**.

Exercise 1: What are the concerns of bisphenol A residue in baby bottles?

Suggested Solution:

Type	**bisphenol a baby bottles** in the Search box
Click	**Search**
Click	**BISPHENOL A**
Click	**Closest Match to Search Terms** in the Table of Contents
Review	the **Closest Match to Search Terms** information in the right frame
Click	**HSDB Home** at the top of the page to prepare for the next search

Exercise 2: What is the average daily intake of mercury?

Suggested Solution:

Type	**mercury** in the Search box
Click	**Search**
Click	**MERCURY COMPOUNDS**
Review	the **Toxicity Summary** information at the beginning of the record for an overview of the substance.
Click	the **+** next to **Human Health Effects** in the Table of Contents
Click	**Average Daily Intake**
Review	the information retrieved
Click	**HSDB Home** at the top of the page to prepare for the next search

Exercise 3: Using the CAS Registry Number 298-00-0, identify the name of the chemical and find information on the occurrence and activity in soil.

Suggested Solution:

Type	**298-00-0** in the Search box
Click	**Search**
Click	**METHYL PARATHION**
Click	the **Environmental Fate & Exposure** link in the Table of Contents
Review	the Summary for soil information

Scenario 1 – Regulatory Information

A health and science news reporter is writing an article related to workers in the lead compounds manufacturing industry. The reporter uses HSDB to obtain some regulatory information on occupational exposure.

Search HSDB to find the Permissible Exposure Limit (PEL), Time Weighted Average (TWA), and NIOSH recommended worker blood level. What level is considered immediately dangerous to life or health (IDLH) by NOISH?

Suggested Solution:

Type	**lead** in the Search box
Click	**Search**
Click	**LEAD COMPOUNDS** in the Search Results list
Click	**Occupational Exposure Standards** in the Table of Contents
Review	the Permissible Exposure Limit, Time Weighted Average, NIOSH recommended worker blood levels, and the amount immediately dangerous to life or health.

Scenario 2 – Chemical Toxicity / Testing

A researcher reads an FDA consumer update on Bisphenol A (BPA), a compound used in plastic food and beverage packaging, including baby bottles. The article states that "current evidence indicates that exposure levels to BPA from food contact materials…are below those that may cause health effects." The researcher decides to take a look at completed and/or ongoing studies that may be included in the "current evidence."

Search HSDB to examine studies: Locate the Bisphenol A record. Open the Bishpenol A record. Navigate the table of contents to locate information on scientific testing and toxicity.

Suggested Solution:

Type	**bisphenol a** in the Search box
Click	**Search**
Click	the primary record for **Bisphenol A**
Scroll	through **Human Health Effects** to examine case reports, surveillance, biomonitoring, and in vitro tests
Click	the **+** next to **Animal Toxicity Studies** to expand it (in the Table of Contents)
Click	**National Toxicology Program Studies** and **Ongoing Test Status** to view NTP study results

Scenario 3 – Environmental Fate & Exposure

An environmental scientist is interested in examining current information on how ethylene glycol behaves in the environment based on the chemical's physical properties.

Search HSDB to find the information: Locate the ethylene glycol record in HSDB. Open the ethylene glycol record. Navigate the table of contents to locate the Environmental Fate & Exposure section.

Suggested Solution:

Type	**ethylene glycol** in the Search box
Click	**Search**
Click	the primary record for **Ethylene Glycol**
Click	**Environmental Fate & Exposure** in the Table of Contents
	The Environmental Fate & Exposure Summary provides information on how a chemical behaves in air, soil, and water; routes of human occupational exposure; and more.
Scroll	through the **Summary** and other subsections
	Notice the physical properties provided to support statements within the summary (vapor pressure, octanol-water partition coefficient (Koc), and Henry's Law constant). Ethylene glycol is used in antifreeze and various other automotive and consumer products.

Scenario 4 – Advanced Search

A Department of Homeland Security employee is interested in finding out what chemical warfare agents have a record in HSDB.

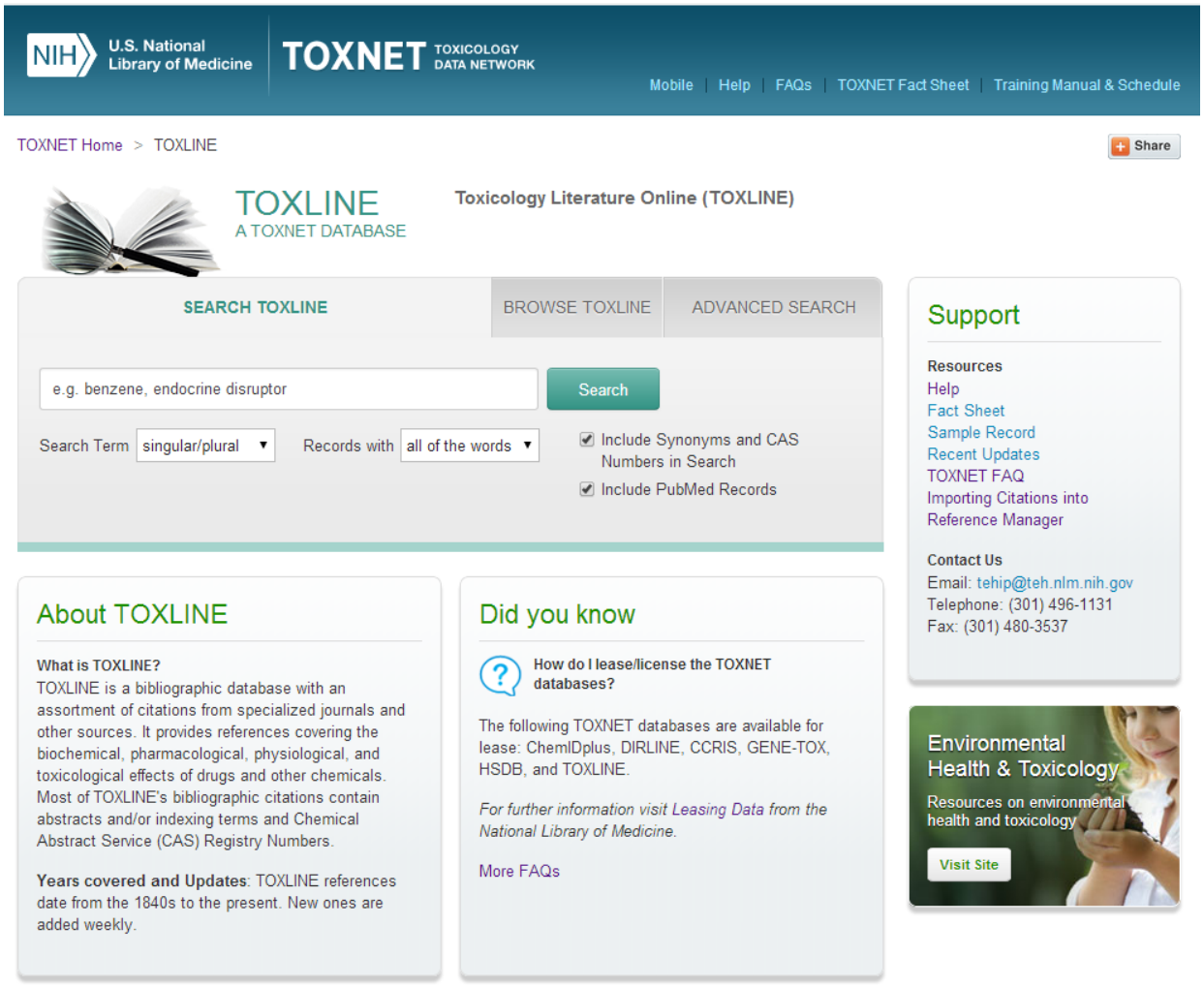
Search HSDB with advanced options: Pull up the HSDB Advanced Search tab. Limit the search to major uses under Manufacturing/Use Information. Enter the specified use query.

Suggested Solution:

Return	to the **HSDB Home**
Select	the **Advanced Search** tab
Click	the **+ icon (⊞)** to expand the Manufacturing Use/Information field
Click	the box next to **Uses**
Type	**chemical warfare** in the Search box
Select	**exact words** from the Search Term drop-down menu
Select	**the phrase** from the Records with drop-down menu
Click	**Search**
	Note: The results may contain chemicals used against chemical warfare agent exposure.

Toxicology Literature Online (TOXLINE®)

TOXLINE (Toxicology Literature Online) is the National Library of Medicine® (NLM) bibliographic database for toxicology, providing information covering the biochemical, pharmacological, physiological, and toxicological effects of drugs and other chemicals. It contains more than 4 million bibliographic citations from the 1840s to the present, most with abstracts and/or indexing terms and Chemical Abstracts Service (CAS) Registry Numbers.



toxnet.nlm.nih.gov/newtoxnet/toxline.htm

TOXLINE Components

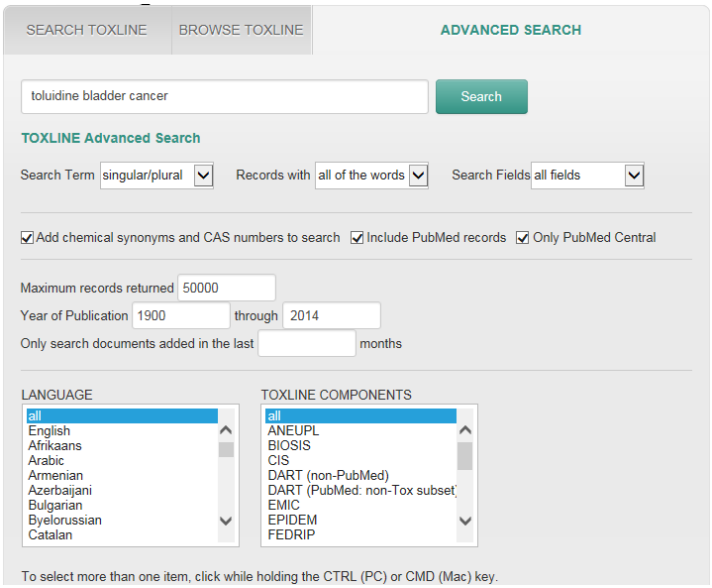
TOXLINE references come from various sources organized into components. These components are searched together but may be used to limit searches.

- **Standard Biomedical/Toxicology Journal Literature:**
  - MEDLINE®/PubMed®
- **Special Journal and Other Research Literature:**
  - Developmental and Reproductive Toxicology (DART®)
- **Technical Reports and Research Projects:**
  - NIH RePORTER (RePORTERTOX)
  - National Technical Information Service (NTIS)
- **Archival Collections (material is no longer being added to these components):**
  - Aneuploidy (ANEUPL)
  - Environmental Mutagen Information Center File (EMIC)
  - Environmental Teratology Information Center File (ETIC)
  - Epidemiology Information System (EPIDEM)
  - Federal Research in Progress (FEDRIP)
  - HEEP Abstracts on health effects of environmental pollutants
  - Hazardous Materials Technical Center (HMTC)
  - International Labour Office (CIS)
  - International Pharmaceutical Abstracts (IPA)
  - MTGABS Meeting Abstracts
  - NIOSHTIC (NIOSH)
  - Pesticides Abstracts (PESTAB)
  - Poisonous Plants Bibliography (PPBIB)
  - Swedish National Chemicals Inspectorate (RISKLINE or KEMI RISKLINE)
  - Toxic Substances Control Act Test Submissions (TSCATS)
  - Toxicological Aspects of Environmental Health (BIOSIS)

Searching TOXLINE

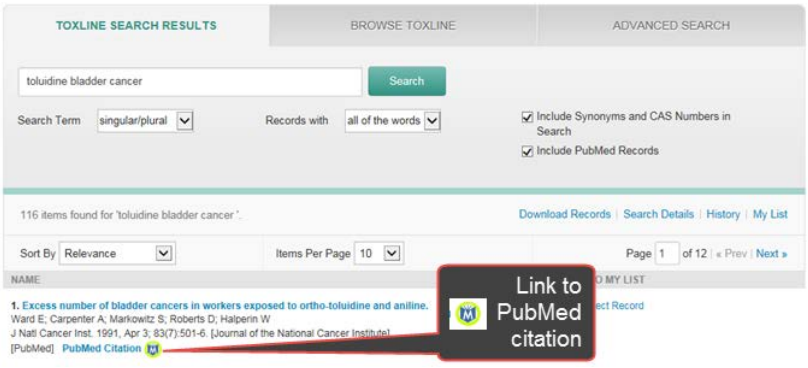
Any terms entered in the query box will be searched automatically against both the keyword and MeSH® fields, in addition to other fields such as title, abstract, and author. Chemical names are mapped to names, synonyms, and CAS Registry Numbers® derived from ChemIDplus®. Words such as **a**, **an**, **and**, **for**, **the**, and **it** will not be searched.

An **Advanced Search** may be applied to narrow the search to:



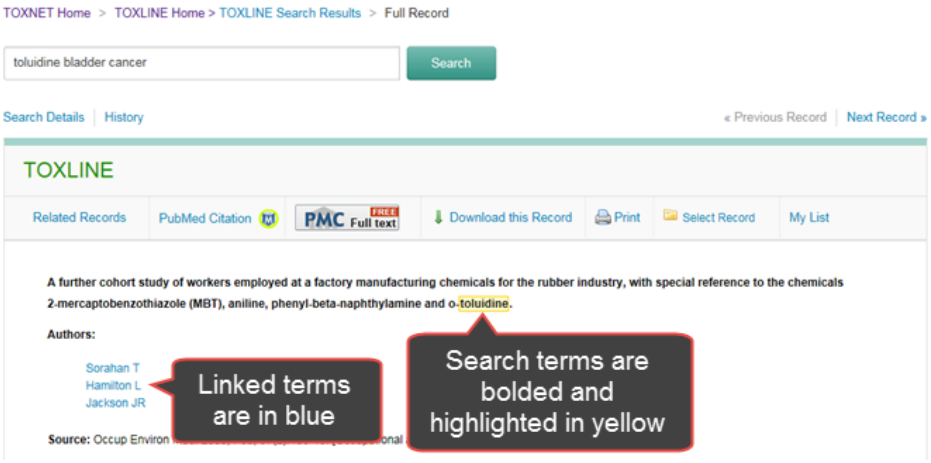
- Titles or authors
- Exact words or word variants
- Year of publication
- Documents added within a specified number of months
- TOXLINE components (more than one component can be selected)
- Language
- A maximum number of records
- Articles found in PubMed Central, the NLM free digital archive of biomedical and life sciences journal literature (**Include PubMed records** must also be checked)

Search Results



The initial retrieval is displayed as a list—in relevancy ranked order—of bibliographic references with the titles in blue. Each reference is followed by the acronym in brackets of the component from which the article was retrieved. References coming from PubMed/MEDLINE will be marked PubMed Citation with a green and blue M-encircled icon (Ⓜ) and linked to the same reference in PubMed. Click this icon for access to PubMed functions such as LinkOut®, Related Links, and document ordering.

Selected Record Screen



The record screen displays the complete record for the item selected on the results screen. Individual author names, MeSH headings, keywords, and CAS Registry Numbers are in blue and linked to similar records in the database. Click an author link to find other articles by that author. Click a keyword to find other articles indexed with that keyword. Click **PubMed Citation** to access PubMed. Click **PMC Full text** to access the free, full text version of the article.

Other information appearing includes the article language, the month it was entered into the system, the year of publication, and a secondary source ID—a unique identifying number for the record and tagged to its component.

Additional Resources

For further information, review these additional resources:

- PubMed
  pubmed.gov
- TOXLINE Help
  sis.nlm.nih.gov/toxnethelp/toxlinehelp.html
- TOXLINE Fact Sheet
  nlm.nih.gov/pubs/factsheets/toxlinfs.html
- Importing citations into reference management programs
  toxnet.nlm.nih.gov/newtoxnet/faq.html#references
- Free Full-Text Health Science/Medical Journals
  sis.nlm.nih.gov/enviro/findingfreefulltext.html

TOXLINE Search Exercises

Search Exercises

 Go to **toxnet.nlm.nih.gov**.

 Click **TOXLINE**.

Exercise 1: Search for the chemical of concern in baby bottles, bisphenol A (BPA). Explore navigating through the retrieval, examining individual records, and going to linked records.

Suggested Solution:

Type	bisphenol a baby bottles in the Search box
Click	**Search**
Review	record(s) of choice
Click	**TOXLINE Home** at the left to prepare for the next search

Exercise 2: Find citations on the salmonella contamination in eggs. Limit the results to citations since 2010.

Suggested Solution:

Click	the **Advanced Search** tab
Type	**salmonella eggs** in the Search box
Type	**2010** in the first Year of Publication box
Click	**Search**
Review	the citation(s)

Scenario 1 – General Search

Michelle, a graduate student, is aware that many studies on pesticides have been conducted. She is also aware that pesticides are regulated in the United States. Michelle would like to get an idea of how much literature exists on cancer among agricultural workers because they may experience higher exposure to pesticides than the general public.

Suggested Solution:

Type	**cancer agricultural workers** in the Search box
Click	**Search**
Review	the citation(s)
Click	**TOXLINE Home** to prepare for the next search

Scenario 2 – Limiting Search Results

Thomas, a principal investigator, is designing a new breast cancer study for women. He would like to perform a literature search for recent articles focused on the effects of diet on breast cancer. Thomas would like articles published since 2010.

Suggested Solution:

Click	the **Advanced Search** tab
Type	**diet breast cancer** in the Search box
Select	**Titles** from the Search fields drop-down menu
Type	**2010** in the first Year of Publication box (replacing **1900**)
Click	**Search**
Review	record(s) of choice
Click	**TOXLINE Home** at the top left of the page to prepare for the next search

Scenario 3 – Sorting Search Results

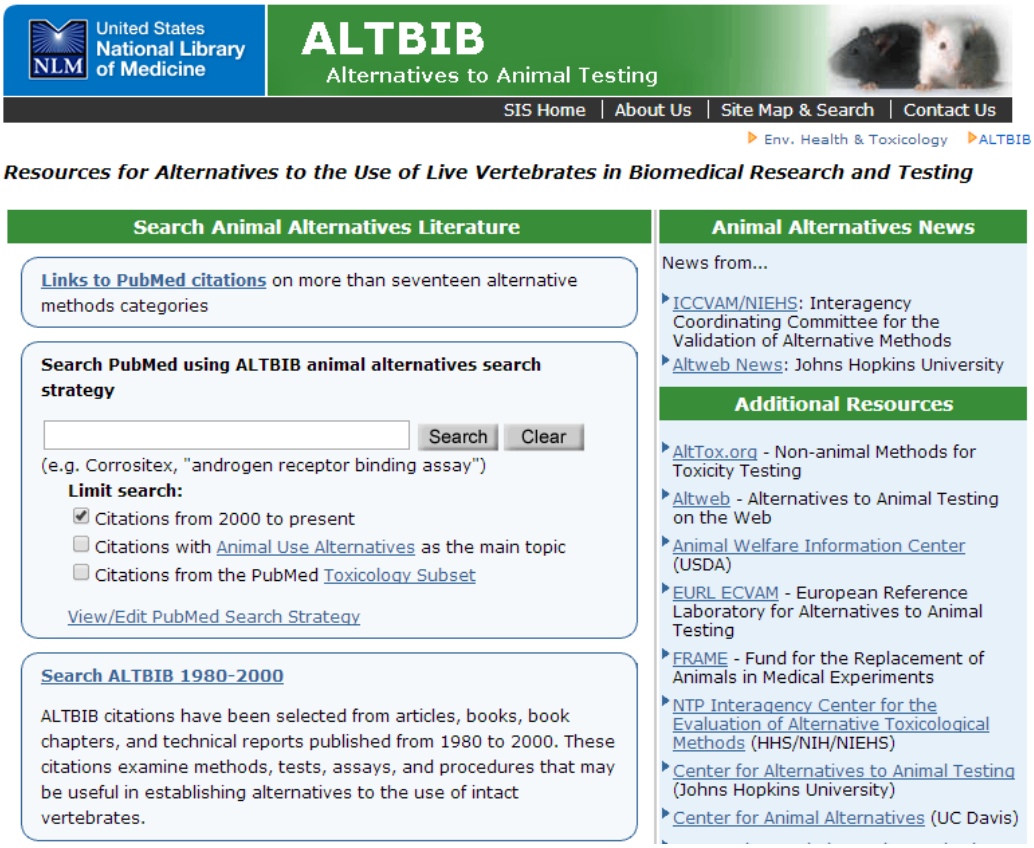
Jean, an industrial hygienist, would like to examine articles on worker exposure to caprolactam. She is interested in how studies have changed over time, beginning with older articles and ending with the most recent. Jean would also like to retrieve only English citations.

Suggested Solution:

Click	the **Advanced Search** tab
Type	**occupational exposure caprolactam** in the Search box
Select	**English** in the Language box
Click	**Search**
Select	**Title** from the **Sort By** drop-down menu
Review	the citation(s)

Alternatives to Animal Testing (ALTBIB®)

ALTBIB (Alternatives to Animal Testing) provides access to PubMed®/MEDLINE® citations relevant to alternatives to the use of live vertebrates in biomedical research and testing. Many citations provide access to free full text.



toxnet.nlm.nih.gov/altbib.html

Topic area searches include:

- General Topics on Alternatives to Animal Testing
- Hepatic/Renal Toxicity
- Pulmonary Toxicity
- Biologics and Vaccines
- Immunotoxicity/Immunology
- Quantitative Structure Activity Relationship (QSAR)
- Carcinogenesis
- Neurotoxicity
- Reproductive and Developmental Toxicity
- Cytotoxicity

- Ocular Toxicity
- Skin Toxicity
- Ecotoxicity
- Pharmacokinetic/Mechanistic Studies
- Welfare (Animal)
- Genotoxicity
- Pyrogenicity

In addition to the topic area PubMed searches, the ALTBIB portal includes a searchable bibliographic collection on alternatives to animal testing. This collection provides citations from published articles, books, book chapters, and technical reports published from 1980 to 2000. The bibliography features citations concerning methods, tests, assays, and procedures that may prove useful in establishing alternatives to the use of intact vertebrates. The ALTBIB bibliographic collection has not been updated since 2001, when the preformulated searches of PubMed were substituted for collecting a formal bibliography.

ALTBIB provides access to animal alternatives news sources, such as the Interagency Coordinating Committee on the Validation of Alternative Methods (ICCVAM). The portal has an extensive collection of links to key organizations providing information on alternatives to animal testing. ALTBIB also offers access to ICCVAM's "International Acceptance of Alternative Methods, 1998-2012" and "US and International Milestones in Alternative Test Method Development and Evaluations."

ALTBIB Search Exercises

 Go to toxnet.nlm.nih.gov.

 Click **ALTBIB**.

Exercise 1: Locate PubMed publications available for the Comet assay.

Suggested Solution:

Click	**Links to PubMed citations** at the top of the page
Scroll	to **Genotoxicity** (section 6)
Click	**TK6 Alkaline Comet Assay**
Review	the list of PubMed links returned
Click	the browser's back button to prepare for the next search

Exercise 2: Search for "Draize test" with Animal Use Alternatives as the main topic.

Suggested Solution:

Select	the **Citations with Animal Use Alternatives as the main topic** checkbox under the Limit search section (if it is not already selected)
Type	"**Draize test"** in the Search field
Click	**Search**
Review	the list of search results (appears in a new tab)
Close	the search results tab to return to ALTBIB

Exercise 3: Search for "Zebrafish" with citations from the PubMed Toxicology Subset.

Suggested Solution:

Select	the **Citations from the PubMed Toxicology Subset** checkbox under the Limit search section
Type	**zebrafish** in the Search field
Click	**Search**
Review	the list of search results (appears in a new tab)
Close	the search results tab to return to ALTBIB

Exercise 4: Locate records for in silico studies of Alzheimer's disease treatments.

Suggested Solution:

Select	**Citations from 2000 to present** under Limit Search (ensure the other checkboxes are unchecked)
Type	**in silico alzheimers** in the Search field
Click	**Search**
Review	the list of search results (appears in a new tab)
Close	the search results tab to return to ALTBIB

Additional Resources

For further information, review these additional resources:

- Center for Alternatives to Animal Testing (Johns Hopkins University)
  caat.jhsph.edu
- ICCVAM/NIEHS: Interagency Coordinating Committee for the Validation of Alternative Methods
  ntp.niehs.nih.gov/pubhealth/evalatm/iccvam/

Section 4: Reproductive Health

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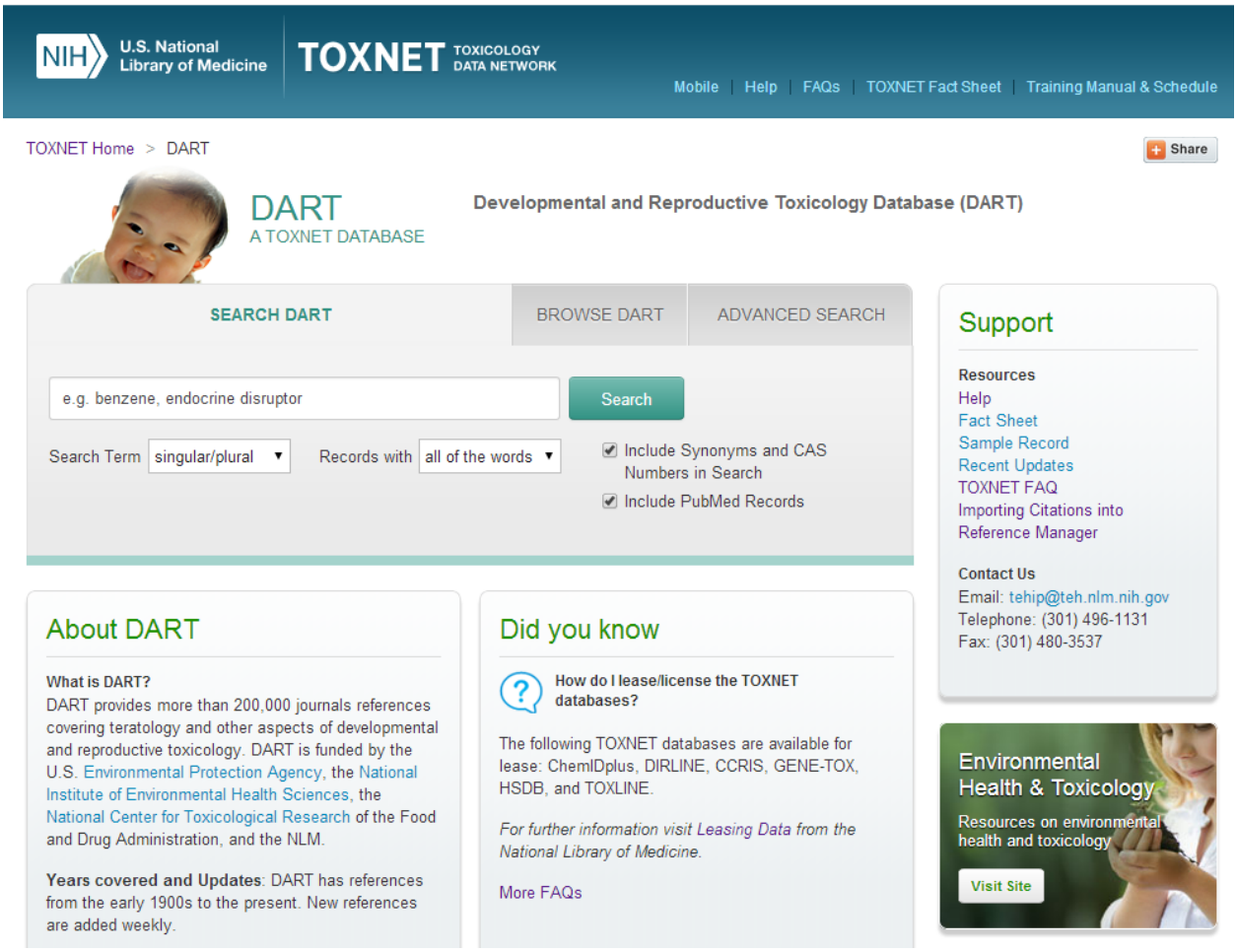
Developmental and Reproductive Toxicology (DART®)

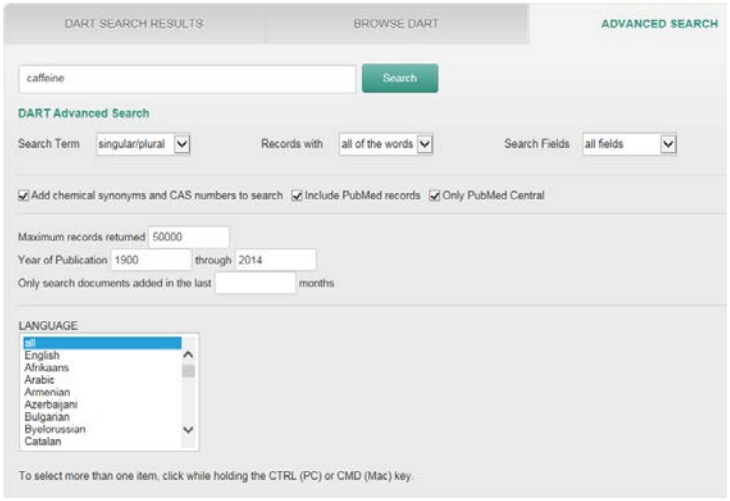
DART (Developmental and Reproductive Toxicology Database) is a bibliographic database that covers teratology and other aspects of developmental and reproductive toxicology. It contains more than 200,000 references to literature published since the early 1900s.



toxnet.nlm.nih.gov/newtoxnet/dart.htm

Searching DART

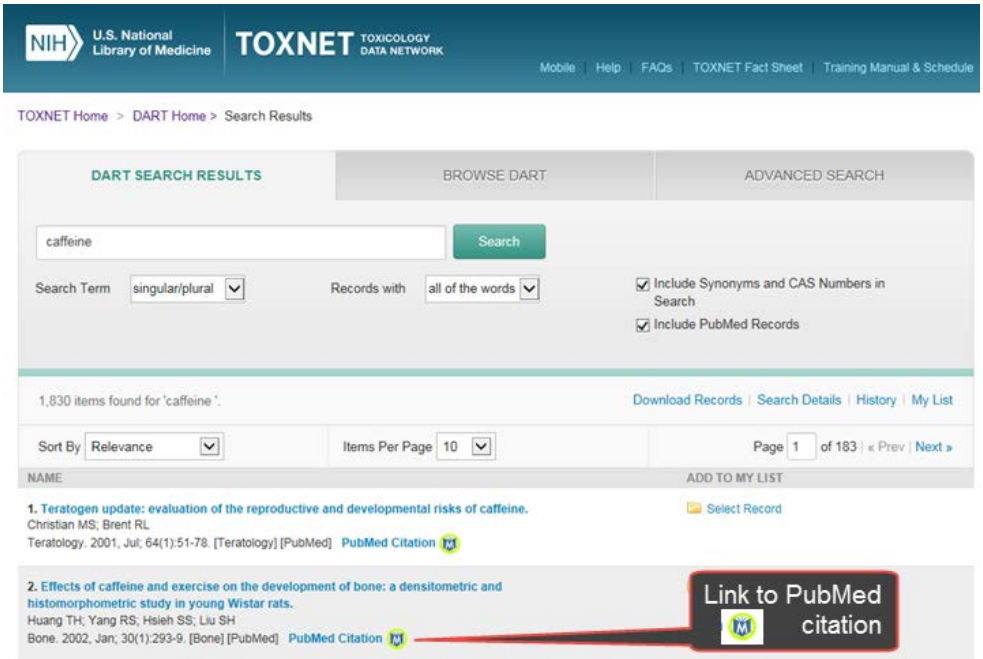
Any term(s) entered in the query box will automatically be searched against both the keyword and MeSH fields, in addition to other fields such as title, abstract, and author. Chemical names are mapped to names, synonyms, and Chemical Abstracts Service (CAS) Registry Numbers derived from ChemIDplus®. Words such as **a**, **an**, **and**, **for**, **the**, and **it** will not be searched.



An **Advanced Search** may be applied to narrow the search to:

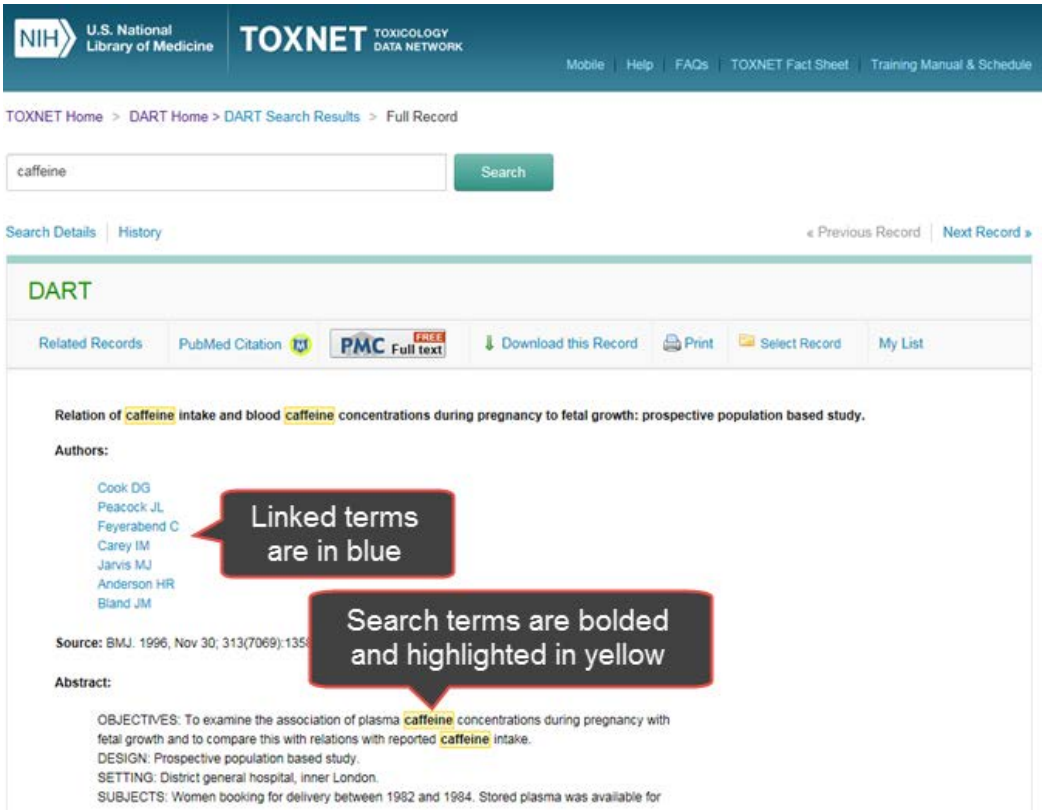
- Titles
- Authors
- Exact words or word variants
- Year of publication
- Documents added within a specified number of months
- Language
- A maximum number of records
- Articles found in PubMed Central, the NLM free digital archive of biomedical and life sciences journal literature (**Include PubMed records** must also be checked)

Search Results



The initial retrieval is displayed as a list—in relevancy ranked order—of bibliographic references with the titles in blue. References that come from PubMed/MEDLINE have PubMed Citation in blue and a green and blue M-encircled icon (Ⓜ). This icon is linked to the same citation as it appears in PubMed. Click this icon for access to PubMed functions such as LinkOut and document ordering.

Selected Record Screen



This screen displays the complete record for the item selected on the Results Screen. The search terms are highlighted in yellow. Individual author names, MeSH headings/ keywords, and CAS Registry Numbers are in blue and linked to related records in the database. Click an author link to find other articles by that author. Click a keyword to find other articles indexed with that keyword. Click **PubMed Citation** to access PubMed. Click **PMC Full text** to access the free, full text version of the article.

Other information appearing includes the article language, the month it was entered into the system, the year of publication, and a secondary source ID—a unique identifying number for the record and tagged to its component.

Additional Resources

For further information, review these additional resources:

- DART Fact Sheet
  nlm.nih.gov/pubs/factsheets/dartfs.html
- PubMed
  pubmed.gov
- Importing citations into reference management programs
  toxnet.nlm.nih.gov/newtoxnet/faq.html#references
- TOXNET® Help-DART
  toxnet.nlm.nih.gov/help/DARThelp.htm

DART Search Exercises

 Go to **toxnet.nlm.nih.gov**.

 Click **DART**.

Exercise 1: Find the latest citations pertaining to food allergies and prevention. Sort the citations by author in descending order.

Suggested Solution:

Type	**food allergies prevention** in the Search box
Click	**Search**
Review	the citation(s)
Select	**Author** from the **Sort By** drop-down menu
Review	the citation(s) as they now appear
Click	**DART Home** in the upper left to prepare for the next search

Exercise 2: Locate articles on psychomotor stimulants.

Suggested Solution:

Type	**psychomotor stimulants** in the Search box
Click	**Search**
Review	the citation(s)
Click	**DART Home** in the upper left to prepare for a new search

Exercise 3: Find information on the effects of alcohol on the fetus.

Suggested Solution:

Type	**alcohol fetus** in the Search box
Click	**Search**
Click	the record of choice to view the abstract
Click	**DART Home** in the upper left to prepare for a new search

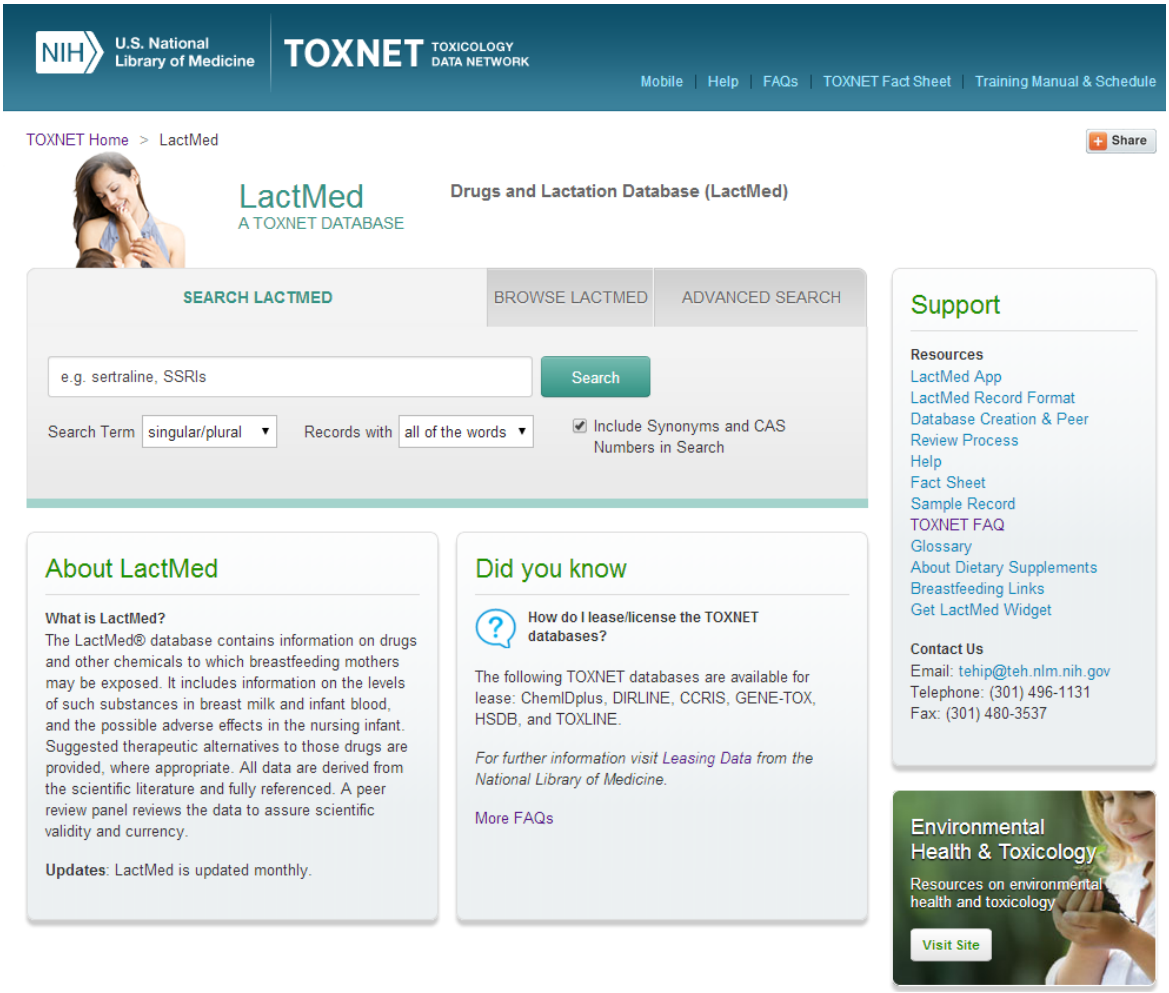
Exercise 4: Find articles on the adverse effect of citalopram. Download the first three records to full format.

Suggested Solution:

Type	**adverse effect citalopram** in the Search box
Click	**Search**
Review	the citation(s)
Click	the **Select Record** option to the right of the first three records
Click	the **My List** link in the upper right of the search results list
	This opens your list of saved records
Click	**Download Records**
Select	**Full Format**
Click	the **Download** button
Open	the downloaded text file and review the full format records
Close	the text file and return to DART
Close	the pop-up windows
Click	the **Deselect Record** link to the right of the first three records

Drugs and Lactation Database (LactMed®)

LactMed (Drugs and Lactation Database) is a database that contains information on more than 900 drugs and other chemicals to which breastfeeding mothers may be exposed. It includes information on the levels of such substances in breast milk and infant blood, and the possible adverse effects in the nursing infant. All data are derived from the scientific literature and fully referenced. Data are organized into substance-specific records, which provide a summary of the pertinent reported information and include links to other National Library of Medicine® (NLM) databases.



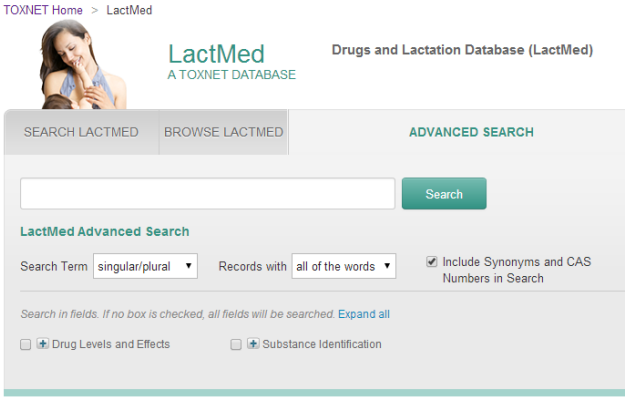
lactmed.nlm.nih.gov

Searching LactMed

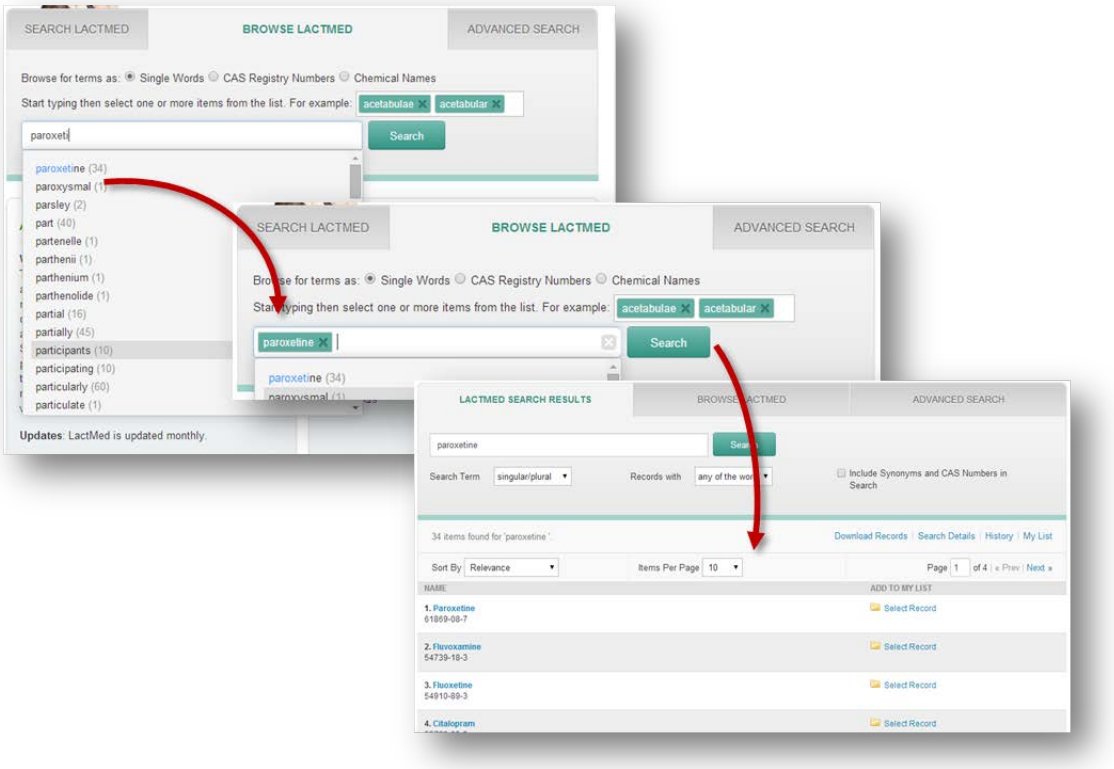
Search LactMed by chemical, brand name, Chemical Abstracts Service (CAS) Registry Number, pharmacologic category, and/or subject terms. By default, the system adds synonyms and CAS numbers to chemical searches. Search results, displayed in relevancy ranked order, can easily be viewed, printed, or downloaded.

Click the **Advanced Search** tab to search:

- Exact words, singular and plural forms, or words variants
- Records with the phrase, all words, or any words
- In specific fields or categories of fields: LactMed contains ten search fields organized under two broad categories. Click the plus sign (+) to the left of a category to show all fields in that category. Use the **Expand All** link above the categories to display all contents.



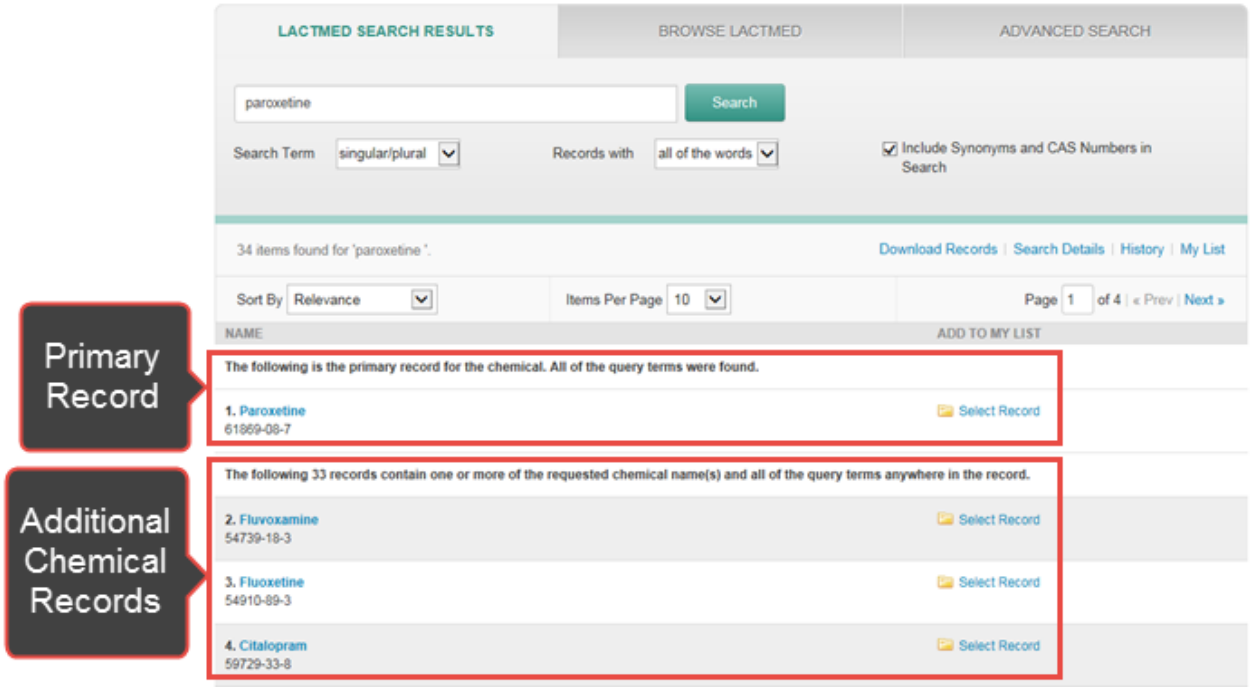
Click the **Browse LactMed** tab to search a list of index terms related to the search term entered and the number of records containing that term. Select the record(s) to be viewed by clicking the appropriate term in the drop-down list and clicking **Search**.



Search Results

The initial retrieval is displayed as a list of chemical names, highlighted in blue and underlined, and their CAS Registry Numbers. If the search was for a chemical or drug (e.g., codeine) and there is a match for it in the database, the record for this chemical—referred to as the primary chemical record—will display first, followed by a list of other chemical records which also contain some mention of the chemical entered. This latter list of chemicals is displayed according to a Relevancy Ranking algorithm. Clicking directly on any of the items will provide a display of the Selected Record Screen, containing all the data for that item. If the query consists of words that are not chemical or drug terms, this same Relevancy Ranking algorithm determines the order of display of all the search results.

When searching for a chemical, the retrieval may include other chemical records in addition to the initial matching chemical record (the **Primary Record**).

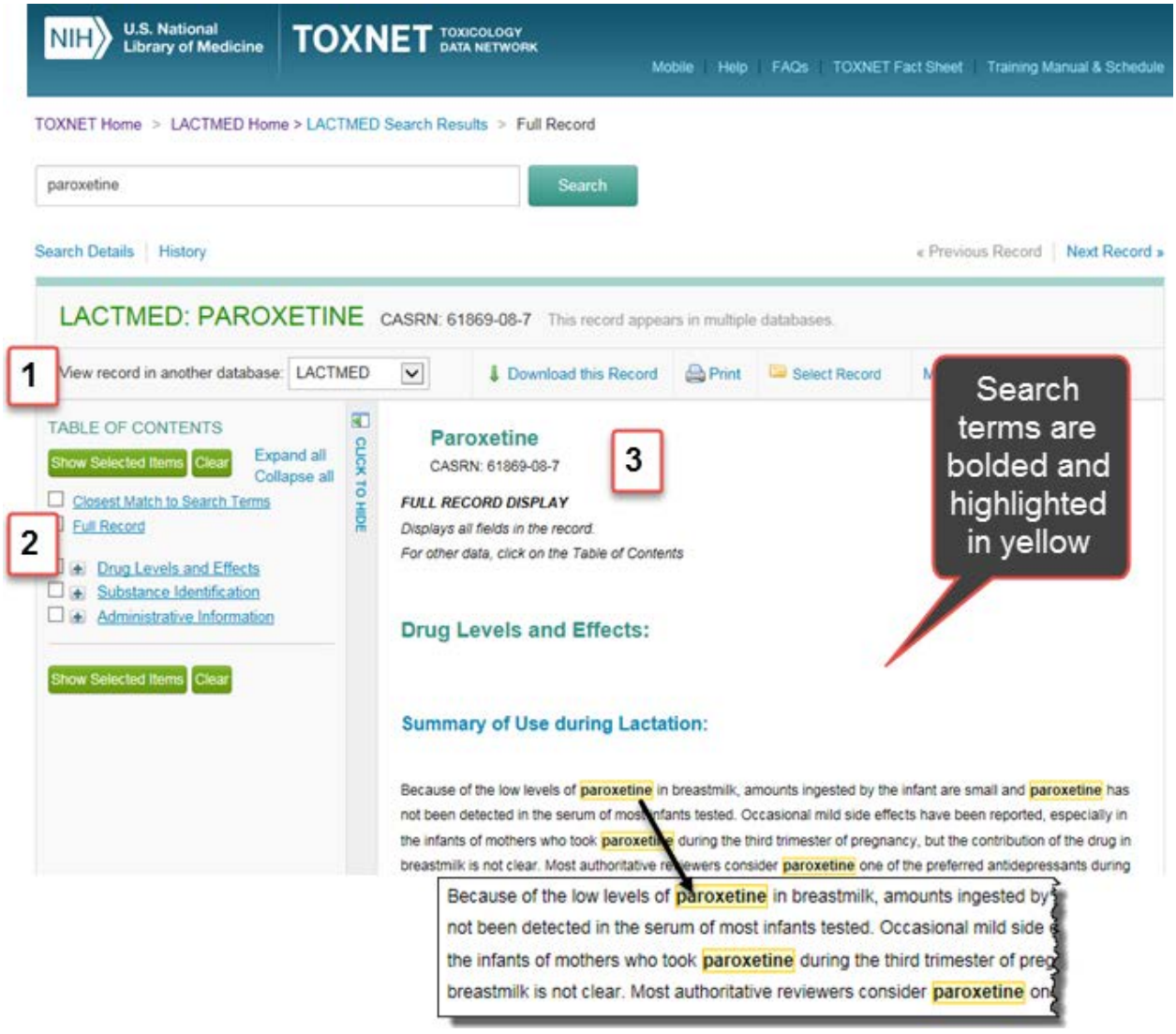


These additional records appear if they contain the chemical name or search term. Click any of these non-primary chemicals on the **Search Results** screen to display the sections of the record best matching the query terms (**Closest Match to Search Terms**), those where the chemical search term(s) appear with greatest frequency. The search term(s) are bolded and highlighted in yellow.

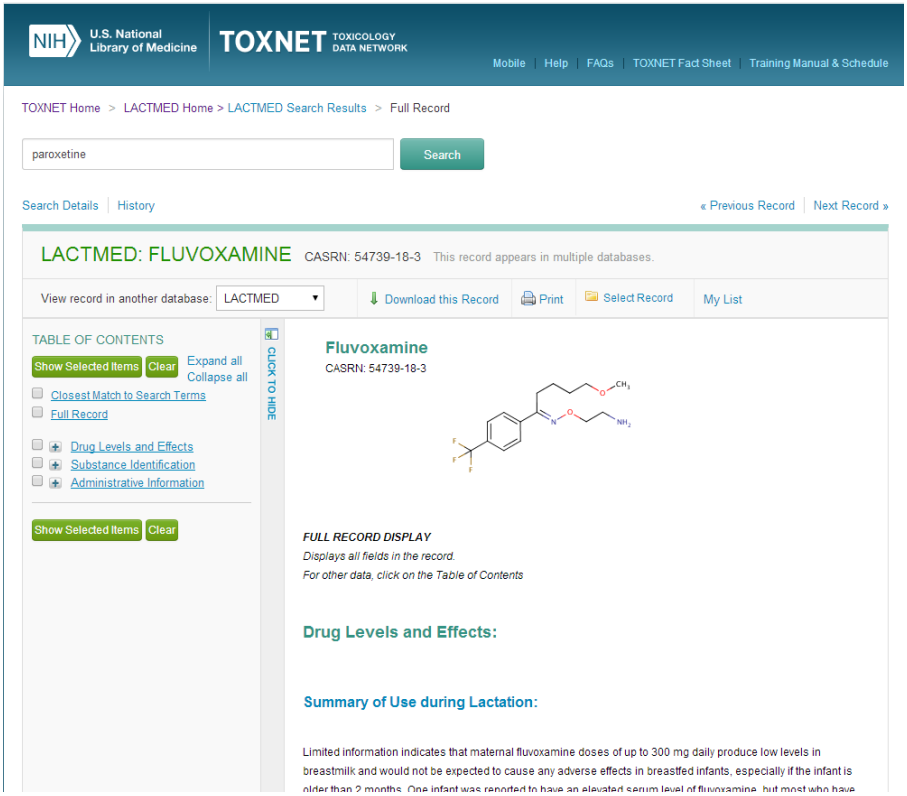
The **Record** screen is organized into three sections:

1. Navigation buttons at the top of the record allow you to **View record in another database** (NLM databases), **Download Record**, **Print** the record, **Select Record** (adding it to your list), and view your list of selected records (**My List**).
2. A **Table of Contents** in the left frame allows users to choose categories and fields for display.
3. Chemical Data is shown in the right frame.

Primary Record



Additional Chemical Record



LactMed Mobile

A mobile version of LactMed is available as an app download for both Android and Apple iOS devices. To find the app, access **toxnet.nlm.nih.gov/help/lactmedapp.htm** on your device and select the appropriate option on the page.

Additional Resources

For further information, review these additional resources:

- Drugs and Lactation Database (LactMed) Fact Sheet
  nlm.nih.gov/pubs/factsheets/lactmedfs.html
- LactMed App
  toxnet.nlm.nih.gov/help/lactmedapp.htm
- LactMed Basics Brochure
  nnlm.gov/mcr/resources/consumer/LactMed.pdf
- Pregnancy Riskline (University of Arizona College of Pharmacy)
  pharmacy.arizona.edu/centers/pregnancy-riskline
- Organization of Teratology Information Specialists
  otispregnancy.org

LactMed Search Exercises

 Go to **toxnet.nlm.nih.gov**.

 Click **LactMed**.

Search Exercises

Exercise 1: To which class of drugs does clomipramine belong?

Suggested Solution:

Type	**clomipramine** in the Search box
Click	**Search**
Click	**Clomipramine**
Click	the **+** next to **Substance Identification** in the Table of Contents
Click	**Drug Class** in the **Table of Contents**
Review	the information
Click	**LACTMED Home** in the upper left to prepare for the next search

Exercise 2: Is there a substitute for the use of hydrocodone during lactation?

Suggested Solution:

Type	**hydrocodone** in the Search box
Click	**Search**
Click	**Hydrocodone**
Click	the **+** next to **Drug Levels and Effects** in the Table of Contents
Click	**Alternate Drugs to Consider**
Review	the information

Scenario 1 – Summary Information

Carolyn, a nursing mother, has been prescribed methotrexate because of an early onset of rheumatoid arthritis. Her doctor has told her that she may continue to nurse her baby because he has prescribed a low dose of the medication. Carolyn would like to do some research herself to confirm her doctor's statements.

Search LactMed to gather information: Locate the methotrexate record in LactMed. Open the methotrexate record. Browse the record for information.

Suggested Solution:

Type	**methotrexate** in the Search box
Click	**Search**
Click	**Methotrexate** record in the Search Results list
Scroll	through the record or use the **Table of Contents**
	The Summary of Use during Lactation supports the doctor's statements.

Scenario 2 – Alternative Drug Field

While browsing the methotrexate record, Carolyn (Scenario 1) notices auranofin listed as an alternate drug to consider. Have any effects in infants been reported after use of auranofin by a nursing mother?

Use links within the methotrexate record to find information: Locate the alternate drugs within the methotrexate record. Open the auranofin record. Locate the infant effects section of the record.

Suggested Solution:

Click	the **+** next to **Drug Levels and Effects** in the Table of Contents
Click	**Alternate Drugs to Consider** in the Table of Contents
Click	**(Rheumatoid Arthritis) Auranofin** under Alternate Drugs to Consider
Click	**Auranofin**
Click	the **+** next to **Drug Levels and Effects** in the Table of Contents
Click	**Effects in Breastfed Infants** in the Table of Contents
Review	the information
Click	**LACTMED Home** in the upper left to prepare for the next search

Section 5: Carcinogenesis Research

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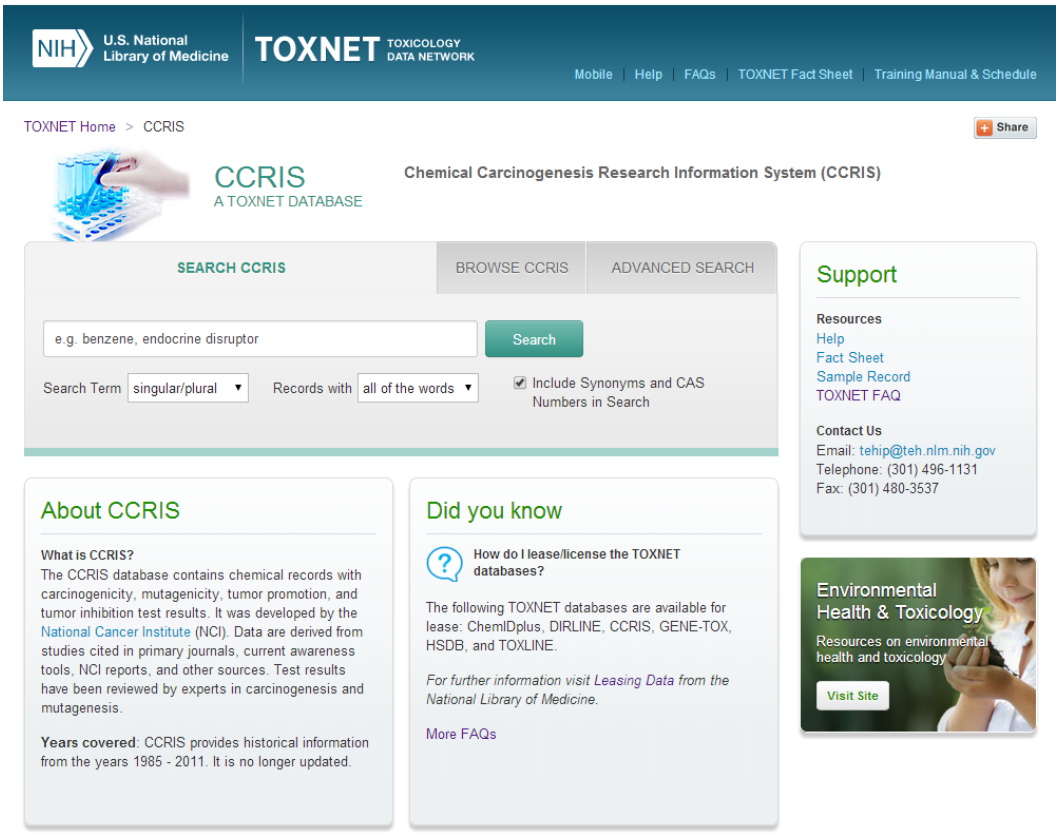
Chemical Carcinogenesis Research Information System (CCRIS) – Archived and no longer updated

CCRIS (Chemical Carcinogenesis Research Information System) provides historical information from the years 1985–2011. It is no longer updated.

CCRIS contains chemical records with carcinogenicity, mutagenicity, tumor promotion, and tumor inhibition test results. It was developed by the National Cancer Institute (NCI). Data are derived from studies cited in primary journals, current awareness tools, NCI reports, and other sources. Test results have been reviewed by experts in carcinogenesis and mutagenesis.



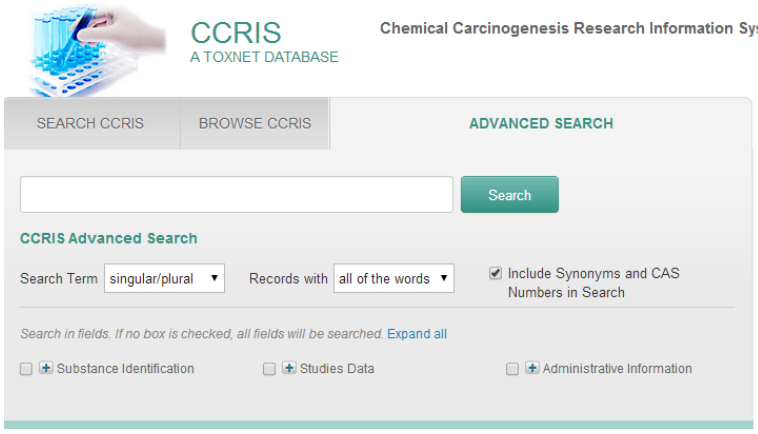
toxnet.nlm.nih.gov/newtoxnet/ccris.htm

Searching CCRIS

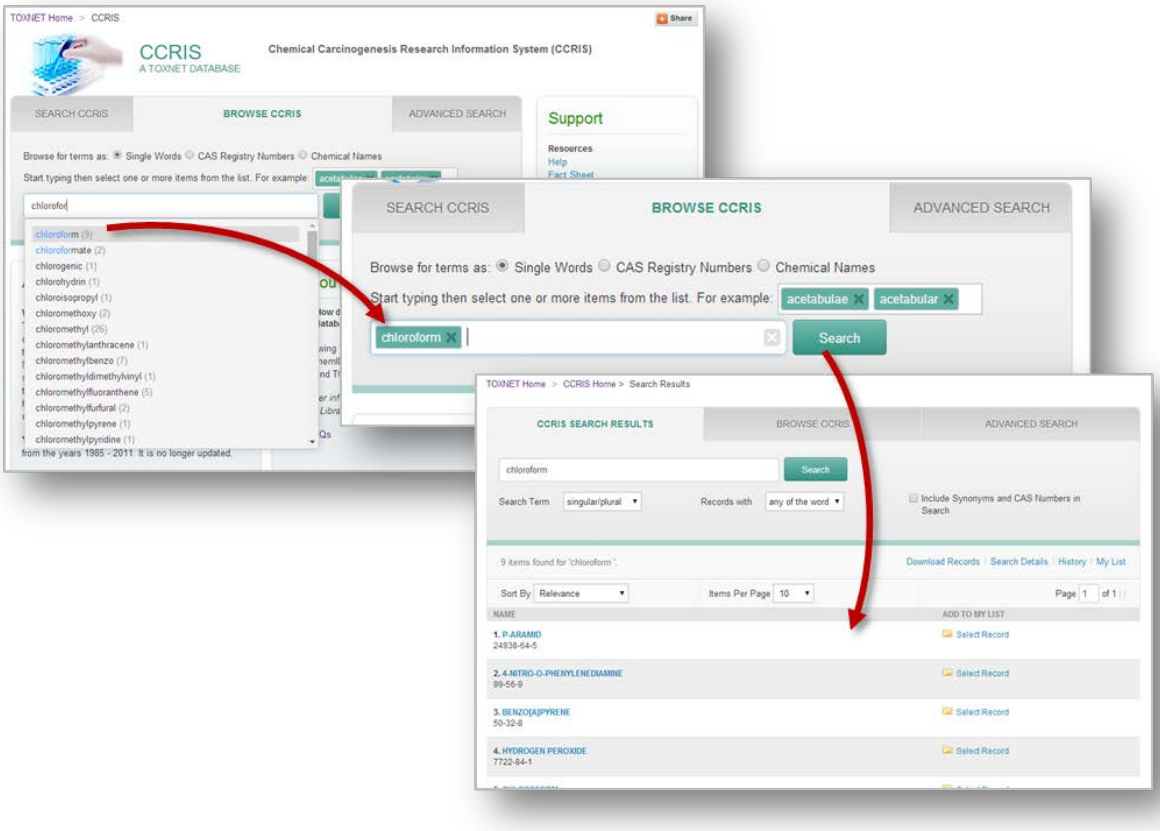
Search CCRIS by any combination of words, chemical names, and numbers, including Chemical Abstracts Service (CAS) Registry Numbers. By default, the system adds synonyms and CAS numbers to chemical searches.

Use truncation (*), Boolean operators (AND, OR, NOT), nested parentheses, limits, and index browsing to refine the search results.
Click the **Advanced Search** tab to search:

- Exact words, singular and plural forms, or word variants
- Records with the phrase, all words, or any words
- In specific fields or categories of fields, click the plus sign (+) to the left of a category to show all fields in that category. Use the **Expand all** link to expand all categories



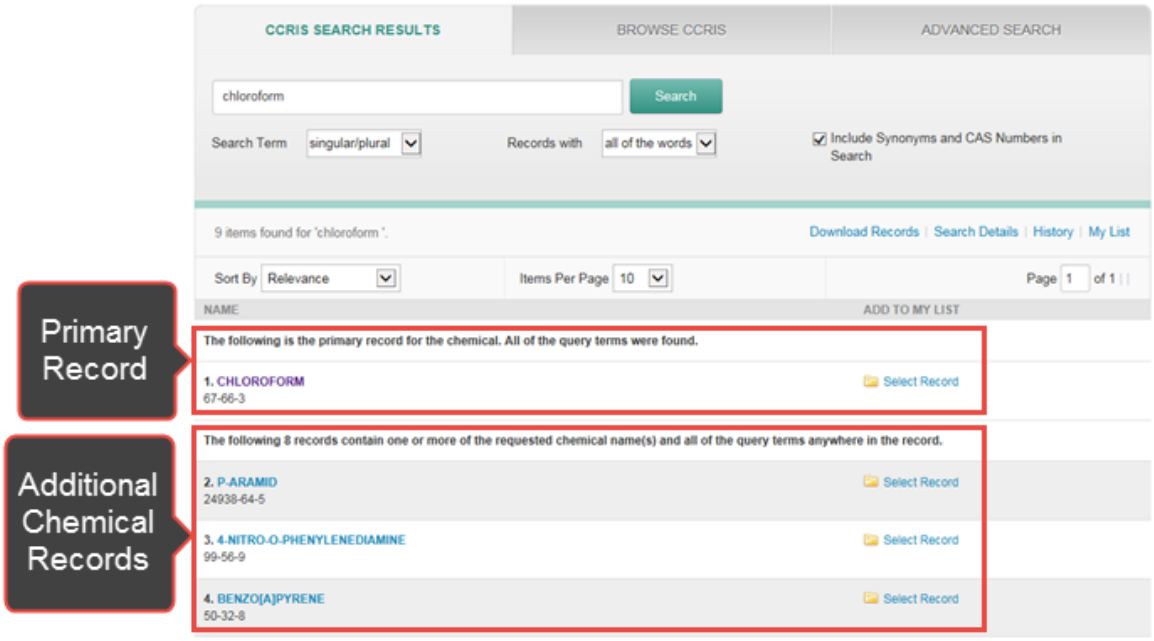
With the **Browse CCRIS** feature, the system returns a list of index terms related to the search term entered and the number of records containing that term. Select the record(s) to be viewed by clicking the appropriate term in the drop-down list and clicking **Search**.



Search Results

The initial retrieval is displayed as a list of substance names in blue and their CAS Registry Numbers. Substances are listed in **relevancy ranked order,** based on the number of individual search terms occurring in a document, the number of times each search term occurs in a document, the rarity of the search terms within the database, and the nearness of search terms to each other. Records containing combinations of search terms tend to be ranked higher than records with isolated occurrences of search terms. Click the substance name to retrieve the record for that substance.

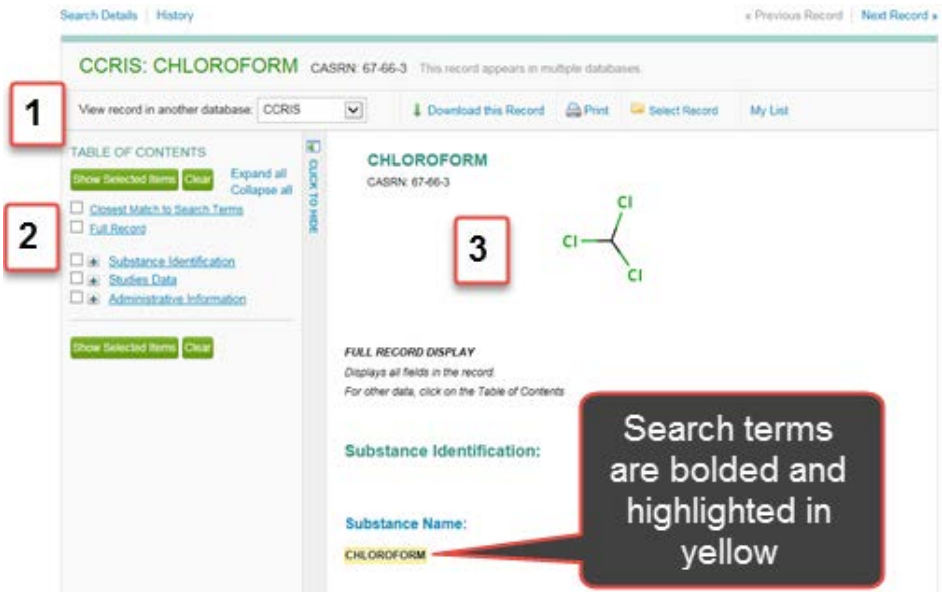
When searching for a chemical, the retrieval may include other chemical records in addition to the initial matching chemical record (the **Primary Record**). These additional records appear if they contain the chemical name or search term.



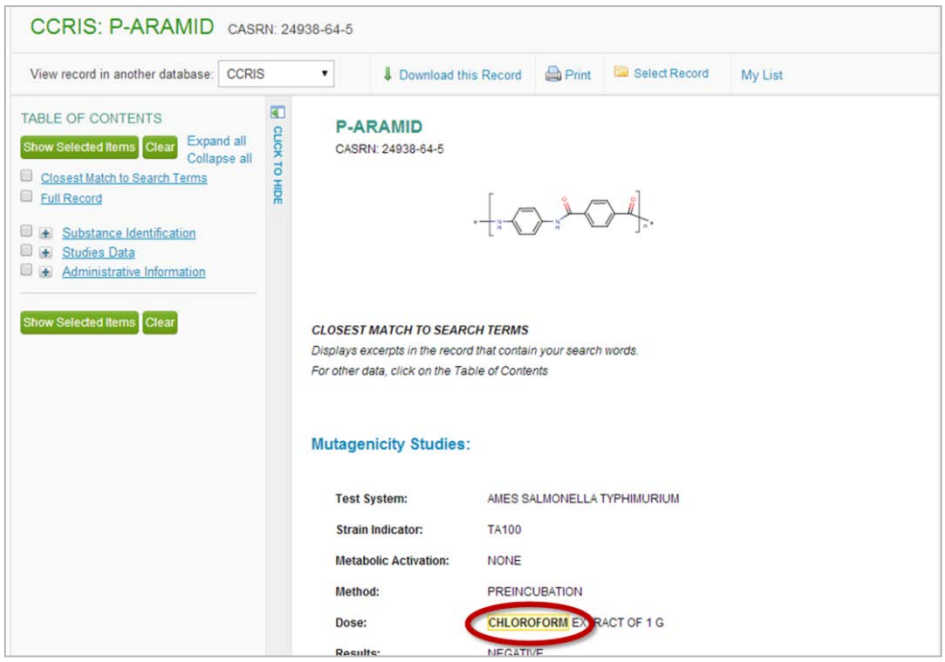
Click any of these non-primary chemicals on the **Search Results** screen to display the sections of the record best matching the query terms (**Closest Match to Search Terms**), those where the chemical search term(s) appears with greatest frequency. The search term(s) are bolded and highlighted in yellow.
The **Record** screen is organized into three sections:

1. Navigation buttons at the top of the record allow you to **View record in another database** (NLM databases), **Download Record**, **Print** the record, **Select Record** (adding it to your list), and view your list of selected records (**My List**).
2. A **Table of Contents** in the left frame allows users to choose categories and fields for display.
3. Chemical Data is shown in the right frame.

Primary Record



Additional Chemical Record



Additional Resources

For further information, review these additional resources:

- CCRIS Fact Sheet
  nlm.nih.gov/pubs/factsheets/ccrisfs.html
- TOXNET Help-CCRIS
  toxnet.nlm.nih.gov/help/CCRIShelp.htm

CCRIS Search Exercises

 Go to **toxnet.nlm.nih.gov.**

 Click **CCRIS**.

Exercise 1: Does the record for naphthalene contain any positive carcinogenicity studies? Does it contain any positive mutagenicity studies?

Suggested Solution:

Type	**naphthalene** in the Search box
Click	**Search**
Click	**NAPHTHALENE**
Click	the **+** next to **Studies Data** in the Table of Contents
Click	**Carcinogenicity Studies**
Review	the information retrieved in the right frame
Click	**Mutagenicity Studies** in the Table of Contents
Review	the information retrieved in the right frame
Click	**CCRIS Home** at the top left of the page to prepare for a new search

Exercise 2: Locate the mirex record and review the tumor promotion studies.

Suggested Solution:

Type	**mirex** in the Search box
Click	**Search**
Click	**MIREX**
Click	the **+** next to **Studies Data** in the Table of Contents
Click	**Tumor Promotion Studies** under Studies Data
Review	the information in the right frame
Click	**CCRIS Home** at the top left of the page to prepare for a new search

Exercise 3: Review the citral record for carcinogenicity data and any associated human health effects.

Suggested Solution:

Type	**citral** in the Search box
Click	**Search**
Click	**CITRAL**
Click	the **+** next to **Studies Data**
Click	**Carcinogenicity Studies**
Review	the information in the right frame
Select	**HSDB** from the **View record in another database** drop-down
Review	the information in the right frame
Click	**Return to CCRIS** at the top of the page
Click	**CCRIS Home** the top left of the page to prepare for a new search

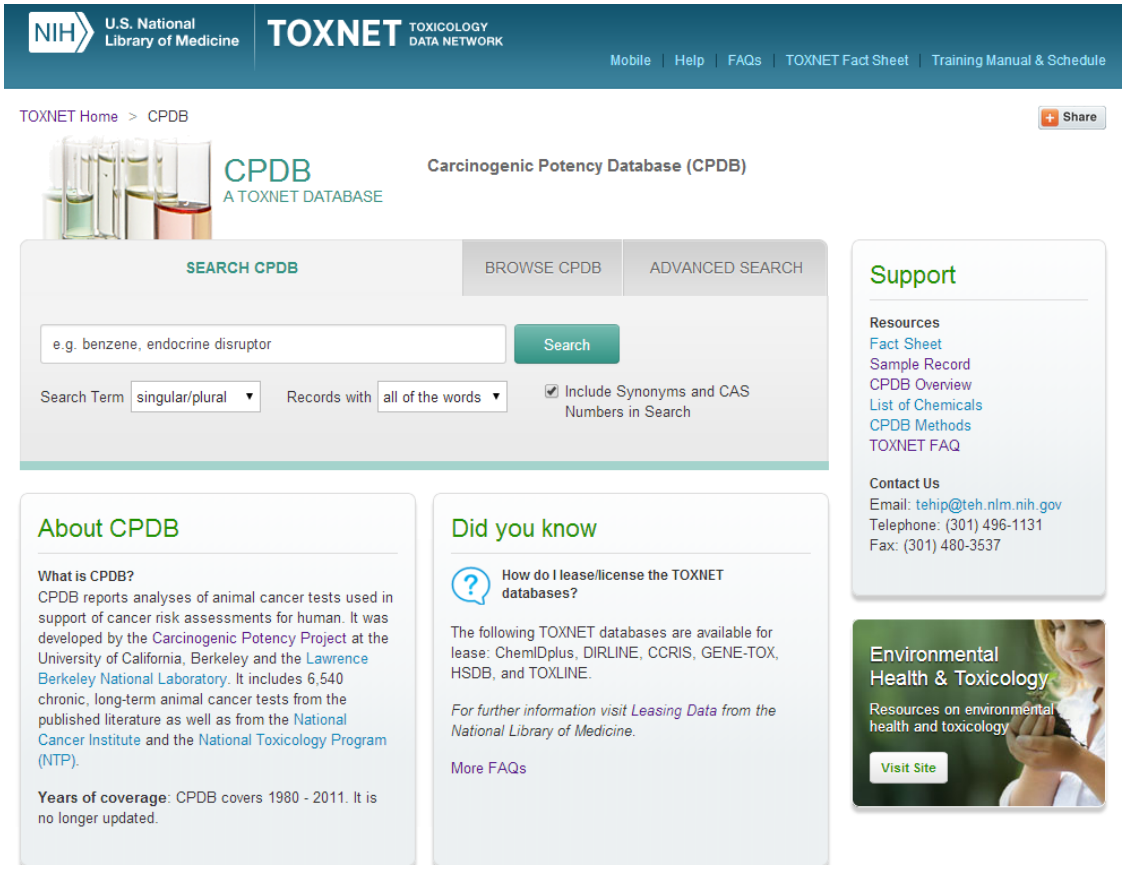
Exercise 4: How many substances are identified in CCRIS as positive for lung cancer?

Suggested Solution:

Type	**positive lung cancer** in the Search box
Click	**Search**
Click	chemical record(s) of choice
Review	the information in the right frame

Carcinogenic Potency Database (CPDB) – Archived and no longer updated

The **Carcinogenic Potency Database (CPDB)** covers 1980-2011 and is no longer updated. CPDB reports analyses of animal cancer tests used in support of cancer risk assessments for humans. It was developed by the Carcinogenic Potency Project at the University of California, Berkeley, and the Lawrence Berkeley National Laboratory. It includes 6,540 chronic, long-term animal cancer tests from the published literature as well as from the National Cancer Institute and the National Toxicology Program (NTP).



toxnet.nlm.nih.gov/newtoxnet/cpdb.htm

Searching CPDB

Search by chemical name or fragment, or Chemical Abstracts Service Registry Number. Results include a summary for each sex-species tested, including carcinogenicity, target organs, and carcinogenic potency values. Detailed results from each experiment on that particular chemical are given in a plot format suitable for screen viewing.

Additional Resources

For further information, review these additional resources:

- Carcinogenic Potency Database Fact Sheet
  nlm.nih.gov/pubs/factsheets/cpdbfs.html

CPDB Search Exercises

Go to **toxnet.nlm.nih.gov**.
Click **CPDB**.

Exercise 1: Use CPDB to research the rat and mice cancer data for limonene.

Suggested Solution:

Type	**limonene** in the Search field
Click	**Search**
Click	the **d-Limonene** link
	The record opens in the CPDB archival site
Locate	the rat and mouse cancer data summary

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Section 6: Genetics and Genomics

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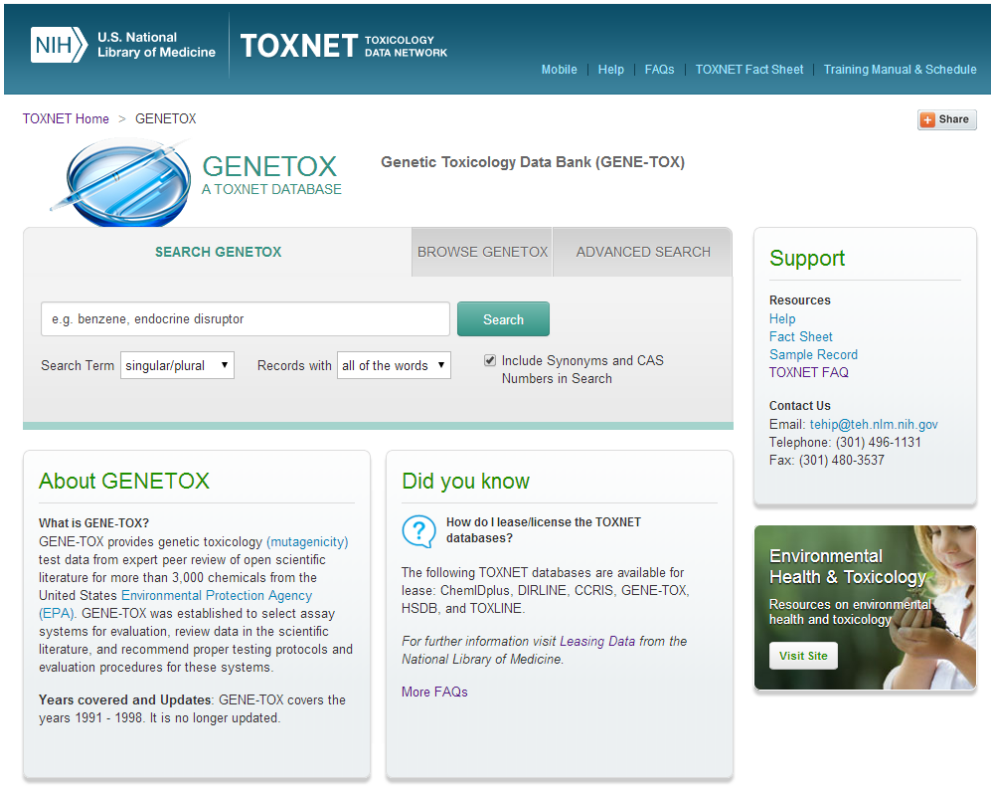
Genetic Toxicology Database (GENE-TOX) – Archived and no longer updated

GENE-TOX (Genetic Toxicology Database) covers the years 1991-1998 and is no longer updated. GENE-TOX is created by the US Environmental Protection Agency (EPA) and contains genetic toxicology (mutagenicity) test data, resulting from expert peer review of the open scientific literature, on more than 3,000 chemicals.



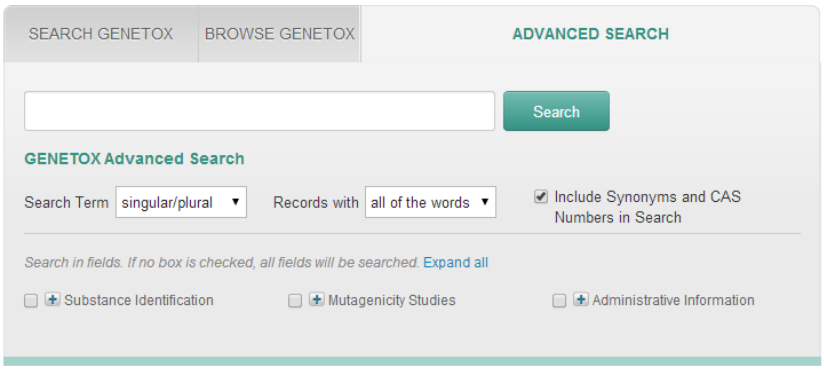
toxnet.nlm.nih.gov/newtoxnet/genetox.htm

Searching GENE-TOX

Search GENE-TOX by chemical or other name, chemical name fragment, Chemical Abstracts Service (CAS) Registry Number®, and/or subject terms. By default, the system adds synonyms and CAS numbers to chemical searches.

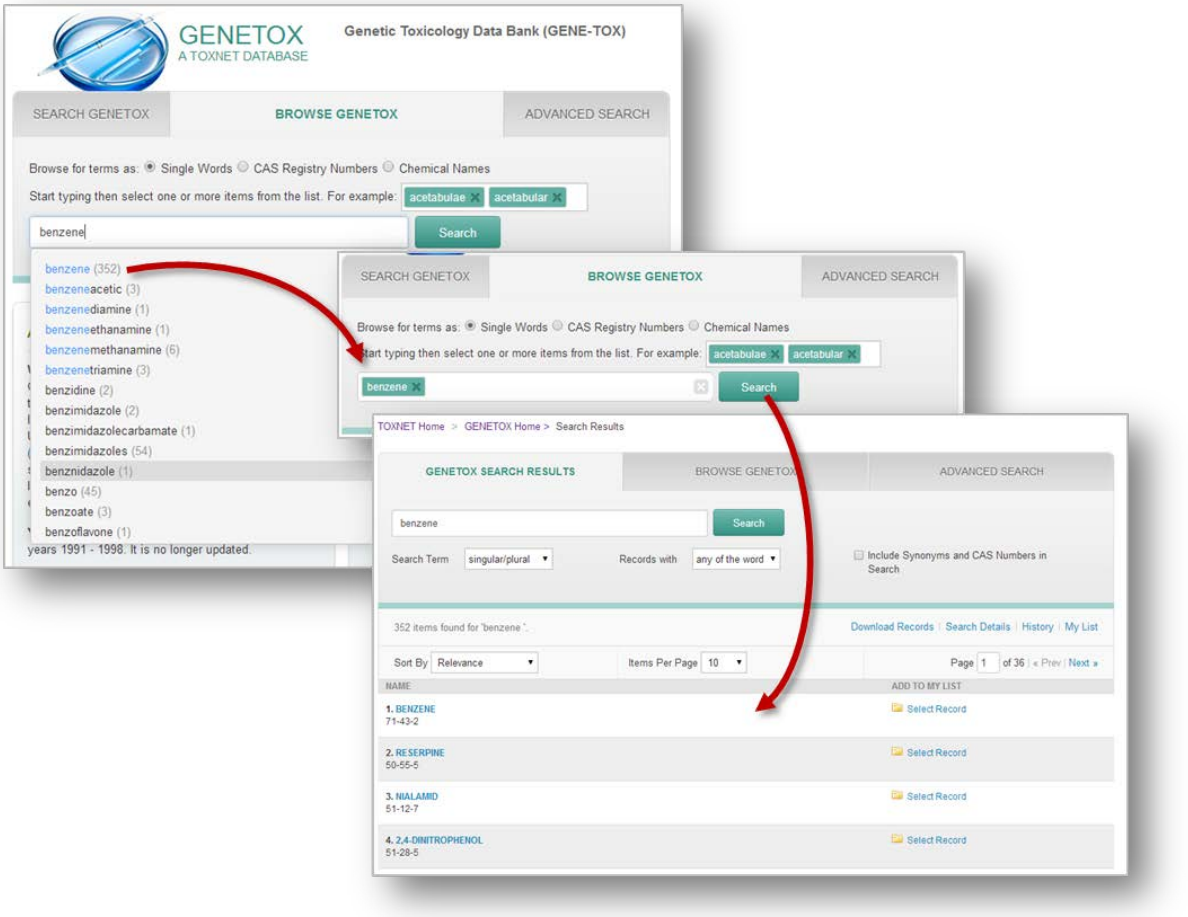
Use truncation (*), Boolean operators (AND, OR, NOT), nested parentheses, limits, and index browsing to refine the search results.

Click the **Advanced Search** tab to search:



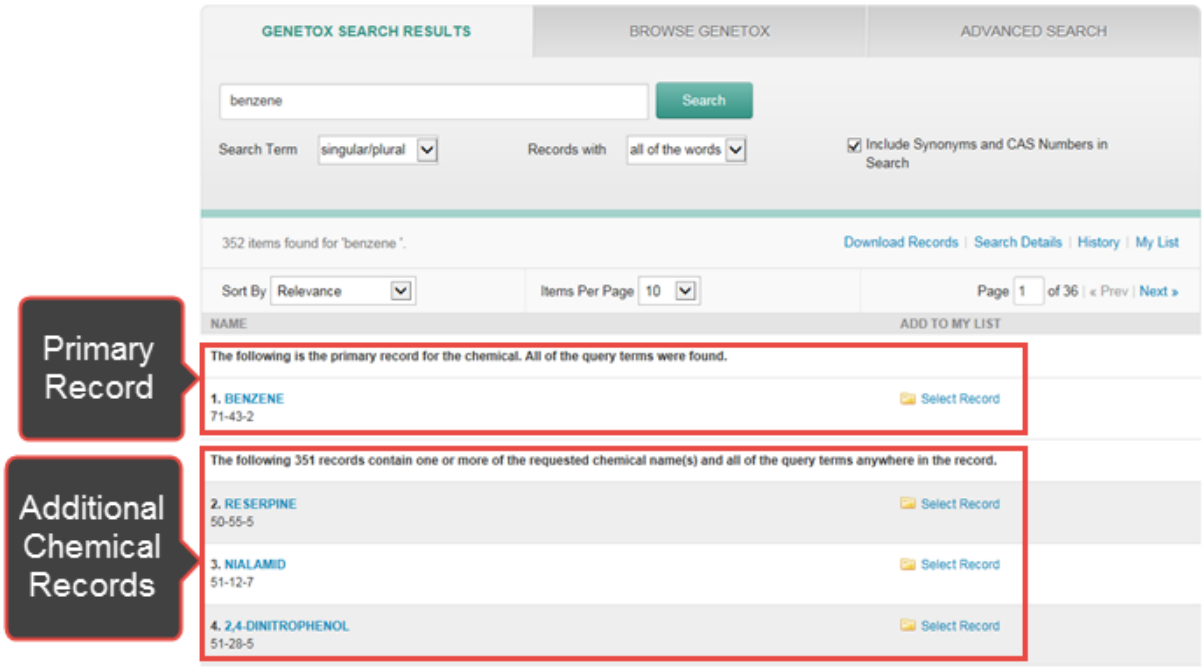
- Exact words, singular and plural forms, or word variants
- Records with the phrase, all words, or any words
- In specific fields or categories of fields, click the plus sign (+) to the left of a category to show all fields in that category. Use the **Expand all** link above the list to display all categories.

With the **Browse GENETOX** feature, the system returns a list of index terms related to the search term entered and the number of records containing that term. Select the record(s) to be viewed by clicking the appropriate term in the drop-down list and clicking **Search**.



Search Results

The initial retrieval is displayed as a list of substance names in blue and their CAS Registry Numbers. Substances are listed in relevancy ranked order. Relevancy ranking is based on the number of individual search terms occurring in a document, the number of times each search term occurs in a document, the rarity of the search terms within the database, and the nearness of search terms to each other. Records containing combinations of search terms tend to be ranked higher than records with isolated occurrences of search terms. When searching for a chemical, the retrieval may include other chemical records in addition to the initial matching chemical record (the **Primary Record**).



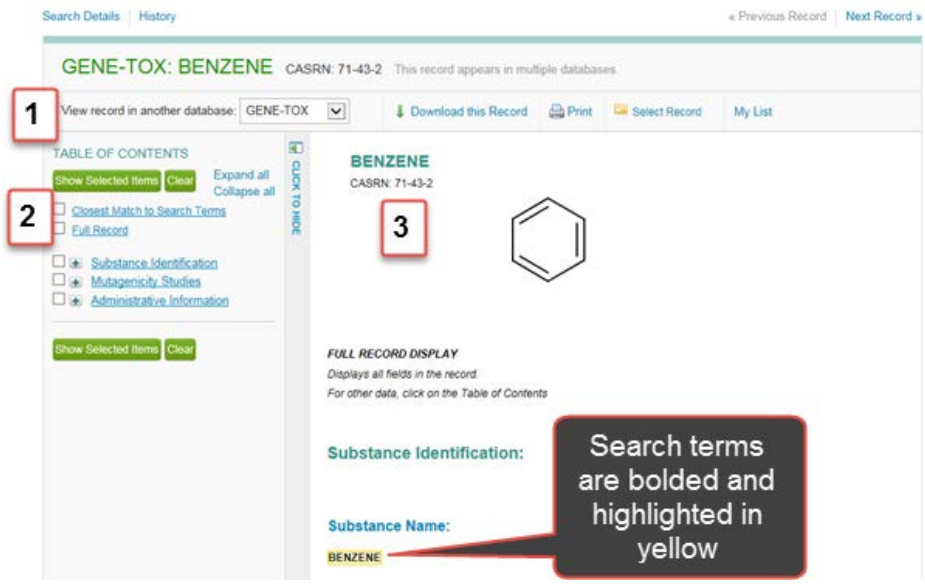
These additional records appear if they contain the chemical name or search term. Click any of these non-primary chemicals on the **Search Results** screen to display the sections of the record best matching the query term(s) (**Closest Match to Search Terms**), those where the chemical search term(s) appear with greatest frequency. The search term(s) are bolded and highlighted in yellow.
The **Record** screen is organized into three sections:

1. Navigation options at the top of the record allow you to **View record in another database** (NLM databases), **Download Record**, **Print** the record, **Select Record** (adding it to your list), and view your list of selected records (**My List**).

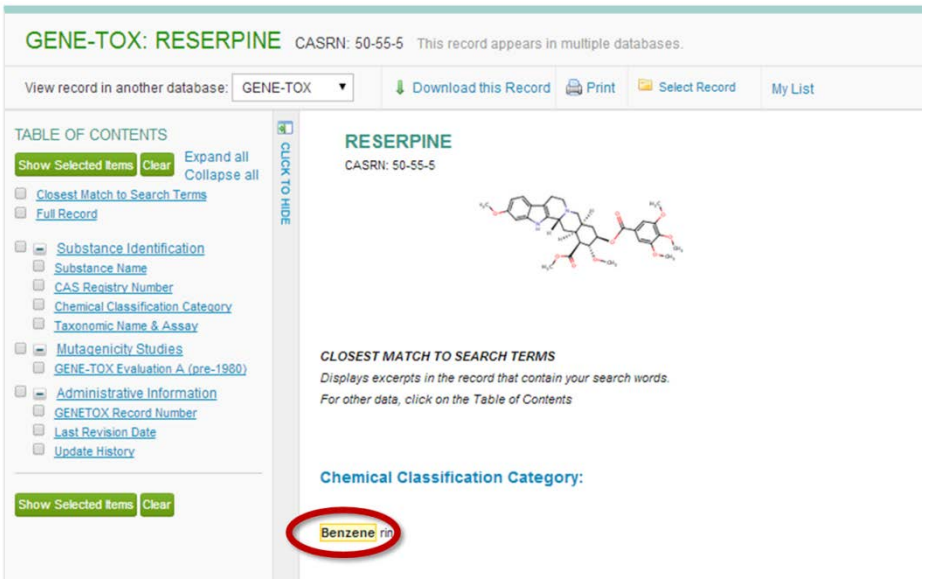
2. A **Table of Contents** in the left frame allows users to choose categories and fields for display.

3. Chemical Data is shown in the right frame.

Primary Record



Additional Chemical Record



Additional Resources

For further information, review these additional resources:

- GENE-TOX Fact Sheet
  nlm.nih.gov/pubs/factsheets/genetxfs.html
- TOXNET Help- GENE-TOX
  toxnet.nlm.nih.gov/help/GENETOXhelp.htm

GENE-TOX Search Exercises

 Go to **toxnet.nlm.nih.gov**.

 Click **GENE-TOX**.

Exercise 1: Using the CAS Registry Number 108-95-2, identify the chemical it represents. Review the mutagenicity studies panel report.

Suggested Solution:

Type	**108-95-2** in the Search box
Click	**Search**
Click	**PHENOL**
Click	**Mutagenicity Studies** in the Table of Contents
Review	the information retrieved in the right frame
Click	the link for the Panel Report of choice to view the abstract
Review	the abstract
Click	the browser's **Back** button to return to the GENE-TOX record
Click	**GENE-TOX Home** at the top of the page to prepare for the next search

Exercise 2: Has cyclophosphamide been studied for effects on human male fertility and sterility?

Suggested Solution:

Type	**cyclophosphamide human male fertility** in the Search box
Click	**Search**
Click	**CYCLOPHOSPHAMIDE**
Click	the **Closest Match to Search Terms** link in the Table of Contents
Click	**GENE-TOX Home** at the top of the page to prepare for the next search

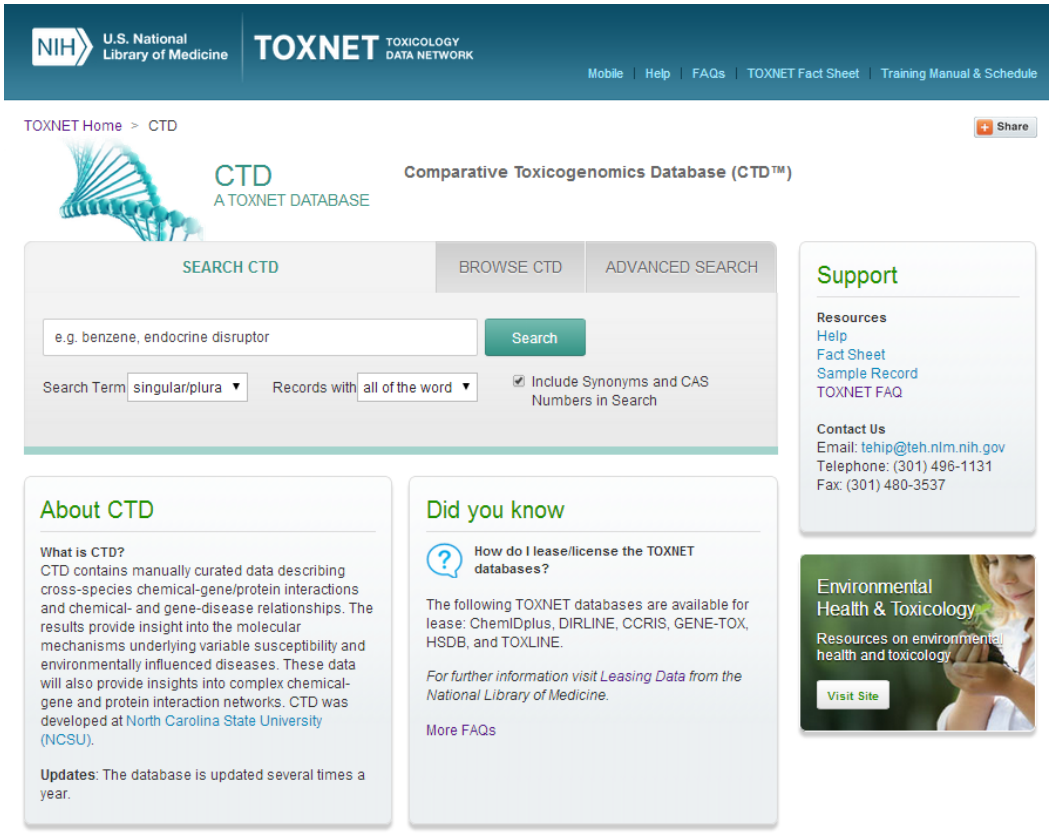
Exercise 3: Search GENE-TOX for mutagenicity study results for caffeine. How do study results compare with results in CCRIS?

Suggested Solution:

Type	**caffeine** in the Search box
Click	**Search**
Click	**Mutagenicity Studies** in the Table of Contents
Review	the information retrieved in the right frame
Select	**CCRIS** from the **View record in another database** dropdown
Click	the **+** next to **Studies Data** in the Table of Contents
Click	**Mutagenicity Studies**
Review	the information in the right frame
Click	**Return to GENE-TOX** at the top of the page to return to the GENE-TOX record

Comparative Toxicogenomics Database (CTD)

CTD (Comparative Toxicogenomics Database) contains manually curated data describing cross-species chemical-gene/protein interactions and chemical- and gene-disease relationships. The results provide insight into the molecular mechanisms underlying variable susceptibility and environmentally influenced diseases. These data will also provide insights into complex chemical-gene and protein interaction networks. CTD was developed at North Carolina State University. The database is updated several times a year.



toxnet.nlm.nih.gov/newtoxnet/ctd.htm

Searching CTD

In TOXNET, users can search CTD by chemical or other name, diseases, Chemical Abstracts Service Registry Number, genes, GO terms, organisms, pathways, and references.

Use truncation (asterisks: *), Boolean operators (AND, OR, NOT), and index browsing to refine the search results. Users can then be taken via the TOXNET's CTD results to the complete CTD site for further details.

Users can perform several types of searches, for example:

- Browse relationships among chemicals, and obtain detailed information about them, including structure, toxicology data and related genes, diseases, pathways and references.
- Browse relationships among diseases, and obtain detailed information about them, including related chemicals, genes, pathways, and references.
- Browse for genes from diverse vertebrates and invertebrates by symbol, synonym, accession ID, organism taxon, chemical, interaction type, disease or Gene Ontology annotation.
- Search for cross-species chemical–gene and protein interactions curated from the published literature. Interactions may be retrieved by chemical, interaction type, gene, organism or Gene Ontology annotation. Search for references by gene, organism taxon, chemical, chemical–gene interaction type, disease, citation information or accession ID.

Users can also easily conduct their CTD search strategy against other databases (e.g., Hazardous Substances Data Bank®, TOXLINE®, and ChemIDplus®).

Additional Resources

For further information, review these additional resources:

- CTD Resource Guide
  ctdbase.org/documents/ctd_resource_guide.pdf
- Glossary
  ctdbase.org/help/glossary.jsp
- Tutorials
  ctdbase.org/help/tutorials.jsp
- CTD – Users E-mail List
  ctdbase.org/help/emailListHelp.jsp
- Frequently Asked Questions
  ctdbase.org/help/faq/
- CTD Fact Sheet
  nlm.nih.gov/pubs/factsheets/ctdfs.html

CTD Search Exercises

Go to **toxnet.nlm.nih.gov**.
Click **CTD**.

Exercise 1: What are the related genes and related diseases for acetone? Use CTD to find this information. Then, open the record in the main CTD database.

Suggested Solution:

Type	**acetone** in the Search field
Click	**Search**
Click	**Acetone** to view the record
Click	the **+** next to **Genetic Information** in the Table of Contents
Select	**Related Genes** in the Table of Contents
Review	the information about related genes
Click	the **+** next to **Disease Information** in the Table of Contents
Select	**Related Diseases** in the Table of Contents
Review	the information about related diseases
Click	the **CTD** logo (ctd™) in the upper right corner of the record display.
	The main CTD record opens in a new tab.
Review	the CTD record.
Close	the CTD tab to return to TOXNET.
Click	**CTD Home** in the upper left area of the page to prepare for the next scenario.

Scenario 1 – Disease Information

A researcher in occupational health is investigating the connections between exposure to the industrial chemical, trichloroethylene (TCE), and the later development of liver cancer. She is most interested in the connections between chemical exposure, genes, and disease.

Search CTD to determine if TCE is associated with liver tumors in humans: Locate the TCE record in CTD. Open the CTD record. Find examples of liver tumors that have been inferred with TCE. What is the level of inference that has been reported for TCE and liver tumors?

Suggested Solution:

Type	**TCE** in the Search box
Click	**Search**
Click	**Trichloroethylene** in the search results list
Click	on the **Disease Information** section in the Table of Contents
Scroll	to **Disease: Carcinoma, Hepatocellular**
	The inference score reflects the degree of similarity between CTD chemical-gene-disease networks and a similar scale-free random network. The higher the score, the more likely the inference network has atypical connectivity.
View	the **Inference Score** for the gene named ABCB1: 38.83

Section 7: Risk Assessment

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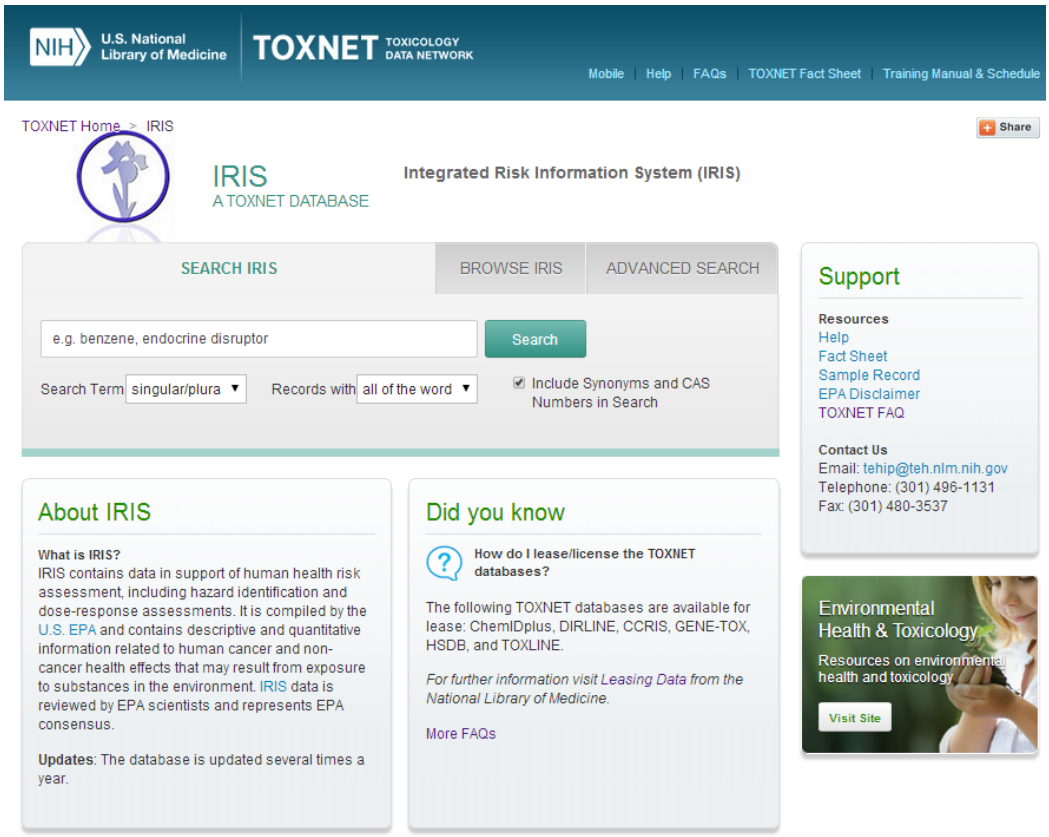
Integrated Risk Information System (IRIS)

IRIS (Integrated Risk Information System) contains data for more than 500 chemicals, compiled by the US Environmental Protection Agency (EPA), in support of human health risk assessment. Overall, IRIS focuses on the human health effects that may result from exposure to various substances found in the environment with data on hazard identification and dose-response assessments.



toxnet.nlm.nih.gov/newtoxnet/iris.htm

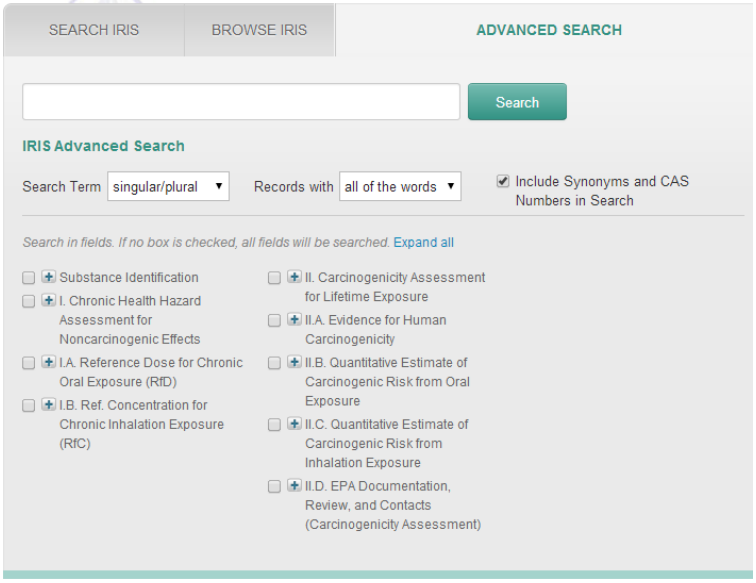
Searching IRIS

Search IRIS by chemical or other name, chemical name fragment, Chemical Abstracts Service (CAS) Registry Number, and/or subject terms. Search results, displayed in relevancy ranked order, can easily be viewed, printed, or downloaded.

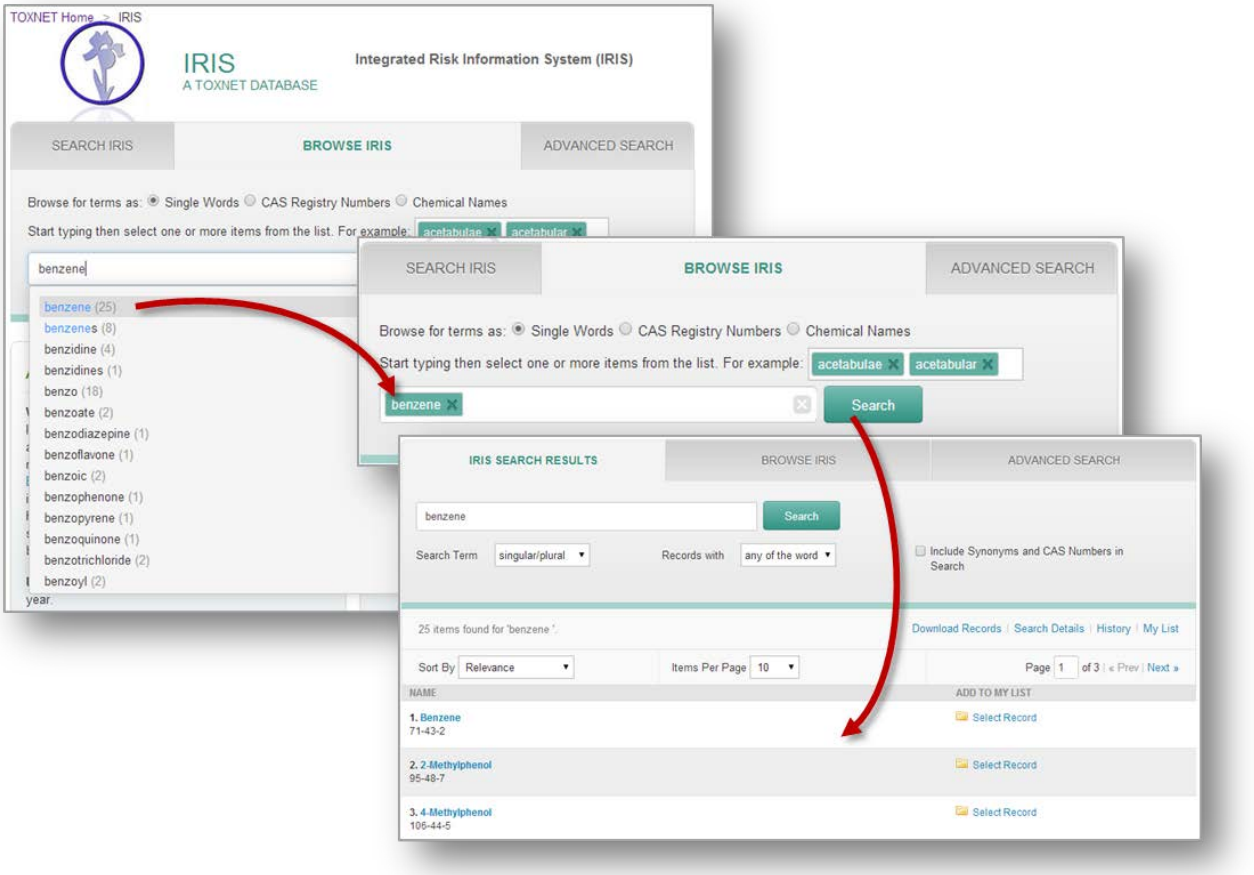
Use truncation (*), Boolean operators (AND, OR, NOT), phrase searching, nested parentheses, limits, and index browsing to refine the search results.

Click the **Advanced Search** tab to search:

- Exact words, singular and plural forms, or word variants
- Records with the phrase, all words, or any words
- In specific fields or categories of fields, click the plus sign (+) to the left of a category to show all fields in that category. Use the **Expand all** link to display all available categories.

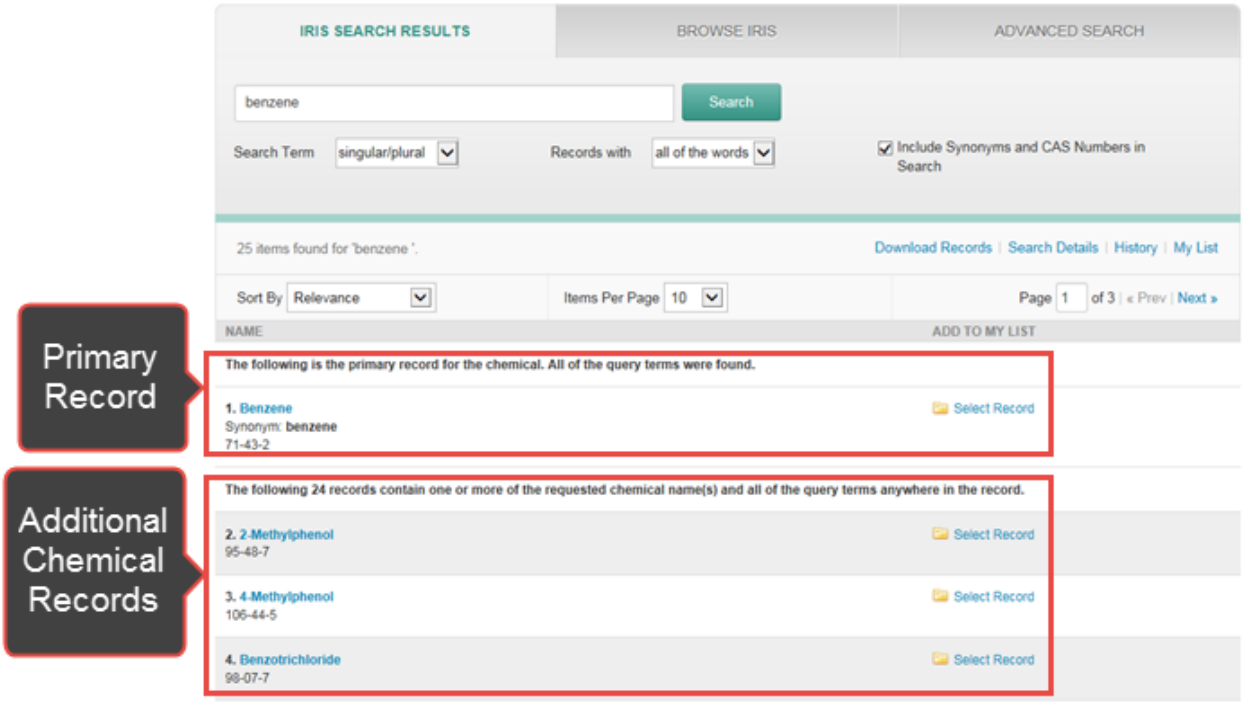


With the **Browse IRIS** tab, the system returns a list of index terms related to the search term entered. Select one or more index terms and click the **Search** button for the search results.



Search Results

Search results are relevancy ranked. Relevancy ranking is based on the number of individual search terms occurring in a document, the number of times each search term occurs in a document, the rarity of the search terms within the database, and the nearness of search terms to each other. Records containing combinations of search terms tend to be ranked higher than records with isolated occurrences of search terms. When searching for a chemical, the retrieval may include other chemical records in addition to the initial matching chemical record (the **Primary Record**).



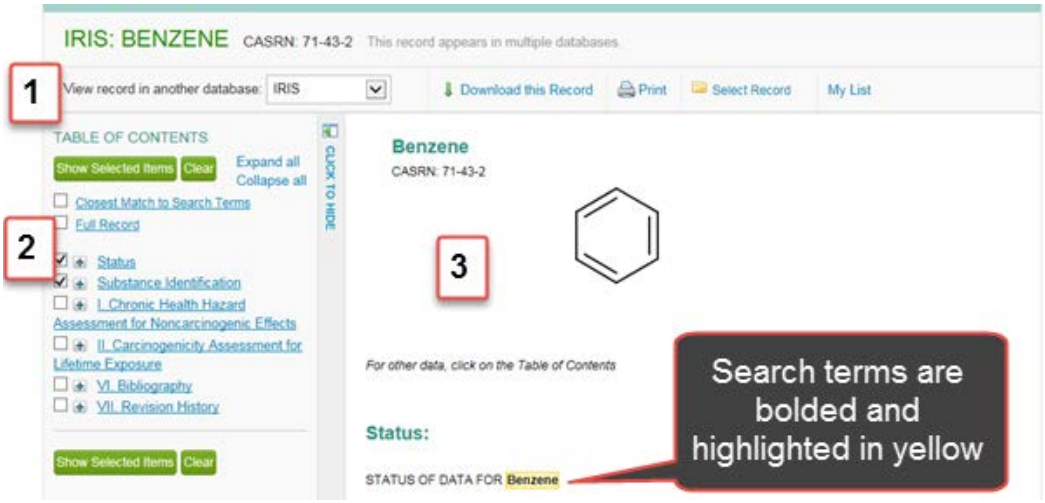
These additional records appear if they contain the chemical name or search term. Click any of these non-primary chemicals on the **Search Results** screen to display the **Closest Match to Search Terms**, those where the chemical search term(s) appear with greatest frequency. The search term(s) are bolded and highlighted in yellow. The **Record** screen is organized into three sections:

1. Navigation options at the top of the record allow you to **View record in another database** (NLM databases), **Download Record**, **Print** the record, **Select Record** (adding it to your list), and view your list of selected records (**My List**).

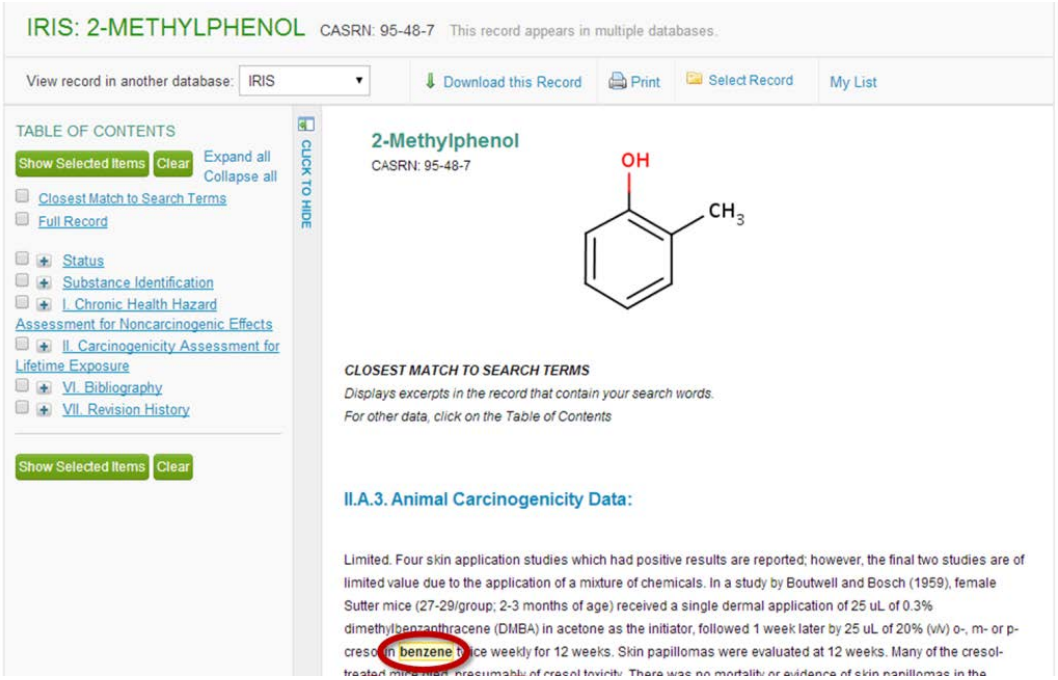
2. A **Table of Contents** in the left frame allows users to choose categories and fields for display.

3. Chemical Data is shown in the right frame.

Primary Record



Additional Chemical Record



Additional Resources

For further information, review these additional resources:

- IRIS Fact Sheet
  nlm.nih.gov/pubs/factsheets/irisfs.html
- EPA IRIS Web Site
  epa.gov/NCEA/iris
- TOXNET® Help Text - IRIS
  toxnet.nlm.nih.gov/help/IRIShelp.htm

IRIS Search Exercises

Go to **toxnet.nlm.nih.gov**.

Click **IRIS**.

Exercise 1: What is the NOAEL (No Observed Adverse Effect Level) for significant proteinuria from cadmium?

Suggested Solution:

Type	**cadmium proteinuria** in the Search box
Click	**Search**
Click	**Cadmium**
Click	**Closest Match to Search Terms** in the Table of Contents
Review	the information in the right frame
Click	**IRIS Home** at the top left to prepare for the next search

Exercise 2: What is the Inhalation Reference Concentration (RfC) of ammonia? (Note: The RfC is a non-carcinogenic risk assessment parameter). Also, view the Download options available.

Suggested Solution:

Type	**ammonia** in the Search box
Click	**Search**
Click	**Ammonia**
Scroll	down and review the **I.B. Reference Concentration for Chronic Inhalation Exposure (RfC)** information
Click	**I. Chronic Health Hazard Assessment for Noncarcinogenic Effects** in the Table of Contents
Click	**Download this Record** at the top of the page
Review	the Custom Formats
Close	Custom Formats window
Click	**IRIS Home** in the upper left to prepare for the next search

Exercise 3: How does the US Environmental Protection Agency (EPA) characterize the carcinogenicity of methylmercury?

Suggested Solution:

Type	**methylmercury** in the Search box
Click	**Search**
Click	**Methylmercury (MeHg)**
Click	**II. Carcinogenicity Assessment for Lifetime Exposure** in the Table of Contents
Scroll	down to the **II.A. Evidence for Human Carcinogenicity** section
Review	the information retrieved
Click	**IRIS Home** in the upper left to prepare for the next search

Exercise 4: What is the Inhalation BMC (Benchmark Concentration) for n-hexane?

Suggested Solution:

Type	**n-hexane** in the Search box
Click	**Search**
Click	**n-Hexane**
Click	the **+** next to **I. Chronic Health Hazard Assessment for Noncarcinogenic Effects** in the Table of Contents
Click	**I.B.1. Inhalation RfC Summary**
Review	the information retrieved
Click	**IRIS Home** in the upper left to prepare for the next search

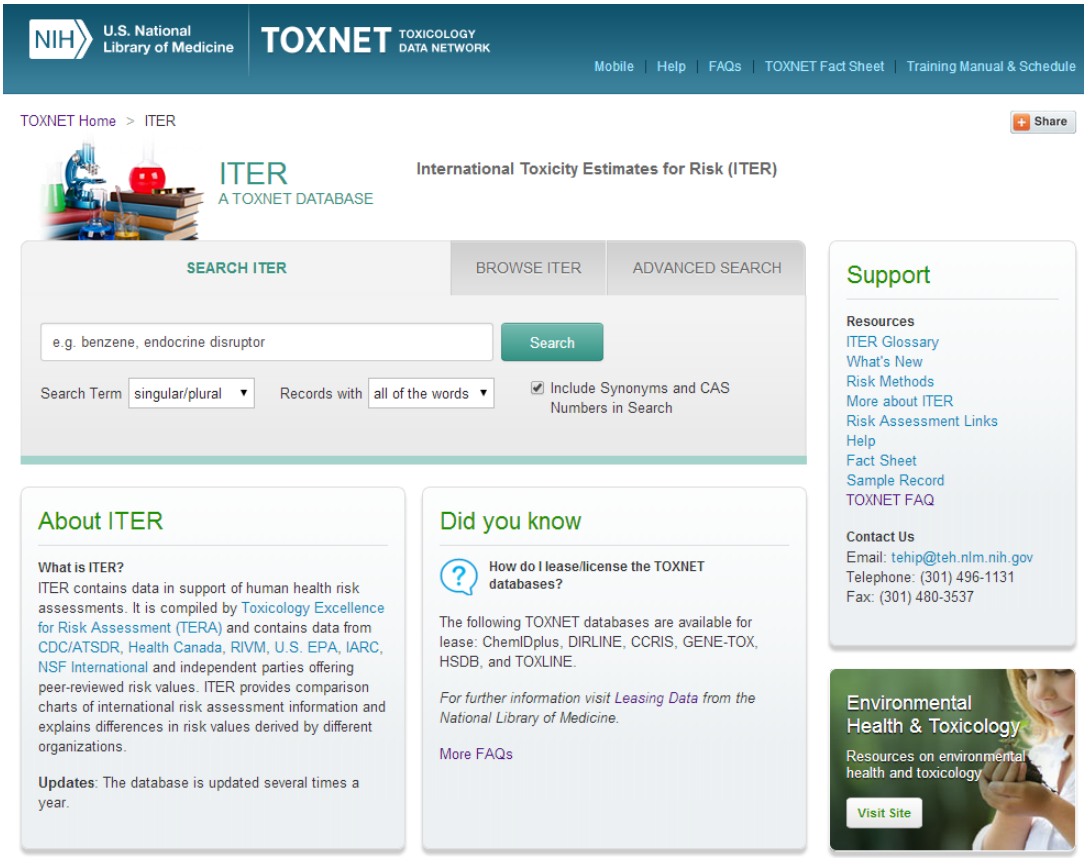
Exercise 5: Review the carcinogenicity assessment documentation listed for boron.

Suggested Solution:

Type	**boron** in the Search box
Click	**Search**
Click	**II. Carcinogenicity Assessment for Lifetime Exposure** in the Table of Contents
Review	the information retrieved

International Toxicity Estimates for Risk (ITER)

ITER (International Toxicity Estimates for Risk) contains data in support of human health risk assessments. Compiled by Toxicology Excellence for Risk Assessment, ITER is a small database with data on more than 600 chemical records. It is structured to provide a comparison of international risk assessment information in a side-by-side format and explains differences in risk values derived by different organizations.



toxnet.nlm.nih.gov/newtoxnet/iter.htm

ITER provides risk data and cancer classifications. Information is derived from:

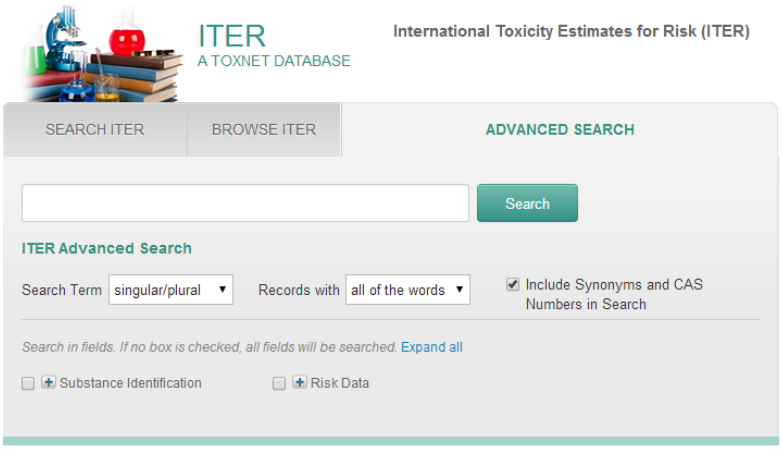
- Agency for Toxic Substances & Disease Registry (ATSDR)
- Health Canada
- US Environmental Protection Agency (EPA)
- International Agency for Research on Cancer (IARC)
- NSF International (National Sanitation Foundation)
- National Institute of Public Health & the Environmental (RIVM), The Netherlands

Searching ITER

Search ITER by chemical or other name, chemical name fragment, Chemical Abstracts Service (CAS) Registry Number, and/or subject terms. By default, the system adds synonyms and CAS numbers to chemical searches.

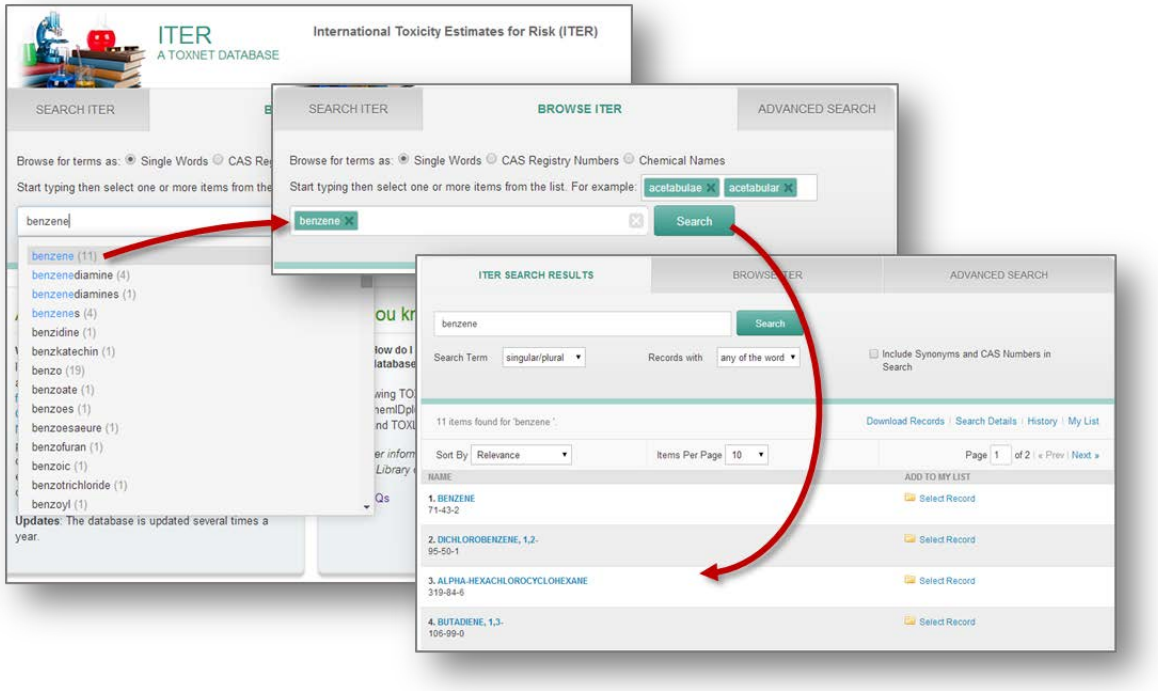
Use truncation (*), Boolean operators (AND, OR, NOT), nested parentheses, limits, and index browsing to refine the search results.

Click the **Advanced Search** tab to search:



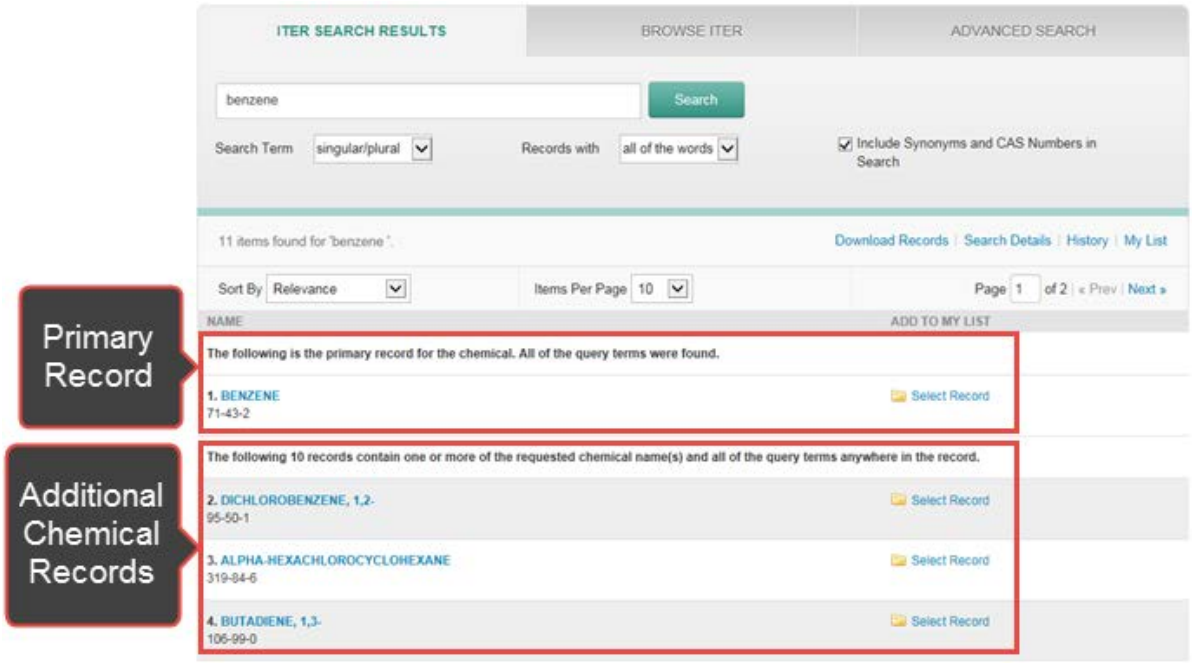
- Exact words, singular and plural forms, or word variants
- Records with the phrase, all words, or any words
- In specific fields or categories of fields, click the plus sign (+) to the left of a category to show all fields in that category. Use the **Expand all** link to display all categories.

With the **Browse ITER** feature, the system returns a list of index terms related to the search term entered. Select one or more index terms and click the **Search** button for the search results.



Search Results

The initial retrieval is displayed as a list of substance names highlighted in blue and their CAS Registry Numbers. Substances are listed in relevancy ranked order. Relevancy ranking is based on the number of individual search terms occurring in a document, the number of times each search term occurs in a document, the rarity of the search terms within the database, and the nearness of search terms to each other. Records containing combinations of search terms tend to be ranked higher than records with isolated occurrences of search terms. When searching for a chemical, the retrieval may include other chemical records in addition to the initial matching chemical record (the **Primary Record**).



These additional records appear if they contain the chemical name or search term. Click any of these non-primary chemicals on the **Search Results** screen to display the sections of the record best matching the query terms (**Closest Match to Search Terms**), those where the chemical search term(s) appear with greatest frequency. The search term(s) are bolded and highlighted in yellow.

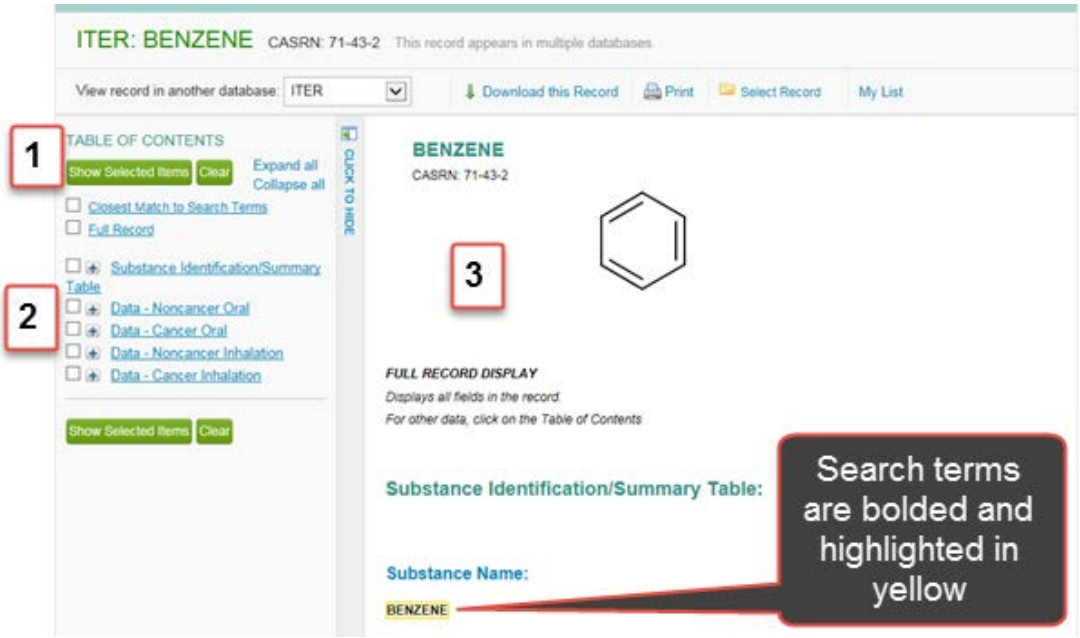
The **Record** screen is organized into three sections:

1. Navigation options at the top of the record allow you to **View record in another database** (NLM databases), **Download Record**, **Print** the record, **Select Record** (adding it to your list), and view your list of selected records (**My List**).

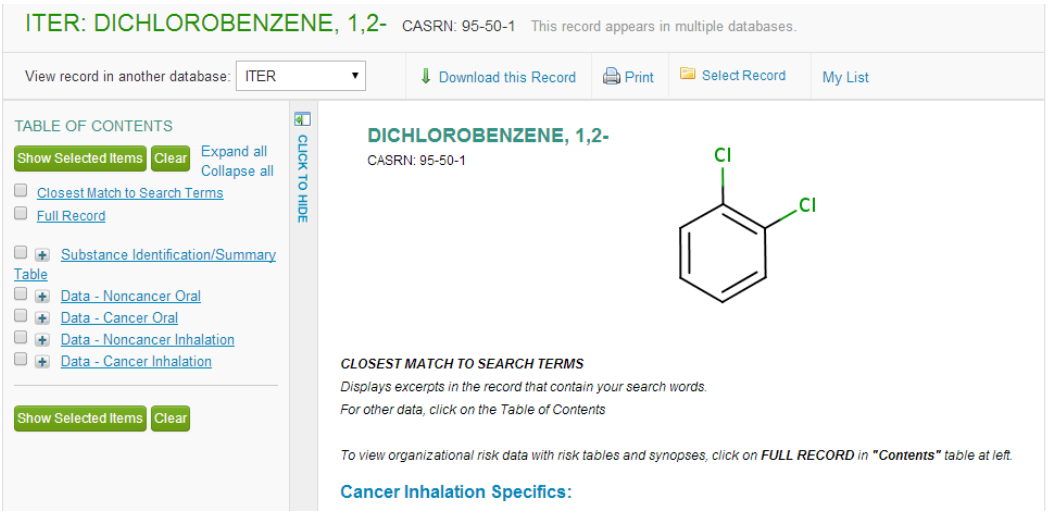
2. A **Table of Contents** in the left frame allows users to choose categories and fields for display.

3. Chemical Data is shown in the right frame.

Primary Record



Additional Chemical Record



Additional Resources

For further information, review these additional resources:

- ITER Fact Sheet
  nlm.nih.gov/pubs/factsheets/toxnetfs.html
- TOXNET Help Text – ITER
  toxnet.nlm.nih.gov/help/ITERhelp.htm
- What's New
  tera.org/iter

ITER Search Exercises

Go to **toxnet.nlm.nih.gov.**

Click **ITER**.

Exercise 1: Do ATSDR and US EPA currently have any noncancer oral risk data for the chemical acetone?

Suggested Solution:

Type	**acetone** in the Search box
Click	**Search**
Click	**ACETONE**
Click	the **+** next to **Data - Noncancer Oral** in the Table of Contents
Click	**Noncancer Oral Risk Values Table** in the Table of Contents
Review	the information in the right frame
Click	the **+** next to **Data - Cancer Oral** in the Table of Contents
Click	**Cancer Oral Risk Values Table** in the Table of Contents
Review	the information in the right frame
Click	**ITER Home** in the upper left to prepare for the next search

Exercise 2: How many international agencies have classified dichloroacetic acid as carcinogenic to humans?

Suggested Solution:

Type	**dichloroacetic acid** in the Search box
Click	**Search**
Click	**DICHLOROACETIC ACID**
Review	the information displayed (the full record is shown by default)
Click	**ITER Home** in the upper left to prepare for the next search

Exercise 3: How do the Dutch RIVM, Health Canada, and ATSDR compare in their noncancer inhalation risk values for nickel oxide?

Suggested Solution:

Type	**nickel oxide** in the Search box
Click	**Search**
Click	**NICKEL OXIDE**
Click	the **+** next to **Data - Noncancer Inhalation** in the Table of Contents
Click	**Noncancer Inhalation Risk Values Table** in the Table of Contents
Review	the **Noncancer Inhalation Risk Values Table**

Section 8: Environmental Health

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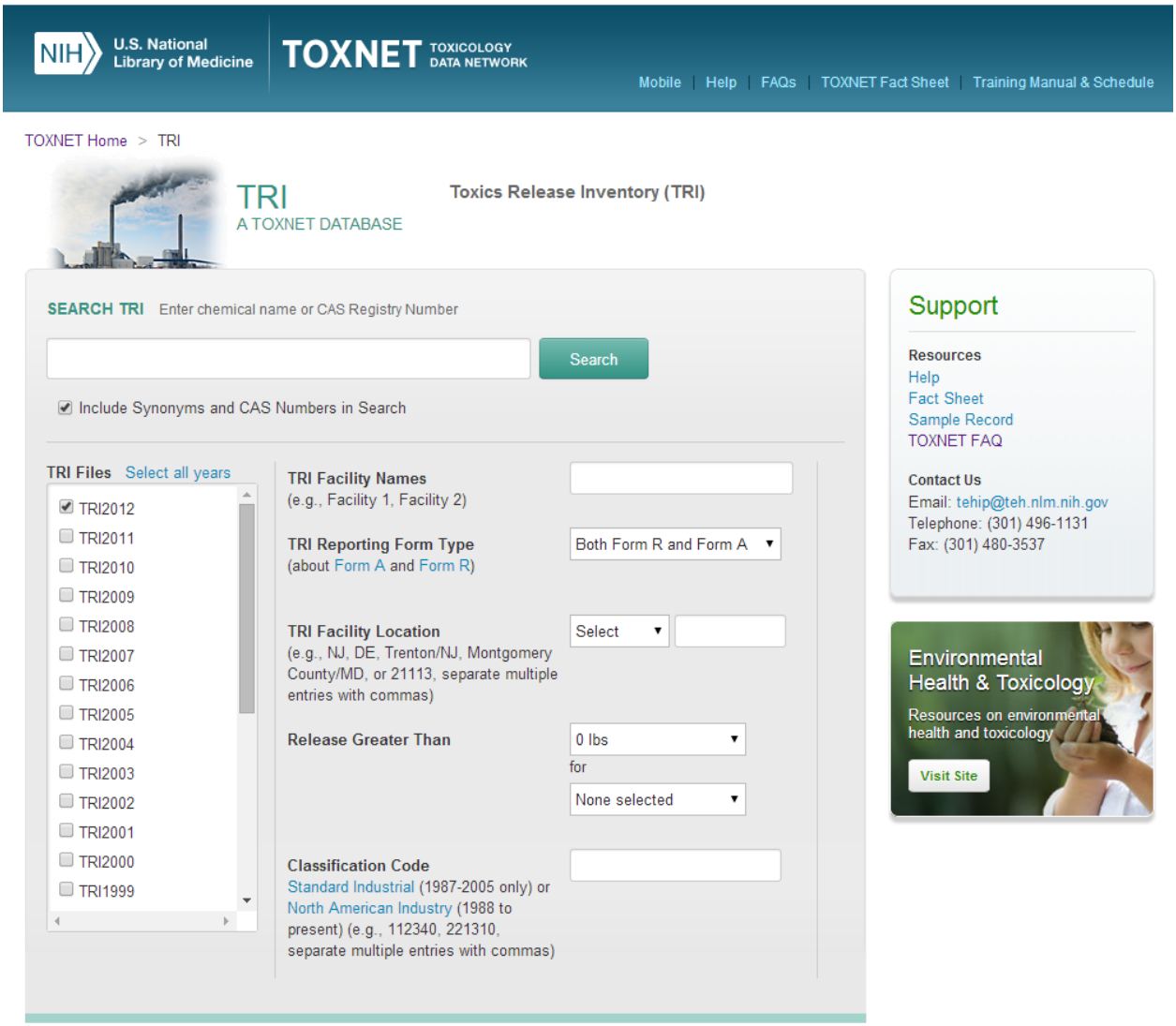
Toxics Release Inventory (TRI)

TRI (Toxics Release Inventory) is a publicly available resource of the US Environmental Protection Agency (EPA). It contains detailed information on more than 650 chemicals and chemical categories, which more than 23,000 US industrial and Federal facilities manage through disposal or other releases, recycling, energy recovery, or treatment. This inventory was established under the Emergency Planning and Community Right to Know Act of 1986 (EPCRA) and was expanded by the Pollution Prevention Act of 1990. TRI's data, beginning with the 1987 reporting year, cover air, water, land, and underground injection releases as well as transfers to waste sites.

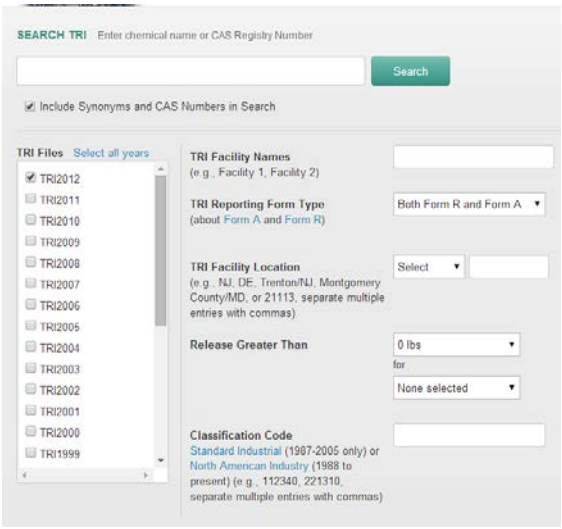


toxnet.nlm.nih.gov/newtoxnet/tri.htm

Searching TRI

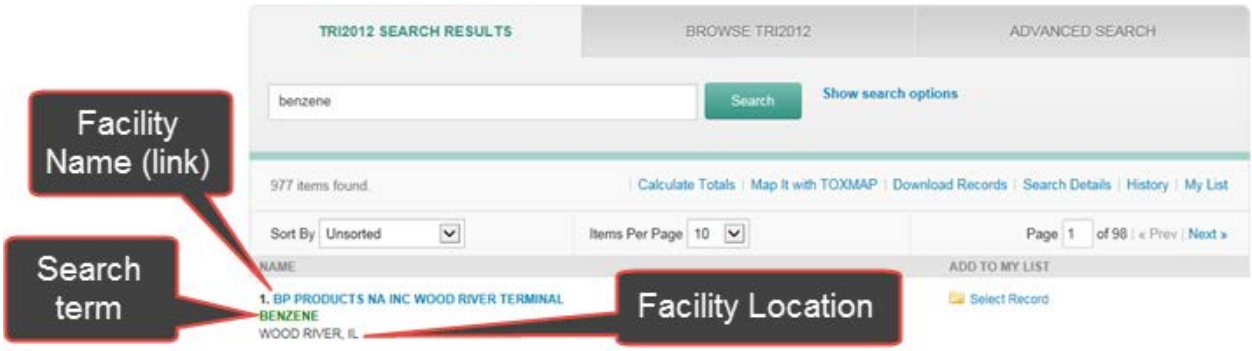
Search TRI by chemical or other name, chemical name fragment, Chemical Abstracts Service (CAS) Registry Number, and/or subject terms. By default, the system adds synonyms and CAS numbers to chemical searches. Use limits to refine the search results. TRI currently contains data from 1987 through 2012. By default the system will search the most current year. Limit the search with the following criteria:

- Facility Name
- TRI Reporting Form Type
  - Ability to search for either Form R (long) or Form A (short) or both
- Facility Location
  - Select State, City/State, County/State, or ZIP Code
- Weight in pounds (Greater Than)
- Type of release (onsite-air, onsite-water, onsite-land, onsite-underground injection, total disposal, or total production-related waste)
- Standard Industrial Classification Code or North American Industry Classification System Code
  - Separate multiple entries with commas



Search Results

The initial retrieval is displayed as a list of abbreviated records with the facility name (which links to the record), chemical name, and city and state where the facility is located. Relevancy ranking is based on the number of individual search terms occurring in a document, the number of times each search term occurs in a document, the rarity of the search terms within the database, and the nearness of search terms to each other. Records containing combinations of search terms tend to be ranked higher than records with isolated occurrences of search terms.



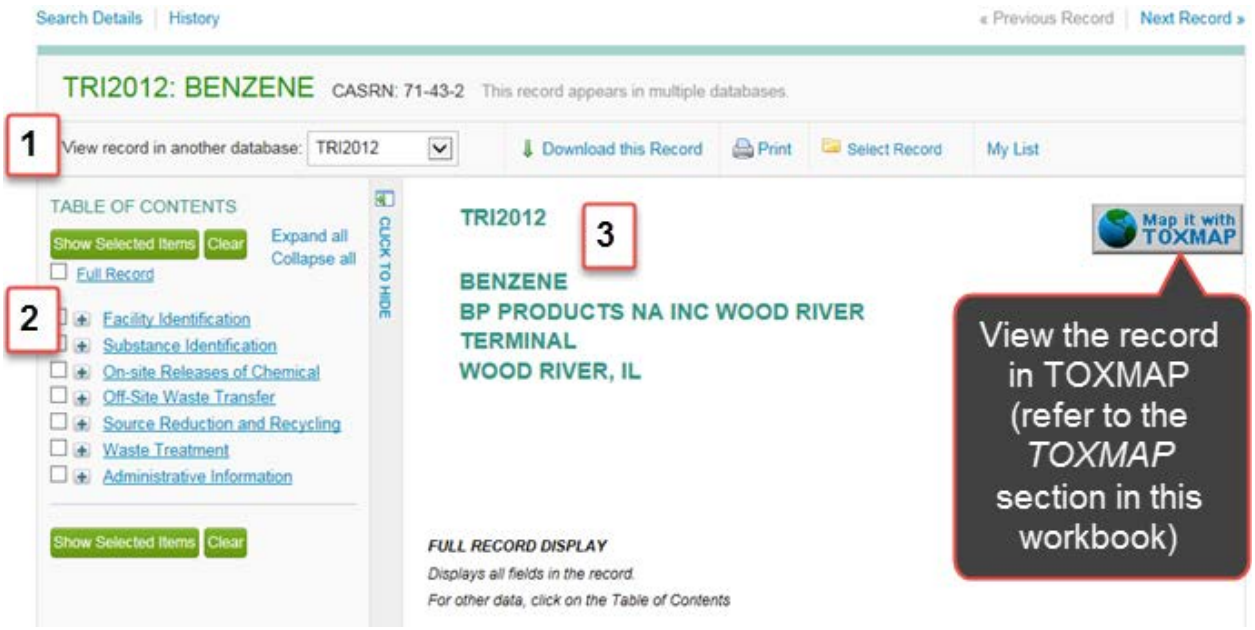
Record Screen

The Record screen is organized into three sections:

1. Navigation options at the top of the record allow you to **View record in another database** (NLM databases), **Download Record**, **Print** the record, **Select Record** (adding it to your list), and view your list of selected records (**My List**).

2. A **Table of Contents** in the left frame allows users to choose categories and fields for display.

3. Data is shown in the right frame. Click the **Map it with TOXMAP** button on the right to visually explore on-site releases in TOXMAP® classic.



Additional Resources

For further information, review these additional resources:

- TRI Fact Sheet
  nlm.nih.gov/pubs/factsheets/trifs.html

- TRI/EPA
  epa.gov/tri

- North American Industry Classification System (NAICS) Code
  www2.epa.gov/toxics-release-inventory-tri-program/my-facilitys-six-digit-naics-code-tri-covered-industry

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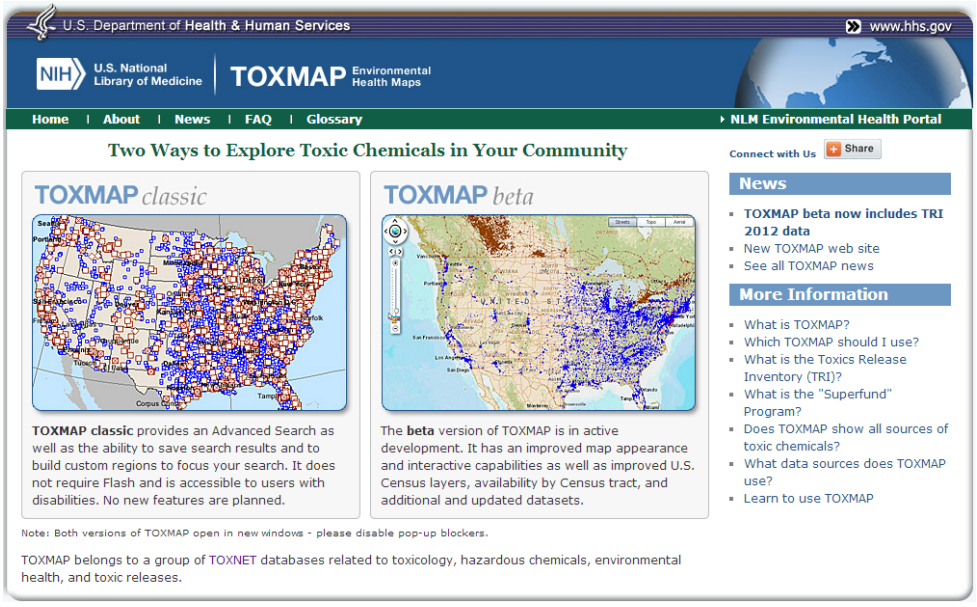
TOXMAP®

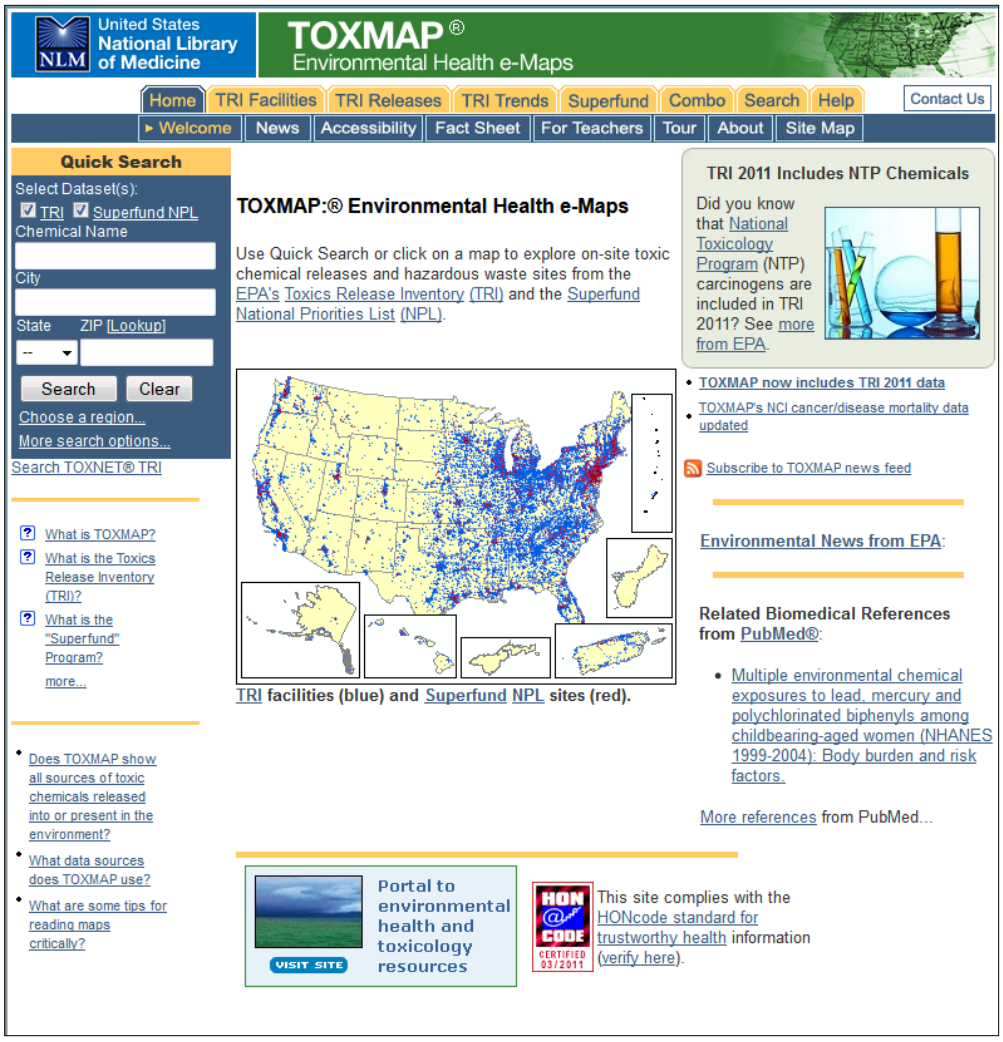
TOXMAP is a Geographic Information System (GIS) that uses maps of the United States to help users visually explore data from the US Environmental Protection Agency's (EPA) Toxics Release Inventory (TRI) and Superfund programs. TOXMAP helps users create nationwide, regional, or local area maps showing where TRI chemicals are released on site into the air, water, and ground. Maps can also show locations of Superfund sites on the National Priorities List (NPL). The NPL guides the Federal Government in determining which sites should be investigated. It is updated on a regular basis.

Two versions of TOXMAP are available: the classic version of TOXMAP released in 2004, and a new version of TOXMAP based on Adobe® Flash/Flex technology. In addition to many of the features of TOXMAP classic, the new version provides an improved map appearance and interactive capabilities as well as a more current GIS appearance. This includes seamless panning, immediate update of search results when zooming to a location, two collapsible side panels to maximize map size, and automatic size adjustment after a window resize. The new TOXMAP also has improved US Census layers and availability by Census Tract (2000 and 2010), Canadian National Pollutant Release Inventory (NPRI) data, US commercial nuclear power plants, and improved and updated congressional district boundaries. Both versions of TOXMAP can be accessed from **toxmap.nlm.nih.gov**. Entering the site will prompt users to select the classic or beta version.



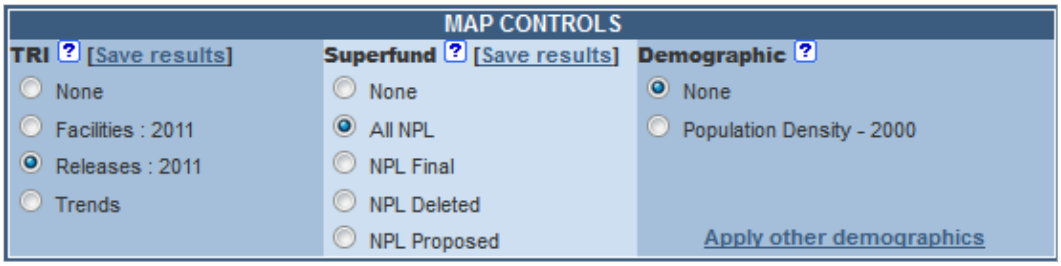
toxmap.nlm.nih.gov

TOXMAP Classic



Map Features

TOXMAP classic offers several ways to create maps: using the tabs and sub-tabs along the top of the page, the **Quick Search** box on the homepage, and the **Map Controls** below each created map.



TOXMAP classic can create several types of maps:

- TRI Facilities
- TRI Chemical Releases
- TRI Chemical Trends
- Superfund Maps
- Combination (Combo) Maps
- Search (Advanced)

TOXMAP classic also overlays map data such as:

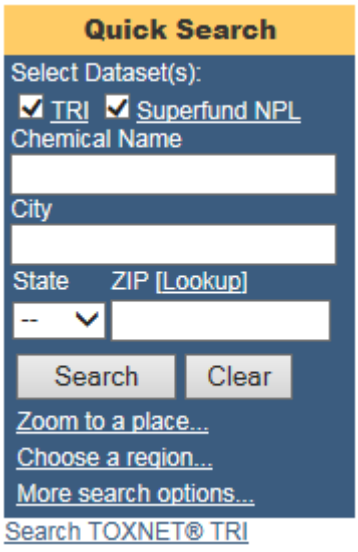
- US Census Data—1990 and 2000 demographics (population, ethnicity, age, gender ratio)
- Income Data—per capita personal income
- Health Data—mortality data for cancer and various causes
- Reference Data—cities, roads, hospitals, Federal land, and urban areas

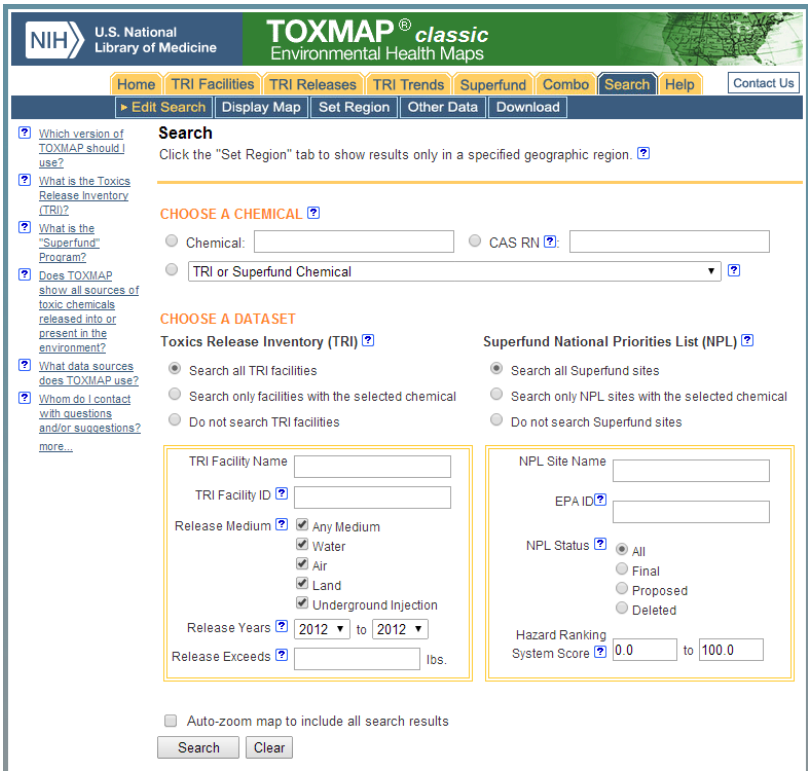
DISCLAIMER: The co-occurrence of a substance and a particular health problem does not by itself imply an effect on human health by that substance.

Searching and Creating Maps in TOXMAP Classic

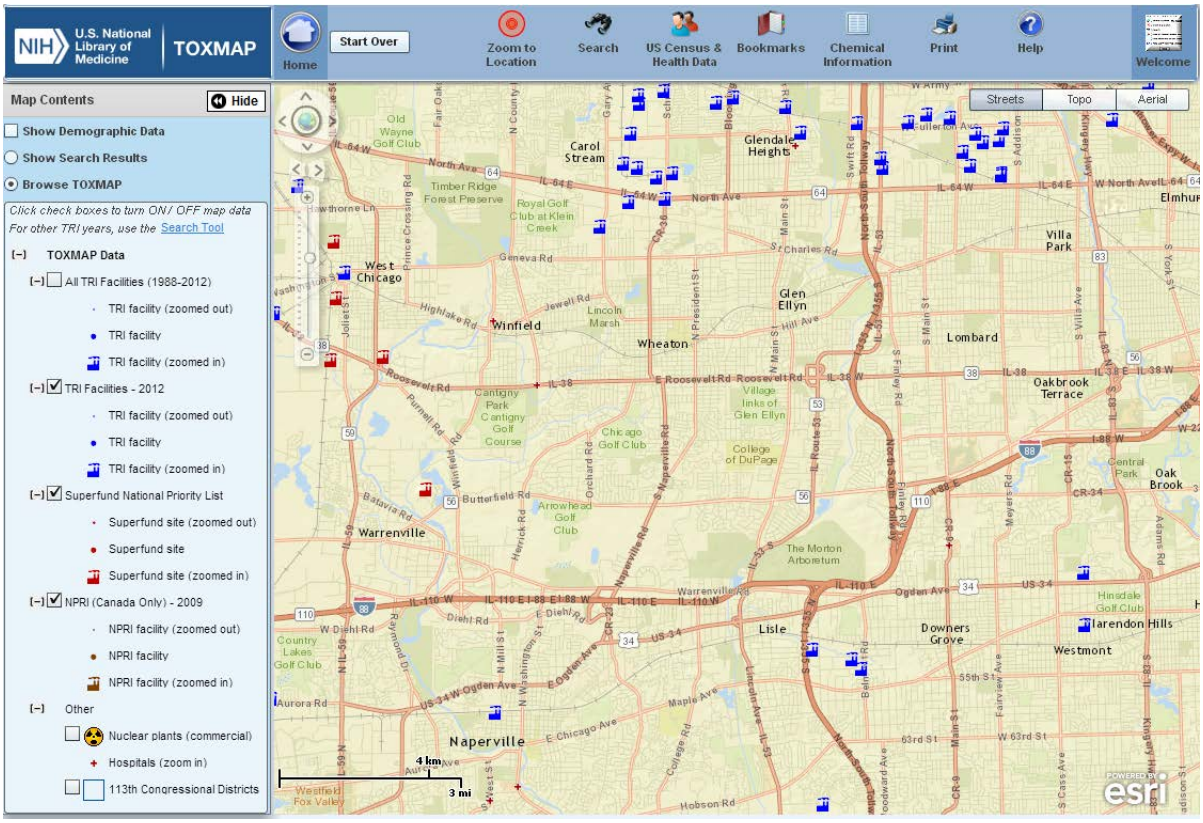
TOXMAP classic's **Quick Search** feature on the homepage allows users to search TRI and Superfund data by chemical and to zoom the resulting map to a specific city, state, or ZIP Code. More advanced search options are available by clicking the More search options… link or by selecting the **Search** tab at the top of the page.

The **Search** page allows users to search a chemical CAS RN, TRI facility name/ID, release year ranges, release medium, release amount, Superfund NPL site name/ID/status, and Hazard Ranking System (HRS) score. Also, specific geographic regions can be selected. Release color coding is calibrated only for releases in that region rather than for the entire nation.



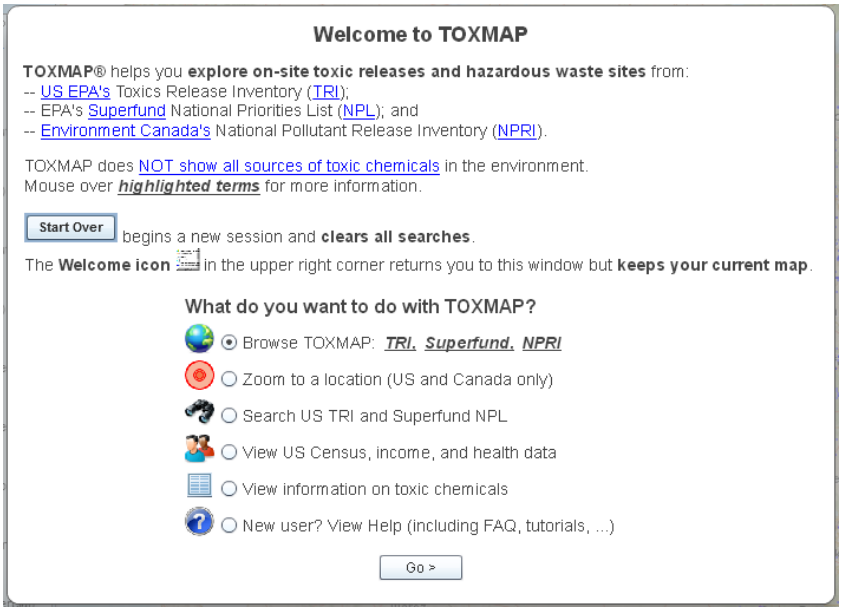


TOXMAP Beta



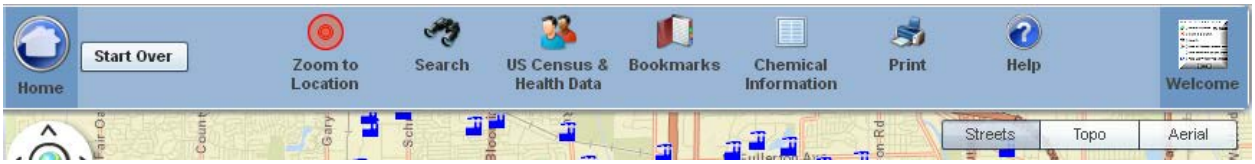
Map Features

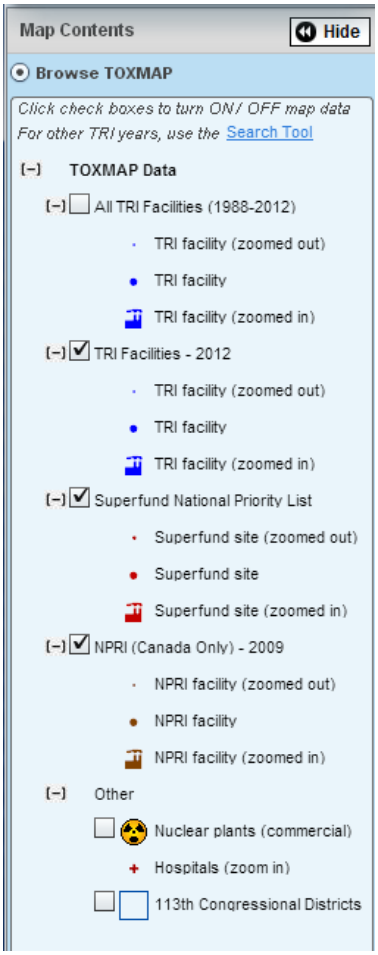
When first launched, TOXMAP beta displays a Welcome window allowing you to select what you want to do with TOXMAP. The default selection is to Browse TOXMAP.



After selecting the desired option and clicking the **Go** button, the interactive map is displayed. From here, you can interact with the map by panning and zooming as needed.

TOXMAP offers several ways to modify the map: using the icons along the top of the page, using the view options in the upper right corner of the map, and using the **Map Contents** panel to the left of the map.





TOXMAP provides several map layers that can be toggled:

- TRI facilities 2012
- All TRI facilities
- Superfund
- NPRI (Canada only)
- Nuclear plants
- Congressional districts

TOXMAP also overlays demographic map data, including US Census & Health Data, such as:

- 1990, 2000, and 2010 demographics (options depend on the year selected)
  - **Population**—density, gender ratio, and diversity index
  - **Age**—median age, under 18, and over 65 years of age
  - **Race**
  - **Cancer and Disease Mortality** (coming soon)
- **Income**—per capita personal income by year (1988-2008)

DISCLAIMER: The co-occurrence of a substance and a particular health problem does not by itself imply an effect on human health by that substance.

Searching and Interacting with TOXMAP

TOXMAP's Search feature—accessible from the **Welcome** window and the toolbar—allows you to search TRI and Superfund data. You can optionally search by chemical and/or TRI release year, and you can zoom to a particular city, state, or ZIP Code. When you specify a state or ZIP Code, then only results from the specified state (or state containing the ZIP code) are displayed and TRI release color-coding is calibrated only for releases in that state rather than for the entire nation.

In the resulting Search Results side panel, move the mouse over facilities to highlight them on the map. Click the name in the list or the point on the map to pop up details about the facility. On the details window, click **more...** to see chemical release and other details. To return to all TOXMAP data, click **Browse TOXMAP** in the Map Contents side panel or via the Welcome window which can itself be accessed with the icon in the upper-right corner.

TOXMAP features include:

- **Zoom to Location—**Click this option to open the Zoom to Location window. Here, zoom to a specific location on the map by entering an address or place, or by providing a longitude and latitude.
- **Search—**Click the **Search** button at the top of the page to open the Search window. Here, several search options are provided, including searching TRI, Superfund, or both datasets for a specific chemical, year, city, state, or ZIP Code. Up to the top 1000 releasing TRI facilities will be shown.
- **US Census & Health Data—**Opens the demographics window, allowing users to select census and health overlay options.
- **Bookmarks—**Opens the list of bookmarks that zoom the map to specific locations. The list provides bookmarks to the entire United States and to various country regions. It also allows users to create their own bookmarks.
- **Chemical Information—**Opens a window allowing users to select specific chemicals from TRI, Superfund, or both datasets. Double-clicking a chemical displays it in the View Details tab, which links to various NLM and CDC resources. The Health Risk Information tab provides links to other related information.
- **Start Over—**Clears your map and refreshes the page.

Additional Resources

For further information, review these additional resources:

- TOXMAP Fact Sheet
  nlm.nih.gov/pubs/factsheets/toxmap.html
- TOXMAP Brochure
  toxmap.nlm.nih.gov/toxmap/home/TOXMAP_Brochure.pdf
- TOXMAP FAQ
  toxmap.nlm.nih.gov/toxmap/faq.html
- TOXMAP classic FAQ
  toxmap-classic.nlm.nih.gov/toxmap/help/faq.jsp
- TOXMAP classic Tour
  toxmap.nlm.nih.gov/toxmap/tour/index.html
- TOXMAP Tour
  youtu.be/QUMRCH7YuU8

Stay Connected

Subscribe to TOXMAP news feed
toxmap.nlm.nih.gov/toxmap/news/atom.xml

TRI / TOXMAP Decision Tree

TRI (Toxics Release Inventory) is the US Environmental Protection Agency's (EPA) publicly available database that contains information on toxic chemical releases and waste management activities, and more recently, source reduction and recycling information, reported annually by US industrial and Federal facilities beginning with the 1987 reporting year. TRI is accessible via the National Library of Medicine® (NLM) **TOXNET®** (TOXicology Data NETwork) databases, which cover toxicology, hazardous chemicals, environmental health and related areas.

TOXMAP is a geographic information system from the NLM Division of Specialized Information Services that uses maps of the United States to help users visually explore data from the EPA's TRI and Superfund Program. With TOXMAP, users can create nationwide, regional, or local area maps showing where TRI chemicals are released on-site into the air, water, and ground. Information on the releasing facilities is provided. Maps can also show locations of Superfund sites, with listings of all chemical contaminants present at these sites.

Use this decision tree to choose the correct database:

Use TRI if…	Use TOXMAP if…
▶ You want full-reference, book-style information on TRI facilities or releases ▶ You are using other TOXNET resources ▶ You want to benefit from chemical synonyms ▶ You would like to use a browse interface ▶ You want to calculate the total release of chemicals ▶ You want multiple sorting options for search results	▶ You are interested in a health-related presentation of data ▶ You want to see TRI locations on a map ▶ You are interested only in on-site chemical releases ▶ You want to search by combinations of states and/or counties ▶ You are also interested in Superfund sites and/or demographic data ▶ You only want location data from the Federal Registry System (not self-reported locations)

Use this decision tree to choose the correct TOXMAP version:

Use TOXMAP beta if…	Use TOXMAP classic if…
▶ You want a more responsive map with a rich user experience ▶ You have the free Adobe Flash Player ▶ You want a map experience that reflects regular updates and enhancements ▶ You want a map that offers Census layers (including for Census 2010) available by county and by Census Tract	▶ You cannot or choose not to install the free Adobe Flash Player ▶ You do not wish to use a pre-release Web site ▶ You require features that are currently only available in TOXMAP classic, including Advanced Search, the ability to save your search results, and regional TRI summaries ▶ You have an old computer, a slow Internet connection, or a screen resolution of less than 1100 pixels wide or 800 pixels high ▶ You are visually impaired

TRI / TOXMAP Classic Search Exercises

Search Exercises

The following exercises have been designed to be completed in sequence, beginning in TRI and moving to TOXMAP classic.

Go to **toxnet.nlm.nih.gov.**

Click **TRI**.

Exercise 1: Search TRI to gather environmental information about methanol in Mississippi, including: how much methanol was released in Mississippi, where the release(s) occurred, and what type of release(s) occurred.

Suggested Solution:

Type	**methanol** in the Chemical Name or CAS Registry Number Search box
Select	**State** from the drop-down menu next to **TRI Facility Location**
Type	**MS** in the **TRI Facility Location** field
Click	**Search**
Click	**Calculate Totals** at the top of the search results
Review	the calculation results
	Information is for the most recently reported year available from EPA.
Close	the pop-up window
Click	**TRI Home** in the upper left to prepare for the next search

Exercise 2: Did any facilities in Mississippi release more than 100 pounds of methanol to the air in 2006? Map the releases in TOXMAP and view the environmental release information for the first facility.

Suggested Solution:

Type	**methanol** in the TRI Chemical Name Search box
Select	**State** from the **TRI Facility Location** drop-down menu
Type	**MS** in the TRI Facility Location field
Select	**100 lbs** from the Release Greater Than drop-down menu
Select	**Total On-site Air Release** from the drop-down menu under Release Greater Than
Click	**Search**
Click	the first facility link in the list of **Facility / Substance** names

Click	**On-site Releases of Chemical** in the Table of Contents
Review	the information in the right frame
Click	**Map it with TOXMAP** ()
Select	**MS** from the ZOOM TO drop-down menu just to the left of the map
Click	**TRI on-site release details** to the right of the map under Map Details
Click	the facility name link under **Facilities reporting to TRI** to the right of the map
Review	the **On-site Release Estimates** and All chemicals reported by this facility

Exercise 3: Link to HSDB to explore the human health effects of methanol.

Suggested Solution (continued from previous exercise):

Scroll	to the top of the page and find the **Information about this chemical** section to the left of the map
Click	**Human Health Effects** under Information about this Chemical
Review	the information in the HSDB Search Results window
Close	the HSDB window and return to the TOXMAP results page
Click	**Start over** at the top right of the page to prepare for the next search

Exercise 4: What TRI facility in EPA Region 5 released the most chemicals on site in 2004? What were the top five chemicals released by that facility in 2004?

Suggested Solution:

Click	**Choose a region** in the Quick Search box
Select	**EPA Region 5** from the Pre-defined Region list
Click	**Submit**
Select	**Define Map** sub-tab at the top of the page
Select	**2004** from the Facilities drop-down menu
Click	**Submit**
Click	**TRI facilities details** in the MAP DETAILS box
Click	the first facility name in the **Facilities reporting to TRI** list
View	the facility name and the chemicals listed in the **Chemical (summary table)**

Click **Start over** at the top left of the page to prepare for the next search

Exercise 5: How many NPL Final Superfund sites are located in New England?

Suggested Solution:

Click **Choose a region** in the Quick Search box

Select **New England** from the Pre-defined Region list

Click **Submit**

Click the **Superfund** tab at the top of the page

Click the **NPL Final** sub-tab

View the search results above the map to see how many NPL Final sites are in this region

Scenario 1 – Mapping TRI and Health Data in TOXMAP Classic

Teresa, an epidemiologist, is familiar with the TRI database. She has learned about TOXMAP and decides to take a look at cancer data for females and chemical releases from 2001 to 2005 for styrene in her home state of New Jersey, excluding Superfund NPL. Monitoring data indicate that populations may be exposed to styrene through inhalation of air polluted by industrial sources, so she wants to limit her search to air releases. Teresa knows current studies do not provide adequate evidence to classify styrene as a human carcinogen.

Go to **toxnet.nlm.nih.gov.**

Click **TOXMAP**.

Click **TOXMAP classic**.

Suggested Solution (TOXMAP classic):

Click **Search** tab at the top of the page (Search)

Click the **Chemical** button under Choose a Chemical

Type **styrene** in the Chemical Name Search box

Click the **Water**, **Land**, and **Underground Injection** checkboxes to deselect them (if they are currently selected)

Select **2001** and **2005** in the **Release Years** drop-down menus

Click **Search**

Note that this shows releases for all of the United States and territories.

Select the **Set Region** sub-tab

Click the **Create a new region** link

Select **New Jersey** from the US States and Territories drop-down menu

Click **Add selected>>** to add New Jersey, all counties to the **Region County List states/counties**

Note that assigning a region name is optional. However, naming the search makes it easy to identify when saved as a previous search.

Click **Submit**

Click **Continue to map**

Click **Health Data** under Map Other Data to the left of the page

Select **Mortality, Cancers 2004-2008**

Select **All Malignant Cancers - All Races - Female** from the Mortality, Cancer 2004-2008 list

Click **Submit**

Click **Show legend values** in the legend below the map

View the map legend to interpret the information

Click **Start Over** to prepare for the next search

Scenario 2 – Mapping TRI and Health Data in TOXMAP Classic

You are a public health professional researching lung cancer. You are interested in all releases of benzene, a known carcinogen, in Texas between 1995 and 2001.

Suggested Solution:

Click	**Search** tab at the top of the page (Search)
Type	**benzene** in the Chemical Name Search box or select it from the **chemical drop-down menu**
Select	**1995** and **2001** in the **Release Years** drop-down menus
Click	**Search**
	This zooms the map to include all search results
Select	**TX** from the ZOOM TO drop-down menu to the left of the map
Click	**Health Data** under Map Other Data to the left of the page
Select	**Mortality, Cancers 2004-2008**
Select	**Lung and Bronchus - All Races - Female** from the Mortality, Cancer 2004-2008 list
Click	**Submit**
Click	**Show legend values** in the legend below the map
View	the map legend to interpret the information
Click	**Start over** at the top right of the page to prepare for the next search

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TOXMAP Beta Exercises

The following exercises have been designed to be completed in TOXMAP beta.

- Go to **toxmap.nlm.nih.gov**.
- Select **TOXMAP beta**.
- Click **Go**.

Exercise 1: Using population data from the 2010 US Census, create a map displaying the Hispanic population in Mississippi.

Suggested Solution:

Select	**Zoom to a Location (US and Canada only)**
Click	**Go**
Select	**Mississippi** from the State or Province drop-down menu
Click	**Zoom to**
Click	**US Census and Health Data** at the top of the map
Click	the **Race** tab
Click	the **US Census 2010** tab
Select	**Hispanic**
Click	the close button ( ) on the US Census & Health Data window
Click	the close button ( ) on the Zoom to Location window
Review	the map
Click	the **Start Over** button in the top left area of the map

Exercise 2: Rickenbacker Air National Guard base in Lockbourne, Ohio, is a proposed NPL Superfund site. What are some of its contaminants?

Suggested Solution:

Select	**Browse TOXMAP**
Click	**Go**
Select	only the **Superfund National Priority List** under TOXMAP Data to the left of the map
	Deselect all the other TOXMAP data sets by unchecking the boxes
Click	**Zoom to Location** near the top center of the map
Type	**Rickenbacker Air National Guard** in the Address or Place search box
Type	**Lockbourne** in City search box
Select	**Ohio** from the State or Province drop-down menu
Click	**Zoom to**
Click	the close button () on the **Zoom to Location** window
Click	the superfund site symbol ()
Click	**more…** on the Superfund Site Details window
Review	the list of contaminants
Click	**Close Window** at the bottom of the display area
Click	the **Start Over** button in the top left area of the map

Exercise 3: How many facilities in West Virginia released mercury compounds for all years in TOXMAP?

Suggested Solution:

Select	**Search US TRI and Superfund NPL**
Click	**Go**
Select	**TRI** next to Dataset(s)
Enter	**mercury compounds** in the Chemical Name field
Select	the **All years** checkbox
Select	**West Virginia** from the State drop-down menu
Click	**Search**
Review	the results to the right of the page to answer the question
Click	the **Start Over** button in the top left area of the map

Exercise 4: View a topographic map of Vancouver, Canada's National Pollutant Release Inventory (NPRI) facilities.

Suggested Solution:

Select	**Browse TOXMAP**
Click	**Go**
Select	only **NPRI (Canada Only)** under TOXMAP Data to the left of the map
	Deselect all the other TOXMAP data sets by unchecking the boxes
Click	**Zoom to Location** near the top center of the map
Type	**Vancouver** in City search box
Select	**Canada** from the Country drop-down menu
Click	**Zoom to**
Click	**Topo** in the upper right area of the page
Click	the close button () on the **Zoom to Location** window
Click	any NPRI site symbol ()
Click	**more…** on the NPRI Facility Details window
Review	the Facility and Substance Information
Close	the **Facility and Substance Information** tab or window to return to TOXMAP beta
Click	**Start Over** in the upper left to prepare for the next exercise

Scenario 1 – Benzene Releases in Arizona

You are an environmental justice advocate researching minority exposure to benzene, a known carcinogen. You are interested in the minority population in areas of benzene releases in Arizona in 2010.

Use TOXMAP beta to examine information about benzene releases in Arizona in 2010.

Suggested Solution:

Select	**Search US TRI and Superfund NPL** from the What do you want to do with TOXMAP? radio buttons
Click	**Go**
Type	**benzene** in the Chemical Name search box
Select	**2010** in the Year drop-down menu
Select	**Arizona** from the State drop-down menu
Click	**Search**
	This zooms the map to Arizona and includes only results in that state
Click	**US Census & Health Data** at the top of the screen
Click	the **Race** tab on the US Census & Health window
Click	the **US Census 2010** secondary tab
Click	**Minority Population**
Click	the close button () in the upper right corner of the US Census & Health Data window
View	the map, the search results, and the demographic legend in the Map Contents side panel to interpret the information

Household Products Database (HPD)

Household Products Database contains links for more than 14,000 consumer household products to information on health effects from Material Safety Data Sheets (MSDS) provided by the manufacturers.

hpd.nlm.nih.gov

Household Products Database is designed to help answer the following questions:

- What are the chemical ingredients and their percentage in specific brands?
- Which products contain specific chemical ingredients?
- Who manufactures a specific brand? How do I contact this manufacturer?
- What are the acute and chronic effects of chemical ingredients in a specific brand?

Searching Household Products Database

The Household Products Database is divided into four categories: **Products**, **Manufacturers**, **Ingredients**, and **Health Effects**.

- Navigate to a category by clicking the appropriate tab at the top of the page.
- Search Household Products by using the **Quick Search** box on the homepage (see left sidebar). For a more detailed search, select the **Advanced Search** link. Clicking the **Health Effects** tab will bring up the Advanced Search screen with the Health Effects category preselected for searching.
- Browse Household Products by product category or alphabetically by product names, types of products, manufacturers, or ingredients (see left sidebar).

Additional Resources

For further information, review these additional resources:

MSDS Information Resources

- SIRI MSDS Archive
  hazard.com/msds

- MSDSprovider: Free Access to Manufacturer-Direct MSDSs
  msdsprovider.com

Government Information Resources

- OSHA's MSDS Regulation – Hazard Communication 1910.1200
  osha.gov/pls/oshaweb/owadisp.show_document?p_table=standards&p_id=10099

- Read the Label First! Campaign (EPA)
  epa.gov/pesticides/regulating/labels/consumer-labeling.htm#read

- Household Hazardous Waste (EPA)
  epa.gov/epawaste/conserve/materials/hhw.htm

From the National Library of Medicine

- TOXNET®—databases in toxicology and environmental health
  toxnet.nlm.nih.gov

- Tox Town®—an interactive guide to commonly encountered toxic substances
  toxtown.nlm.nih.gov

Product Recalls

- Product Safety and Recall Lists
  hpd.nlm.nih.gov/recalls.htm

HPD Search Exercises

Search Exercises

 Go to **toxnet.nlm.nih.gov**.

 Click **Household Products Database**.

Exercise 1: How can I find information about specific brands of teeth whiteners, including their manufacturing information, ingredients, and health effects?

Suggested Solution:

Click	**Personal Care**
Click	**toothpaste** in the Personal Care column
Click	**Oral Hygiene** in the Type column
Click	the **Brand Name** of choice and under Product Name
Review	the product information
Click	the **Home** tab to prepare for the next search

Exercise 2: What household products are associated with cyanosis?

Suggested Solution:

Click	the **Health Effects** tab at the top right
Type	**cyanosis** in the Search box
Click	**Search** and view the list of products
Click	a product of choice and review the information under **Health Effects**
Review	the information under **Health Effects**
Click	the **Home** tab to prepare for the next search

Exercise 3: How can I do a quick search to find information on color-safe bleach?

Suggested Solution:

Type	**color safe bleach** in the Quick Search box to the left of the homepage
Click	**Go**
Click	**Color safe oxygen bleach** under Search Results in the **As Ingredient** section

Click	**Search TOXNET** in the Chemical Information section to the right of **Toxicity Information** to launch a search in TOXNET
Click	the **Sodium percarbonate** link in the TOXNET databases to display the record in HSDB
Review	the information provided
Close	the HSDB window and return to Household Products Database
Click	**Home** to prepare for the next search

Exercise 4: What auto products contain oleic acid?

Suggested Solution:

Click	the **Ingredients** tab
Click	**O** in the alphabetic list at the top
Select	**Oleic acid** from the list of ingredients
Click	the **brand name** of choice with Auto Products listed in the **Category** column
Review	the information retrieved
Click	**Home** to prepare for the next search

Scenario – Browse by Category

Cassie, an avid home gardener, adopted a puppy to enjoy with her grandchildren. She is concerned about a weed killer product she uses in spring and fall because the children and puppy will be playing in the yard. She uses a popular brand of extended residual fertilizer with weed control. Are there any health effects of which Cassie should be aware?

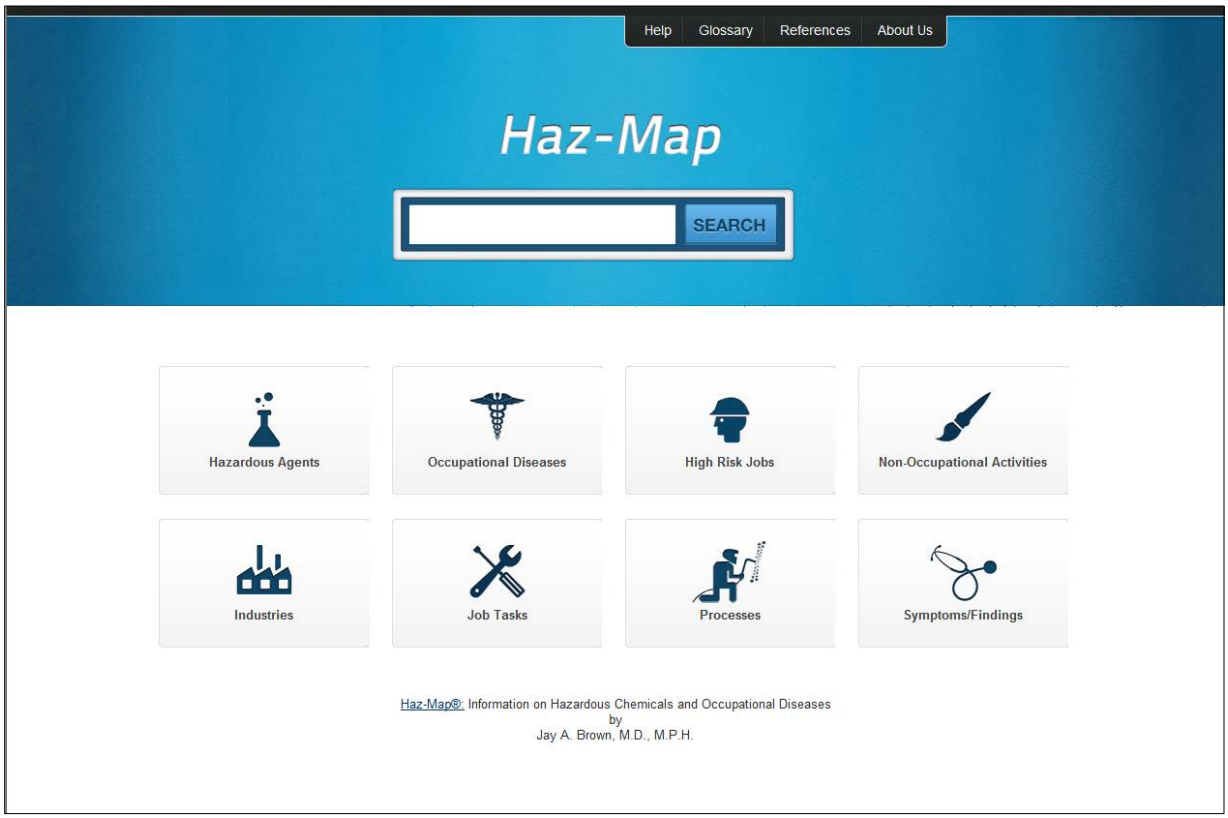
Browse the Household Products Database to find information. Select the appropriate product category. Select the appropriate Landscape/Yard product category. Select the appropriate type of product. Select the appropriate product.

Suggested Solution:

Click	**Landscape/Yard** in the left margin or next to the picture on the main page
Click	**fertilizer w/weed control**
Click	**Herbicide** under Type
Click	an extended residual product with weed control under Product Name
View	the Health Effects and Handling/Disposal information
Click	the **Home** tab at the top of the page to prepare for the next search

Haz-Map®

Haz-Map is an occupational health database designed for health and safety professionals and for consumers seeking information about the adverse effects of workplace exposures to chemical and biological agents. The main links in Haz-Map are between chemicals and occupational diseases. Haz-Map shows the diseases linked to each agent and the agents linked to each disease. Agents are chemicals, such as formaldehyde, or biological, such as grain dust. Haz-Map links jobs and hazardous job tasks with occupational diseases and their symptoms. In Haz-Map, chronic occupational diseases are linked to both jobs and industries, while acute diseases and infectious diseases are linked only to jobs. Cancers are not linked to jobs, industries, or findings.



hazmap.nlm.nih.gov

Searching Haz-Map

Text words can be searched in all Haz-Map text fields. Search results display in relevancy ranked order. Users can also browse alphabetically in each category or by Types of Agents, Adverse Effects, Types of Diseases, Jobs and Symptoms, or Types of Jobs.

Browse agents by adverse effects

Users can search for all agents that have one or more potential adverse effects. Adverse effects in some categories are displayed in a list of radio buttons. For radio buttons, select only one option in each group. When checkboxes are used, it means that each agent may have one or more of the listed adverse effects. When radio buttons are used, it means that each agent may have only one of the adverse effects. On the **Search Results** page, click the **Search Details** link to see the conditions that were checked for the search.

Find diseases by jobs and symptoms

- **Search by Jobs:** Search diseases related to a job by selecting a job from the drop-down menu.
- **Search by Symptoms:** Search diseases from their symptoms by checking the symptoms grouped by organ/tissue systems.
- **Search by Jobs and Symptoms:** By selecting both Job and Symptoms, users can find diseases related to both. For example: searching carpenters and cough.

Haz-Map Mobile

A mobile-friendly version of the Haz-Map Web site is available at **hazmap.nlm.nih.gov**. The site automatically adapts to the size of the device or browser window.

Additional Resources

For further information, review these additional resources:

- Haz-Map Help
  hazmap.nlm.nih.gov/help
- Haz-Map Fact Sheet
  nlm.nih.gov/pubs/factsheets/hazmap.html

Haz-Map Search Exercises

Search Exercises

Go to **toxnet.nlm.nih.gov**.

Click **Haz-Map**.

Exercise 1: What are some high risk tasks associated with sheet metal workers?

Suggested Solution:

Click	**High Risk Jobs**
Click	**Alphabetically**
Select	**S** from the Select a Letter drop-down menu
Click	**Sheet Metal Workers**
Click	the high risk job task of choice under Related Information in Haz-Map
Review	the information about this job task
Click	**Home** to prepare for the next search

Exercise 2: What are some of the agents, diseases, and jobs associated with asthma? Perform a text search.

Suggested Solution:

Type	**asthma** in the Search box
Click	**Search**
Click	the record of choice in the **Agents** list
Review	the information about the selected record
Click	the browser's **Back** button to return to the search results page
Click	**Diseases Results** and select the record of choice
Review	the information about the selected record
Click	the browser's **Back** button to return to the search results page
Click	**Jobs Results** and select the record of choice
Review	the information about the selected record
Click	**Home** to prepare for the next search

Scenario – Jobs and Agents Associated with Disease

Gloria, an occupational analyst, performs research used to assist in the processing of employee compensation claims for a government agency. Gloria has a list of specific chemicals from various work sites where certain job tasks were performed. She needs to determine if specific conditions/diseases are associated with these chemicals and job tasks. Gloria needs to begin her research by determining if aplastic anemia is associated with aviation mechanics that performed maintenance on fuel tanks.

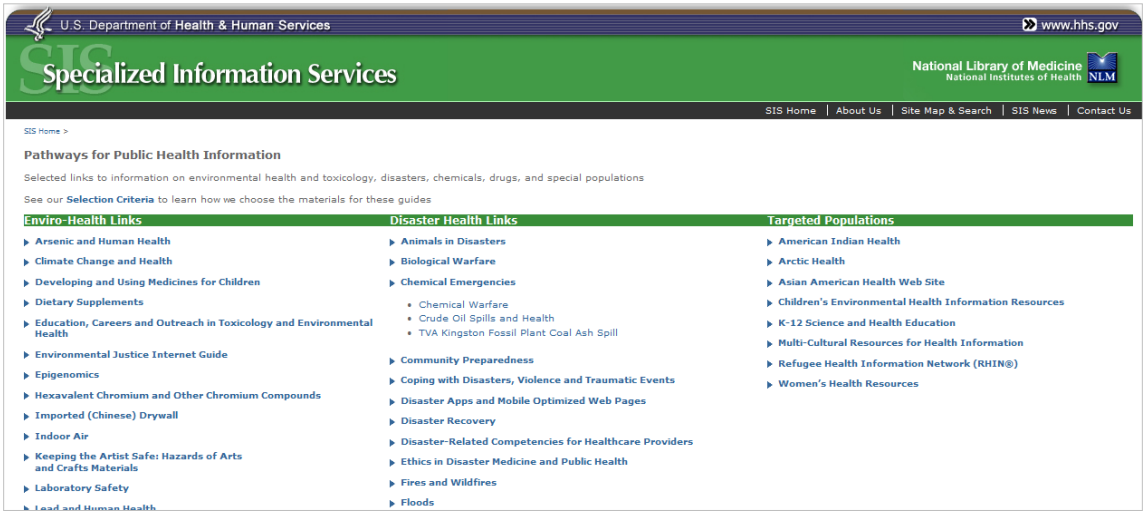
Search Haz-Map to identify associations: Browse the High Risk Jobs by type. Select the appropriate job category. Select the appropriate job name. Select the appropriate job task. Browse related information.

Suggested Solution:

Click	**High Risk Jobs**
Click	**By Types of Jobs**
Click	**Installation, Maintenance & Repair**
Click	**Aircraft Mechanics & Service Technicians**
Click	**Repair or maintain gasoline or jet fuel tanks**
Review	the job task record and note any chemicals and diseases listed
Click	**Aplastic anemia** under Diseases associated with this job task
Review	the disease record and note additional information and references
Click	**Home** to prepare for the next search

Pathways for Public Health Information

Enviro-Health Links, **Disaster Health Links**, and **Targeted Populations**, available from the National Library of Medicine® (NLM) Environmental Health and Toxicology Portal, are curated guides to Web resources on environmental health and toxicology, disasters, chemicals, and special populations. Resources can include background information, laws and regulations, and pre-formulated searches of relevant National Library of Medicine databases. All resources are evaluated and selected according to selection criteria that were designed to find appropriate and trustworthy health information.



sis.nlm.nih.gov/pathway.html

Links to information of special interest include:

- Arsenic and Human Health
- Climate Change and Health
- Coping with Disasters, Violence, and Traumatic Events
- Dietary Supplements
- Disaster and Emergency Response Tools
- Disaster Recovery
- Environmental Justice
- Fires and Wild Fires
- Geological Hazards
- Health Effects from the Collapse of the World Trade Center
- Indoor Air
- Infectious Diseases: Pandemic, Epidemic and Disaster-Related Outbreaks
- Laboratory Safety
- Mercury and Human Health
- Nanotechnology
- Public Health Preparedness for Mass Gatherings
- Special Populations: Emergency and Disaster Preparedness
- Tobacco, Smoking, and Health
- Water Pollution

Enviro-Health Links Search Exercise

Scenario – Electronic Cigarettes

A high school teacher is concerned because he notices that many of his students have started using electronic cigarettes. He would like to know more about how e-cigarettes work and how exposure to nicotine and other chemicals in tobacco compares to e-cigarettes.

Use the Enviro-Health Links on Tobacco, Smoking, and Health to find the information about electronic cigarettes and how they compare to regular cigarettes.

Go to sis.nlm.nih.gov/pathway.html.

Suggested Solution:

Click	**Tobacco, Smoking, and Health** under Enviro-Health Links
Click	on **Electronic Cigarettes**
Click	on a link in the Electronic Cigarettes section
Review	the information provided.
Click	the browser's **Back** button to return to the list of resources
Review	some of the other links provided under Electronic Cigarettes
Scroll	down to the list of **Topic-related Searches of National Library of Medicine Resources**
Review	the list of topic-related searches
Click	on the **Electronic Cigarettes** link in the PubMed section
Review	the search results
Click	the browser's **Back** button to return to the list of resources
Scroll	down to the **TOXLINE** section
Click	on the **Electronic Cigarettes** link in the TOXLINE section
Review	the search results
Click	the browser's **Back** button to return to the list of resources

Tox Town®

Tox Town provides an introduction to toxic chemicals and environmental health risks that may be encountered in everyday life, in everyday places. Tox Town allows visitors to tour a Town, City, Farm, Port, US Border, and US Southwest region to identify common environmental hazards. It is a companion to the extensive information in the TOXNET® collection of databases that are typically used by toxicologists and health professionals. Tox Town is also available in Spanish.

toxtown.nlm.nih.gov

Tox Town is highly interactive, with graphics, animation, and sound to enhance learning about the connections between chemicals, the environment, and the public's health. It is recommended for high school and college students, educators, and the concerned public. This is an excellent resource for health educators to find easy-to-understand information about environmental toxins in their community.

The Tox Town Web site is designed to provide information on the following:

- Everyday locations where toxic chemicals might be found
- Non-technical descriptions of chemicals
- Links to selected, authoritative chemical information on the Internet
- How the environment can impact human health
- Internet Resources on environmental health topics

Tox Town Search Exercises

Scenario 1 – Uranium Tailings

Merissa is aware of uranium tailings in the Western United States. She would like to know if they can be found in any other parts of the country.

Use Tox Town to determine the locations of uranium tailings.

Go to toxtown.nlm.nih.gov.

Suggested Solution:

Click	**US Southwest** on the homepage *OR* select it from the **Neighborhoods** menu
Click	**Uranium Tailings** in the lower right area below the illustration
Review	the information provided along the right
Click	**What are uranium tailings?**
Review	the information provided in the pop-up to find the locations of uranium tailings in the United States.
Close	the pop-up window
Click	the **Home** tab in the upper left to prepare for the next scenario

Scenario 2 – Shellfish Contaminated with Algae Blooms

Cam's local health department issued an advisory about local shellfish possibly being contaminated with algae blooms. It sounds harmless, but he is curious whether people could get sick from eating the shellfish.

Use Tox Town to determine whether shellfish contaminated with algae blooms can cause food poisoning.

Suggested Solution:

Click	**Port** on the homepage *OR* select it from the **Neighborhoods** menu
Click	**Algae Blooms** in the lower left area below the illustration, or click the pockets of algae showing in the water portion of the illustration
Review	the information provided along the right
Click	**What are algae blooms?** to learn more about them
Review	the information provided in the pop-up to determine if consuming shellfish contaminated with algae blooms can make people sick
Close	the pop-up window
Click	the **Home** tab in the upper left to prepare for the next scenario

Scenario 3 – Chemicals Found in Funeral Homes

Formaldehyde is perhaps the most commonly known chemical used in funeral homes. Mona would like to know if funeral homes use any other potentially harmful chemicals.

Use Tox Town to identify chemicals found in funeral homes.

Suggested Solution, Method 1:

Click	the **Locations** tab at the top of the page
Click	**Funeral Home** in the list of locations under City
Review	the information in the **Why are funeral homes a concern?** section to see other chemicals used in funeral homes.

Suggested Solution, Method 2:

Click	**City** on the Tox Town homepage or select it from the **Neighborhoods** menu
Click	the **Funerals** building to the left of the hospital in the illustration, or click the **City Locations** button and select **Funeral Home**
Click	**Why are funeral homes a concern?** in the right column
Review	the information to see other chemicals used in funeral homes.

Section 9: Drugs

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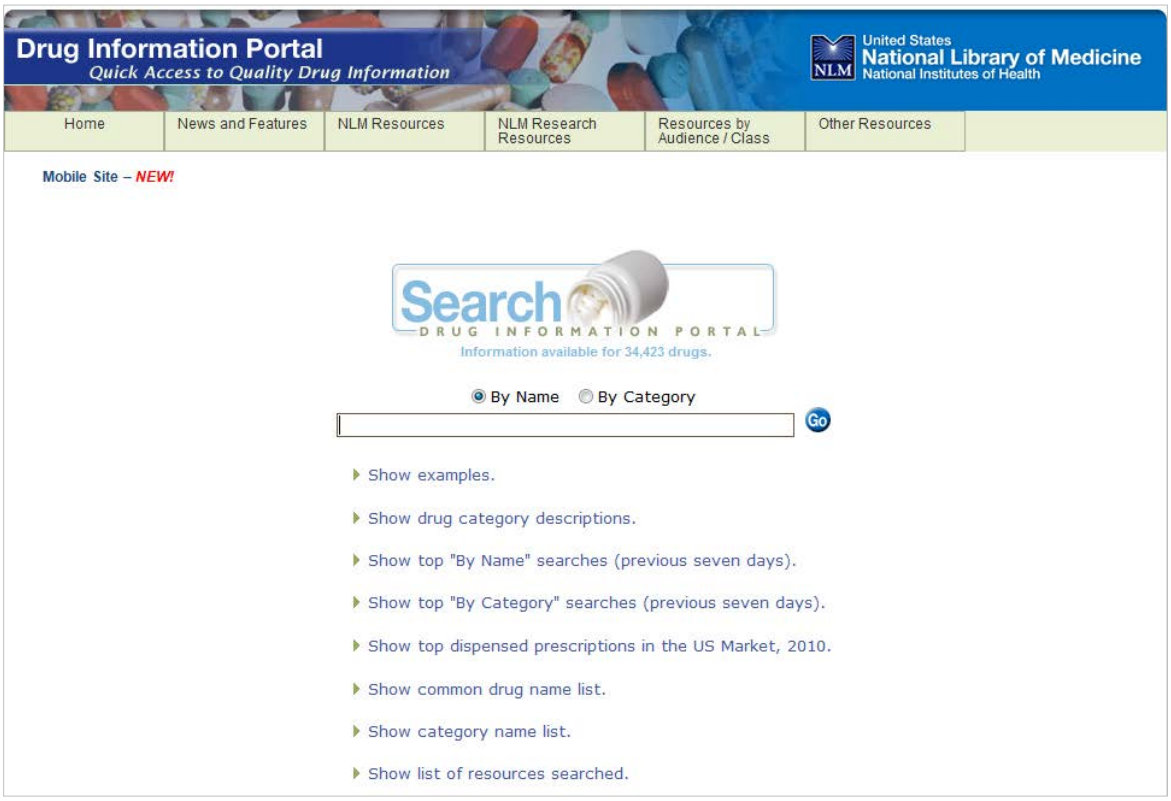
Drug Information Portal

Drug Information Portal provides current information on more than 53,000 selected drugs from their entry into clinical trials through entry into the marketplace. Information includes consumer health, clinical trials, AIDS-related drug information, MeSH® pharmacological actions, PubMed® biomedical literature. The Drug Information Portal is also available as a mobile site. Smartphones accessing the main Drug Portal site will be redirected to the mobile site.



druginfo.nlm.nih.gov

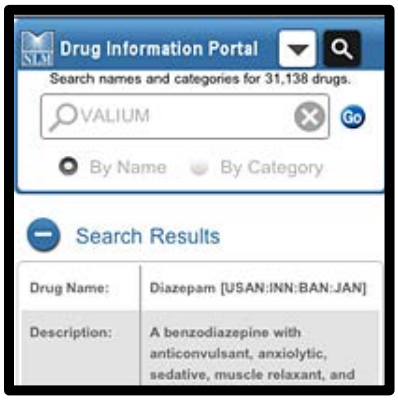
Resources include summaries tailored to various audiences, National Library of Medicine® (NLM) search systems useful in searching for a drug, NLM research resources, resources organized by drug audience and class, and other National Institutes of Health (NIH) and government resources such as US Federal Drug Administration (FDA) and the Centers for Disease Control and Prevention (CDC). Resources are shown as links at the top of the page. Experimental drugs or untested folk remedies not covered by NIH, and government resources are not covered in this portal.

Searching the Drug Information Portal

Search on a drug's trade name or generic name by entering the search term(s) in the search box on the homepage to search many resources simultaneously. A spellchecker provides suggestions for misspelled names. Find embedded portions of names by using an asterisk (*) at the beginning and/or end of a search term. Results will include the drug's type and usage as well as links leading to further information. JavaScript must be enabled in the browser for the NLM Drug Information Portal to work properly.

Drug Information Portal Mobile

A mobile-friendly version of the Drug Information Portal can be accessed at **druginfo.nlm.nih.gov/m.drugportal/m.drugportal.jsp**. The mobile site automatically adapts to the size of the device or browser window.



Additional Resources

For further information, review these additional resources:

- Drug Information Portal Mobile site
  druginfo.nlm.nih.gov/m.drugportal/m.drugportal.jsp
- Drug Information Portal Fact Sheet
  nlm.nih.gov/pubs/factsheets/druginfoportalfs.html
- MedlinePlus®
  medlineplus.gov
- PubMed
  pubmed.gov
- DailyMed®
  dailymed.nlm.nih.gov/dailymed
- AIDS*info*®
  aidsinfo.nih.gov

- Federal Drug Administration Center for Drug Evaluation and Research
  fda.gov/Drugs/
- CDC Drug Service Scientific Resources Program
  cdc.gov/ncidod/srp/drugs/drug-service.html
- US Drug Enforcement Administration Drug Information
  justice.gov/dea/index.shtml
- USA.gov – Prescription Drugs
  usa.gov/Citizen/Topics/Health/Prescription_Drugs.shtml
- National Guideline Clearing house
  guideline.gov

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Drug Information Portal Search Exercises

Go to **druginfo.nlm.nih.gov**.

Exercise 1: View the NLM Medical Subject Headings (MeSH) drug category descriptions.

Suggested Solution:

Click	the **Show drug category descriptions** link
Review	the list of MeSH drug category descriptions
Click	the **Home** button in the upper left corner to prepare for the next exercise

Exercise 2: Review the resources that the Drug Information Portal searches and how the resources are displayed in a drug record.

Suggested Solution:

Click	the **Show list of resources searched** link
Scroll	down and review the list of resources searched
Click	the **Information** icon (i) next to a resource to see information about the resource
	Resource links are only displayed in a drug record if information is available from that resource for a particular drug, thus results may vary.
Click	the **Hide list of resources searched** link to prepare for the next scenario

Scenario – Naltrexone and Parkinson's Disease

A woman is reading Medical News Today online and comes across an article titled *Naltrexone may be effective in diminishing impulse control disorder in Parkinson's disease*. She knows someone with Parkinson's disease and would like to learn more about the drug and new uses.

Use the Drug Information Portal to research naltrexone.

Suggested Solution:

Type	**naltrexone** in the search field
	Note the site automatically suggests search terms as you type to help with spelling errors.
Click	**Go**

What is the MeSH drug category for naltrexone?

Suggested Solution (continued):

View the **Categories** section to identify the drug category.

Use MedlinePlusDrug to see what naltrexone has been used for previously.

Suggested Solution (continued):

Click the **Summary of drug information (MedlinePlusDrug)** link in the Summary section

The information opens in a new tab

View the information to determine prior uses, noting the information in the Important Warning section

Close the **MedlinePlusDrug** tab or window when finished reviewing the information

Review biological and physical data from HSDB.

Suggested Solution (continued):

Click the **Summary of reviewed biological and physical data (HSDB)** link in the Detailed Summary section

The information opens in a new tab

Review the table of contents and some of the information provided

Note that HSDB offers more technical information for professionals and researchers, as do the other links in the Detailed Summary section of the Drug Information Portal search results.

Close the HSDB tab or window when finished reviewing the information

View information about clinical trials performed with naltrexone.

Suggested Solution (continued):

Click the **Clinical trials (ClinicalTrials.gov)** link in the Summary section

The information opens in a new tab

Browse the results to see other uses for naltrexone

Type **naltrexone AND parkinson's** in the Search field in the upper right of the **ClinicalTrials.gov** page

Click **Search**

View	the list of clinical trials
Click	the name of the study (**Naltrexone for Impulse Control Disorders in Parkinson's disease**).

Using the information provided, answer the following questions about this clinical trial:

a. **Was the trial completed?**

b. **What will be measured as a primary outcome?**

c. **Who is eligible for this trial?**

d. **What are two factors that would exclude a person from this trial?**

e. **Where is the trial being conducted?**

f. **What phase is this trial in and what does that mean?**

g. **Have the results been posted?**

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LiverTox

LiverTox is a central repository of up-to-date, accurate, and easily accessed information on the diagnosis, cause, frequency, patterns, and management of liver injury attributable to prescription and nonprescription medications, herbals, and dietary supplements. LiverTox is a joint effort of the Liver Disease Research Branch of the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) and the Division of Specialized Information Services (SIS) of the National Library of Medicine® (NLM).

livertox.nih.gov

Searching LiverTox

Use the search box at the top of each page to search for a specific prescription and nonprescription medications, herbals, and dietary supplements or browse using the alphabetical listing on the homepage.

LiverTox Components

LiverTox has three major components:

- Introduction and overview of drug induced liver injury
- Specific drug records that provide concise data on the hepatotoxicity of medications, herbals, and dietary supplements
- Case submission registry that allows users to provide comments about the LiverTox database and submit clinical cases to the LiverTox Website and US Food and Drug Administration (FDA)

Additional Resources

For further information, review these additional resources:

- The National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK)
  niddk.nih.gov

LiverTox Search Exercises

Go to **livertox.nih.gov**.

Exercise 1: Use LiverTox to determine uses and effects of Tylenol.

Suggested Solution:

Type **Tylenol** in the Search box

Click **Search**

In this case, the search term is a brand name. The record that was retrieved is for acetaminophen, the active ingredient in Tylenol.

Click the **Acetaminophen** link

Use the information provided to answer the following questions:

a. Can taking acetaminophen be fatal?

Suggested Solution (continued):

Refer to the **Introduction** section

b. What is this drug recommended for?

Suggested Solution (continued):

Refer to the **Background** section

c. What life-threatening effects have resulted from the standard use of acetaminophen?

Suggested Solution (continued):

Refer to the **Hepatotoxicty** section

d. What factors may increase the metabolism of acetaminophen and predispose individuals to toxicity?

Suggested Solution (continued):

Refer to the **Mechanism of Injury** section

e. How many case reports are listed for acetaminophen?

Suggested Solution (continued):

Browse the case reports for this record.

Note the case reports contain a description, key points, laboratory values, comments, and references with links to PubMed.

f. Can you access the product label information?

Go to the following site to view product label information **dailymed.nlm.nih.gov/dailymed/search.cfm?query=ACETAMINOPHEN**

Return to the Acetaminophen record in LiverTox.

Section 10: Emergencies and Disasters

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Chemical Hazards Emergency Medical Management (CHEMM)

CHEMM (Chemical Emergency Medical Management) is a comprehensive Web-based resource designed to enable first responders, first receivers, and other health care providers and planners to plan for, respond to, and recover from the effects of mass-casualty incidents involving chemicals. CHEMM offers resources, tools, and guidelines to help responders make safer decisions and provide them with the right information when it is needed most. CHEMM is downloadable in advance for use when Internet is not accessible.

chemm.nlm.nih.gov

CHEMM content is extensively hyperlinked, interconnected, and organized in multiple ways. Customized information can be accessed by selecting the tab for first responder, hospital provider, or incident preparedness on the homepage. Information organized by role is also available under **CHEMM for You** on the home page.

The types of information in CHEMM that can be accessed using the left side menu on the homepage include:

- Quick Chemical Information
- Acute Patient Care Guidelines
- Initial Event Activities
- Patient Management
- Medical Treatment Modifiers
- Tools, Guidelines, and Planning
- References/Data Center

CHEMM was produced by the US Department of Health and Human Services, Office of Assistant Secretary for Preparedness and Response, Office of Planning and Emergency Operations, in cooperation with the National Library of Medicine, Division of Specialized Information Services, and medical, emergency response, toxicology, and other types of experts.

Additional Resources

For further information, review these additional resources:

- CHEMM Quick Tour
  youtube.com/watch?v=I0f406KMIqA

- CHEMM Listserv
  chemm.nlm.nih.gov/email.htm

- Download CHEMM to Your Computer
  chemm.nlm.nih.gov/download.htm

CHEMM Exercises

 Go to **chemm.nlm.nih.gov**.

Exercise 1: View the "Where Do I Start" information for new users and the CHEMM Quick Tour.

Suggested Solution:

Click	**New Users: Where Do I Start?** in the Quick Links section to the right of the page
Review	the information provided
Click	**Take a CHEMM Quick Tour**
Review	the video tour
Click	the browser's **Back** button to return to CHEMM
Click	the **CHEMM Home** tab in the upper left corner of the page to prepare for the next activity

Exercise 2: What are some hospital management and prehospital management implications for ammonia?

Suggested Solution:

Type	**ammonia** in the Search box in the upper right corner of the page
Press	**Enter**
Select	**Ammonia Emergency Department/Hospital Management**
Review	the information provided
Click	the browser's **Back** button to return to the search results
Select	**Ammonia Prehospital Management**
Review	the information provided

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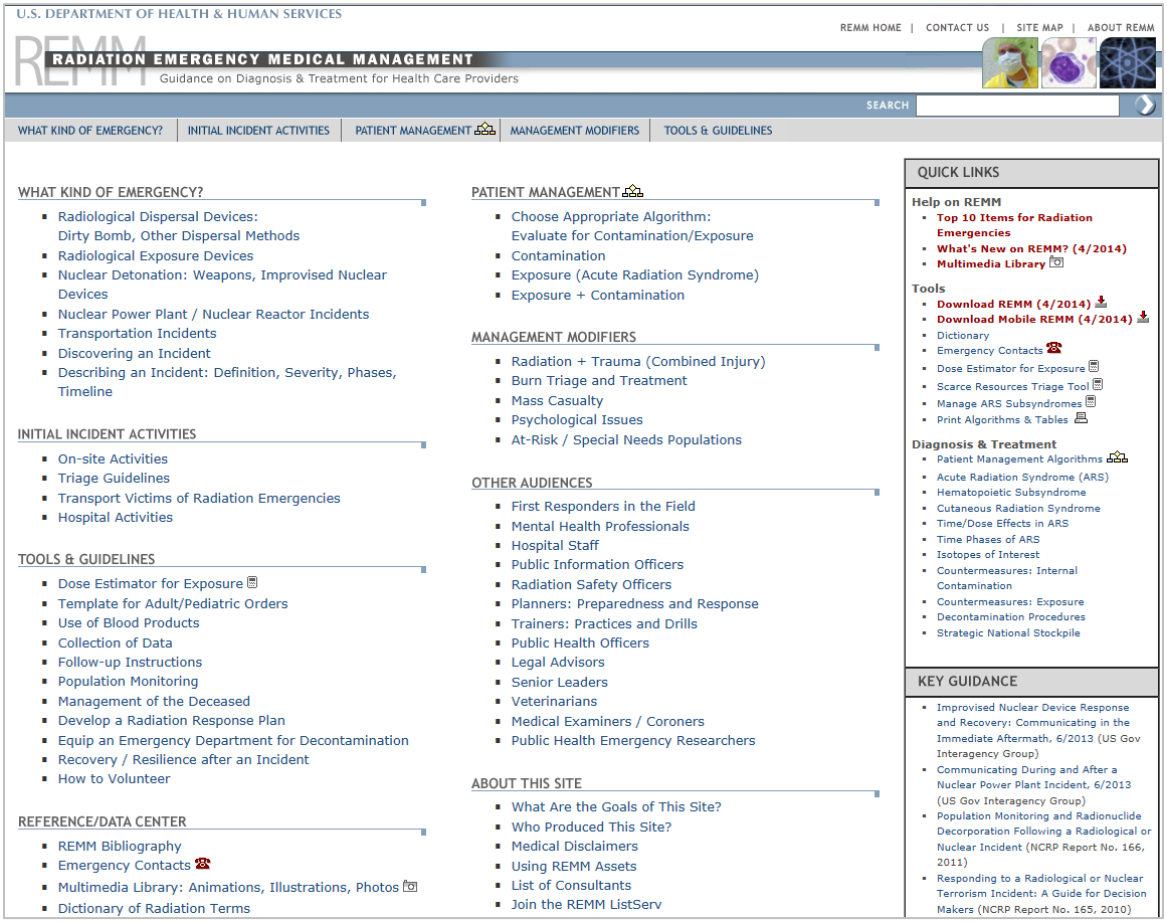
Radiation Emergency Medical Management (REMM)

REMM provides easy-to-follow algorithms on clinical diagnosis, treatment, and management of radiation contamination and exposure during mass casualty radiological/nuclear emergencies. REMM is primarily for physicians with little to no formal radiation training. REMM also provides information for those who may be involved in responding to a radiation emergency in other capacities. REMM is available for download for multiple types of mobile devices including Apple iPhone, iPod touch and iPad, Android, and BlackBerry devices.



remm.nlm.gov

REMM is extensively hyperlinked and interconnected. The hyperlinks are organized in eight content categories. The following are the most commonly used categories and appear across the top of the page beneath the REMM logo.

- **What Kind of Emergency? —**information relevant to each type of radiation emergency, including radiological dispersal devices, radiological exposure devices, nuclear explosions, nuclear reactor accidents, and transportation accidents

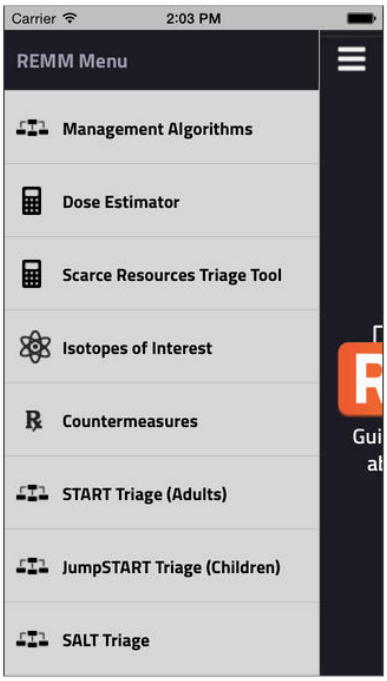
- **Initial Incident Activities—**information regarding activities that should occur as part of an initial response following an emergency, including onsite activities, triage guidelines, and hospital activities
- **Patient Management—**patient management procedures to assist medical responders following a radiological or nuclear emergency determine whether patients have been exposed, contaminated, or both
- **Management Modifiers—**provides detailed information about radiation + trauma (combined injury), burn triage and treatment, mass casualty, psychological issues, and specific populations
- **Tools & Guidelines—**tools to facilitate quick lookup of information

Quick Links, on the right side of most REMM pages, can help users navigate through the portal. Quick Links offers easy access to some of the portal's most important features and tools, including a link to all of the animations, illustrations, and photos founding REMM.

REMM was produced by the US Department of Health and Human Services, Office of the Assistant Secretary for Preparedness and Response, Office of Planning and Emergency Operations, in cooperation with the National Library of Medicine, Division of Specialized Information Services, with subject matter experts from the National Cancer Institute, the Centers for Disease Control and Prevention, and many US and international consultants.

Mobile REMM

A mobile version of REMM is available as an app download for Android, Apple iOS, and BlackBerry devices. Simply visit **remm.nlm.gov/downloadremm.htm** and follow the directions on the screen to download the appropriate app for your device.



Additional Resources

For further information, review these additional resources:

- Sources of Radiological/Nuclear Information
  remm.nlm.nih.gov/remm_SourcesofRadInfo.htm
- Understanding Radiation
  remm.nlm.gov/remm_RadPhysics.htm
- Multimedia Library
  remm.nlm.gov/imagegallery.htm
- Download REMM to Your Computer
  remm.nlm.gov/download.htm
- Download Mobile REMM
  remm.nlm.gov/downloadmremm.htm
- Join REMM Listserv
  remm.nlm.gov/email.htm

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REMM Exercises

Scenario – Managing Internal Contamination

A radiation accident occurred in Samut Prakan Province in Thailand in January/February, 2000. The accident happened when scrap metal collectors recovered an insecurely stored, unlicensed cobalt-60 radiation source. The scrap metal collectors, together with a scrapyard worker, subsequently dismantled the container, unknowingly exposing themselves and others nearby to ionizing radiation. Over the following weeks, those exposed developed symptoms of radiation sickness and eventually sought medical attention (excerpt taken from Wikipedia's Samut Prakan radiation accident page, retrieved from **en.wikipedia.org/wiki/Samut_Prakan_radiation_accident**).

The victims got radiation sickness (acute radiation syndrome) by getting the gamma ray irradiation from the radiation source.

1. What is the half-life of Cobalt-60?

Go to **remm.nlm.gov**.

Suggested Solution:

Type	**cobalt** in the Search box in the upper right corner of the page
Press	**Enter**
Select	**Managing Internal Contamination** from the list of search results
Scroll	to the **Isotopes of Interest: Properties, Treatment, and Fact Sheets** section
Locate	**Cobalt (Co-60)** in the table
Review	the radioactive half-life and treatment options for Cobalt (Co-60)

2. What are the symptoms of acute radiation syndrome?

Suggested Solution:

Type	**ARS** in the Search box
Press	**Enter**
Select	**"What is ARS…"**
Review	the information provided

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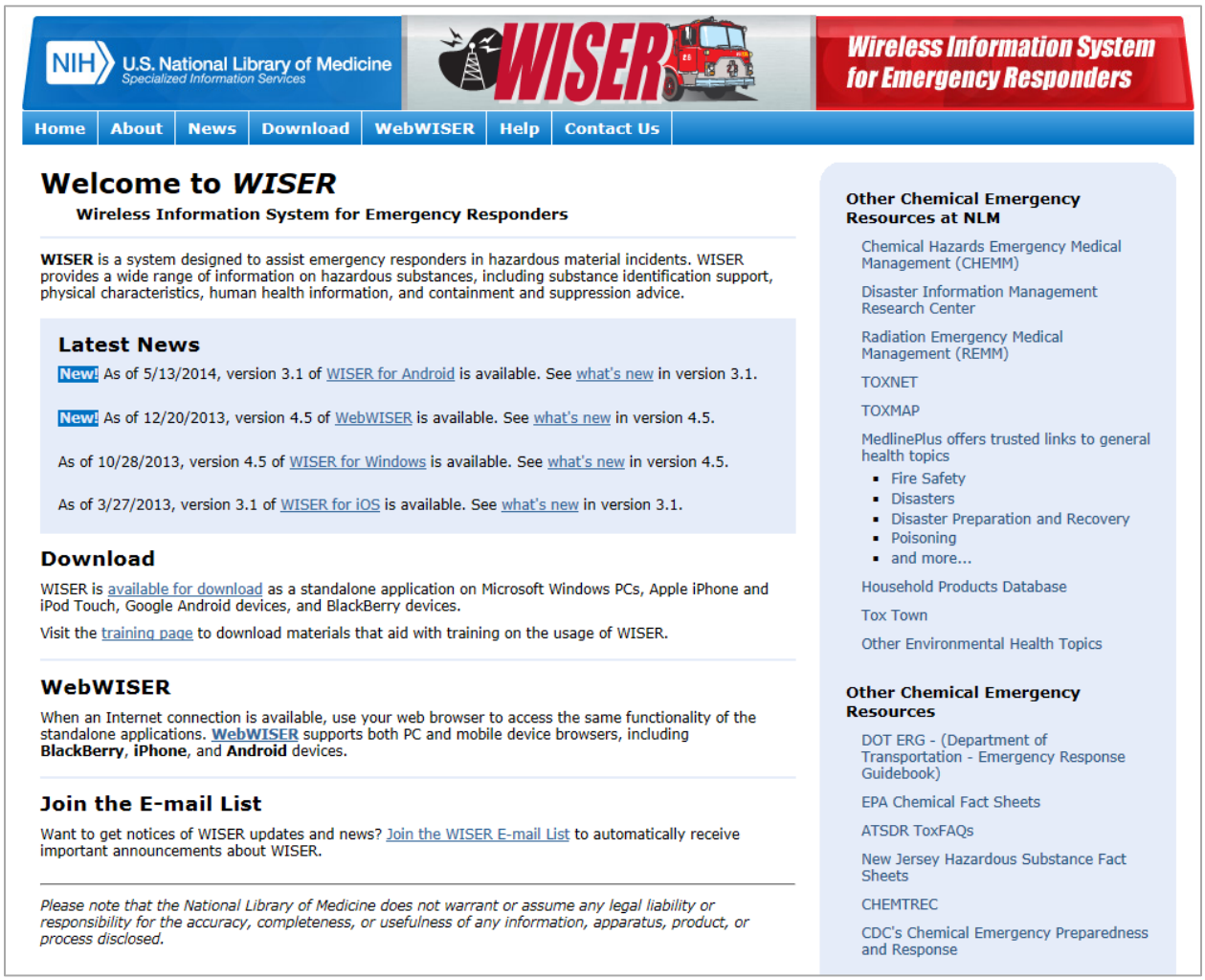
Wireless Information System for Emergency Responders (WISER)

WISER® (**W**ireless **I**nformation **S**ystem for **E**mergency **R**esponders) is a mobile application designed to assist first responders in hazardous material incidents. Standalone versions are currently available for the Microsoft Windows™, Apple iOS, and Android platforms. A connected version of WISER supports the BlackBerry platform and a Web-based version (WebWISER) supports Web browsers for PCs and mobile devices.

Developed by the National Library of Medicine (NLM), **WISER** provides a wide range of information on hazardous substances, including chemical identification support, physical characteristics, and human health, containment, and suppression information. In addition to chemicals, **WISER** now includes radioisotopes and biological agents.



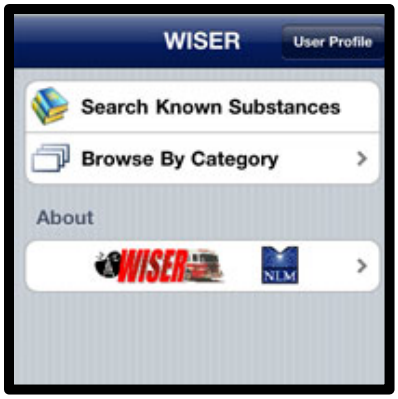
wiser.nlm.nih.gov

Features

- **Rapid access to the most important information** about a hazardous substance
- **Intuitive, simple, logical user interface** developed by working with experienced first responders
- **Comprehensive decision support**, including assistance in identification of an unknown chemical or chemical syndrome and guidance on the immediate actions necessary to save lives and protect the environment
- **GIS support** provides for isolation/protective distance overlays on a map of the incident
- **Access to HSDB and CHEMM**, which contain a wealth of detailed, peer-reviewed information on hazardous substances
- **User Profiles** enable users to specify the role they are currently playing at the scene of an incident: first responder, HAZMAT specialist, EMS specialist, hospital provider, or preparedness planner. The application interface is customized so that the information most relevant to the respective job can be quickly accessed.
- **Tools and reference materials**, including triage tools, radiological incident support, WMD response guidelines, and the ERG 2012 electronic version
- **Mobile support**, providing first responders critical information where they need it, when they need it

WISER Mobile App

WISER is available as a mobile app for Android, Apple iOS, and BlackBerry. To download the app, access WISER at **wiser.nlm.nih.gov/choose_platform.html** on your device. Follow the directions on the screen to locate the appropriate download.



Additional Resources

For further information, review these additional resources:

- WISER Fact Sheet
  nlm.nih.gov/pubs/factsheets/wiser.html
- WISER Training Resources
  wiser.nlm.nih.gov/training.html
- WISER updates and news
  wiser.nlm.nih.gov/listserv_join.html
- US Department of Transportation–Emergency Response Guidebook (DOT–ERG)
  phmsa.dot.gov/hazmat/library/erg
- CHEMM Homepage
  chemm.nlm.nih.gov

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WISER Search Exercises

 Go to **wiser.nlm.nih.gov**.

 Select the **WebWISER** tab from the menu bar at the top of the page.

Exercise 1: Should chemical extinguishers be used to put out a fire involving hydrogen peroxide?

Suggested Solution:

Select	the **Known Substances** link
Type	**hydrogen peroxide** in the Search Text field to the left
Click	**Search**
Select	the **Hydrogen Peroxide** link in the search results to the right
Select	**Fire Fighting Procedures** in the list of links to the left
Review	the information provided to answer the question

Exercise 2: View a map of the protective distance area for a specific location.

Suggested Solution (continued from the previous search exercise):

Select	the **Protective Distance Map** link to the left
Enter	a street address or other location in the Location field at the top of the map
Click	the **Submit** button
Select	from the Materials drop-down (in the upper right area of the map) a material or worst case
	The map automatically updates as additional items are selected along the right
Select	a Wind Direction and any other desired options along the right side of the map

Exercise 3: Review the help documentation for WISER.

Suggested Solution (continued from the previous search exercise):

Select	the **Help** tab at the top of the page
Review	the information provided, including links to the WISER User Guide

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Disaster Information Management Research Center

The core purpose of the **Disaster Information Management Research Center (DIMRC)** is to develop and provide access to health information resources and technology for disaster preparedness, response, and recovery. The goal of DIMRC is to connect people to quality disaster health information and foster a culture of community resiliency.

disasterinfo.nlm.nih.gov

DIMRC is committed to help prepare for, respond to, recover from, and mitigate the adverse health effects of disasters in conjunction with Federal, State, and local governments, organizations, and local communities. To accomplish this, DIMRC is focused on several areas:

- Maintain access to health information during disasters
- Develop innovative products and services to serve health professionals and the public
- Conduct research to support disaster health information management
- Collaborate with other agencies and communities

Additional Resources

For further information, review these additional resources:

- DIMRC Fact Sheet
  nlm.nih.gov/pubs/factsheets/dimrcfs.html
- Disaster Lit: Resource Guide for Disaster Medicine and Public Health
  disasterlit.nlm.nih.gov

Appendix

Environmental Health & Toxicology Portal Decision Tree

The National Library of Medicine® (NLM) Environmental Health and Toxicology Portal provides access to many resources. The following chart is a guide to selecting the appropriate resource or database depending on user information needs. Database and resource links can be accessed at: **sis.nlm.nih.gov/enviro.html**

Use this decision tree to choose the correct database or resource:

For this type of information…	Go to…
Journal references to toxicology literature including developmental/reproductive and teratology (birth defects) information	TOXLINE® or DART®
Summary of peer-reviewed human health effects and emergency medical treatment for chemicals	HSDB®
Animal Toxicity Studies	HSDB
Environmental Fate, Exposure, Standards and Regulations	HSDB
Chemical/Physical properties and safety/handling/disposal of chemicals	HSDB
Manufacturing, formulation and use of chemicals	HSDB
Chemical names and synonyms	ChemIDplus® or HSDB
Chemical structures and structure searching/drawing capability	ChemIDplus
InChI and/or SMILES structure notations	ChemIDplus
List of links to NLM/NIH and other government agency information for a single chemical	ChemIDplus
Carcinogenicity, mutagenicity, tumor promotion and tumor inhibition data from the National Cancer Institute (NCI)	CCRIS (covers 1985-2011; no longer updated)
Peer-reviewed mutagenicity test data from the US Environmental Protection Agency (EPA) including species, type of assay, test result and more	GENE-TOX (covers 1991-1998; no longer updated)
Hazard identification and dose-response risk assessment information from the EPA	IRIS
Cancer and noncancer oral and inhalation risk values and types from government and independent risk information groups worldwide	ITER
Results and analyses of chronic and long-term animal cancer test from NCI, the National Toxicology Program (NTP) and the general published literature	CPDB (covers 1980-2011; no longer updated)

For this type of information…	Go to…
Drug information related specifically to breastfeeding mothers and their nursing infants including maternal/infant drug levels, possible effects and more	LactMed®
Environmental releases of chemicals and waste management activities reported by facilities to the EPA	TRI
Electronic maps of chemical releases, Superfund sites, health, census, income data and more	TOXMAP®
Chemicals, occupations, job tasks, and associated diseases/conditions	Haz-Map
Drug information including names, descriptions, labels, drug categories and links to additional resources	Drug Information Portal
Safety and health information for products used in and around the home	HPD
Material Safety Data Sheets (MSDS) and consumer product recalls	HPD
Health information and research related to natural, accidental, or deliberate disasters	DIMRC
Tool about chemical, biological, and radiological agents of concern for emergency responders, with a focus on Hazmat and transportation incidents	WISER®
Diagnosis and treatment information for radiological events and emergencies	REMM
Interactive Web site on toxic chemicals and environmental health concerns in the community	ToxTown®
Resources for alternatives to the use of live vertebrates in biomedical research and testing	ALTBIB®
Selected links to internet resources on environmental issues of special interest	Enviro-Health Links
Directory of Health Organizations	DIRLINE®
Online tutorials on basic toxicology principles and concepts	Toxicology Tutorials
Interactive children's learning site about household chemical hazards	ToxMystery™
Information about drug induced liver injury caused by prescription and nonprescription drugs, herbals, and dietary supplements	LiverTox
Data explaining molecular mechanisms by which environmental chemicals affect human disease	CTD (updated several times a year)
Chemical emergency information with a focus on potential mass casualty chemicals: Chemical identification, acute patient care guidelines, and initial event activities	CHEMM

Contact the National Library of Medicine® for Database Assistance

Toll-free: 888.FIND.NLM (346.3656)

E-mail: **custserv@nlm.nih.gov**

TOXNET® E-mail: **tehip@teh.nlm.nih.gov**

Online TOXNET Resources

Resource	URL
Training Manuals	**sis.nlm.nih.gov/enviro/manuals.html**
Toxicology Tutorials	**sis.nlm.nih.gov/enviro/toxtutor.html**
Fact Sheets	**sis.nlm.nih.gov/sisfactsheets.html**
Frequently Asked Questions	**toxnet.nlm.nih.gov/newtoxnet/faq.html**

See Help and FAQ links on each database homepage.

National Network of Libraries of Medicine®

Toll-free number for all Regional Medical Libraries: 800.338.7657

Monday-Friday 8:30 a.m. – 5:00 p.m. in all time zones

Web site: **nnlm.gov**

National Training Center

Toll-free number: 800.338.7657, press 2

Web site: **nnlm.gov/ntc**