TOXNET and Beyond:

Using the National Library of Medicine Environmental Health and Toxicology Portal

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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, due to 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 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 TOXNET system of databases in chemistry, toxicology, environmental health, and related fields. In addition to TOXNET, the course will highlight various resources available through the Environmental Health and Toxicology Portal.

The National Library of Medicine Environmental Health and Toxicology Information Program was created in 1967 to serve as the federal government's centralized resource for toxicology and environmental health information. Throughout history, the effects and importance of poisons and exposure to toxic substances has 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 recognized throughout time
- Socrates – hemlock
- Cleopatra – asp
- Paracelsus (1493–1541), Father of Toxicology – "The dose makes the poison"
- Lucretia Borgia – 15th & 16th Centuries
- Harvey W. Wiley's Poison Squad (1903)
- The Jungle (1906) Upton Sinclair – lack of hygiene in the meat-packing industry
- 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"
- TEHIP Created (1967)
- Situated within NLMs Division of Specialized Information Services (SIS)

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Environmental Health & Toxicology Portal Decision Tree
(a pull-out reference card) ..... final page

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Introduction

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 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 health 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
- **Chemical Carcinogenesis Research Information System (CCRIS)**—scientifically evaluated and fully referenced data on more than 9,000 chemicals
- **Developmental and Reproductive Toxicology Database (DART)**—a bibliographic database containing more than 200,000 references to literature published since 1965
- **GENE-TOX**—genetic toxicology test data on more than 3,000 chemicals resulting from expert peer review of the open scientific literature
- **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 650 chemicals with links to source documentation

- **LactMed**—a database of more than 900 drugs and other chemicals to which breastfeeding mothers may be exposed
- **Toxics Release Inventory (TRI)**—information on annual environmental releases of more than 650 toxic chemicals by U.S. facilities from the U.S. Environmental Protection Agency (EPA)
- **TOXMAP**—a Geographic Information System that uses maps of the United States to help users visually explore TRI data
- **Haz-Map**—an occupational toxicology database that links job tasks to occupational diseases and their symptoms
- **Household Products Database**—human health effects information on more than 11,000 brand-name consumer products

Information on the following resources is included in the "More to Explore" section of this manual.

- **Drug Information Portal**—current drug information for more than 33,000 drugs with links to additional online resources with potential drug information
- **Dietary Supplements Labels Database**—information from the labels of more than 7,000 brands of dietary supplements in the marketplace
- **Tox Town**—an interactive guide to commonly encountered toxic substances and environmental health risks
- **Radiation Emergency Medical Management**—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
- **Enviro-Health Links**—selected links to Internet resources on environmental health and toxicology issues of special interest

These additional resources will be demonstrated:

- **Disaster Information Management Research Center (DIMRC)**—health information resources and informatics research related to disasters of natural, accidental, or deliberate design
- **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 1547 chemicals
- **Comparative Toxicogenomics Database (CTD)**—curated scientific data describing relationships between chemicals, genes and human diseases
- **LiverTox**—Information about drug induced liver injury caused by prescription and nonprescription drugs, herbals and dietary supplements

Environmental Health & Toxicology Portal

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

sis.nlm.nih.gov/enviro.html

Browse the easily navigable 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, a list of NLM databases and electronic resources. You can also search all TOXNET databases 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 NLM Division of Specialized Information Services **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

Subscribe to RSS

- Receive frequently updated information from NLM Division of Specialized Information Services

  sis.nlm.nih.gov/rss/sisnewsfeed.rss

News Updates

- News from NLM Division of Specialized Information Services

  sis.nlm.nih.gov/news.html

Additional Resources

For further information, we recommend 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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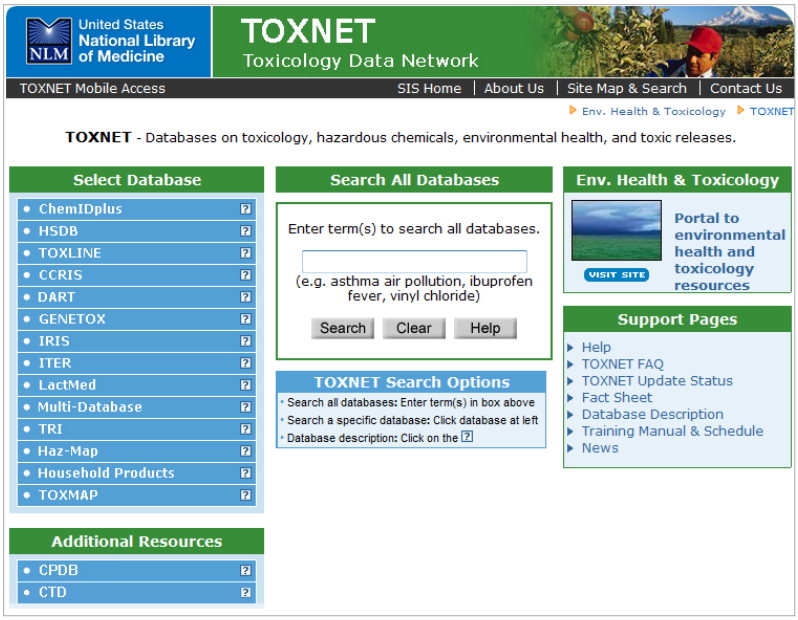
TOXNET

TOXNET Overview

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. Information includes specific chemicals, mixtures, and products; unknown chemicals; and special toxic effects of chemicals in humans and/or animals.



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

Click the information icon (?) to the right of each database in the Select Database column for a description of the database, a link to the fact sheet, and a sample record.

The TOXNET Databases

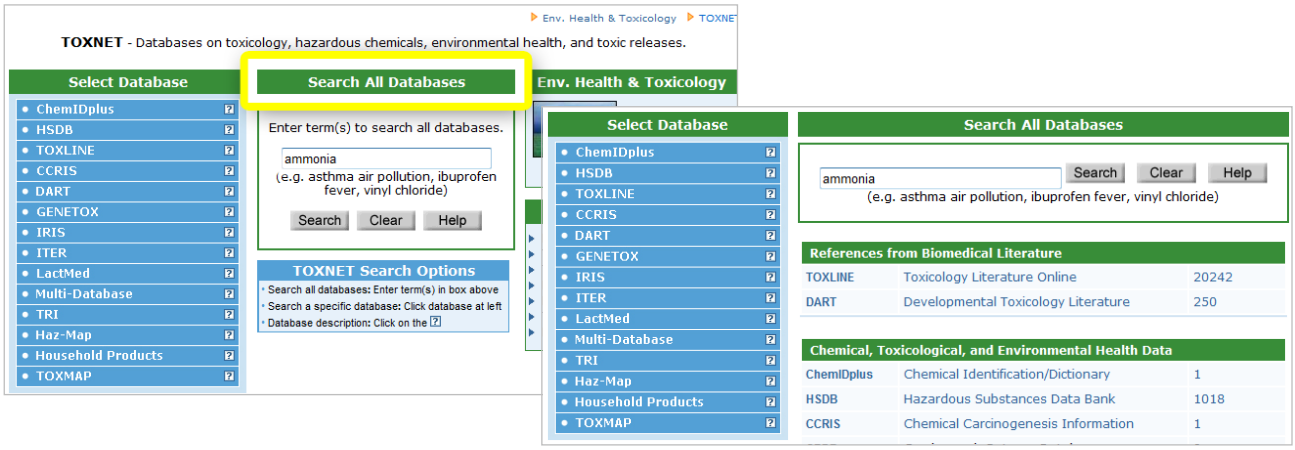
The TOXNET databases covered in this course can be grouped in the following categories:

- Chemical Nomenclature—ChemIDplus
- Toxicology Data (one record per chemical)—HSDB, IRIS, CCRIS, GENE-TOX, ITER, and LactMed—can also search any combination of these files with the Multi-Database feature
- Toxicology Literature (bibliographic references)—TOXLINE and DART

  Toxic Release—TRI and TOXMAP
- Specialty Databases—Haz-Map, CPDB, and CTD

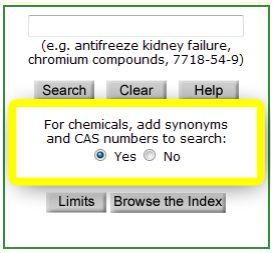
TOXNET Basic Searching

From the TOXNET home page, you can search all TOXNET databases simultaneously. Your results will be displayed as links to the databases in which your 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)—You may 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.

Synonym searching—By default the system will search for the exact name, synonyms, and CAS number as derived from ChemIDplus. Select "No" 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.

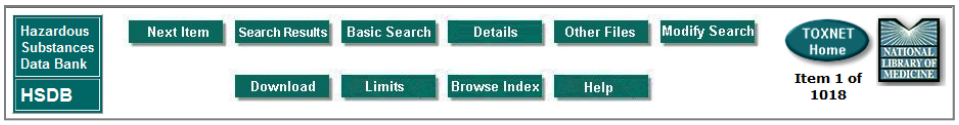
Boolean searching—Use the logical operators "AND," "OR," and "NOT" to limit a search of two or more terms to specific criteria. In searches with combinations of these operators, "AND" takes precedence, followed by "NOT" and then "OR." This default precedence may be overridden with the use of parentheses, which may also be nested (i.e., parentheses within parentheses). Examples:
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 the Index—This feature provides a scannable index of all terms beginning with the search term you entered and the number of records for each term. In the Toxicology Data 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 Buttons—Buttons on the left of the search results screen allow you to:

- Save Checked Items—save items in a set for displaying, sorting, and downloading
- Sort—sort the entire search results or items saved in a set
- Download—download the entire search results or items save in a set in brief, full, abstract, or tagged format
- Modify Search—make changes to the most recent search
- Basic Search—conduct a new search in the same database
- Browse Index—browse all words, CAS Registry Number, chemical name, and in bibliographic databases MeSH headings/keywords and authors
- Go to the Help file for that database
- Go to TOXNET Home

Navigation Buttons—Buttons at the top of the record screen allow you to:



- Go to the Next Item in the search results
- Go back to the Search Results screen
- Perform a new Basic Search in the same database
- View Details of the search
- Display links to Other Files (NLM databases) containing information on the substance
- Modify [your] Search
- Download the record or portions of the record
- Perform a new search in the same database with Limits applied
- Browse [the] Index
- Go to the Help file for that database

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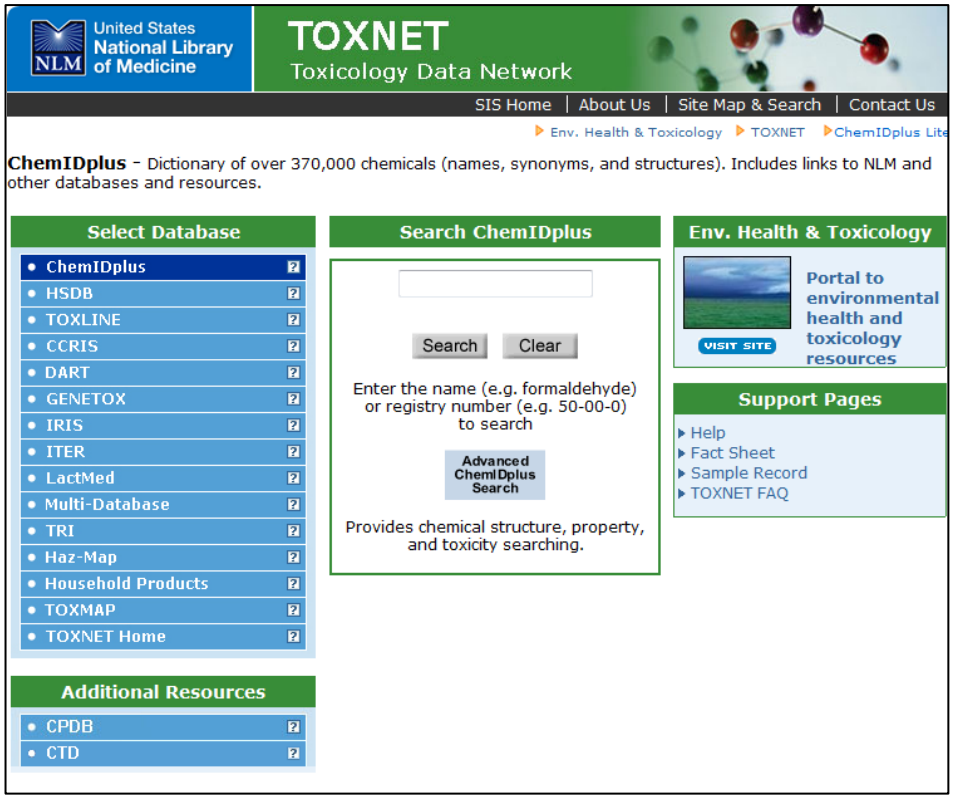
ChemIDplus

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 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 390,000 chemical records, of which more than 295,000 include chemical structures. Each record in ChemIDplus represents a single chemical or substance. The ChemIDplus database has two different applications: **ChemIDplus Lite** (for basic searching) and **ChemIDplus Advanced** (for more experienced users).



toxnet.nlm.nih.gov

Content

Information in the ChemIDplus database includes:

- Systematic, generic, and trade names
- Synonyms
- CAS registry numbers
- Molecular formulas
- Classification codes

- Chemical structures (ChemIDplus Advanced)

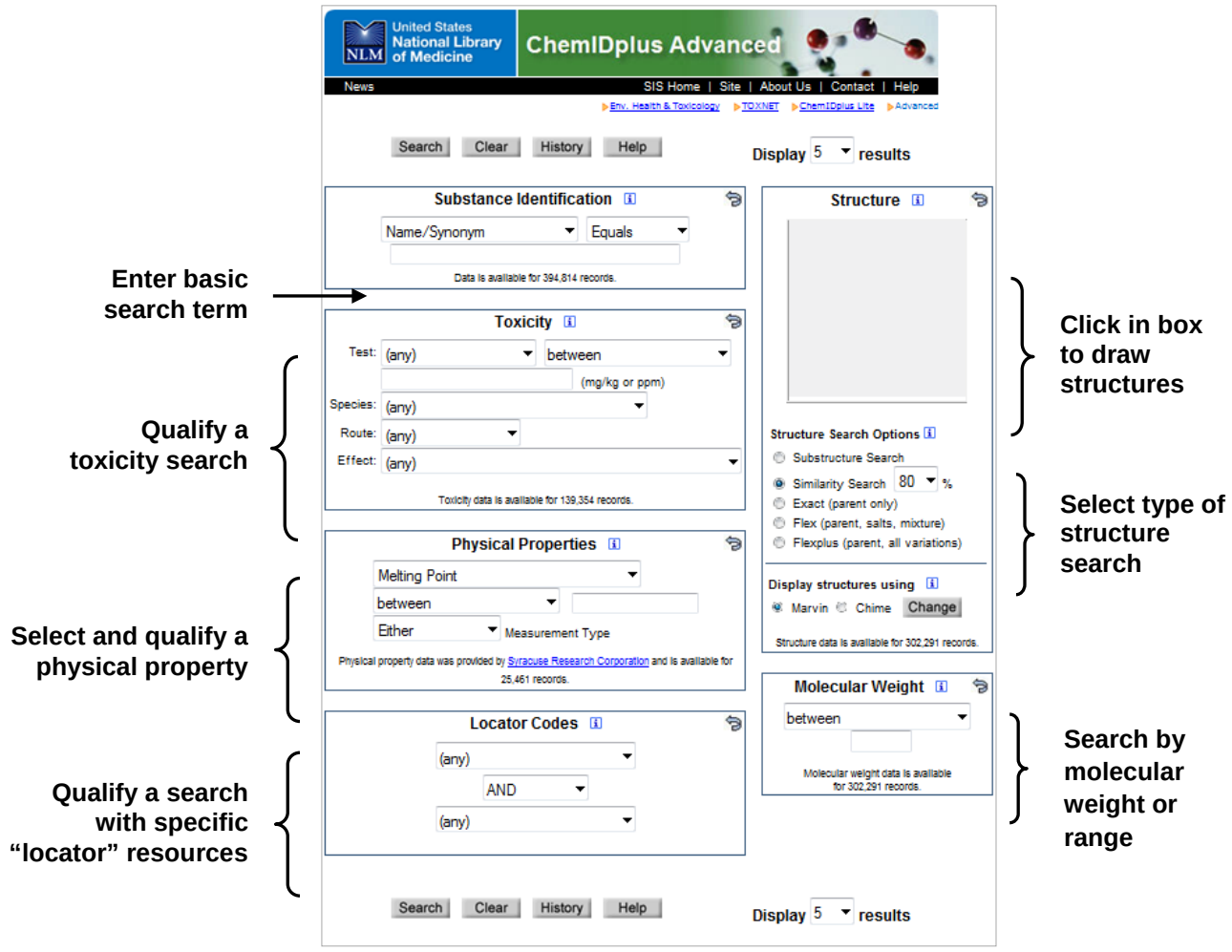
ChemIDplus also provides links to many biomedical resources at NLM and on the Internet for chemicals of interest.

Searching ChemIDplus

Search ChemIDplus by name, synonym, Chemical Abstracts Service (CAS) registry number, molecular formula, classification code, locator code, structure, toxicity, and/or physical properties within two distinct applications:

- **ChemIDplus Lite** (ChemIDplus home page) is designed for simple searching on name or registry number to retrieve basic information about a chemical and provide locator links to other resources and does not require special software applets or plug-ins. 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.

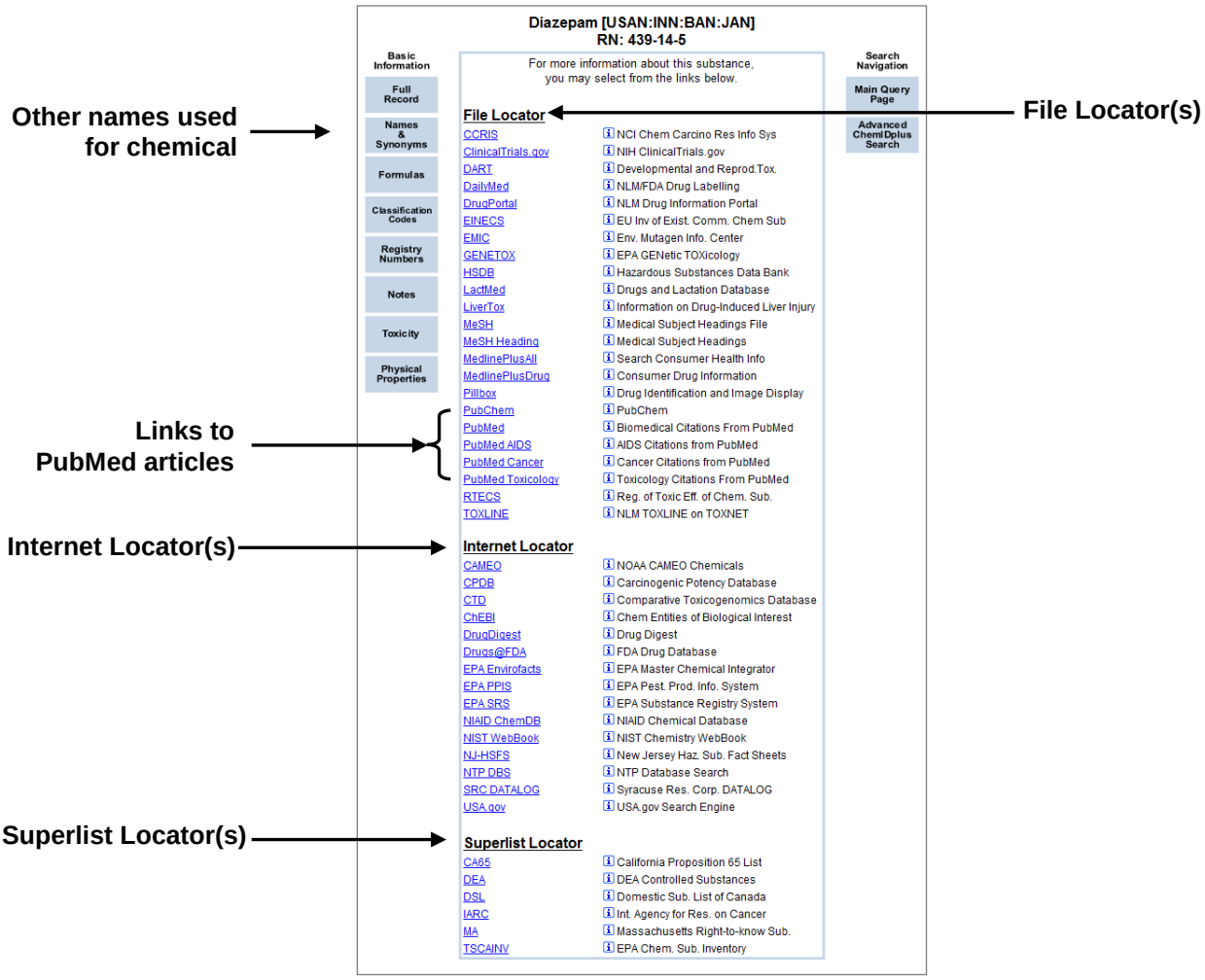


Search Results

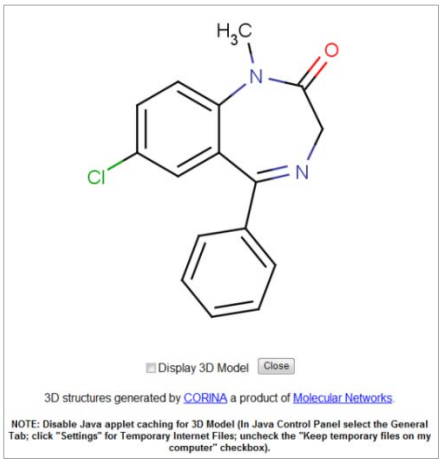
If you searched ChemIDplus Lite, the system displays the record with basic information for the chemical, including links to additional information. If multiple records were retrieved, a list of names would be shown. Following is the ChemIDplus Lite record for diazepam. Use buttons on the left to retrieve 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

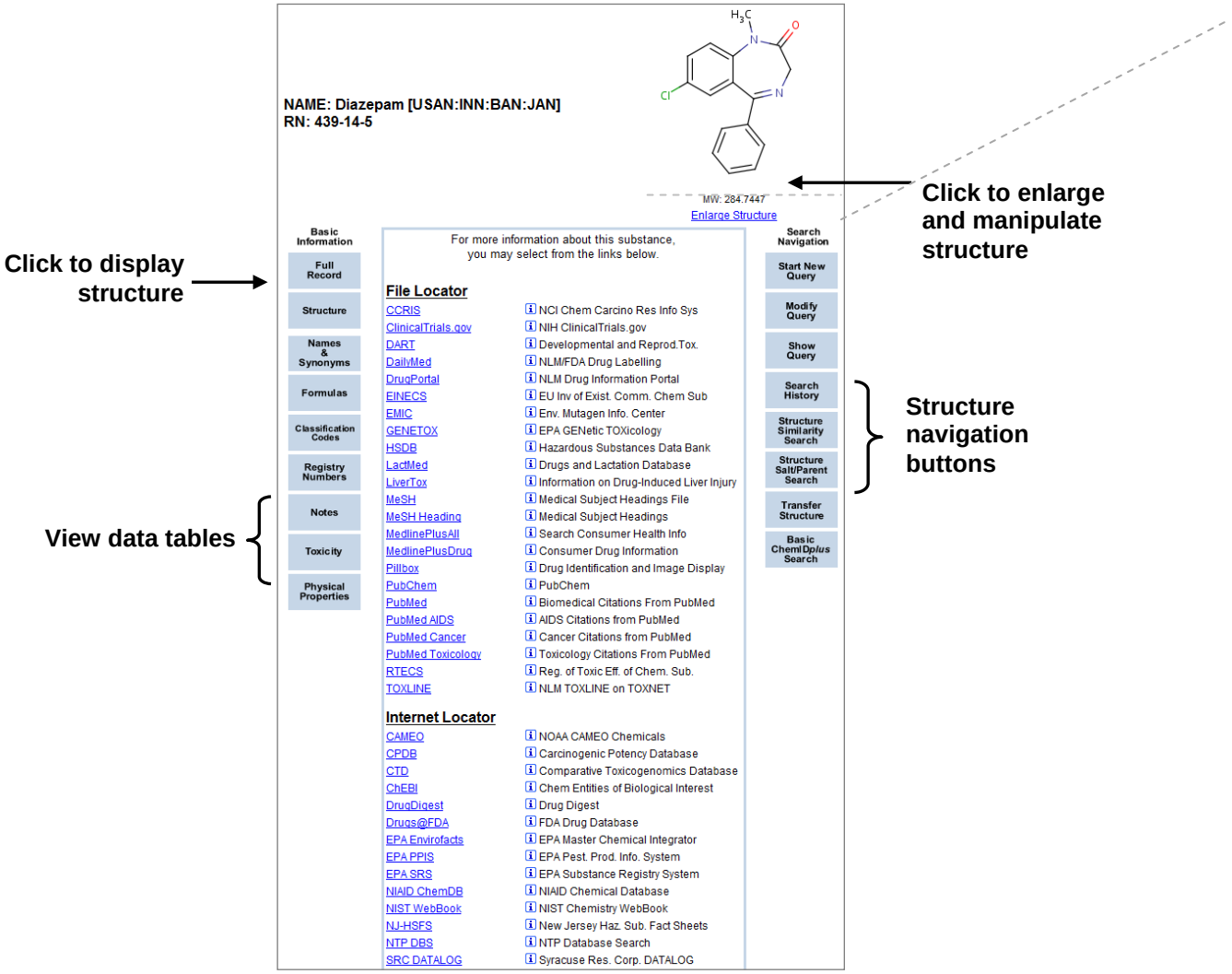
Record for Diazepam (ChemIDplus Lite)



The advanced record shows the same locator lists and basic information as the ChemIDplus Lite record with the addition of structures including structure navigation buttons.



Record for Diazepam (ChemIDplus Advanced)


NAME: Diazepam [USAN:INN:BAN:JAN]
RN: 439-14-5
MW: 284.7447
Enlarge Structure
Click to enlarge and manipulate structure
Click to display structure
Basic Information
Full Record
Structure
Names & Synonyms
Formulas
Classification Codes
Registry Numbers
Notes
Toxicity
Physical Properties
View data tables
For more information about this substance, you may select from the links below.
File Locator
CCRIS NCI Chem Carcino Res Info Sys
ClinicalTrials.gov NIH ClinicalTrials.gov
DART Developmental and Reprod.Tox.
DailyMed NLM/FDA Drug Labelling
DrugPortal NLM Drug Information Portal
EINECS EU Inv of Exist. Comm. Chem Sub
EMIC Env. Mutagen Info. Center
GENETOX EPA GENetic TOXicology
HSDB Hazardous Substances Data Bank
LactMed Drugs and Lactation Database
LiverTox Information on Drug-Induced Liver Injury
MeSH Medical Subject Headings File
MeSH Heading Medical Subject Headings
MedlinePlusAll Search Consumer Health Info
MedlinePlusDrug Consumer Drug Information
Pillbox Drug Identification and Image Display
PubChem PubChem
PubMed Biomedical Citations From PubMed
PubMed AIDS AIDS Citations from PubMed
PubMed Cancer Cancer Citations from PubMed
PubMed Toxicology Toxicology Citations From PubMed
RTECS Reg. of Toxic Eff. of Chem. Sub.
TOXLINE NLM TOXLINE on TOXNET
Internet Locator
CAMEO NOAA CAMEO Chemicals
CPDB Carcinogenic Potency Database
CTD Comparative Toxicogenomics Database
ChEBI Chem Entities of Biological Interest
DrugDigest Drug Digest
Drugs@FDA FDA Drug Database
EPA Envirofacts EPA Master Chemical Integrator
EPA PPIS EPA Pest. Prod. Info. System
EPA SRS EPA Substance Registry System
NIAID ChemDB NIAID Chemical Database
NIST WebBook NIST Chemistry WebBook
NJ-HSFS New Jersey Haz. Sub. Fact Sheets
NTP DBS NTP Database Search
SRC DATALOG Syracuse Res. Corp. DATALOG
Search Navigation
Start New Query
Modify Query
Show Query
Search History
Structure Similarity Search
Structure Salt/Parent Search
Transfer Structure
Basic ChemIDplus Search
Structure navigation buttons

Additional Resources

For further information, we recommend these additional resources:

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

- TOXNET Workbook
  sis.nlm.nih.gov/enviro/manuals.html

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

ChemIDplus Search Exercises

Scenario 1 – Chemical Identification

Linda works for a government agency that monitors ingredients in cigarettes. Linda and her team receive ingredient submissions from cigarette manufacturers. The team is tasked with verifying chemical ingredient names and registry numbers. Linda receives an ingredient submission which lists acetoin with CAS registry number 513-86-0. The previous submission listed acetyl methyl carbinol with the same registry number.

Search ChemIDplus Lite to verify the information: Locate the record for acetoin. Since 513-86-0 is the registry number for the acetoin record, verify whether, or not, acetyl methyl carbinol is a synonym for acetoin. Is there a regulatory source for this synonym?

Suggested Solution:

Type	**acetoin** in the Search box
Click	**Search**
Click	**Names & Synonyms** on the left
Scroll	down to **Superlist Name**
	Remember that the Superlist heading indicates government regulatory information (U.S. and International).
Click	**Information** icon (i) next to “Acetyl methyl carbinol” to view the source
Close	the **Data Source Information** window
Close	**Names & Synonyms** window

Scenario 2 – 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, but exclude pesticides from his initial short list for his team.

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. Return to the Search Results page to continue with Scenario 3.

Suggested Solution:

Click	**Advanced ChemIDplus Search**
Select	**LD50** from the Test drop-down menu under the **Toxicity** input area. Next, qualify the value as **less than** in the drop-down menu to the right
Type	a value of **50** (mg/kg or ppm) in the Search 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 Environmental Protection Agency (EPA).

Select **AND NOT** from the second drop-down menu under Locator Codes

The AND NOT qualifier excludes pesticides from the search results. The shaded rows indicate an exact match on the search query. The red text indicates a partial match. Notice links to PubMed in the Source column.

Select **EPA PPIS** from the last drop-down menu under Locator Codes

The EPA PPIS is the EPA's Pesticide Product Information System. The system identifies registered pesticides for use in the United States (current and former).

Click **Search**

Click the first record in the search results

Click **Toxicity** on the left side of the page

View the **Effect** column and close the Toxicity pop-up window

Click **Search Results Page** on right side of the page to continue with Scenario 3

Scenario 3 – Structure Similarity

Dr. Stein takes a look at his search results. He notices butanenitrile in the results list. Dr. Stein would like to identify chemicals structurally similar to this compound.

Use the ChemIDplus Advanced search results from Scenario 2 to identify similar structures: From the previous search results, locate the butanenitrile record and transfer the structure to the main query page. On the main query page, choose a level of similarity in the structure search box. The Similarity Search should be pre-selected as the default.

Suggested Solution:

Click **Transfer** icon ( ) button on the right side of the butanenitrile structure

Select **70%** from the drop-down menu under structure search options on the right side of the page

Click **Search**

Notice the similar halogenated structures.

Return to ChemIDplus Lite to prepare for the next search

Additional Exercises

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

Click

in the **Select Database** column.

Exercise 1: Locate the record for trifluralin. Is trifluralin on the U.S. EPA Clean Air List (CAA1)?

Suggested solution:

Type	**trifluralin** in the Search box
Click	**Search**
Click	**CAA1** under SuperList Locator
Review	the information in the pop-up window and close the window
Click	the **Main Query Page** button at the right to prepare for a new search

Exercise 2: Check the File Locator field in the selenium record to see what other NLM databases contain information on selenium. View the listing of selenium synonyms.

Suggested solution:

Type	**selenium** in the Search box
Click	**Search**
Review	the other NLM databases (under **File Locator**), that contain information on the chemical
Click	the **Names & Synonyms** button on the left side of the page
Review	the list in the pop-up window and close the window
Click	the **Main Query Page** button at the right to prepare for a new search

Exercise 3: Find the lowest toxic dose tested (TDLo) for phenobarbital in infants.

Suggested solution:

Type	**phenobarbital** in the Search box
Click	**Search**
Click	**Phenobarbital [USAN:INN:JAN]**
Click	the **Toxicity** button on the left side of the page
Review	the chart and close the window
Click	the **Main Query Page** button at the right to prepare for a new search

Exercise 4: Locate the record for formaldehyde and link to the Internet Locator ATSDR Tox Portal. Then link to the NIOSH Pocket Guide. Use the Classification Code button to find the Overall Carcinogenic Evaluation classification and the source for the rating.

Suggested solution:

Type	**formaldehyde** in the Search box
Click	**Search**
Click	**ATSDR Tox Portal** under Internet Locator
Review	the **Tox Portal for Formaldehyde** in the ATSDR window and close the window
Click	**NIOSH Pocket Guide** under Internet Locator
Review	the information and close the CDC window
Click	**Classification Codes** on the left side of the page
Review	the **Superlist Classification Code** list to find Overall Carcinogenic Evaluation: Group 1
Click	the **information icon (** **)** next to Overall Carcinogenic Evaluation: Group 1 to find the data source – **IARC (International Agency for Research on Cancer)**
Close	the **Data Source Information** window, then the Classification Codes window and return to the **Formaldehyde [USAN]** record
Click	**Main Query Page** at the top right to prepare for a new search

Exercise 5: 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:

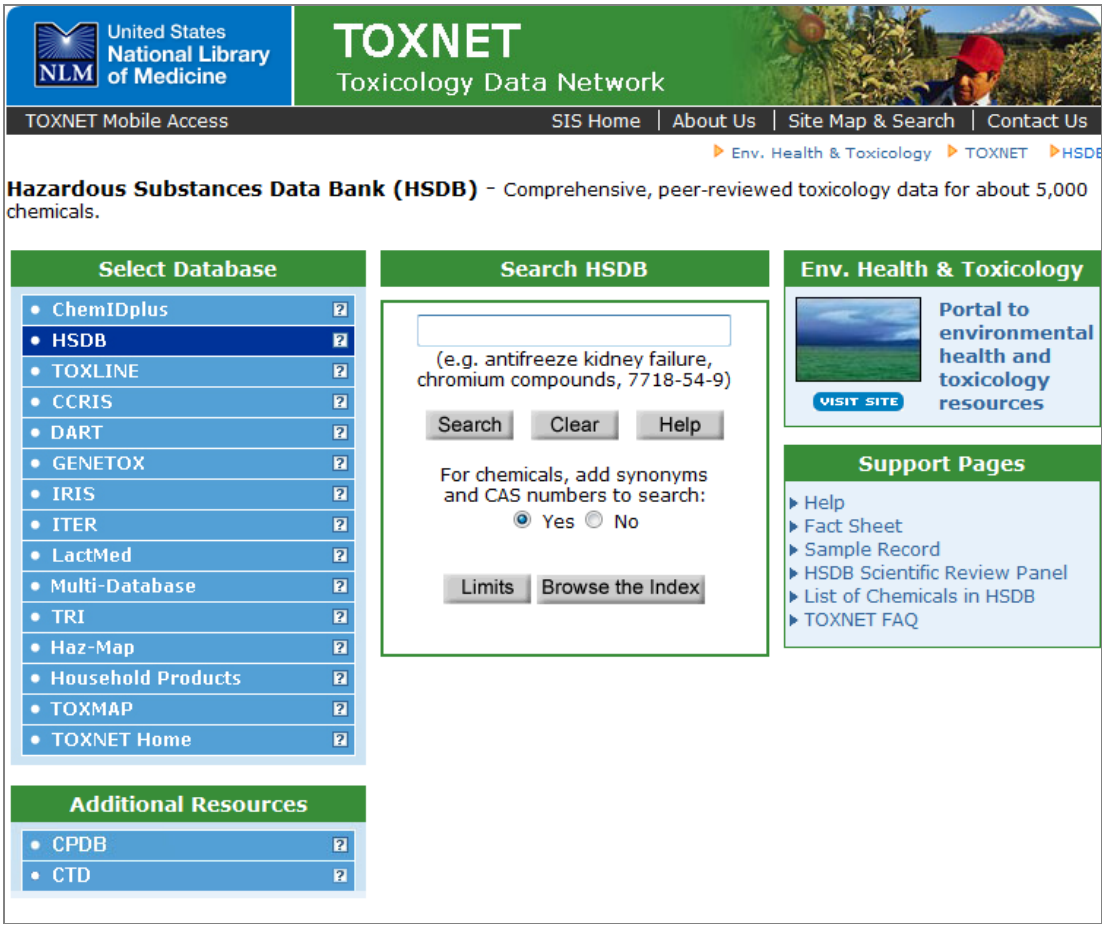
Click	**Advanced ChemIDplus Search**
Type	**xylene** in the Substance Identification search box
Click	**Search** and review the information retrieved
Click	**Transfer Structure** at the right
Click	**Similarity Search** in the **Structure Search Option**s box and change the percentage to **70** in the pull-down menu
Click	**Search** and review the information retrieved

4

Hazardous Substances Data Bank (HSDB)

HSDB

HSDB (Hazardous Substances Data Bank) is a comprehensive toxicology data file on NLM TOXNET system. It contains data on more than 5,000 chemicals, organized into individual records. The average record is approximately 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

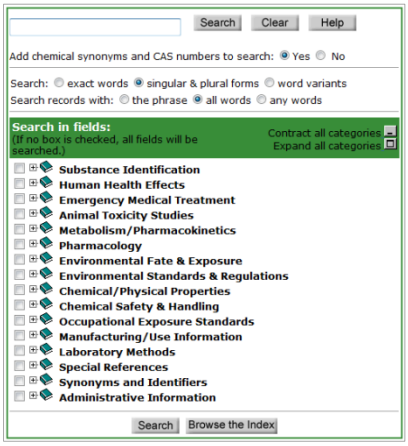
Searching HSDB

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.

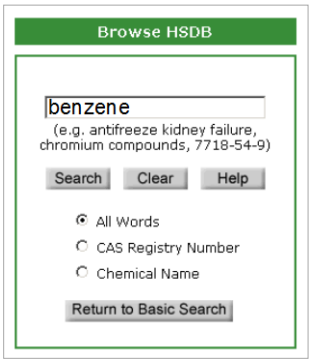
Use truncation (*), Boolean operators (AND, OR, NOT), phrase searching, nested parentheses, limits, and index browsing to refine your search results.

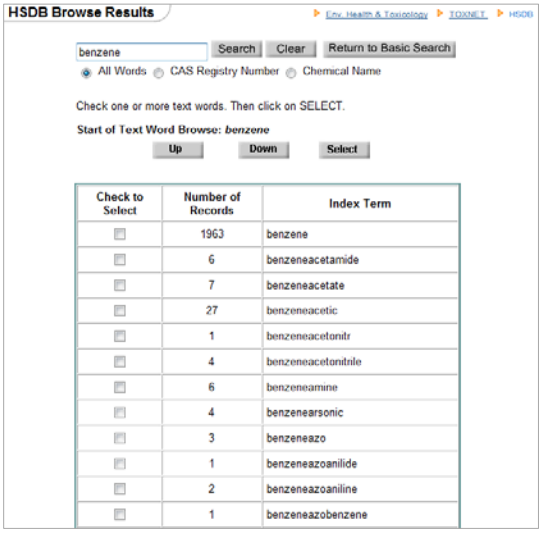
Click the **Limits** button on the home page to search:

- Exact words, singular & 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 Limits Search Fields” in this section)



Click the **Browse the Index** button on the home page 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) you want to view by clicking the appropriate box in the “Check to Select” column and clicking the **Select** button. Scan the index above or below the original display by clicking the **Up** or **Down** button.

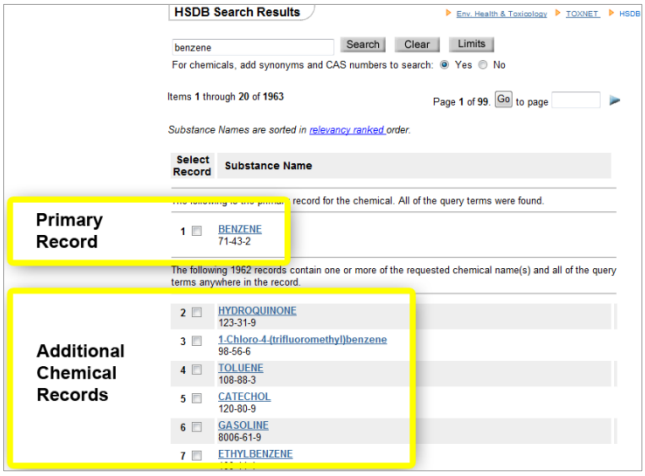




Search Results

Your 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 you entered.

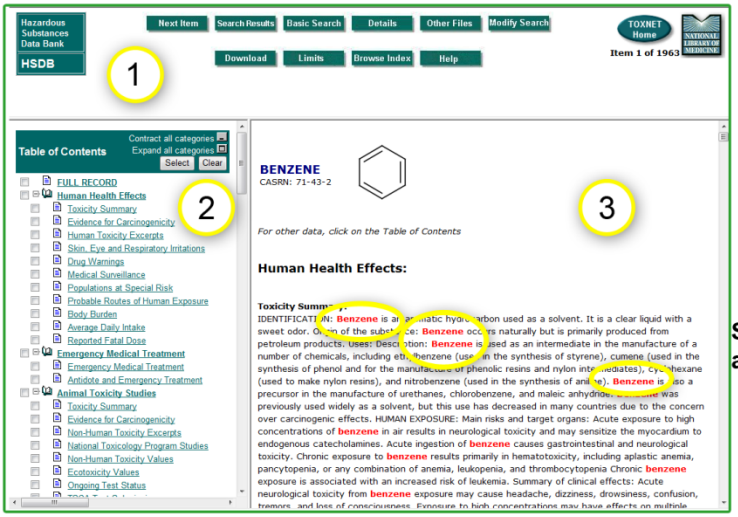


If you click the primary record, the system displays the **Human Health Effects**. If you click a different chemical record, or if your search was for a term other than a chemical, the system will display the sections of the record best matching your query terms (**Best Sections**), those where the chemical 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:

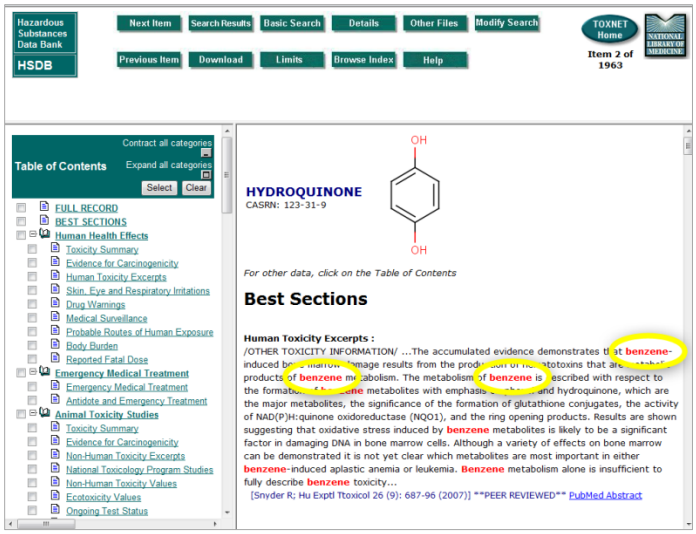
1. Navigation buttons at the top of the screen allow you to link to **Other Files** (NLM databases), modify your search (**Modify Search**), **Download**, return to the **Basic Search** screen, and more.
2. A **Table of Contents** in the left frame allows you to choose categories and fields for display.
3. Chemical data is shown in the right frame. Your search term(s) appear in red.

Primary Record



Search terms are in red

Additional Chemical Record



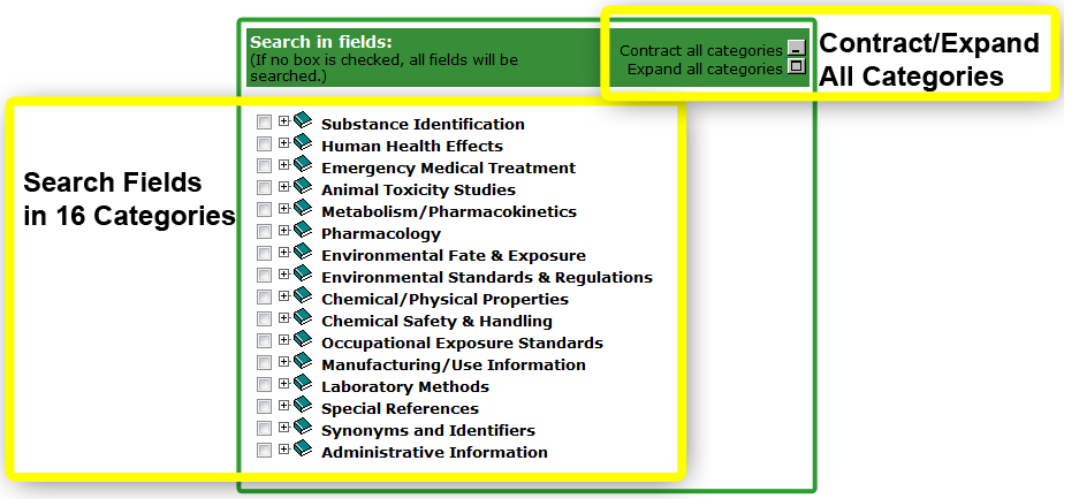
Additional Resources

For further information, we recommend 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 Limits Search Fields

The Limits feature allows you 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
- **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
- Minimum Fatal Dose Level
- 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
- 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
- Prior History of Accidents
- 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

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 Revision Date
- Last Review Date
- Update History

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HSDB Search Exercises

Scenario 1 – Regulatory Information

Sonya, the parent of an elementary school student, receives a letter from the school stating that over the summer water from all sinks and drinking fountains in the building was tested for lead compounds. The letter states that the water contains safe levels of lead for consumption. None of the detected lead levels exceeded 2.0 micrograms per liter. Sonya would like to confirm that this level is safe for drinking water.

Search HSDB to determine the safe level: Locate the lead compounds record in HSDB. Open the lead compounds record. Locate the Federal Drinking Water Standards.

Suggested Solution:

Type	**lead** in the Search box
Click	**Search**
Click	**LEAD COMPOUNDS** in the search results list
Scroll	down to the **Environmental Standards & Regulations** section in the Table of Contents
Click	**Federal Drinking Water Standards**
	States whose standards and guidelines differ from the federal values are listed when the data is available. States not listed follow the federal standards and guidelines.
View	the federal action level for safe drinking water: 15 ug/l

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 **National Toxicology Program Studies** and **Ongoing Test Status** in the Table of Contents 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

Scroll down to the **Environmental Fate & Exposure** section 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 – Limiting a search

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

Search HSDB using limits: Pull up the limits search options. Limit your search to major uses under Manufacturing/Use Information. Enter your specified use query.

Suggested Solution:

Click **Limits** at the bottom of the Search box

Click the **icon (⊞)** to expand the Manufacturing/Use Information field

Click the box next to **major uses**

Type **chemical warfare** in the Search box. Select "exact words" and "the phrase" below the search box. Click search

Examine the use field text. Results may contain chemicals used against chemical warfare agent exposure.

Additional Exercises

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

Click in the **Select Database** column.

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**
Review	the **Best Sections** information in the right frame
Click	**Basic Search** at the top of the page to prepare for the next search

Exercise 2: What is the military usage of arsine? View the ChemIDplus record for arsine.

Suggested Solution:

Type	**arsine military** in the Search box
Click	**Search**
Click	**ARSINE**
Review	the **Best Sections** information in the right frame
Click	**Other Files** at the top of the page
Click	**ChemIDplus Chemical Structure** in the pop-up window
Click	**CDC EP&R** (CDC Emerg. Prep. & Response) under Internet Locator
Review	the information retrieved and close the CDC window
Close	the ChemIDplus window and return to HSDB
Click	**Basic Search** at the top of the page to prepare for the next search

Exercise 3: What is the average daily intake of mercury?

Suggested Solution:

Type	**mercury** in the Search box
Click	**Search**
Click	**MERCURY COMPOUNDS**
Click	**Average Daily Intake** under Human Health Effects in the **Table of Contents**
Review	the information retrieved
Click	**Basic Search** at the top of the page to prepare for the next search

Exercise 4: Using the CAS Registry Number 298-00-0, find information on the occurrence or effects of this chemical in soil.

Suggested Solution:

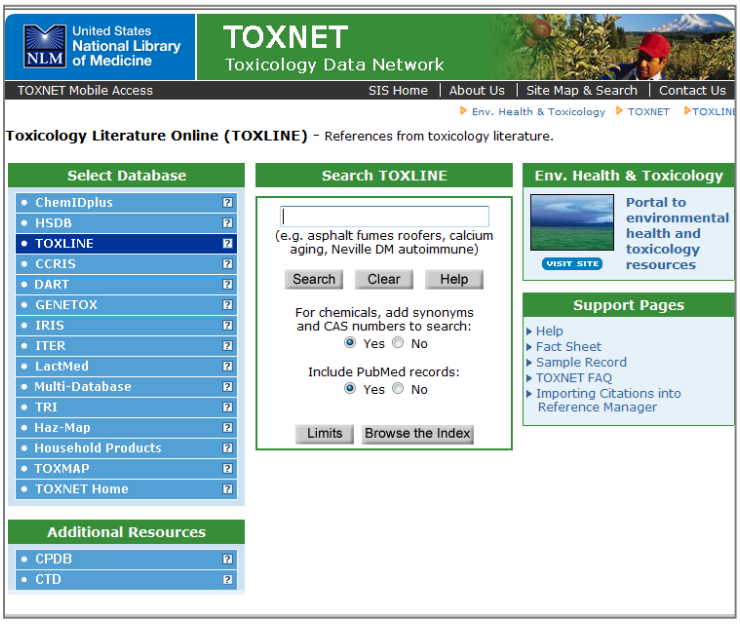
Type	**298-00-0** in the Search box
Click	**Search**
Click	**METHYL PARATHION**
Review	the **Best Sections** information in the right frame

5

Toxicology Literature Online (TOXLINE)

TOXLINE

TOXLINE is 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 1965 to the present, most with abstracts and/or indexing terms and Chemical Abstracts Service (CAS) Registry Numbers.



toxnet.nlm.nih.gov

TOXLINE Components

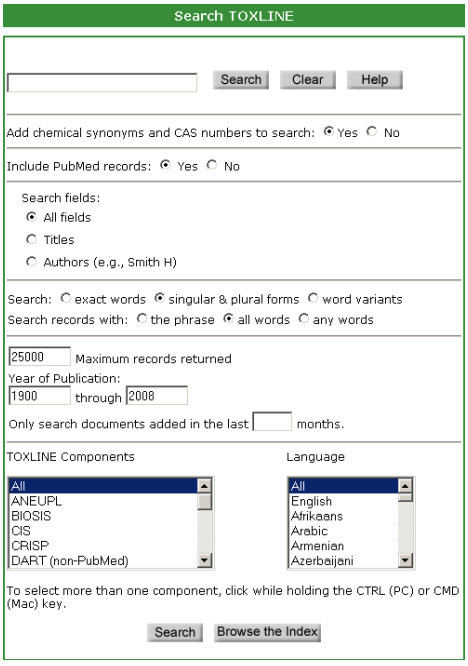
TOXLINE references come from various sources organized into components. These components are searched together but may be used to limit searches.

- **Standard biomedical/toxicology journal literature**
  - PubMed/MEDLINE
- **Special journal and other research literature**
  - Developmental and Reproductive Toxicology (DART)
  - International Labour Office (CIS)
- **Technical reports and research projects**
  - Federal Research in Progress (FEDRIP)
  - Toxic Substances Control Act of Test Submissions (TSCATS)
  - Toxicology Document and Data Depository (NTIS)
  - Toxicology Research Projects (CRISP)

- **Meeting Abstracts**
- **Archival Collection (no longer being updated)**
  - Aneuploidy (ANEUPL)
  - Environmental Mutagen Information Center File (EMIC)
  - Environmental Teratology Information Center File (ETIC)
  - Epidemiology Information System (EPIDEM)
  - Hazardous Materials Technical Center (HMTC)
  - Health Aspects of Pesticides Abstract Bulletin (HAPAB)
  - International Pharmaceutical Abstracts (IPA)
  - NIOSHTIC (NIOSH)
  - Pesticides Abstracts (PESTAB)
  - Poisonous Plants Bibliography (PPBIB)
  - Swedish National Chemicals Inspectorate (RISKLINE)
  - Toxicological Aspects of Environmental Health (BIOSIS)

Searching TOXLINE

Any terms you enter 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 CAS Registry Numbers derived from ChemIDplus. Words such as “a,” “an,” “and,” “for,” “the,” and “it” will not be searched.

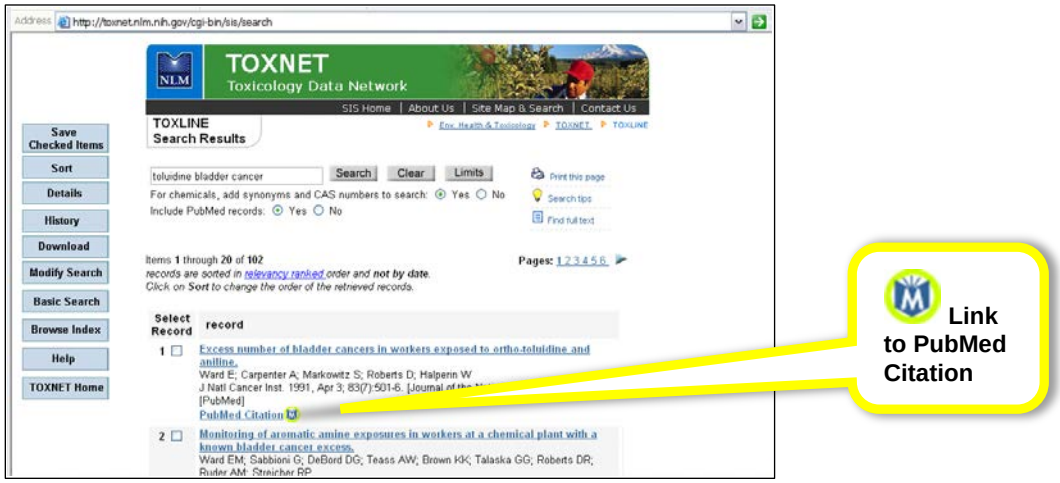


Limits may be applied to narrow your search to:

- 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

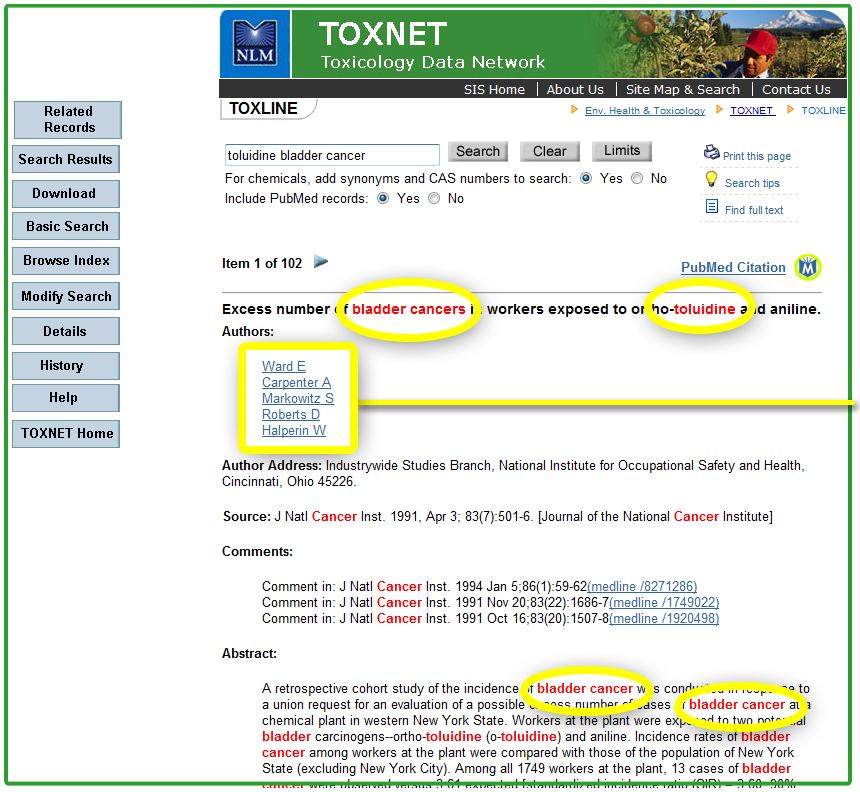
You may also specify the maximum number of records you would like retrieved.

Search Results



Your 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. Clicking on this link takes you to PubMed where you can use functions such as LinkOut, Related Links, and document ordering.

Selected Record Screen



The record screen displays the complete record for the item you selected on the results screen. Your search terms are in red. 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.

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, we recommend 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 Manager
  sis.nlm.nih.gov/enviro/captivate/toxlinespecialimports.htm
- Free Full Text Health Science/Medical Journals
  sis.nlm.nih.gov/enviro/findingfreefulltext.html

TOXLINE Search Exercises

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 since 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	**Basic Search** 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:

Type	**diet breast cancer** in the Search box
Click	**Limits**
Select	**Titles** under Search fields:
Type	**2010** in the first Year of Publication box (replacing “1900”)
Click	**Search**
Review	record(s) of your choice
Click	**Basic Search** 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:

Type	**occupational exposure caprolactam** in the Search box
Click	**Limits**
Select	**English** in the Language box

Click	**Search**
Click	**Sort** in the left margin
Select	**Ascending order**
Click	**Sort**
Review	the citation(s)
Click	**Basic Search** at the left of the page to prepare for the next search

Additional Exercises

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

Click

in the **Select Database** column.

Exercise 1: Search for the chemical of concern in baby bottles, bisphenol A (BPA). Explore navigating through your 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 your choice
Click	**Basic Search** to prepare for the next search

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

Suggested Solution:

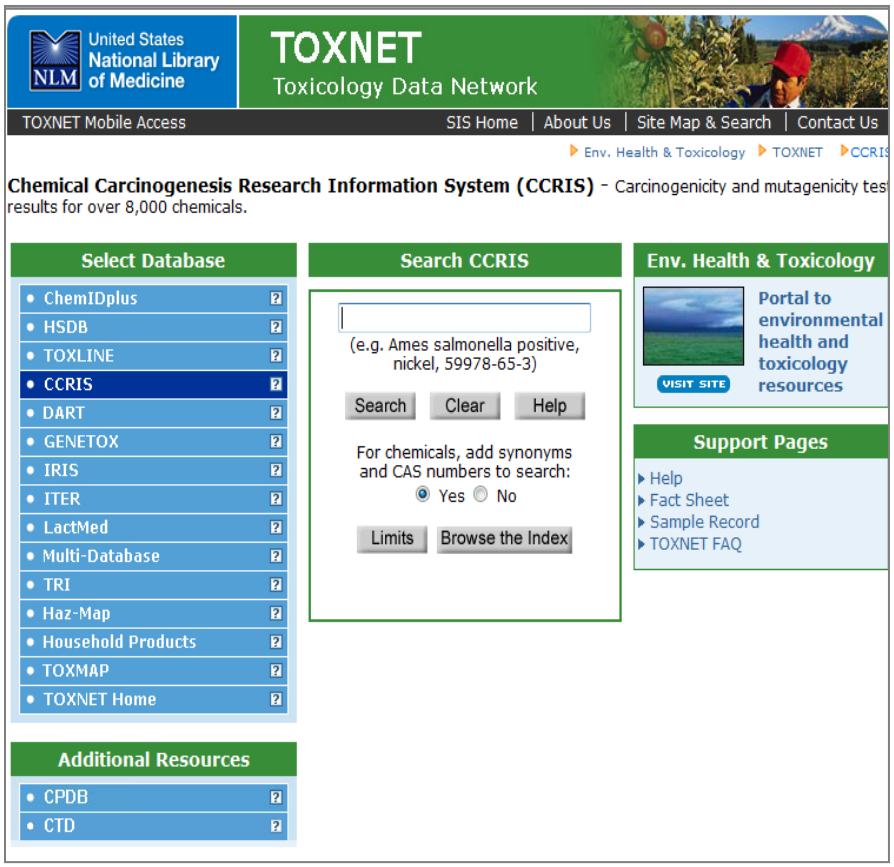
Type	**salmonella eggs** in the Search box
Click	**Limits**
Type	**2010** in the first Year of Publication box
Click	**Search**
Review	the citation(s)

6

Chemical Carcinogenesis Research Information System (CCRIS)

CCRIS

CCRIS (Chemical Carcinogenesis Research Information System) is a toxicology data file of the NLM TOXNET. It is a scientifically evaluated and fully referenced data bank, developed and maintained by the National Cancer Institute (NCI). It contains more than 8,000 chemical records with carcinogenicity, mutagenicity, tumor promotion, and tumor inhibition test results. Data are derived from studies cited in primary journals, current awareness tools, NCI reports, and other special sources. Test results have been reviewed by experts in carcinogenesis and mutagenesis.



toxnet.nlm.nih.gov

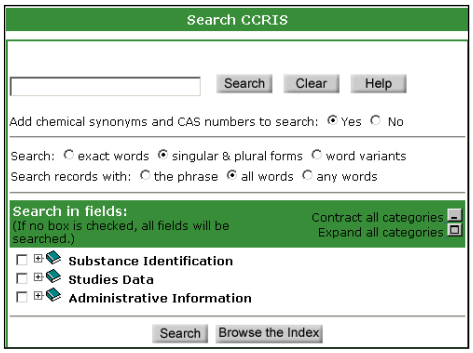
Searching CCRIS

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

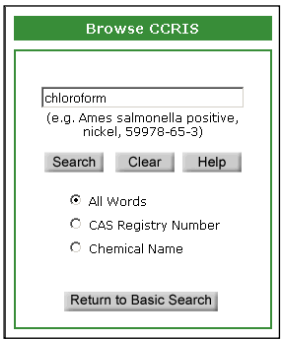
Use truncation (*), Boolean operators (AND, OR, NOT), nested parentheses, limits, and index browsing to refine your search results.

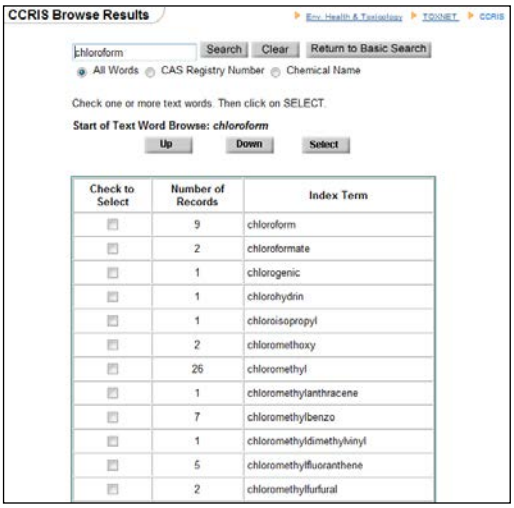
Click the **Limits** button on the home page to search:

- Exact words, singular & 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 (▬) and (▣) buttons to contract or expand all categories



With the **Browse the Index** feature, the system returns a list of index terms related to the search term entered and the number of records containing that term. Select one or more index terms in the **Check to Select** column and click the **Select** button for the search results. Scan the index above or below the original display by clicking the **Up** or **Down** button.

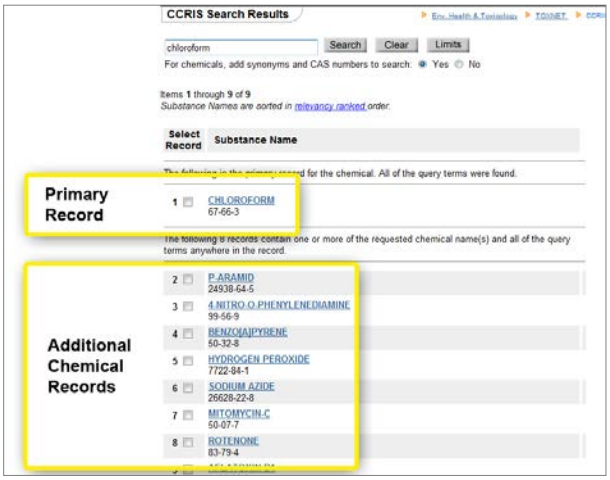




Search Results

Your 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, your 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.

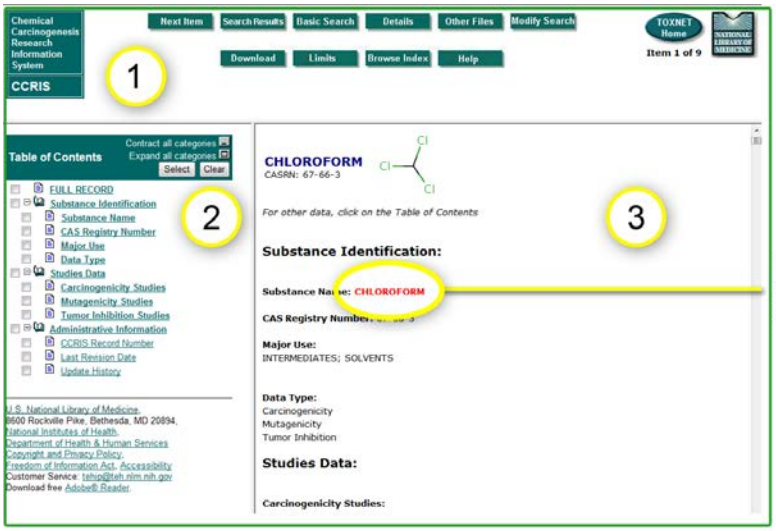


Click any of these non-primary chemicals on the **Search Results** screen to display the sections of the record best matching your query terms (**Best Sections**), those where the chemical search term(s) appears with greatest frequency. The term(s) searched appear in red.

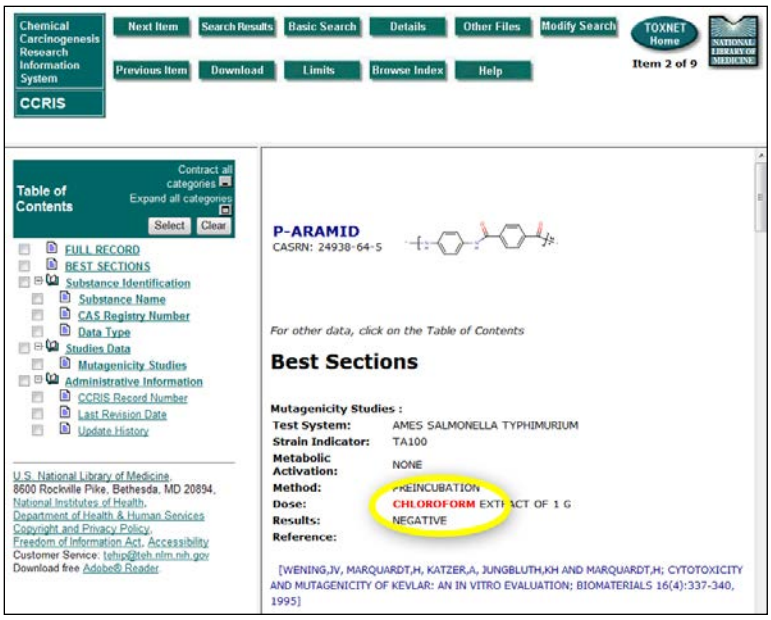
The **Record** screen is organized into three sections:

1. Navigation buttons at the top of the screen allow you to link to **Other Files** (NLM databases), **Modify Search**, **Download**, return to the **Basic Search** screen, and more.
2. A **Table of Contents** in the left frame allows you 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, we recommend 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 in the Select Database column.

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	**Carcinogenicity Studies** under Studies Data
Review	the information retrieved in the right frame
Click	**Mutagenicity Studies** under Studies Data
Review	the information retrieved in the right frame
Click	**Basic Search** at the top of the page to prepare for the next 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	**Tumor Promotion Studies** under Studies Data
Review	the information in the right frame
Click	**Basic Search** at the top 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	**Carcinogenicity Studies** under Studies Data
Review	the information in the right frame
Click	**Other Files** on the top of the page
Click	**HSDB Record** in the pop-up window
Review	the information in the right frame
Click	**Return to CCRIS** at the top of the page
Click	**Basic Search** the top 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:

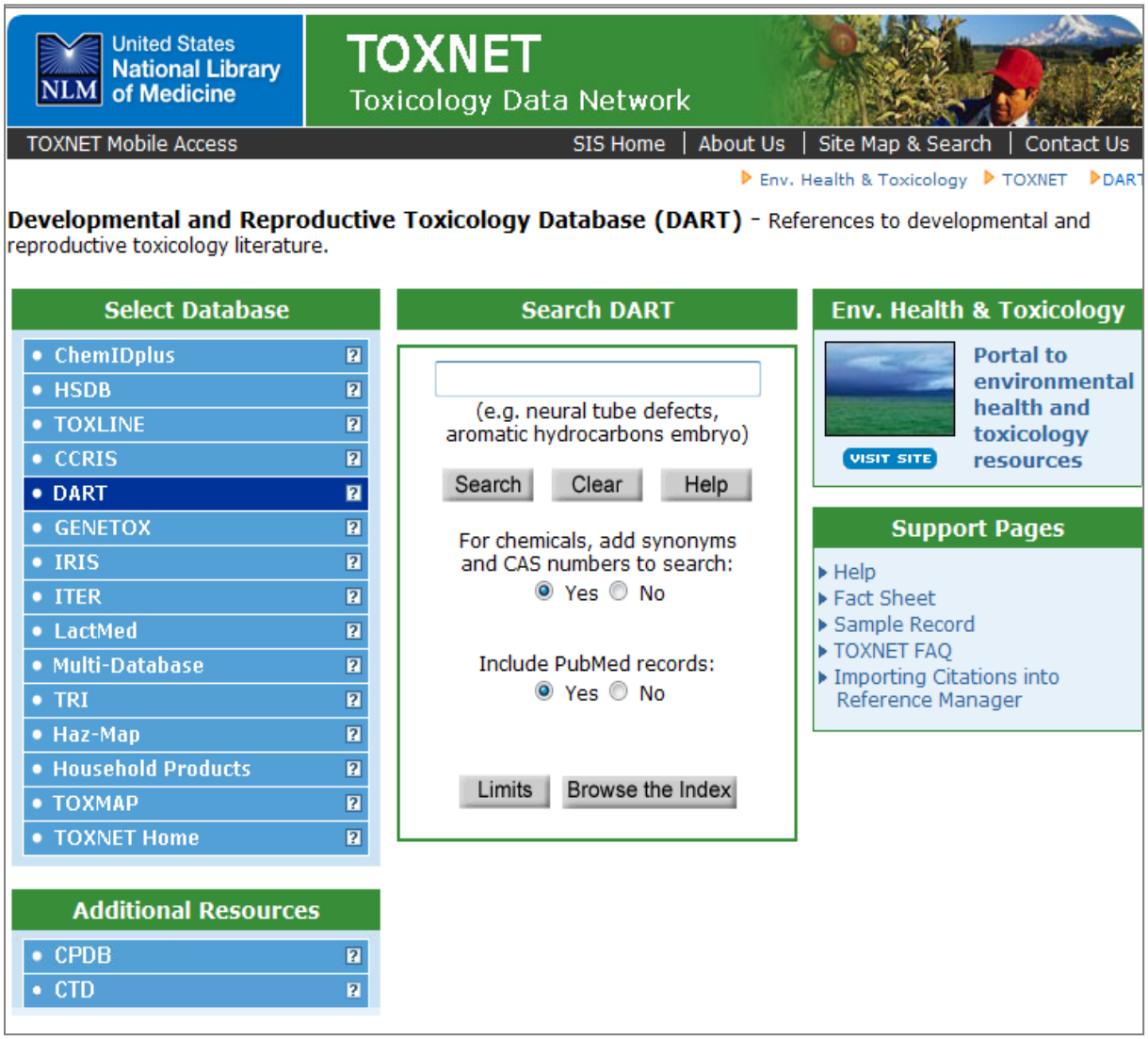
Type	**positive lung cancer** in the Search box
Click	**Search**
Click	chemical record(s) of your choice
Review	the information in the right frame

7

Developmental and Reproductive Toxicology Database (DART)

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 1965.

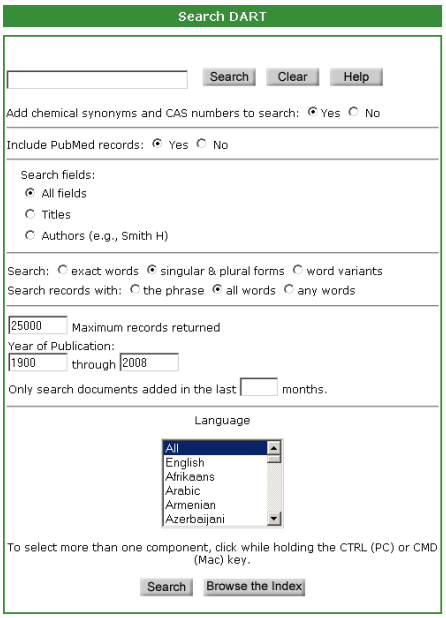


toxnet.nlm.nih.gov

DART has some of the same features as PubMed, including the following: MeSH searching; applying limits by field, publication type, age, gender, language, human or animal, etc.; MyNCBI to store and update search strategies; Related Records; LinkOut and Links to Books; and Interlibrary Loan (Loansome Doc).

Searching DART

Any term(s) you enter 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 CAS Registry Numbers derived from ChemIDplus. Words such as “a,” “an,” “and,” “for,” “the,” and “it” will not be searched.

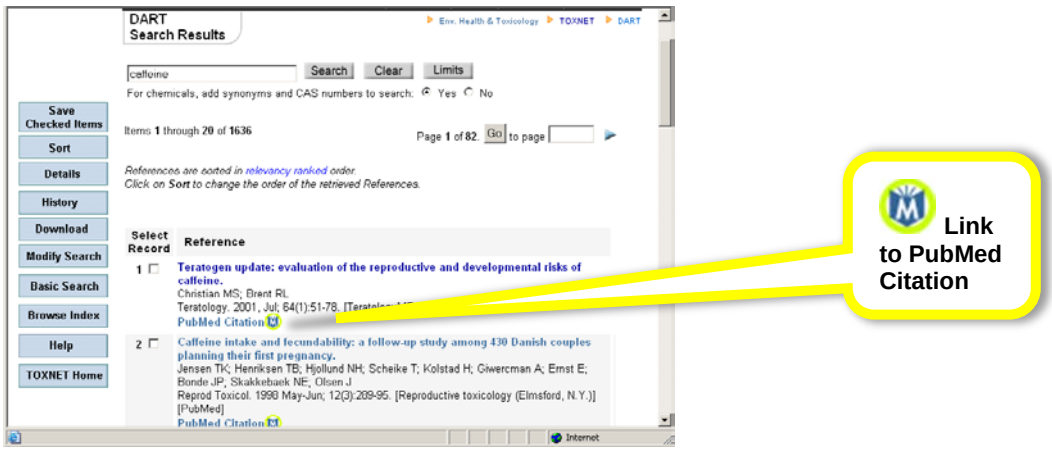


Limits may be applied to narrow your search to:

- Titles
- Authors
- Exact words or word variants
- Year of publication
- Documents added within a specified number of months
- Language

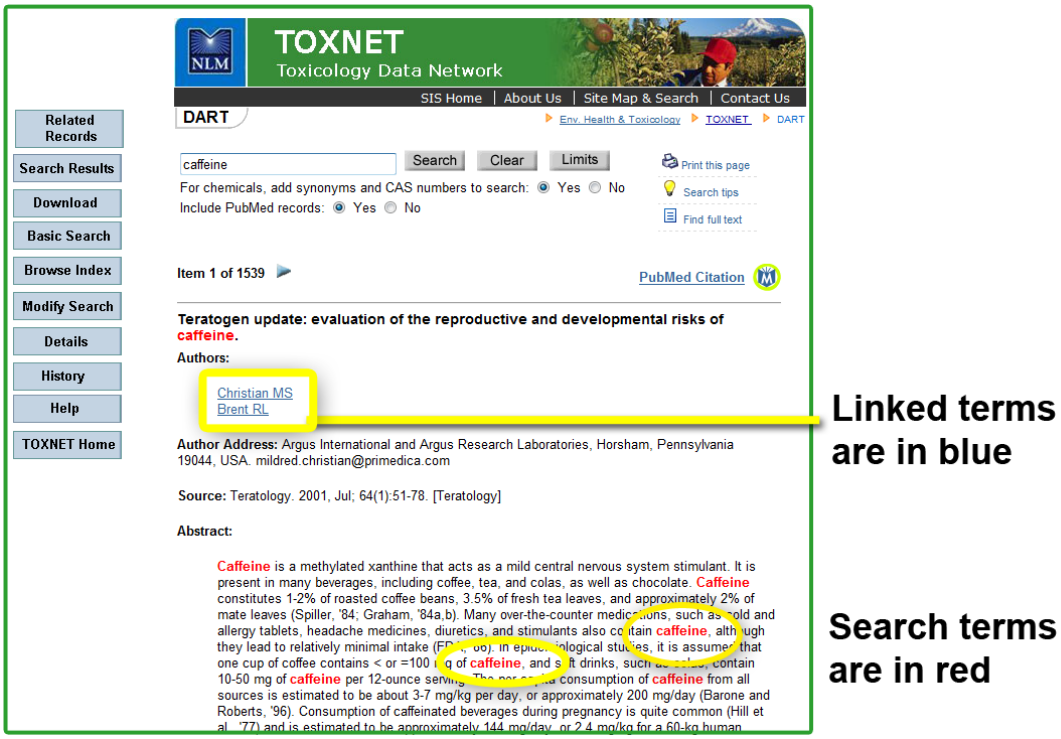
You may also specify the maximum number of records you would like retrieved.

Search Results



Your 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 mnemonic [in brackets] of the subfile from which the article was retrieved. References that come from PubMed/MEDLINE have TOXLINE [PubMed] following the bibliographic citation. They also 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 to go to PubMed where you can use any of the PubMed functions such as LinkOut and document ordering.

Selected Record Screen



This screen displays the complete record for the item you selected on the Results Screen. Your search terms are in red. 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. Other information on the page 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 subfile. References from PubMed have the PubMed citation designation and the green-and-blue PubMed symbol ( ).

Additional Resources

For further information, we recommend these additional resources:

- DART Fact Sheet
  nlm.nih.gov/pubs/factsheets/dartfs.html
- PubMed
  pubmed.gov
- Importing citations into Reference Manager
  sis.nlm.nih.gov/enviro/captivate/toxlinespecialimports.htm
- TOXNET Help-DART
  toxnet.nlm.nih.gov/help/DARThelp.htm

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DART Search Exercises

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

Click in the Select Database column.

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)
Click	**Sort** on the left of the page
Select	**Author** and Descending order
Click	**Sort** to the right
Review	the citation(s) as they now appear
Click	**Basic Search** 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)
	The results will be in relevancy ranked order.
Click	**Basic Search** 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 your choice to view the abstract
Click	**Basic Search** 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:

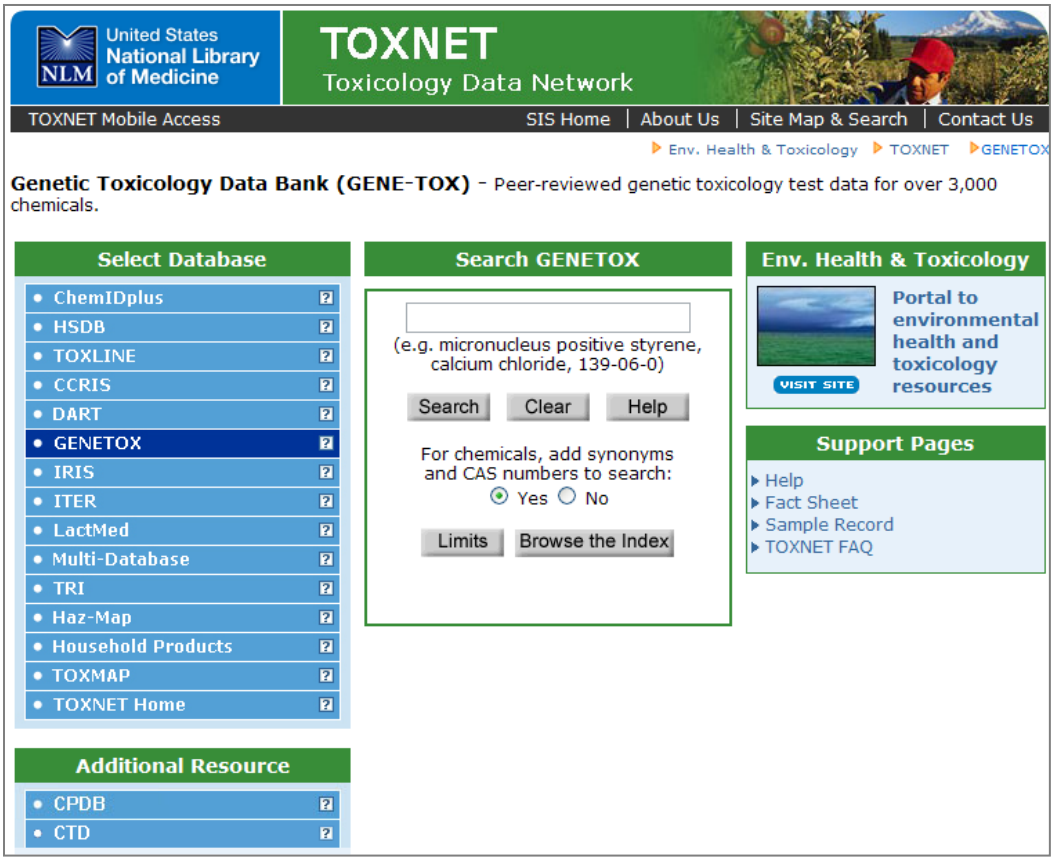
Type	**adverse effect citalopram** in the Search box
Click	**Search**
Review	the citation(s)
Click	the box to the left of the first three records
Click	**Download** to the left of the page
Change	the number in the **Download** box to **3** (for the first 3 records)
Select	**Full** for the format
Click	**Download** to the right
Close	the pop-up window
Review	the full format records
Click	your browser's **Back** button to return to the DART Search Results page

8

Genetic Toxicology Data Bank (GENE-TOX)

GENE-TOX

GENE-TOX is a toxicology data file of the National Library of Medicine Toxicology Data Network (TOXNET). It is created by the U.S. Environmental Protection Agency and contains genetic toxicology (mutagenicity) test data, resulting from expert peer review of the open scientific literature, on more than 3,000 chemicals. The GENE-TOX program was established to select assay systems for evaluation, review data in the scientific literature, and recommend proper testing protocols and evaluation procedures for these systems.



toxnet.nlm.nih.gov

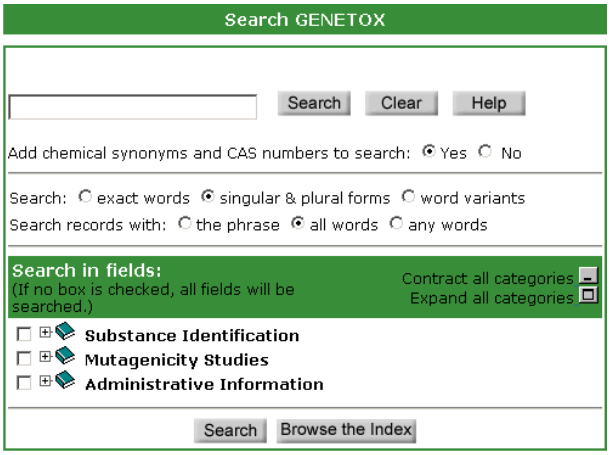
Searching GENE-TOX

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.

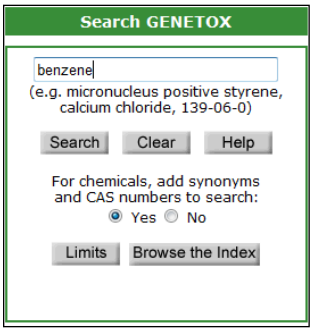
Use truncation (*), Boolean operators (AND, OR, NOT), nested parentheses, limits, and index browsing to refine your search results.

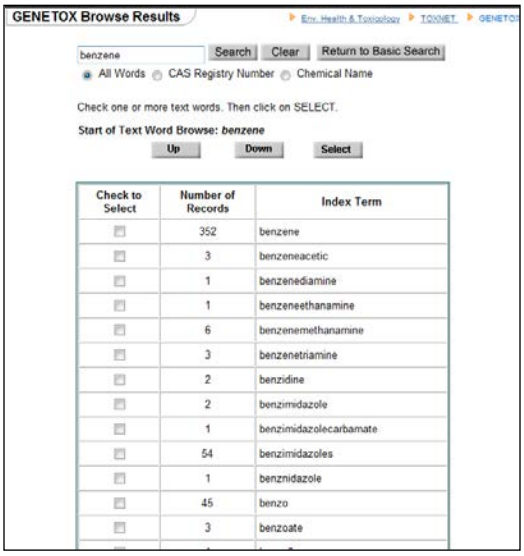
Click the **Limits** button on the home page to search:

- Exact words, singular & 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 (—) and (❐) buttons above and to the right of the list of categories to contract or expand all categories



With the **Browse the Index** feature, the system returns a list of index terms related to the search term entered and the number of records containing that term. Select one or more index terms and click the **Select** button for the search results. Scan the index above or below the original display by clicking the **Up** or **Down** button.

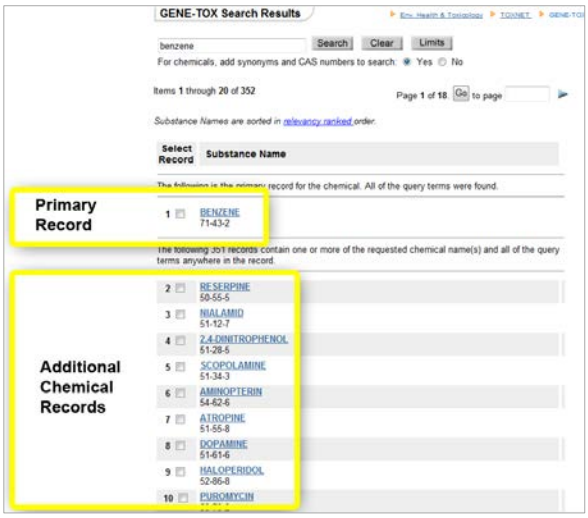




Search Results

Your 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, your 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 your query term(s) (**Best Sections**), those where the chemical search term(s) appear with greatest frequency. Search term(s) appear in red:

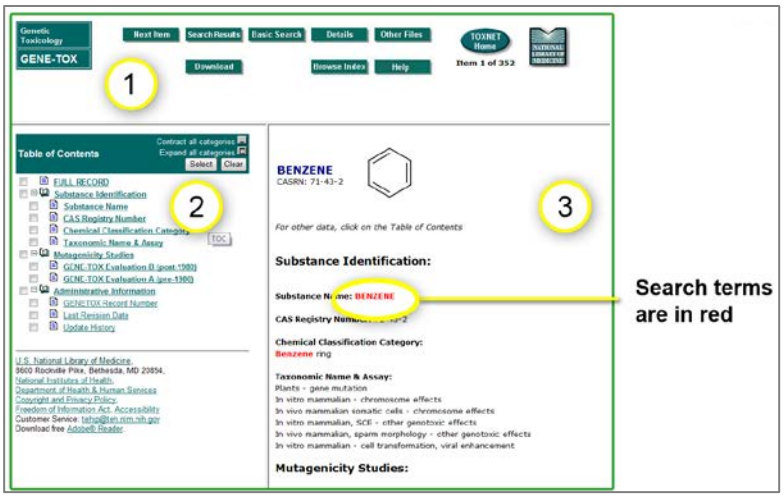
The **Record** screen is organized into three sections:

1. Navigation buttons at the top of the screen allow you to link to **Other Files** (NLM databases), **Modify Search**, **Download**, return to the **Basic Search** screen, and more.

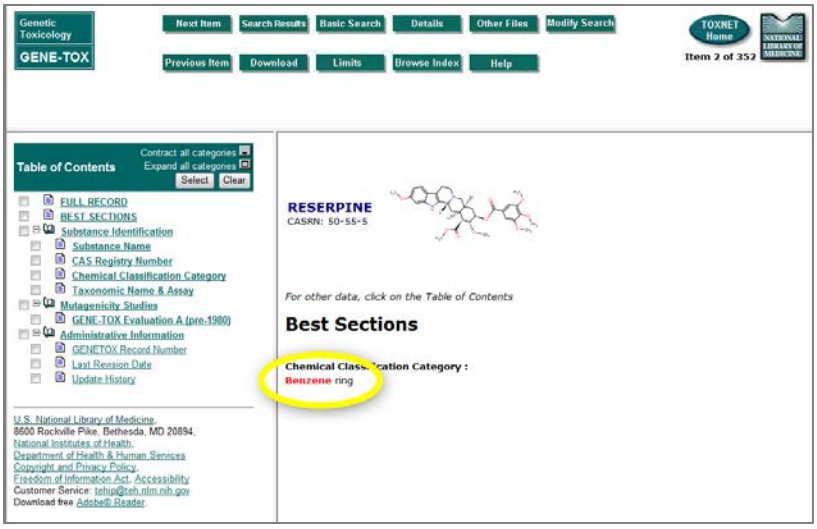
2. A **Table of Contents** in the left frame allows you to choose categories and fields for display.

3. Chemical Data is shown in the right frame.

Primary Record



Additional Chemical Record



Additional Resources

For further information, we recommend 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

in the Select Database column.

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 frame on the left
Review	the information retrieved in the right frame
Click	the link for the Panel Report of your choice to view the abstract
Review	the abstract
Click	your browser's **Back** button to return to the GENE-TOX results page
Click	**Basic Search** 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**
Review	the **Best Sections** information in the right frame
Click	**Basic Search** 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:

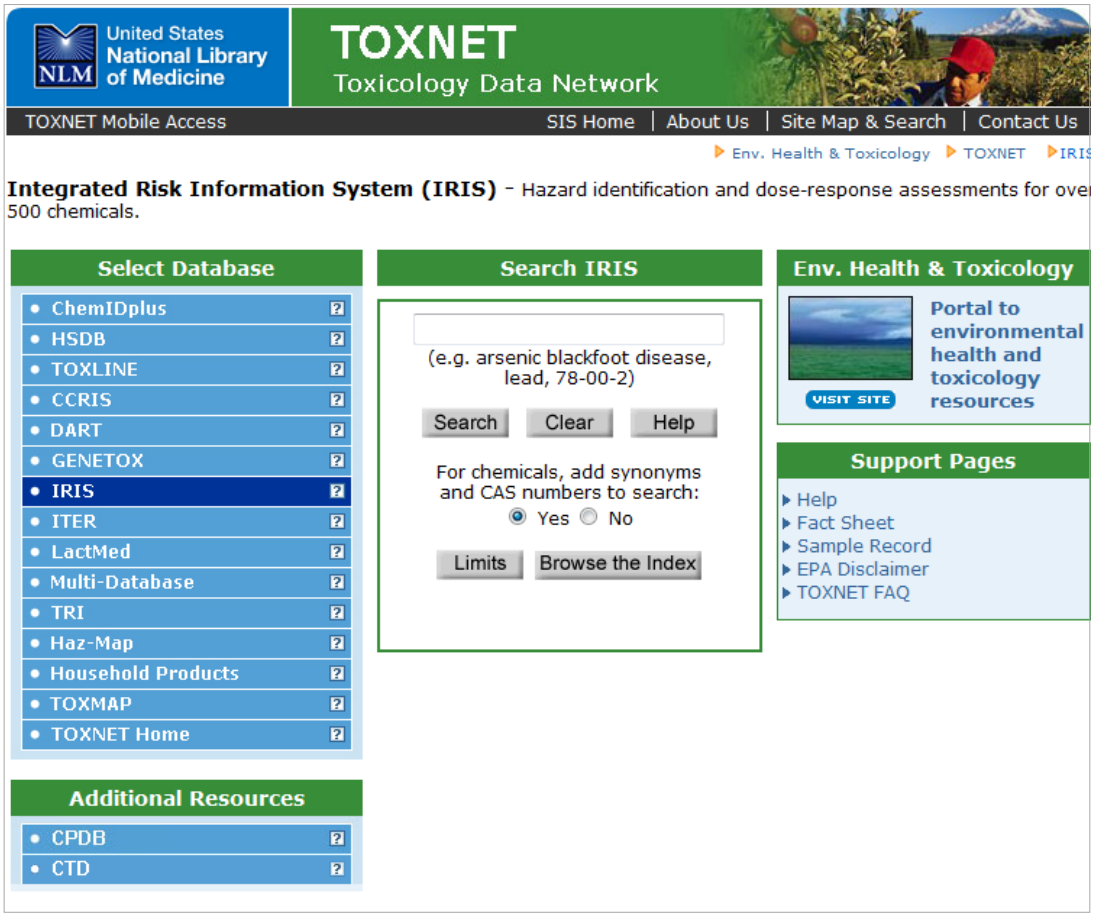
Type	**caffeine** in the Search box
Click	**Search**
Click	**Mutagenicity Studies** in the Table of Contents frame on the left
Review	the information retrieved in the right frame
Click	**Other Files** on the top of the page
Click	**CCRIS Record** in the pop-up window
Click	**Mutagenicity Studies** in the Table of Contents frame on the left
Review	the information in the right frame
Click	**Return to GENE-TOX** at the top of the page

9

Integrated Risk Information System (IRIS)

IRIS

The **Integrated Risk Information System** (IRIS) contains data for more than 500 chemicals, compiled by the 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

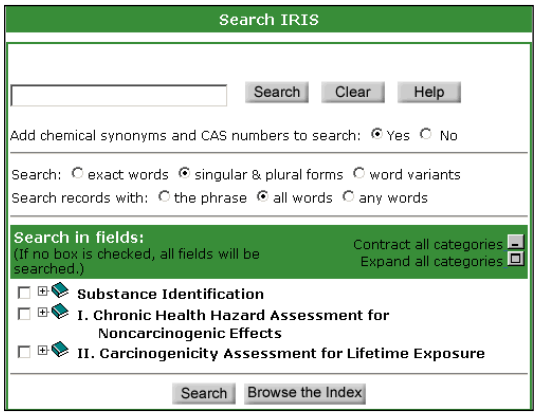
Searching IRIS

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

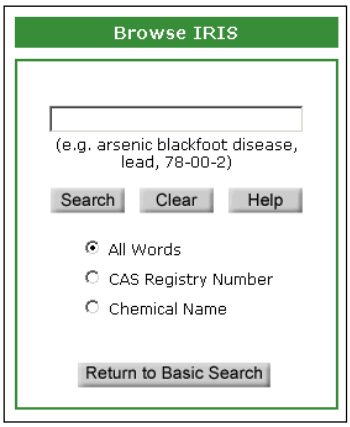
Use truncation (*), Boolean operators (AND, OR, NOT), phrase searching, nested parentheses, limits, and index browsing to refine your search results.

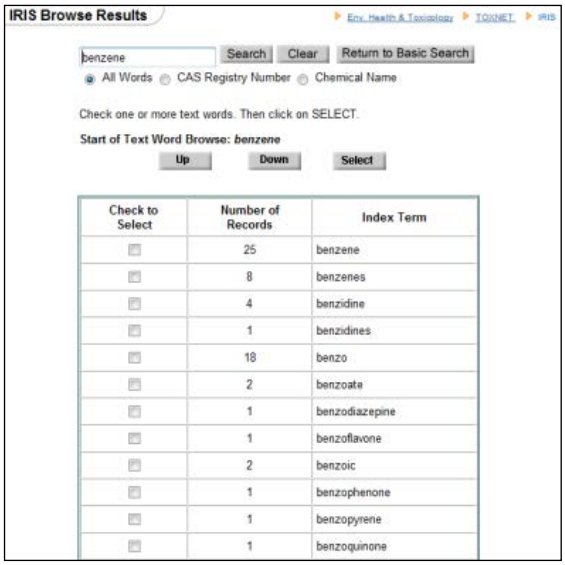
Click the **Limits** button on the home page to search:

- Exact words, singular & 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 (⊟) and (⊞) buttons to contract or expand all categories



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

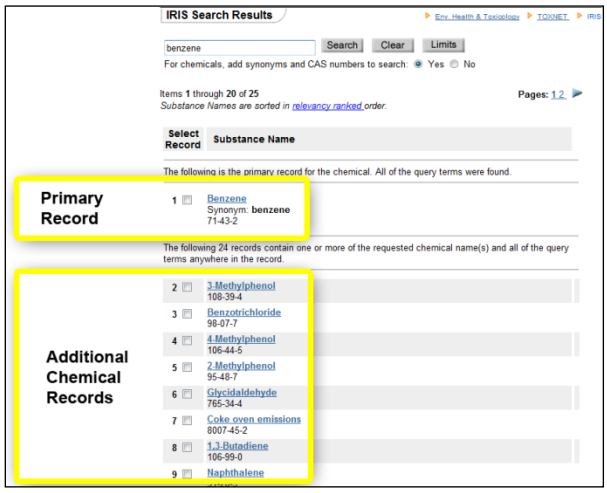




Search Results

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, your 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 **Best Sections**, those where the chemical search term(s) appear with greatest frequency. The term(s) searched appear in red.

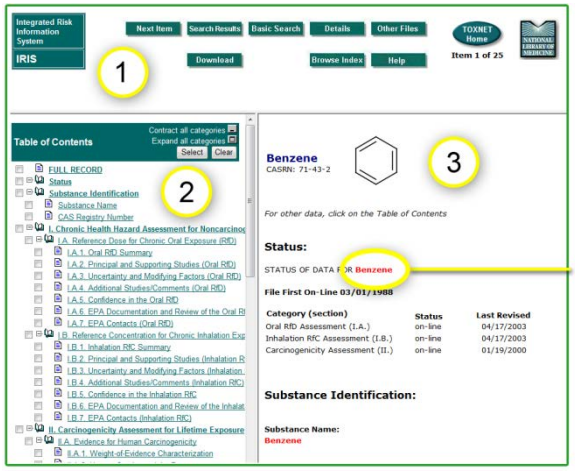
The **Record** screen is organized into three sections:

1. Navigation buttons at the top of the screen allow you to link to **Other Files** (NLM databases), **Modify Search**, **Download**, return to the **Basic Search** screen, and more.

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

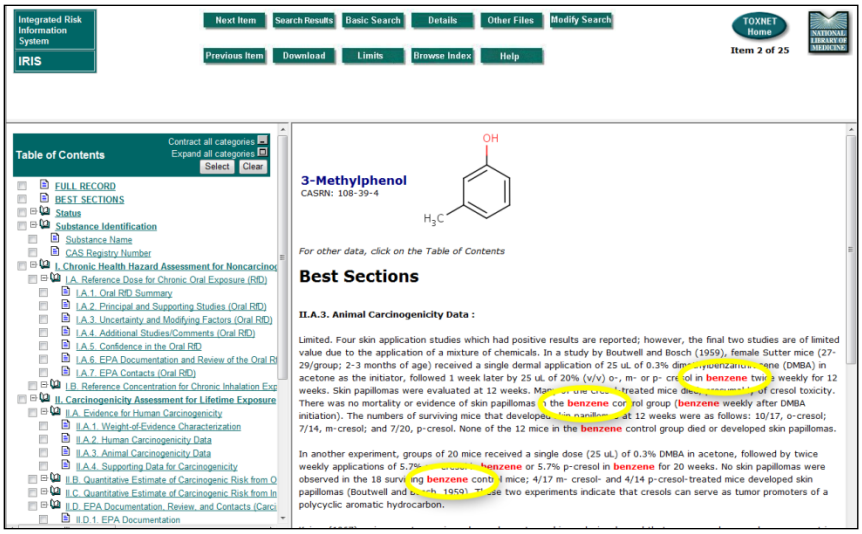
3. Chemical Data is shown in the right frame.

Primary Record



Search terms are in red

Additional Chemical Record



Additional Resources

For further information, we recommend 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 in the Select Database column.

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**
Review	the **Best Sections** information in the right frame
Click	**Basic Search** 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**
Click	**I.B. Reference Concentration for Chronic Inhalation Exposure (RfC)**
Click	**Download** at the top of the page
Review	the Custom Formats
Close	Custom Formats window
Click	**Basic Search** to prepare for the next search

Exercise 3: How does the U.S. Environmental Protection Agency characterize the carcinogenicity of methylmercury?

Suggested Solution:

Type	**methylmercury** in the Search box
Click	**Search**
Click	**Methylmercury (MeHg)**
Click	**II.A. Evidence for Human Carcinogenicity**
Review	the information retrieved
Click	**Basic Search** 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	**I.B.1. Inhalation RfC Summary**
Review	the information retrieved
Click	**TOXNET Home** to prepare for the next search

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

Suggested Solution:

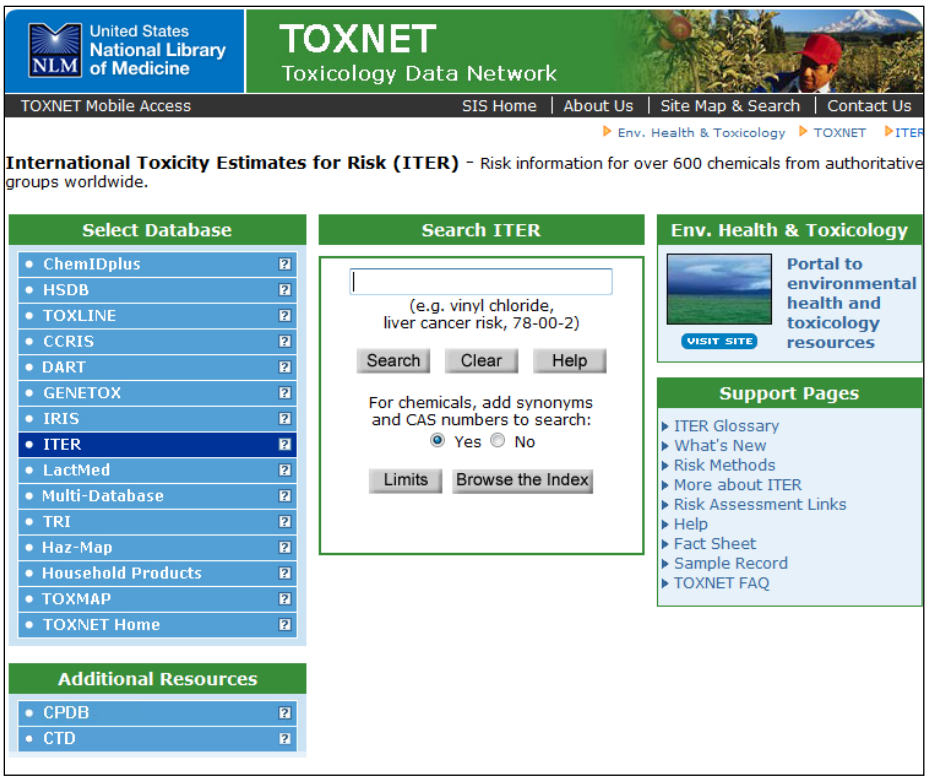
Type	**boron** in the Search box
Click	**Search**
Click	**II. Carcinogenicity Assessment for Lifetime Exposure**
Review	the information retrieved

10

International Toxicity Estimates for Risk (ITER)

ITER

ITER (International Toxicity Estimates for Risk) is a toxicology data file on the National Library of Medicine (NLM) Toxicology Data Network (TOXNET) and 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

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

- Agency for Toxic Substances & Disease Registry (ATSDR)
- Health Canada
- U.S. 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

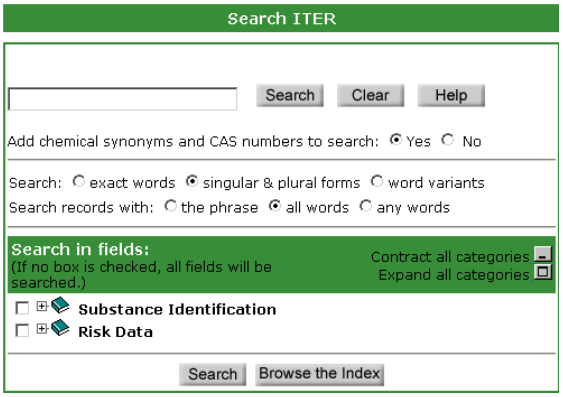
Searching ITER

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.

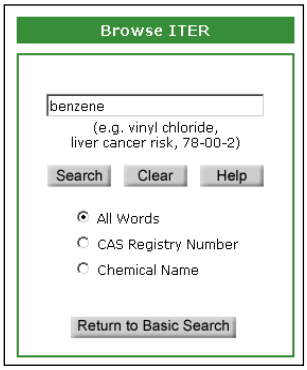
Use truncation (*), Boolean operators (AND, OR, NOT), nested parentheses, limits, and index browsing to refine your search results.

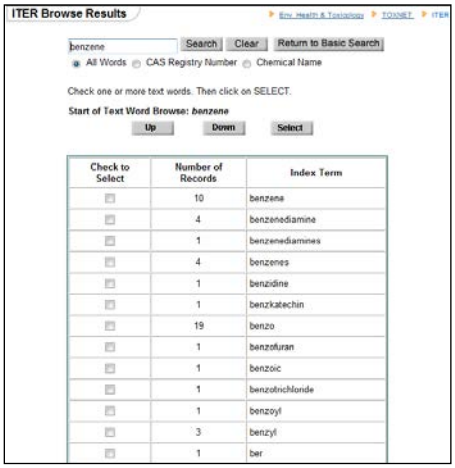
Click the **Limits** button on the home page to search:

- Exact words, singular & 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 (—) and (□) buttons to contract or expand all categories



With the **Browse the Index** feature, the system returns a list of index terms related to the search term entered and the number of records containing that term. Select one or more index terms and click the **Select** button for the search results. Scan the index above or below the original display by clicking the **Up** or **Down** button.

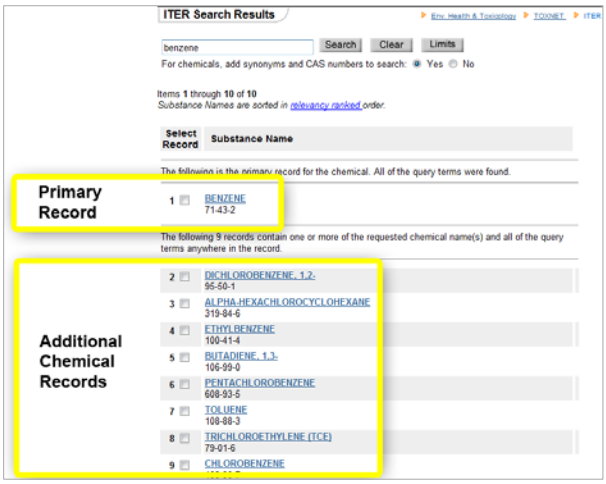




Search Results

Your 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, your 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 your query terms (**Best Sections**), those where the chemical search term(s) appear with greatest frequency. Search term(s) appear in red.

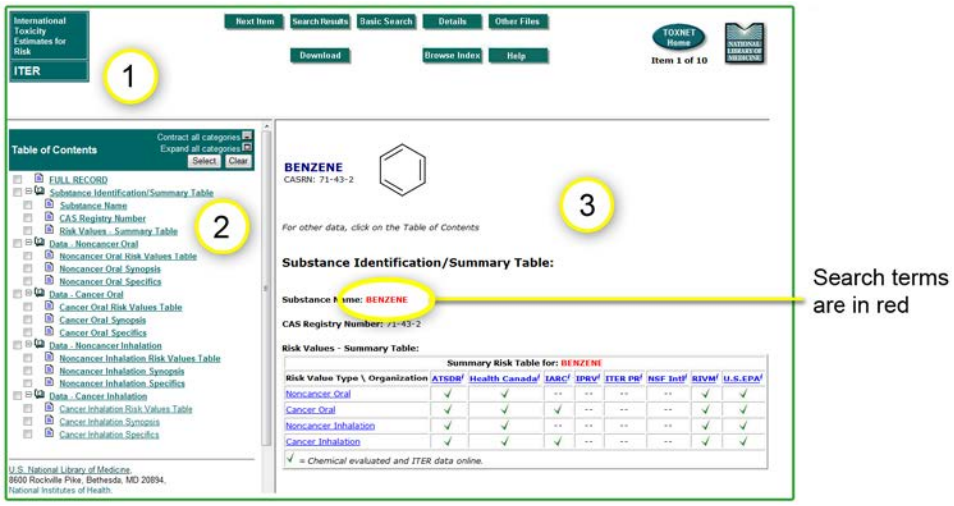
The **Record** screen is organized into three sections:

1. Navigation buttons at the top of the screen allow you to link to **Other Files** (NLM databases), **Modify Search**, **Download**, return to the **Basic Search** screen, and more.

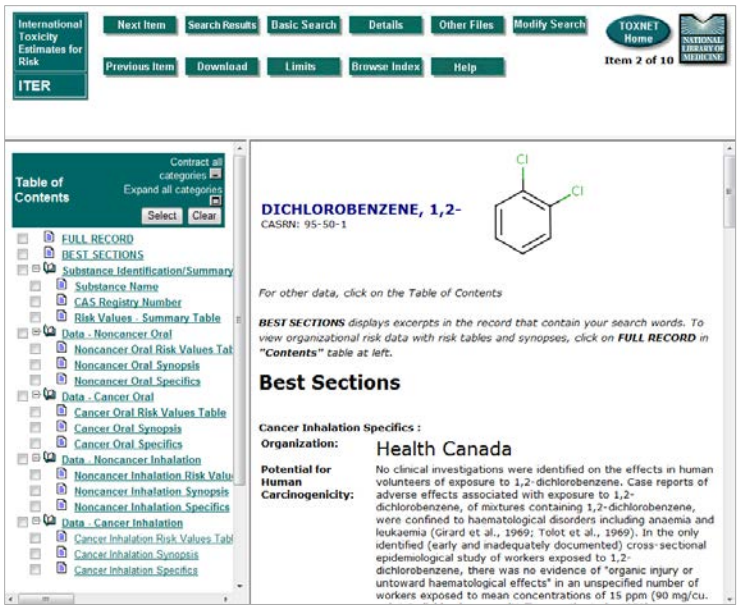
2. A **Table of Contents** in the left frame allows you to choose categories and fields for display.

3. Chemical Data is shown in the right frame.

Primary Record



Additional Chemical Record



Additional Resources

For further information, we recommend 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 in the **Select Database** column.

Exercise 1: Do ATSDR and U.S. 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	**Noncancer Oral Risk Values Table** under Data-Noncancer Oral in the **Table of Contents** frame on the left
Review	the information in the right frame
Click	**Cancer Oral Risk Values Table** under Data-Cancer Oral in the **Table of Contents** frame on the left
Review	the information in the right frame
Click	**Basic Search** 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**
Click	**FULL RECORD** in the Table of contents frame on the left and review the information
Click	**Basic Search** to prepare for the next search

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

Suggested Solution:

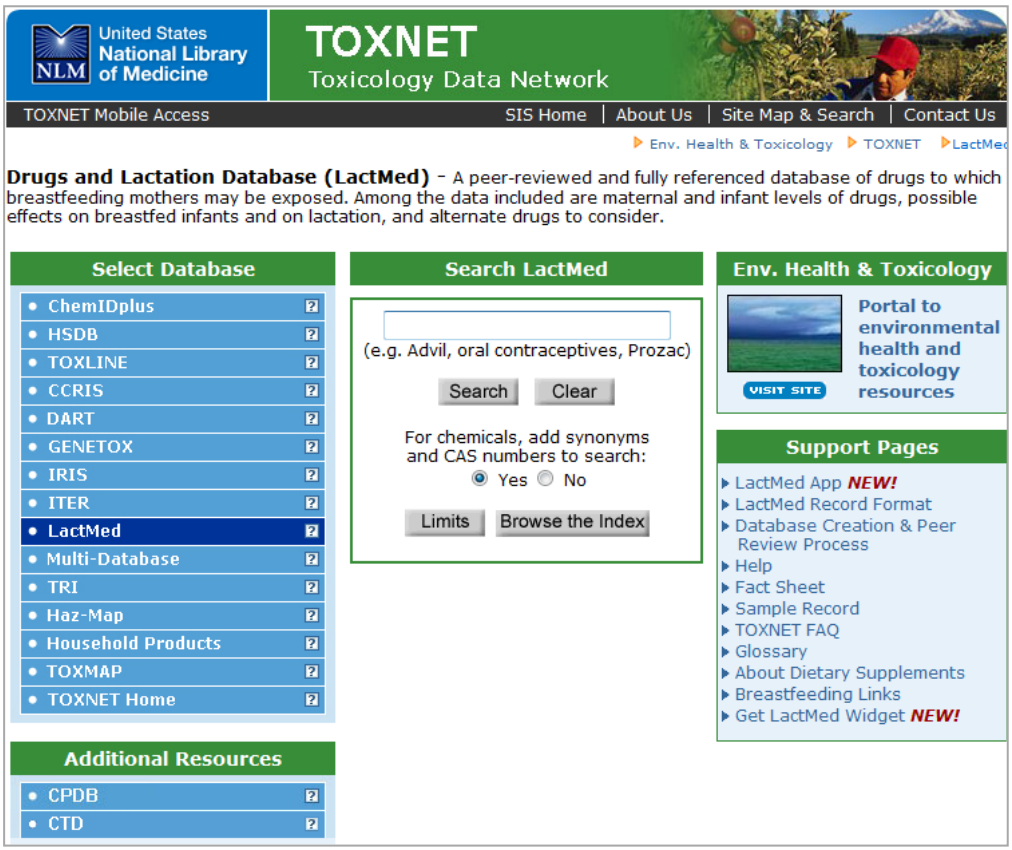
Type	**nickel oxide** in the Search box
Click	**Search**
Click	**NICKEL OXIDE**
Click	**Noncancer Inhalation Risk Values Tables** under Data-Noncancer Inhalation in the **Table of Contents** to the left
Review	the **Noncancer Inhalation Table**

11

LactMed

LactMed

LactMed 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 NLM databases.



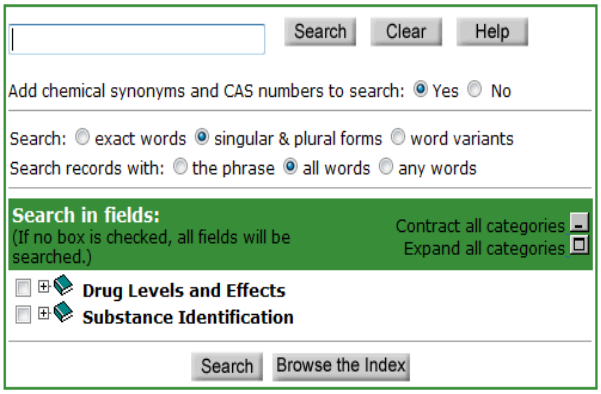
lactmed.nlm.nih.gov

Searching LactMed

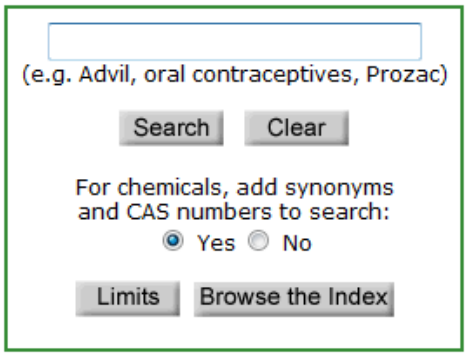
Search LactMed by chemical, brand name, Chemical Abstracts Service (CAS) Registry Number, pharmacologic category, and/or subject terms. By default, the system adds synonyms and CAS numbers to chemical searches. Search results, displayed in relevancy ranked order, can easily be viewed, printed, or downloaded.

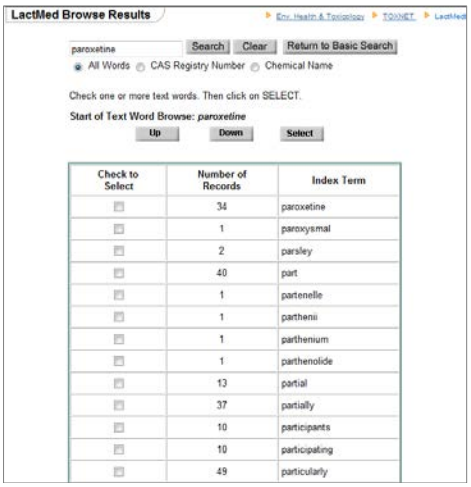
Click the **Limits** button on the home page to search:

- Exact words, singular & 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 ( ) and ( ) buttons above and to the right of the list of categories to contract or expand all categories.



Click the **Browse the Index** button on the home page 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) you want to view by clicking the appropriate box in the "Check to Select" column and clicking the **Select** button. Scan the index above or below the original display by clicking the **Up** or **Down** button.

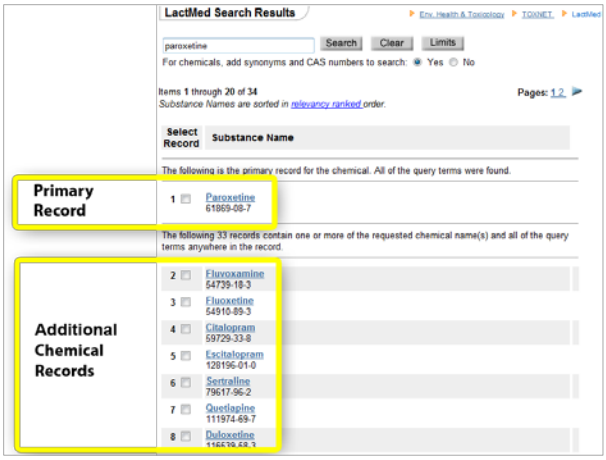




Search Results

Your initial retrieval is displayed as a list of chemical names, highlighted in blue and underlined, and their CAS Registry Numbers. If your 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 you 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 your query consists of words that are not chemical or drug terms, this same Relevancy Ranking algorithm determines the order of display of all your search results.

When searching for a chemical, your 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 your query terms (**Best Sections**), those where the chemical search term(s) appear with greatest frequency. Search term(s) appear in red.

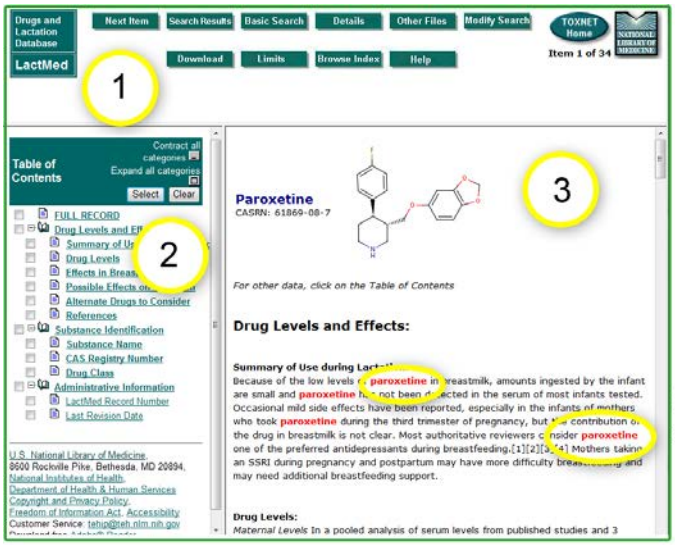
The **Record** screen is organized into three sections:

1. Navigation buttons at the top of the screen allow you to link to **Other Files** (NLM databases), **Modify Search**, **Download**, return to the **Basic Search** screen, and more.

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

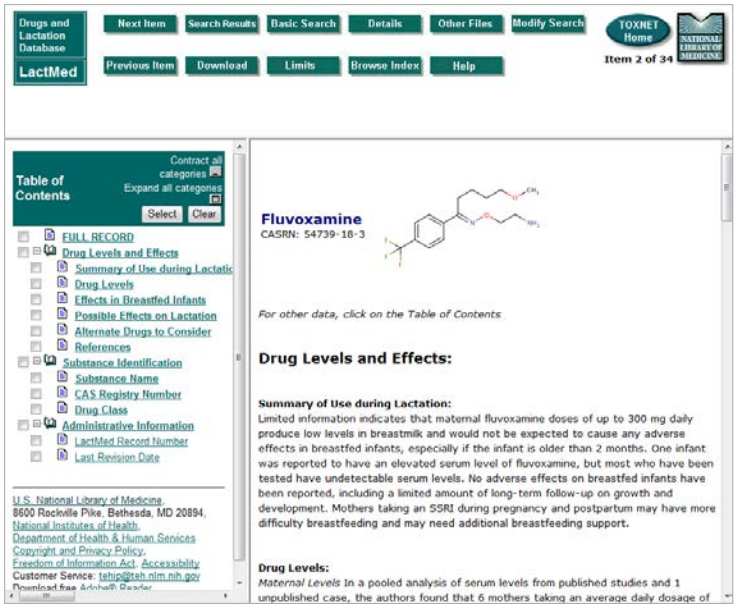
3. Chemical Data is shown in the right frame.

Primary Record



Search terms are in red

Additional Chemical Record



Additional Resources

For further information, we recommend 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)
  www.pharmacy.arizona.edu/centers/pregnancy-riskline
- Organization of Teratology Information Specialists
  otispregnancy.org

LactMed Search Exercises

Scenario 1 – Summary Information

Carolyn, a nursing mother, has been prescribed methotrexate due to an early onset of rheumatoid arthritis. Her doctor has told her that she may continue to nurse her baby since 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	**Alternate Drugs to Consider** in the Table of Contents
Click	the link to the **auranofin** record
Click	**Auranofin**
Click	**Effects in Breastfed Infants** in the Table of Contents

Additional Exercises

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

Click

in the **Select Database** column.

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

Suggested Solution:

Type	**clomipramine** in the Search box
Click	**Search**
Click	**Clomipramine**
Click	**Drug Class** under Substance Identification in the **Contents** frame to the left
Click	**Basic Search** to prepare for the next search

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

Suggested Solution:

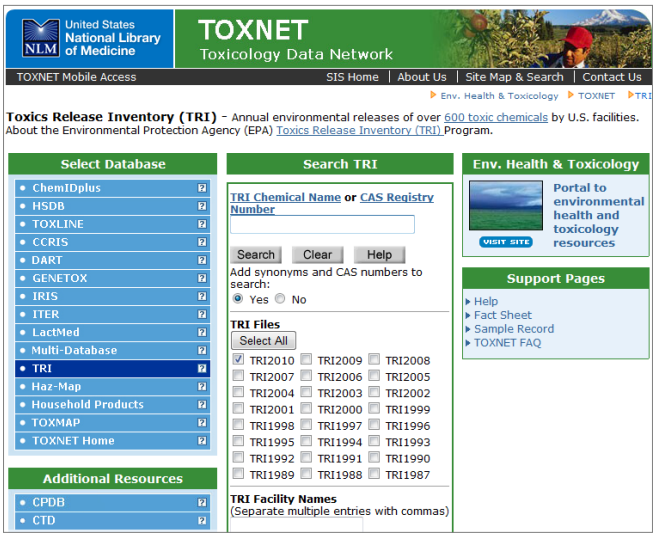
Type	**hydrocodone** in the Search box
Click	**Search**
Click	**Hydrocodone**
Click	**Alternate Drugs to Consider** under Drug Levels and Effects in the **Contents** frame to the left

12

Toxics Release Inventory (TRI) and TOXMAP

Toxics Release Inventory (TRI)

The **Toxics Release Inventory (TRI)** is a publicly available resource of the U.S. Environmental Protection Agency (EPA) containing detailed information on more than 600 chemicals and chemical categories, which more than 23,000 U.S. 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

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 truncation (*), Boolean operators (AND, OR, NOT), nested parentheses, and limits to refine your search results.

TRI currently contains data from 1987 through 2010. By default the system will search the most current year. You can also limit your search with the following criteria:

- Facility Name
- Facility Location
  - Select State, City/State, County/State, or Zip
- TRI Reporting Form Type
  - Ability to search for either Form R or Form A or both

- Standard Industrial Classification Code or North American Industry Classification System Code
    - Separate multiple entries with commas
- Weight in pounds (Great Than)
- Type of release (air, water, land, underground injection, disposal, or total environmental release)

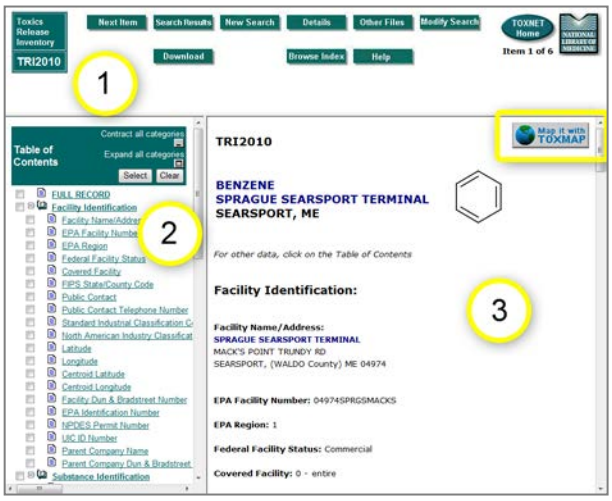
With the **Browse the Index** feature, the system returns a list of index terms related to the search term entered and the number of records containing that term. Select one or more index terms and click the **Select** button for the search results. Scan the index above or below the original display by clicking the **Up** or **Down** button.

Search Results

Your initial retrieval is displayed in relevancy ranked order as a list of abbreviated records with facility name in blue and hot-linked, 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.

The Record screen is organized into three sections:

1. Navigation buttons at the top of the screen allow you to link to **Other Files** (NLM databases), **Modify Search, Download**, return to the **Basic Search** screen, and more.
2. A **Table of Contents** in the left frame allows you 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



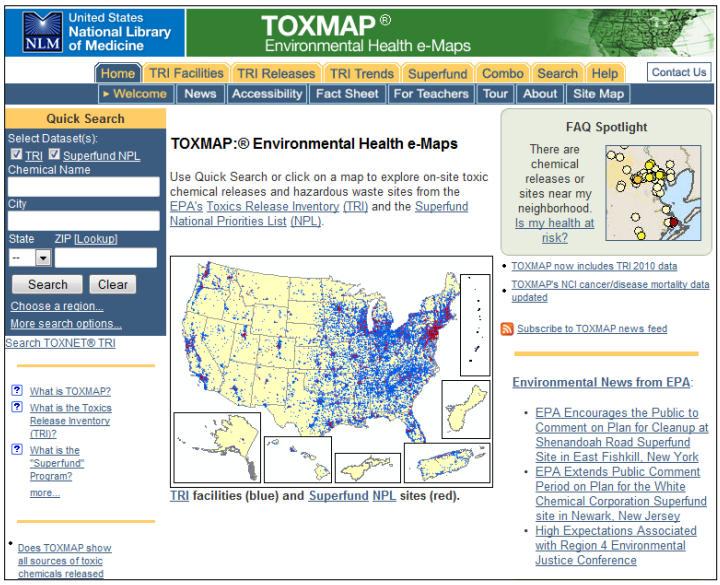
Additional Resources

For further information, we recommend these additional resources:

- TRI Fact Sheet:
  nlm.nih.gov/pubs/factsheets/trifs.html
- TRI/EPA:
  epa.gov/tri

TOXMAP

TOXMAP is a Geographic Information System (GIS) that uses maps of the United States to help users visually explore data from the 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.



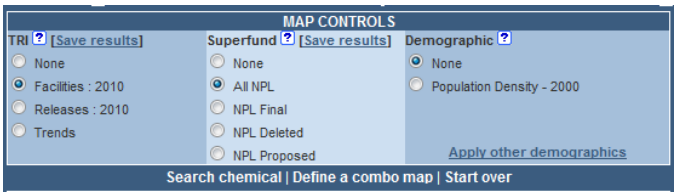
toxmap.nlm.nih.gov

Map Features

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

TOXMAP can create several types of maps:

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



TOXMAP also overlays map data such as:

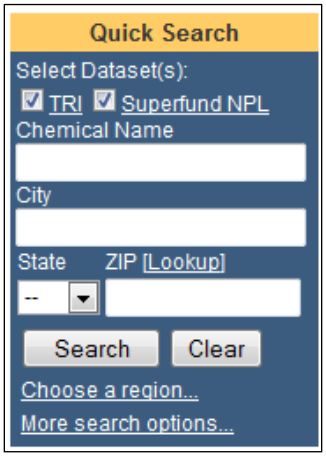
- U.S. Census Data—1990 and 2000 demographics (population, ethnicity, age, gender ratio)
- Income Data—per capita personal Income
- Health Data—mortality data for cancer and various causes
- Reference Data—cities, roads, hospitals, federal land, and urban areas

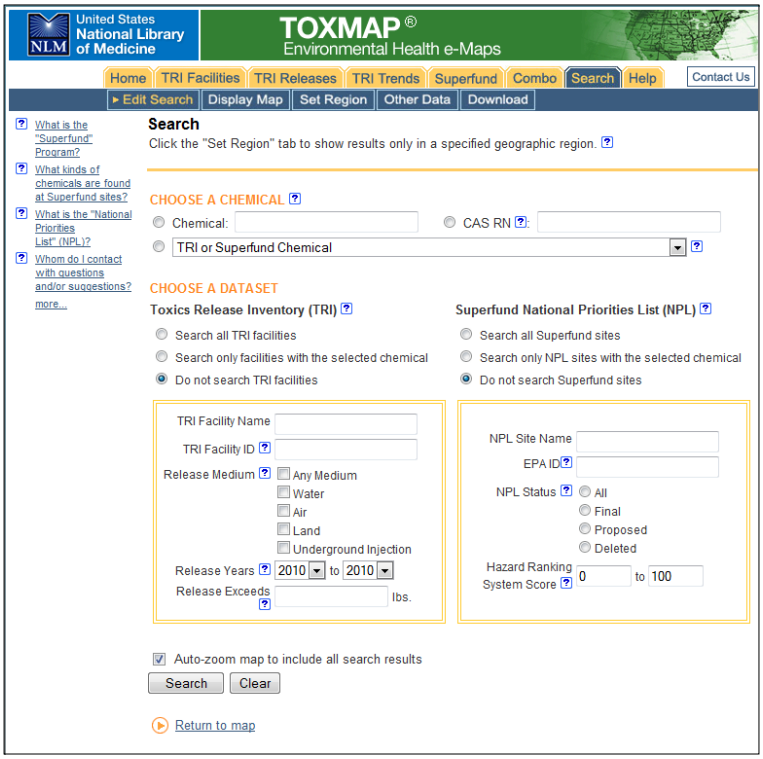
DISCLAIMER: The co-occurrence of a substance and a particular health problem does not by itself imply an effect on human health by that substance.

Searching and Creating Maps in TOXMAP

TOXMAP's **Quick Search** feature on the home page allows you 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. You can also select specific geographic regions. Release color coding is calibrated only for releases in that region rather than for the entire nation.





Additional Resources

For further information, we recommend these additional resources:

- TOXMAP Tour
  toxmap.nlm.nih.gov/toxmap/tour/index.html
- TOXMAP Brochure
  toxmap.nlm.nih.gov/toxmap/home/TOXMAP_Brochure.pdf
- TOXMAP Fact Sheet
  nlm.nih.gov/pubs/factsheets/toxmap.html
- Online Tutorial: TOXMAP Basics
  toxmap.nlm.nih.gov/toxmap/tour/misc/ToxmapBasics.html

Stay Connected

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

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TRI/TOXMAP Decision Tree

TRI (Toxics Release Inventory) is the 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 U.S. industrial and federal facilities beginning with the 1987 reporting year. TRI is accessible via the National Library of Medicine's (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:

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

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TRI/TOXMAP Search Exercises

Scenario 1 – General Search by State using TRI

Michael, a senior in high school, is writing a report for chemistry class. He has decided to report on methanol, a widely used solvent. Michael would like to include an environmental section in his report and provide some information specific to his state, Mississippi. Michael would like to include information in his report such as: how much methanol was released in Mississippi, where did these release(s) occur, and what type of release(s) occurred.

Search the Toxics Release Inventory to gather information.

Suggested Solution:

Type	**methanol** in the Chemical Name or CAS Registry Number Search box
Type	**MS** in the Facility Location Search box
	Note below the search box that "State" is selected by default.
Click	**Search**
Click	**Calculate Totals!** at the left of the page
	Information is for the most recently reported year available from EPA.
Click	**TOXNET Home** to prepare for the next search

Scenario 2 – Mapping TRI and Health Data in TOXMAP

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.

Search TOXMAP to examine information.

Suggested Solution:

Click	**Search**
Type	**styrene** in the Chemical Name Search box
Click	the **Water**, **Land**, and **Underground Injection** checkboxes to deselect them
Select	**2001** and **2005** in the **Release Years** drop-down menus
Click	**Search**
	Note that this shows releases for all of the U.S. and territories.
Select	the **Set Region** sub-tab

Click	the **Create a new region** link
Click	**New Jersey** in the Region Name text box
	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 on the left side of the page
Select	**All Malignant Cancers - All Races - Female** from the top-most 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 3 – Mapping TRI and Health Data in TOXMAP

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.

Search TOXMAP to examine information.

Suggested Solution:

Click	**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**
	Note that 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 on the left side of the page
Select	**Lung and Bronchus - All Races - Female** from the top-most 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

Additional Exercises

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

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

Click

in the **Select Database** column.

Exercise 1: 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 Chemical Name search box
Select	**MS** in the State Search box
Select	**100 lbs** from the Greater Than drop-down menu at the bottom of the TRI home page
Select	**Total Air Release** from the drop-down menu under Greater Than
Click	**Search**
Click	the first facility link in the list of **Facility/Substance** names
Click	**Environmental Release 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 at the right of the map
Click	**TRI on-site release details** at 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 2: 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 **Chemical Information** section to the top 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 3: 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 Predefined Region list
Click	**Submit**
Select	**Define Map** sub-tab
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 right of the page to prepare for the next search

Exercise 4: How many NPL Final Superfund sites are located in New England?

Suggested Solution:

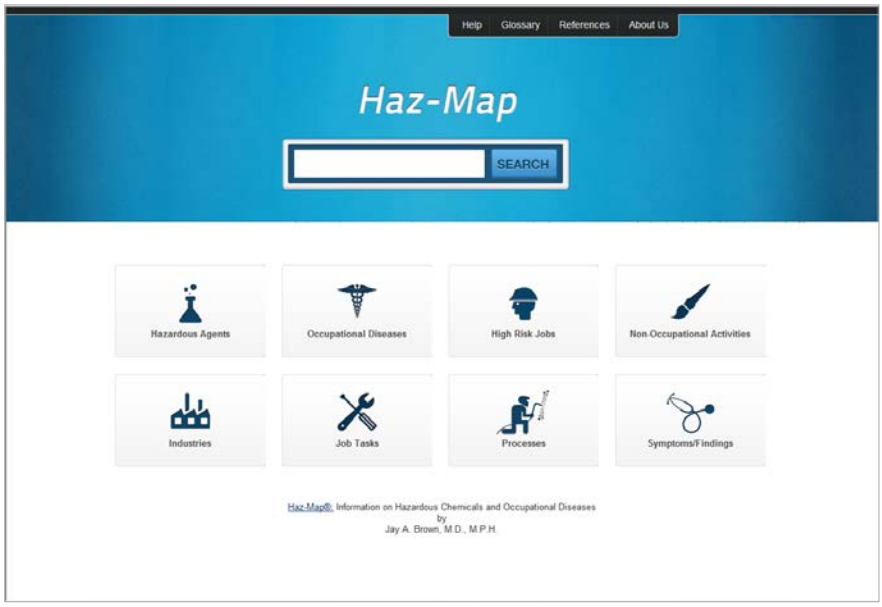
Click	**Choose a Region** in the Quick Search box
Select	**New England** from the Predefined Region list
Click	**Submit**
Click	**Superfund** at the top of the page
Click	**NPL Final** sub-tab
View	the search results above the map to see how many NPL Final sites are in this region

13

Haz-Map

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. You 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

You 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, you may 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. In the search result page, you can click on the Search Details link to see the conditions that were checked for the search.

Find diseases by jobs and symptoms

Search by Jobs: You can search diseases related to a job by selecting a job from the pull-down menu.

Search by Symptoms: You can 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, you can find diseases related to both. For example: searching carpenters and cough.

Additional Resources

For further information, we recommend 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

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

Additional Exercises

Got to **toxnet.nlm.nih.gov.**

Click

in the **Select Database** column.

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 pull-down menu
Click	**Sheet Metal Workers**

Click	the high risk job task of your 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 your choice in the **Agents** list
Click	your browser's **back** button to return to the search results page
Click	**Diseases Results** and select the record of your choice
Click	your browser's **back** button to return to the search results page
Click	**Jobs Results** and select the record of your choice

14

Household Products Database

Household Products Database

Household Products Database contains links for more than 11,000 consumer brands of household products to 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 typical 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 home page or by selecting the **Advanced Search** link for a more detailed search. Clicking the Health Effects tab will bring up the Advanced Search screen with the Health Effects category selected 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, we recommend 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

Household Products Database Search Exercises

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 since the children and puppy will be playing in the yard. She uses a popular brand of extended residual fertilizer with weed control. Are there health effects Cassie should be aware of?

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	**Weed Killer**
Click	**preemergent weed killer** under Type
Click	the extended residual product with weed control
View	the **Health Effects** and Handling/Disposal information

Additional Exercises

Go to **hpd.nlm.nih.gov**.

Click in the **Select Database** column.

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	**Oral Hygiene** in the Personal Care column
Click	**teeth whitener** in the Type column
Click	the **Brand Name** of your choice and 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	**Health Effects**
Type	**cyanosis** in the Search box
Click	**Search** and view the list of products
Click	a product of your choice and 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 bleach?

Suggested Solution:

Type	**bleach** in the Quick Search box on the left of the home page
Click	**Go**
Click	**Bleach (unspecified)** at the top of the page
Click	**Search TOXNET** in the Chemical Information section to the right of **Toxicity Information** to launch a search in TOXNET
Click	**HSDB** in the results list under Chemical, Toxicological, and Environmental Health Data
Click	record(s) of your choice and review the information
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	**Ingredients**
Click	**O** in the alphabetic list at the top
Select	**Oleic acid** from the list of ingredients
Click	the **brand name** of your choice with Auto products in the **Category** column
Review	the information retrieved

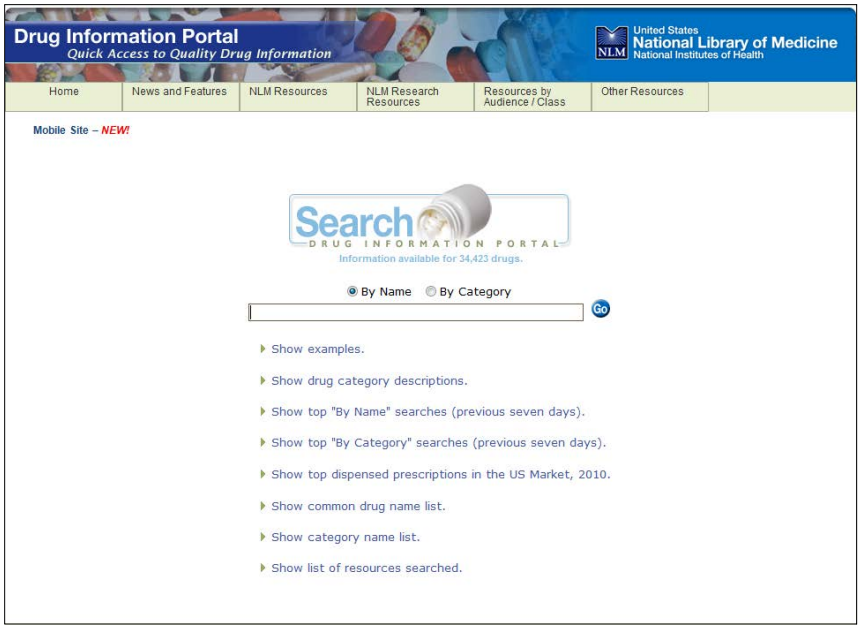
15

More to Explore

- Drug Information Portal
- Dietary Supplements Labels Database (DSLD)
- Tox Town
- Radiation Emergency Medical Management (REMM)
- Wireless Information System for Emergency Responders (WISER)
- Enviro-Health Links

Drug Information Portal

Drug Information Portal provides current information on more than 34,000 selected drugs from their entry into clinical trials through entry into the market place. 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. Smart Phones accessing the main Drug Portal site will be taken the mobile site.



druginfo.nlm.nih.gov

Resources include summaries tailored to various audiences, NLM search systems useful in searching for a drug, NLM research resources, resources organized by drug audience and class, and other NIH and government resources such as FDA and 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 your search term(s) in the search box on the home page to search many resources simultaneously. A spellchecker provides suggestions for misspelled names. You can 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 your browser for the NLM Drug Information Portal to work properly.

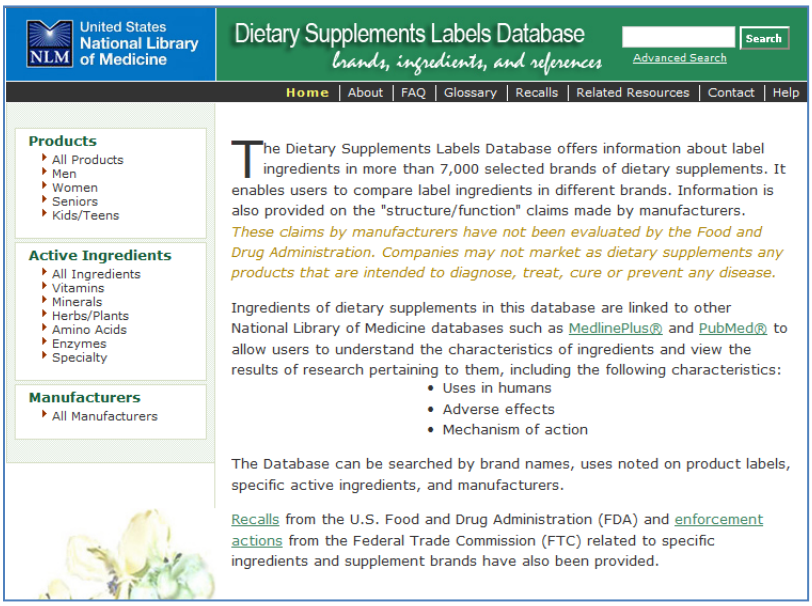
Additional Resources

For further information, we recommend 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
  www.fda.gov/Drugs/default.html
- CDC Drug Service Scientific Resources Program
  cdc.gov/ncidod/srp/drugs/drug-service.html
- U.S. 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

Dietary Supplements Labels Database

The **Dietary Supplements Labels Database** contains information about label ingredients in more than 7,000 selected brands of dietary supplements in the marketplace, including online stores and practitioners, and provides direct links to pertinent health information, fact sheets, research findings and on-going clinical studies at the National Institutes of Health (NIH).



dietarysupplements.nlm.nih.gov

Features include a glossary, Warnings and Recalls from the U.S. Food and Drug Administration, and links to other NLM databases such as MedlinePlus and PubMed for further information including that on the characteristics of ingredients and the results of research pertaining to them.

Searching the Dietary Supplements Labels Database

Enter an active ingredient or a manufacturer in the Quick Search box to query the whole database. You can also search or browse brand names, active ingredients, and manufacturers by clicking the appropriate link in the left sidebar.

Additional Resources

For further information, we recommend these additional resources:

- Office of Dietary Supplements
  dietary-supplements.info.nih.gov
- MedlinePlus Herbs and Supplements
  nlm.nih.gov/medlineplus/druginfo/herb_All.html

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 also offers some resources in Spanish has a text version.

toxtown.nlm.nih.gov

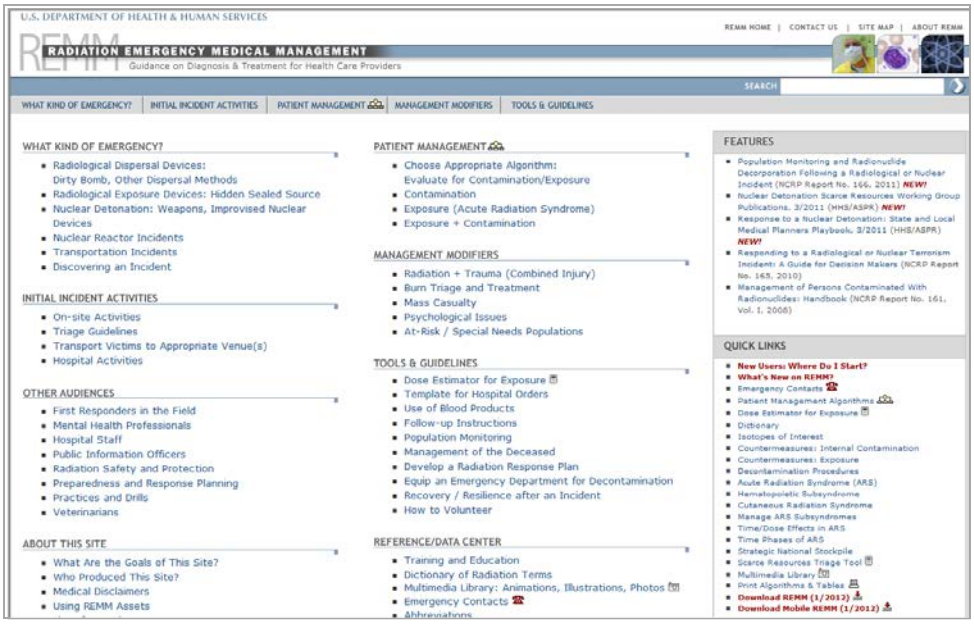
Tox Town is highly interactive, with graphics, animation, and sound to add interest to learning about connections between chemicals, the environment, and the public's health. It is recommended for high school and college students, educators, and the concerned public. This is an excellent resource for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

The Tox Town Web site is designed to give you information on:

- Everyday locations where you might find toxic chemicals
- 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

Radiation Emergency Medical Management System

Radiation Emergency Medical Management System (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 Microsoft Windows Mobile, 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 Event 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 look-up of information

"Quick Links," on the right side of most REMM pages, can help you 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 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 U.S. and international consultants.

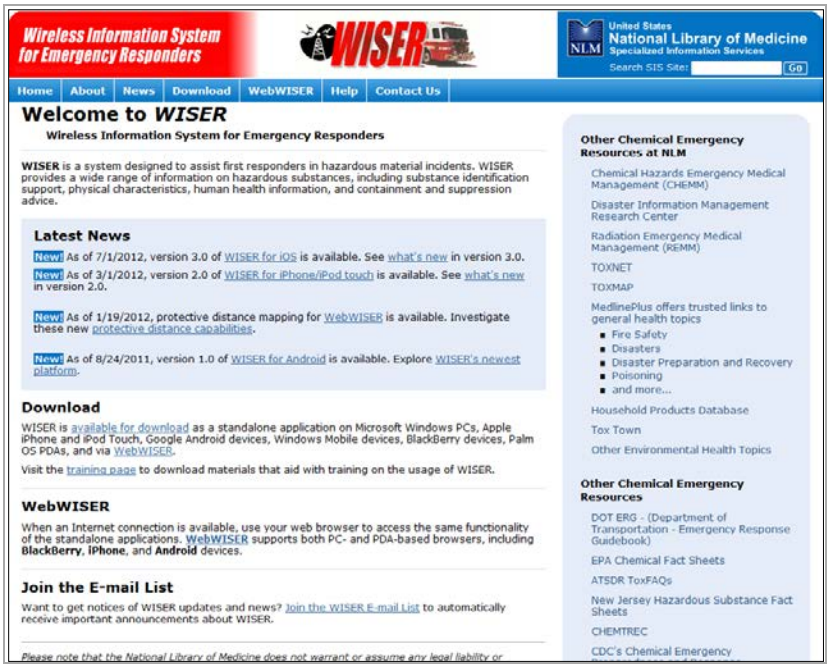
Additional Resources

For further information, we recommend these additional resources:

- Sources of Radiological/Nuclear Information
  remm.nlm.nih.gov/remm_SourcesofRadInfo.htm
- Animated, 13-minute tour of REMM
  remm.nlm.gov/quicktour/index.htm
- Earn Continuing Medical Education Credits
  http://www.remm.nlm.gov/training.htm
- Download REMM to Your Computer
  remm.nlm.gov/download.htm
- Join REMM Listserv
  remm.nlm.gov/email.htm

Wireless Information System for Emergency Responders

Wireless Information System for Emergency Responders (WISER) is a system designed to assist emergency responders in hazardous material incidents. Developed by the National Library of Medicine (NLM), WISER provides a wide range of information on hazardous substances, including substance identification support, physical characteristics, human health information, and containment and suppression guidance. WISER is available for download on Microsoft Windows PC and Mobile devices, Apple iPhone, iPod touch, and iPad, Android, BlackBerry, Palm OS PDAs and via WebWISER.



wiser.nlm.nih.gov

Features

- Mobile support, providing emergency responders with critical information in the palm of their hand
- Comprehensive decision support, including assistance in identification of an unknown substance and, once the substance is identified, providing guidance on immediate actions necessary to save lives and protect the environment
- Access to more than 460 substances from NLM Hazardous Substances Data Bank (HSDB)
- Rapid access to the most important information about a hazardous substance by an intelligent synopsis engine and display called "Key Info"

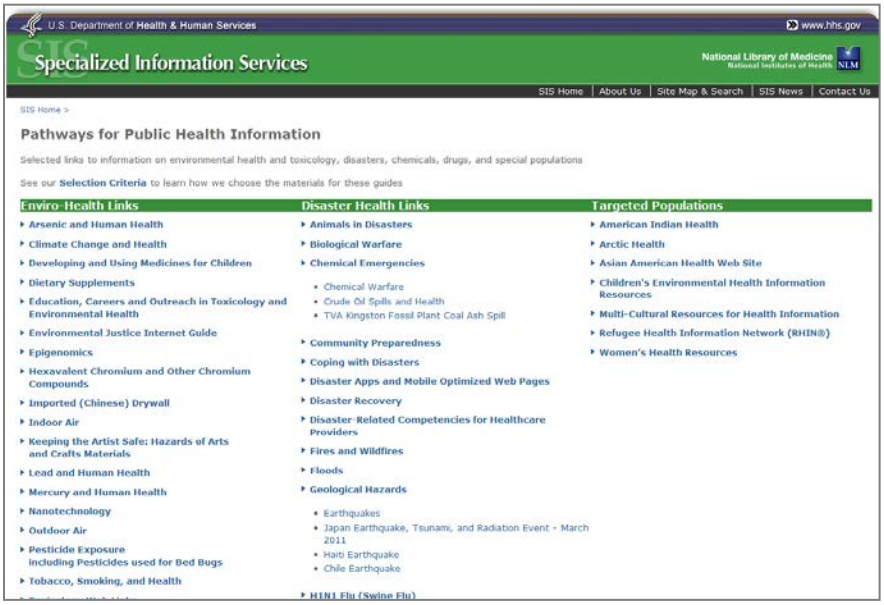
- Visualization of protective distance zones on an interactive map
- Radiological support, including radioisotope substance data, tools, and reference materials
- Biological support, including biological agent data, tools, and reference materials
- General tools, including an electronic version of the ERG
- Intuitive, simple, and logical user interface developed by working with experienced emergency responder

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
- Department of Transportation –Emergency Response Guidebook (DOT –ERG)
  phmsa.dot.gov/hazmat/library/erg

Enviro-Health Links

Enviro-Health Links, available from the NLM Environmental Health and Toxicology Portal, is a list of links to Internet resources on toxicology and environmental health issues of recent special interest. All resources are evaluated and selected according to specific criteria.



sis.nlm.nih.gov/pathway.html

Links to information of special interest include:

- Arsenic and Human Health
- Biological Warfare Agents
- Chemical Emergencies
- Climate Change and Health
- Disaster and Emergency Response Tools
- Disaster Recovery
- Fires and Wild Fires
- Geological Hazards
- Health Effects from the Collapse of the World Trade Center
- H1N1 (Swine Flu)
- Indoor Air
- Japan Disaster in 2011
- Nanotechnology
- Personal Preparedness
- Public Health Preparedness for Mass Gatherings
- Special Populations: Emergency and Disaster Preparedness
- Toxicogenomics
- Water Pollution
- Weather and Storms

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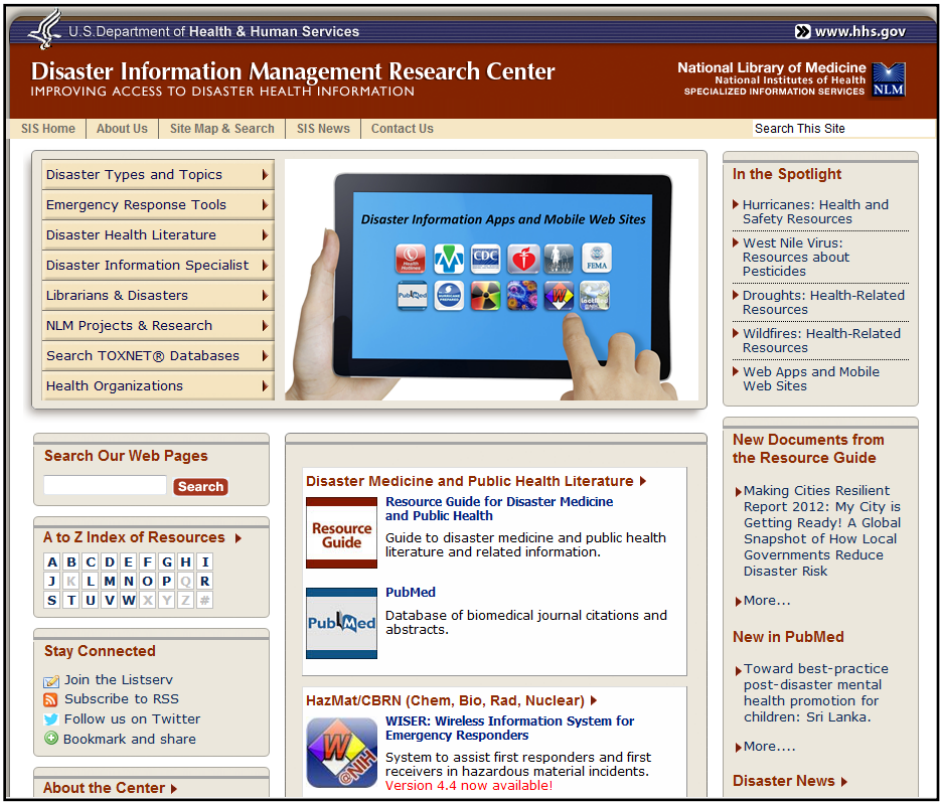
Additional Resources

- Disaster Information Management Research Center (DIMRC)
- Carcinogenic Potency Database (CPDB)
- Comparative Toxicogenomics Database (CTD)
- LiverTox

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

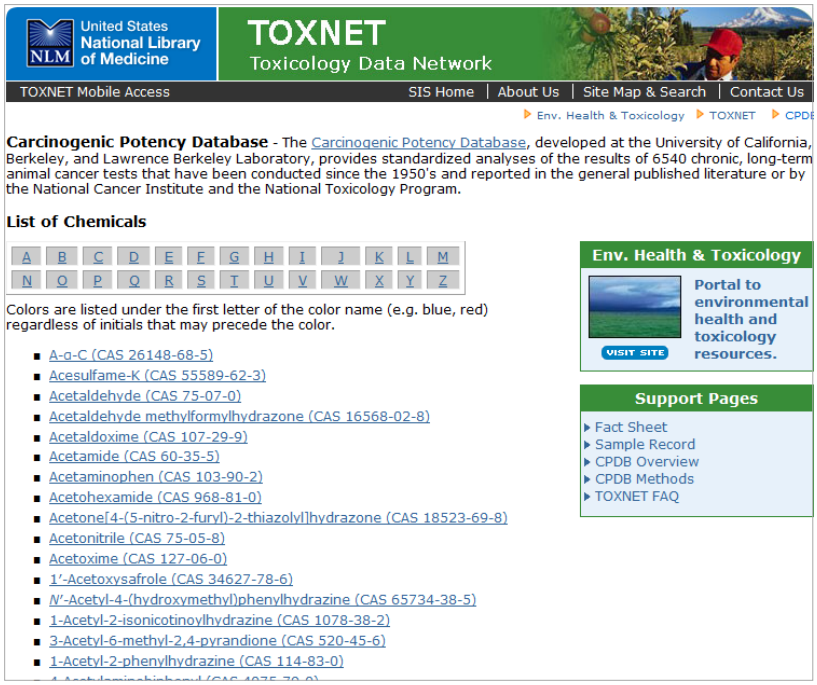
Additional Resources

For further information, we recommend these additional resources:

- Archived Videocast of the DIMRC Disaster Information Outreach Symposium
  videocast.nih.gov/summary.asp?Live=10101
- DIMRC Fact Sheet
  nlm.nih.gov/pubs/factsheets/dimrcfs.html
- Resource Guide for Disaster Medicine and Public Health
  disasterlit.nlm.nih.gov

Carcinogenic Potency Database

The **Carcinogenic Potency Database (CPDB)**, developed at the University of California, Berkeley, and Lawrence Berkeley Laboratory, provides standardized analyses of the results of 6540 chronic, long-term animal cancer tests (both positive and negative for carcinogenicity) that have been conducted since the 1950's and reported in the general published literature or by the National Cancer Institute and the National Toxicology Program.



toxnet.nlm.nih.gov

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, we recommend these additional resources:

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

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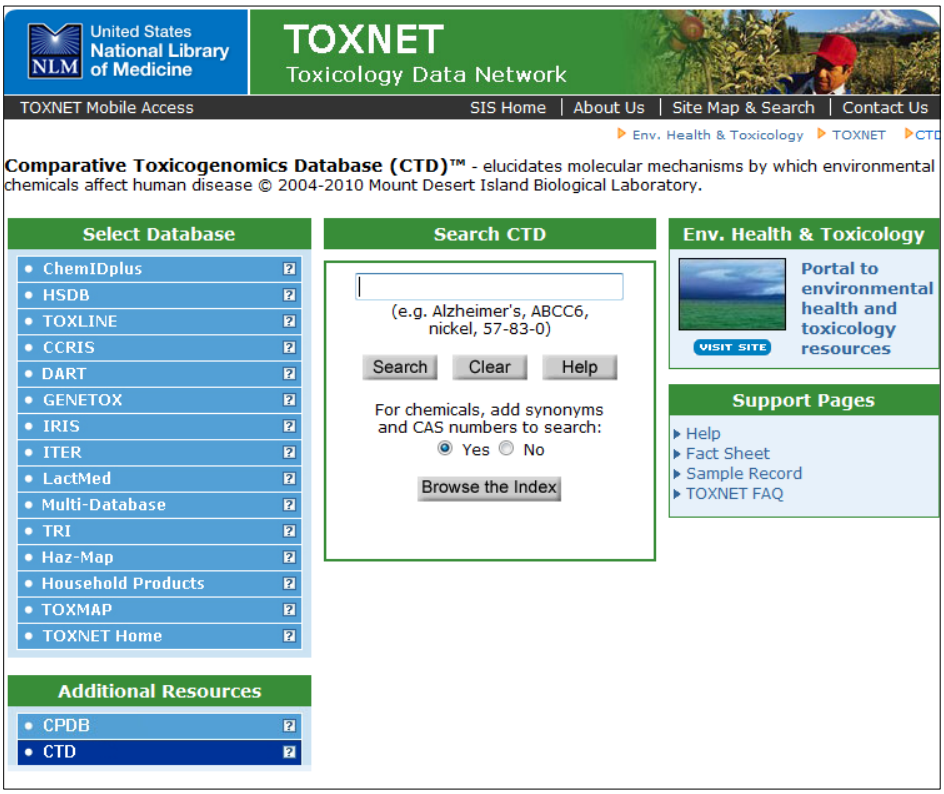
Comparative Toxicogenomics Database (CTD)

The **Comparative Toxicogenomics Database** (CTD) elucidates molecular mechanisms by which environmental chemicals affect human disease. CTD is a data file on the National Library of Medicine (NLM) Toxicology Data Network (TOXNET). It 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.



toxnet.nlm.nih.gov

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 your search results. Users can then be taken via the TOXNET's CTD results to the complete CTD site for further details.

Once in the complete CTD site via TOXNET, 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 search 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, we recommend these additional resources:

- CTD Resource Guide
  ctd.mdibl.org/documents/ctd_resource_guide.pdf

- Glossary
  ctd.mdibl.org/help/glossary.jsp

- Tutorials
  ctd.mdibl.org/help/emailListHelp.jsp

- CTD – Users Email List
  ctd.mdibl.org/help/emailListHelp.jsp

- Frequently Asked Questions
  ctd.mdibl.org/help/faq

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 of the National Library of Medicine (NLM), National Institutes of Health.

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 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 U.S. Food and Drug Administration (FDA)

Additional Resources

- The National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK)

  www2.niddk.nih.gov

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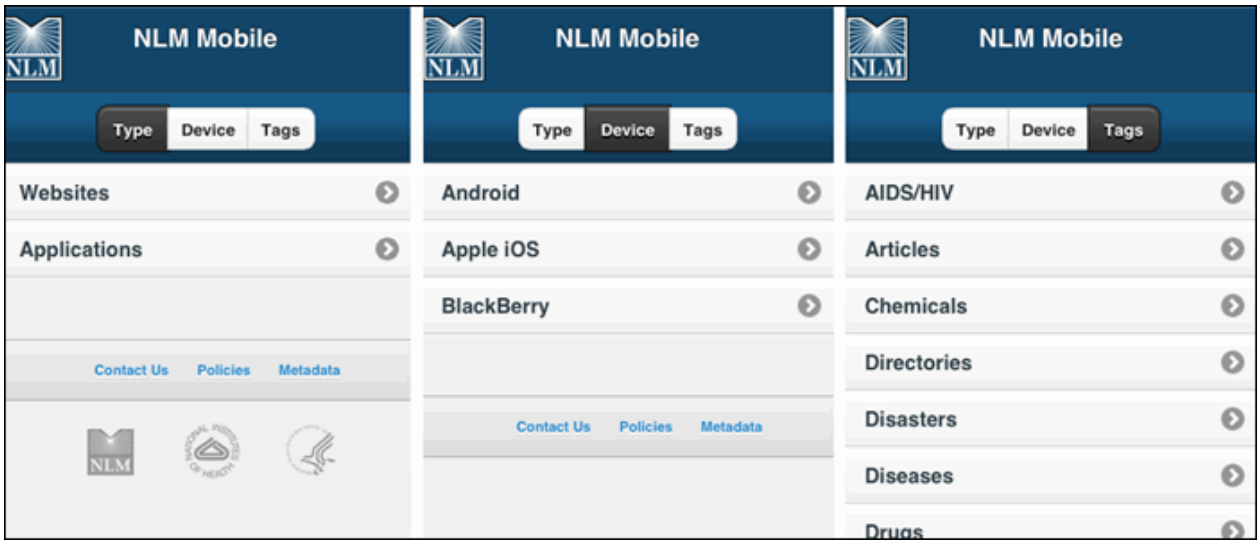
Mobile Tools

Mobile Tools

The National Library of Medicine (NLM) offers a mobile app that is intended to serve as the authoritative guide to NLM mobile resources. This app improves your ability to find and use NLM mobile apps and sites. The app was created as an HTML 5 mobile Website in support of the Library's ongoing efforts to make our information broadly available. Support for HTML 5 is available in Web browsers on many mobile devices including, iPhone, iPad, Android smart phone, Blackberry, or Microsoft phone.

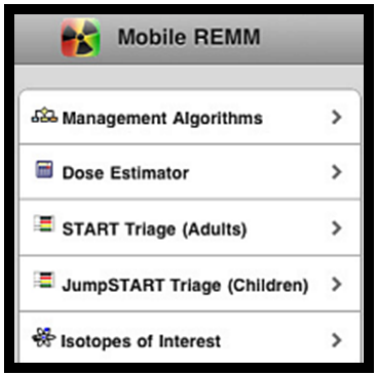
Information on all NLM mobile resources is available through this app.

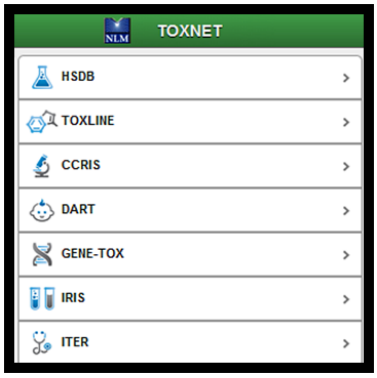


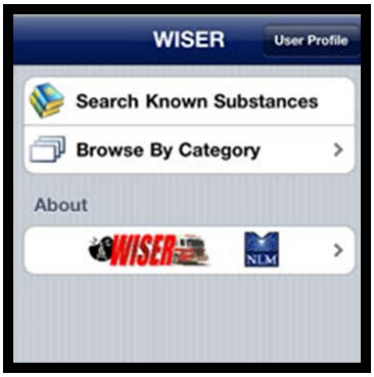
nlm.nih.gov/mobile_app

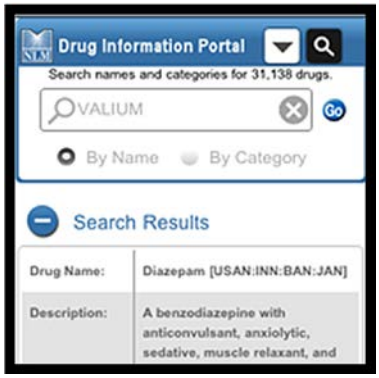
Each mobile resource is represented by an entry which includes:

- Brief description
- Descriptive tag(s)
- Image
- Link to install App or launch Web site









nlm.nih.gov/mobile

Environmental Health & Toxicology Portal
Decision Tree

The National Library of Medicine 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 THE FOLLOWING 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
Peer-reviewed mutagenicity test data from the U.S. Environmental Protection Agency (EPA) including species, type of assay, test result and more	GENE-TOX
Hazard identification and dose-response risk assessment information from the U.S. 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

FOR THE FOLLOWING 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 U.S. 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
Ingredient, health benefit claims and manufacturer information for dietary supplements with links to research	Dietary Supplements Labels Database
Safety and health information for products used in and around the home	Household Products Database
Material Safety Data Sheets (MSDS) and consumer product recalls	Household Products Database
Health information and research related to natural, accidental or deliberate disasters	DIMRC
PDA and/or online tool about chemicals of concern for first responders, hazmat workers, firefighters and others	WISER
Diagnosis and treatment information for radiological events and emergencies	REMM
Interactive website on toxic chemicals and environmental health concerns in the community	ToxTown
Bibliography on alternatives to animal testing in biomedical research	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

Contacting 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

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	sis.nlm.nih.gov/toxnet_faq.html

See also Help and FAQ links on each database home page.

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/ntcc