Elsevier PharmaPendium APIs

Getting started guide

Version 4

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1. Change log

Version	Date	Description of change
3.1	September 2022	Interim version.
4	May 2025	OAuth 2.0 added to Authentication. Mechanism of Action (MoA) and Recommended Dose modules added. Minor formatting edits.

2. Overview

Elsevier's PharmaPendium Application Programming Interface (API) is a group of searchable drug approval documents and extracted data mainly used for drug development decisions.

This user guide explains how to retrieve data through PharmaPendium's API modules:

- Activity
- Documents
- FDA Adverse Event Reporting System (FAERS)
- Pharmacokinetics (PK)
- Chemistry
- Efficacy
- Metabolizing Enzymes (ME)
- Safety
- Drugs Indications
- Mechanism of Action (MoA)
- Recommended Dose

! Visit the following links to access detailed interface documentation:

Activity
Documents
FAERS
Pharmacokinetics
Chemistry
Efficacy
Metabolizing Enzymes
Safety
Drugs Indications
Mechanism of Action (MoA)
Recommended Dose

1.1. API Specifications

Categories	Medical, Science
API Root-Endpoint	https://api.elsevier.com/pharma/
SSL Support	Yes
API Design/Description Proprietary	Non-Proprietary
Hypermedia API	No
Restricted Access	No
Device Specific	No
Type	Web/Internet
Scope	Single purpose API
Supported Request Formats	URI Query String/CRUD
Supported Response Formats	JSON
Authentication Model	API Key, OAuth 2, Token
Support Email	datasupportRD@elsevier.com
Developer Support	https://dev.elsevier.com/

1.2. Additional help

The easiest way to get familiar with the PharmaPendium API is to use the interactive APIs that guide you in constructing a request.

https://dev.elsevier.com/p-harma.html

2. Authentication

PharmaPendium APIs support two types of authentication:

- API keys
- OAuth 2.0

Your application will use either an API key or OAuth 2.0, depending on the access method configured for the specific API.

> **!** To learn more about API keys and authentication and find out the type of authentication your API uses, see the following pages:
>
> - Register for an APIKey.
> - API Technical Specifications.
> - API Authentication.

This section describes how each method works and what you'll need to get started.

2.1. API keys

API key authentication uses a static key linked to your application to identify and authorise requests to the API. Each application must have its own unique key, known as an Application Caller Name (API Key), which cannot be shared or reused by other applications.

Elsevier supports two API key-based authentication methods:

- Institution IP-based authentication
- Institutional token authentication

Institution IP-based authentication

The IP-based method is for institutional subscribers. You must hard-code your API Key into your application and use it to authenticate.

You can authenticate by submitting your API Key within a request URL or request header.

Request URL:

```
http://api.elsevier.com/pharma/activity/search?drugs=Acetaminophen&apiKey=[apikey]
```

Request header:

```
curl -X GET --header 'Accept: application/json' --header 'X-ELS- APIKey: [apikey]' 'https://api.elsevier.com/pharma/activity/search?drugs= Acetaminophen '
```

Institutional token authentication

An institutional token (or 'insttoken') is an additional security token that must be submitted along with your API key. Insttokens are issued only to customers or partners acting on behalf of a customer and provide full access to the customer's account within Elsevier's authentication and entitlements system.

All requests using an insttoken must be made over HTTPS and include the token in the request header. If you are granted an insttoken, Elsevier will provide further details on usage and any applicable restrictions.

2.2. OAuth 2.0

OAuth 2.0 is an open standard for authorization that allows third-party applications to securely access resources without exposing user credentials. It uses access tokens to grant access to APIs.

To access our APIs that use OAuth 2.0, your application must provide OAuth credentials (client ID and client_secret) to obtain an access token. This token must then be included in the authorization header of your requests:

Example request:

```
curl -X GET https://api.elsevier.com/pharma/pk/search?
   -H "Authorization: Bearer YOUR_ACCESS_TOKEN"
```

For details of how to create and use OAuth credentials to obtain an access token, see the Authorization documentation in the Elsevier API developer portal.
https://developer.digital.elsevier.com/Products/PharmaPendium

3. Request

An API URL is called a request while the data sent back to you is called a response.

A request consists of four components:

- Root-endpoint (or route)
- Headers
- Method
- Data (or body)

3.1. Root-endpoint

The root-endpoint is the starting point of the specific PharmaPendium API module to which you are placing a request. It follows this structure: root-endpoint/search?

For example, let's say you want to retrieve adverse event data for the drug Aspirin using the PharmaPendium Safety API Module. Based on the Safety API docs, the Request URL will look something like this:

```
https://api.elsevier.com/pharma/safety/search?drugs=aspirin
```

The last part of the root-endpoint are the query parameters. Query parameters begin with a question mark (?), and each subsequent parameter pair is separated by an ampersand (&).

For example, let's say you want to retrieve adverse event data for the drug Aspirin in relation to fatigue as a side effect using the Safety API Module. Based on the Safety API docs, the Request URL will look something like this:

```
https://api.elsevier.com/pharma/safety/search?drugs=aspirin&effects=fatigue
```

3.2. Headers

The Headers interface of the API allows you to perform various actions on http request and response headers. For the purposes of this guide, we will use the command line utility curl.

Make sure you have curl installed. Type the following command in your system terminal to check the version installed on your system:

```
Curl --version
```

Type curl followed by the root-endpoint you're requesting. For example, to get the PharmaPendium Activity API Module, you would type the following:

```
curl -X GET --header 'Accept: application/json' --header 'X-ELS- APIKey: [apikey]' 'https://api.elsevier.com/pharma/activity'
```

3.3. Method

The method is the type of request you send to the server. PharmaPendium API modules support two methods (actions): GET and POST, which allow you to request data from the server.

Combining your header and root-endpoint with the above actions allows you to search for and retrieve relevant information over an API. To understand what paths are available, check the API portal for each PharmaPendium API module (e.g., Activity) to learn how to code these actions. They're all different!

The following are the interfaces associated with search and it's components:

URL	Method	Description
https://api.elsevier.com/pharma/[APIService]/listDataFields	GET	Use listDataFields to request a list of data field names available for an API service.
https://api.elsevier.com/pharma/[APIService]/listFacets	GET	Use listFacets to request a list of facets available for an API service.
https://api.elsevier.com/pharma/[APIService]/listTaxonomies	GET	Use listTaxonomies to request a list of all taxonomies available for an API service.
https://api.elsevier.com/pharma/[APIService]/lookupFuzzy	GET POST	Both GET and POST allows you to use lookupFuzzy to request to lookup elements of a taxonomy specific for an API service. This method allows wildcards.
https://api.elsevier.com/pharma/[APIService]/search	GET POST	Both GET and POST* allows you to request a search for data by specified criteria. *You must use the POST method to request search data for chemistry structure/substructure (GET is not supported for structure search).
https://api.elsevier.com/pharma/[APIService]/suggest	GET	Use suggest to request elements of a toxonomy matching prefix available for an API service.
https://api.elsevier.com/pharma/[APIService]/getUnits	GET	Use getUnits to request the available filterable units for specified parameter.

3.4. Response

API requests are sent using HTTPS GET or POST requests to the server. The API returns individual results (the response) as JSON (JavaScript Object Notation). The JSON object has two sections:

- meta: metadata about the query.
- results: an array of matching results, depending on which module was queried.

For the purposes of this guide, we will use a JSON response for search results. JSON object looks like a JavaScript Object. In JSON, each item listed (counted) in the response body will have property and value wrapped with curly brackets:

```
{
 "property1": "value1",
 "property2": "value2",
 "property3": "value3"
}
```

The results in a JSON reponse are limited to 500 records. However, you can computationally loop over the respone to download the complete set of data.

Each response is returned with a standardized message about the status of the request.

Response messages

HTTP Status Code	Reason
401	Unauthorized
403	Forbidden
404	Not Found
200	OK
201	Created
204	No content

3.5. Faceting a response

Faceting a response allows you to partition data from a response into categories, effectively narrowing down results along a relevant classification system. By faceting, you can view data from different perspectives, or facets, and reduce the payload prior to data download instead of via post-processing. When faceting, you can indicate that you want only leaf elements of taxonomies, ie., only the end elements of a taxonomic tree. Otherwise, all relevant elements (end and higher-ranking categories) are returned and include the field `'isLeaf'` as true or false.

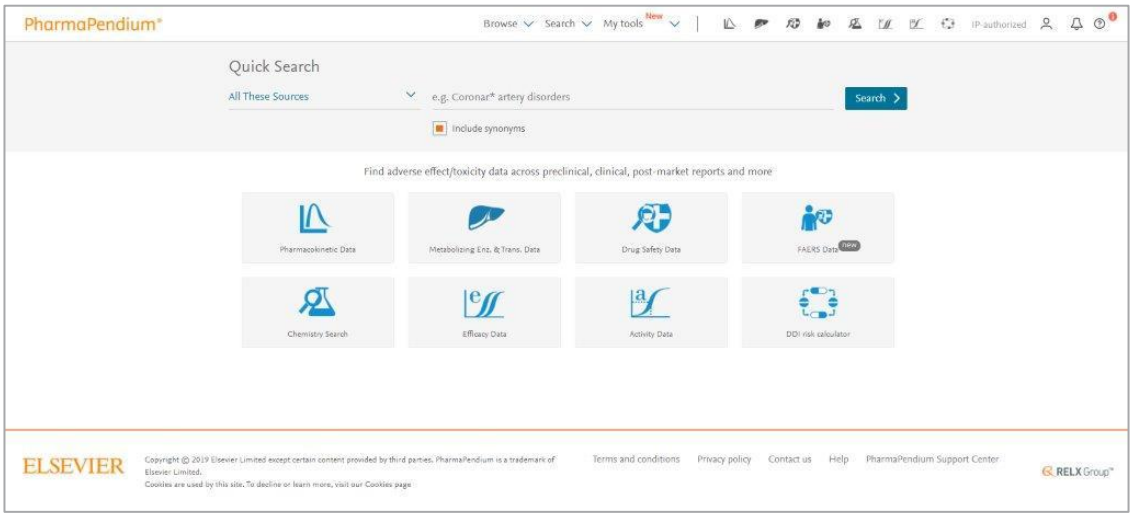
Examples of what faceting enables include:

- Obtain a list of all drugs that have a record of a specific adverse effect in preclinical species and humans.
- Retrieve all reported IC50 data for a particular target, including metabolizing enzymes and transporters.
- Assess how the reporter occupation influences the reporting of a particular adverse effect in the FAERS database; for example, during a certain period of time, did lawyers more frequently report an adverse event for a particular drug over healthcare professionals?
- Retrieve data for all drugs which have been tested for having a drug-drug interaction with anticoagulants and filter by AUC ratio.

The facets available for each PharmaPendium API Module are listed in the corresponding chapter (chapters 4–11). Alternatively, use `listFacets` to request a list of all facets in a given Module.

It is possible to use the web interface of PharmaPendium to explore the content of PharmaPendium API Modules and inform facet entries. One of three strategies can be used, depending on the facet. Facet tables in each Module chapter list the best strategy.

Log into PharmaPendium (www.pharmapendium.com). If you have an IP-based subscription, you should be able to access the PharmaPendium Homepage directly. There, select the relevant Module in PharmaPendium by clicking the corresponding icon.



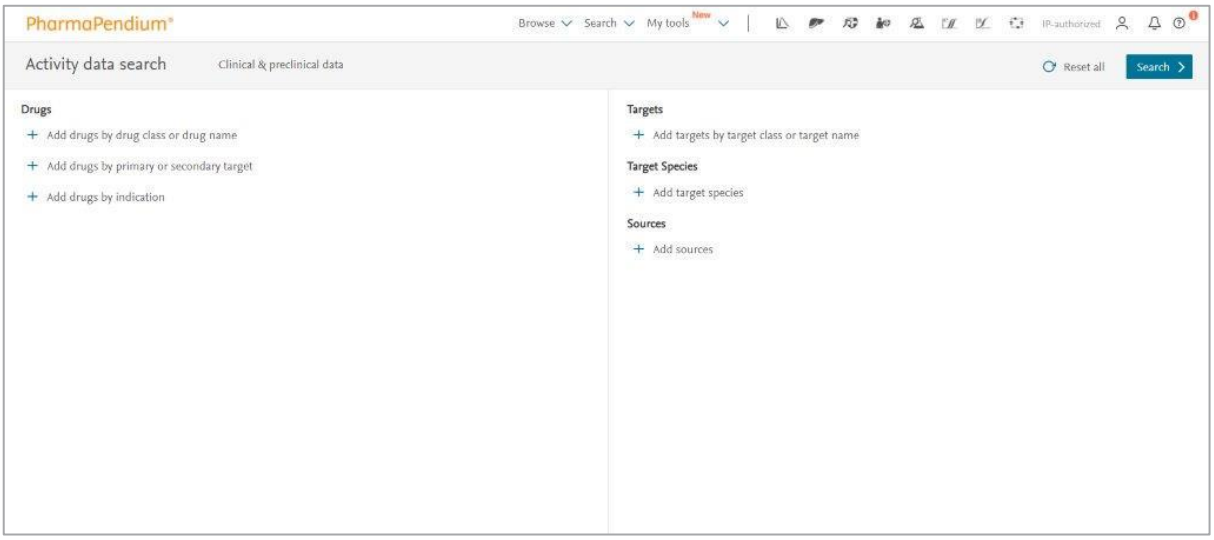
Browse taxonomies

In the top navigation bar of the Module Search Page, you will find the Browse menu. From this menu, you can access and explore nodes and branches of the following PharmaPendium taxonomies:

- Drugs, including drug classes
- Effects/Toxicity, based on MedDRA
- Targets. This taxonomy builds on known druggable targets. The Activity Module contains more targets than listed in this taxonomy because data are imported from activity experiments looking at a broader spectrum of target candidates.
- Indications

Explore dedicated search tools

Each Module Search Page offers dedicated tools to help construct a search. Tools for drugs are in the left panel. Tools for other Module-specific content are in the right panel. For example, the Activity Module includes tools to construct a search based on activity targets, target species and data sources (see screenshot below).



Click the blue plus sign (+) to open a structured checklist of available term options. For example, if you were interested in data on a specific target class, you would select that target class from the expanded checklist, or pick selected targets of interest in that class. The following are the search tools available in each of the Modules:

Module	Available search tools
Activity	Targets, target species, sources
Chemistry	–
Efficacy	Indication type, species, sources, endpoints
FAERS	Adverse events
Metabolizing Enzymes	Data type, enzyme/transporter name, species, sources
Pharmacokinetics	Parameter ranges, species, sources
Safety	Adverse effects/toxicity, species, sources
Drugs Indications	Indication, drug, drug class

Explore filters

A final option is to conduct a search that pulls up all data on all drugs in a given PharmaPendium Module and then browse the **Filters** visible in the left panel of the Results Page.

Completing this search requires selecting all drugs available in a module, which can be tedious. Thus, we recommend performing this comprehensive search once and then saving it to be performed whenever needed.

To save the search, you will need to establish a personal account in PharmaPendium. This is takes only a few minutes:

1. Log out of your IP-based access, by clicking **IP-authorized** in the top navigation bar, and then **Log out**.
2. When you arrive at the PharmaPendium Login Page, click **Not a registered user?** and set up a personal account. This account still runs over your IP-authorization but it allows you to save searches and create alerts in PharmaPendium.
3. Log in with your personal account.

To perform the comprehensive search, first select the PharmaPendium Module of interest to access the corresponding Search Page:

1. Click the blue plus sign (+) for Add drugs by drug class or drug name on the left side of the Search Page.
2. The tool expands to a comprehensive list of all drugs for which data are available in the Module.
3. Select each drug in the list.
4. Click the Search button on the right side of the Search Page.
5. The search hits are returned on a Results Page, which includes a panel of Filters on the left. The filters correspond to facets and can be expanded to reveal a structured

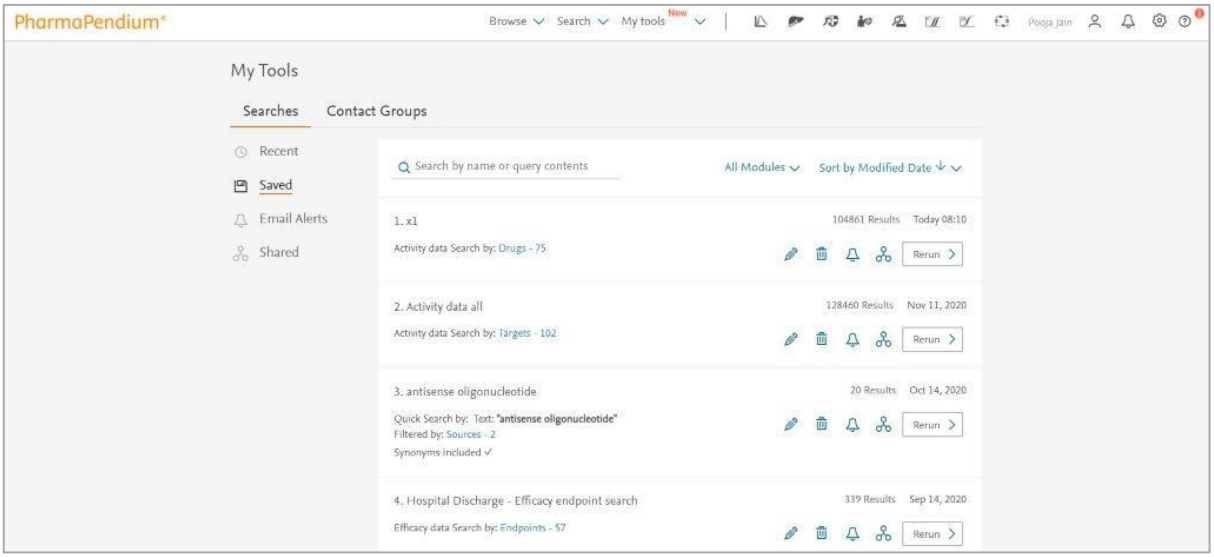
list of entries that occur in the data set. Since the search encompasses all drugs for which data are contained in the Module, the lists include all possible facet terms.

Make sure to save the search so you can use it again in the future:

1. Click the Save icon on the Results Page.
2. Assign the search a name and click Save.
3. The next time you wish to use the same search, click the My tools menu in the top navigation bar and select Searches.

   All searches you've saved appear listed and you can run the appropriate one by clicking the Rerun button.

NOTE: in My Tools you can also set an alert that notifies you when the results of a saved search change, for example, when new data are added.



4. Activity data search

The PharmaPendium Activity API Module allows users to retrieve activity data, such as IC_{50} values, for FDA and EMA approved drugs. Users can also see information on secondary targets related to the approved drugs.

API Root-endpoint	https://api.elsevier.com/pharma/activity/
API Portal / Home Page	https://dev.elsevier.com/documentation/PharmaActivityAPI.wadl Here you can find all the interfaces associated with the Activity search and its auxiliary components.
Interactive Console URL	https://dev.elsevier.com/pharma.html#/Pharmapendium_Activity_Services

The following table lists the facets available in the PharmaPendium Activity API Module and their underlying organizing structure.

Facets available	Organizing structure (taxonomy, list, used categories, etc.)	Strategy to explore terms (see Section 3.5)
drugs	PharmaPendium Drugs Taxonomy	1
species	PharmaPendium Species Taxonomy	2
sources	PharmaPendium Sources Taxonomy	2
targets	PharmaPendium ActivityTargets Taxonomy	2
radioLabel	125I, 2H, 3H	3
isPrimaryTarget	Primary, Non-primary	3
targetType	Chimera, mutated, synthetic, wild, wild-type, unreported, undefined	3
parameter	List of terms* (e.g., CLint, % inhibition, % stimulation, EC50, Emax(%), Fu, Fold-increase, Ki)	3
experimentType	List of terms* (e.g., adenylate cyclase activity, aggregation, cAMP production, Ca2+ mobilization, electrophysiology, enzymology inhibition, flux release, flux uptake, two electrode clamp)	3
actionTested	List of terms* (e.g., inhibitor, stimulator, basal condition, stimulator/protector)	3
transfection	Infected, injected, non-transfected, synthetized, transfected, undefined	3
testSystem	PharmaPendium Test Systems List	3
agonistAntagonist	Activator, agonist, allosteric modulator, antagonist, blocker, inhibitor, inverse agonist, opener, radioligand, stimulator, substrate, not applicable	3
studyType	Binding, cell behavior, DNA assay, enzymology, expression, flux, functional assay, in vitro (others), in vitro electrophysiology, isolated organs, protein interactions, second messenger, signaling, transactivation assay, unreported	3
documentYear	Calendar year	3

* Typically includes terminology used in the source document. We have provided some examples.

The data fields included in a response are listed in Section 13. Use the interactive API to get an overview of the type of data to expect in each field (Model tab) and the structure of the response (Model Schema tab).

Note that empty data fields are excluded from JSON output. To create a data frame that retains empty data fields, parse the JSON output with a method that replaces empty fields with a default value.

4.1. Retrieving data on IC_{50} values

Research question: What data are available on the half maximal concentration measured for the drug Misoprostol to inhibit cell receptors (IC50)?

Request strategy: Request data on “Misoprostol” (drugs) limited to “IC50” as parameters and “cell receptors” as targets.

Request URL:

```
https://api.elsevier.com/pharma/activity/search?drugs=Misoprostol&targets=receptors&parameters=IC50
```

JSON response via the main search method GET:


```
{
 "data": {
  "countTotal": 2,
  "countLimited": 2,
  "items": [
   {
    "id": "81216",
    "drug": "Misoprostol",
    "document": {
     "sourceShort": "TOXICITY",
     "source": "PharmaPendium Published Activity",
     "year": 1991,
     "feature": "AUREUS_transport_journals",
     "citation": "0007-1188$24P$1021991",
     "issn": "0007-1188",
     "journal": "British Journal of Pharmacology",
     "pages": "24P",
     "volume": "102"
    },
```

```
      "smiles": "CCCCC(C)(O)C\\C=C\\[C@H]1C(O)CC(=O)[C@@H]1CCCCCCC(=O)OC",
      "specie": "Cat",
      "source": "PharmaPendium Published Activity",
      "target": "EP-2 Prostanoid Receptor",
      "isPrimaryTarget": "Non-Primary",
      "displayDose": "unreported",
      "dose": "unreported",
      "parameter": "IC50Transfected",
      "cellOrigin": "Cat",
      "testSystem": "Trachea",
      "studyType": "Isolated organs",
      "agonistAntagonist": "Agonist",
      "actionTested": "Inhibitor",
      "documentYear": 1991
    }
   ]
  },
    {
     "id": "29758",
     "drug": "Misoprostol",
     "document": {
      "sourceShort": "TOXICITY",
      "source": "PharmaPendium Published Activity",
      "year": 1991,
      "feature": "AUREUS_transport_journals",
      "citation": "0007-1188$24P$1021991",
      "issn": "0007-1188",
      "journal": "British Journal of Pharmacology",
      "pages": "24P",
      "volume": "102"
     },
     "smiles": "CCCCC(C)(O)C\\C=C\\[C@H]1C(O)CC(=O)[C@@H]1CCCCCCC(=O)OC",
     "specie": "Guinea pig",
     "source": "PharmaPendium Published Activity",
     "target": "EP-3 Prostanoid Receptor",
     "isPrimaryTarget": "Non-Primary",
     "displayDose": "unreported",
     "dose": "unreported",
     "parameter": "IC50",
     "displayValue": "1.5 nM",
     "valueOriginal": "1.5",
     "valueNormalized": "0.0015 (0.0015 to 0.0015)",
     "unitNormalized": "uM",
     "unitOriginal": "nM",
     "sharpN": "4",
     "targetType": "Wild type",
     "transfection": "Non Transfected",
     "cellOrigin": "Guinea pig",
     "testSystem": "Vas deferens",
     "studyType": "Isolated organs",
     "agonistAntagonist": "Agonist",
     "actionTested": "Inhibitor",
     "documentYear": 1991
    }
   ]
  },
  "facets": null
}
```


The JSON response returned 2 records from Activity data ["countTotal": 2]. Since we didn't facet the search, the JSON response returned a list of all available data fields and facets.

Note: If you would like to filter your search by parameters values, you can GET filterable units available for specified parameter. For example, the available units for IC50 are:

```
{
 "status": "OK",
 "duration": 4,
 "payload": [
  "uM",
  "nM",
  "M",
  "ug/mL",
  "ms",
  "mM",
  "ng/mL",
  "mg/mL",
  "umol",
  "pM",
  "nmol/kg",
  "nmol",
  "g/mL",
  "pmol",
  "%",
  "mg/kg",
  "mol",
  "pg",
  "umol/mg protein"
 ]
}
```


4.2. Target search

Research question: What ATP targets in vertebrates have been tested in 1321N1 cells to report on half maximal effective concentration (EC50)? Facet results by species.

Request strategy: Request data for “ATP targets” (targets) limited to “vertebrates” as species, “1321N1 cells” as testSystems, and “EC50” as parameters. Facet results by “species”.

You can focus your results to include certain data fields (“displayColumns”). For this example, we are limiting our data fields to the following:


```
 "isPrimaryTarget": "Primary/Non-primary",
 "targetType": "Target Type",
 "target": "Target",
```

Construct your query request URL

https://api.elsevier.com/pharma/ activity/search?displayColumns=isPrimaryTarget&displayColumns=targetType&displayColumns=target&facets=species&species=Vertebrates&targets=ATP%20Targets%20&testSystems=1321N1%20cells&parameters=EC50

JSON response via the main search method GET


```
{
 "data": {
  "countTotal": 1,
  "countLimited": 1,
  "items": [
   {
    "target": "P2X-7 Receptor",
    "isPrimaryTarget": "Non-Primary",
    "targetType": "Wild type"
   }
  ]
 },
 "facets": {
  "species": {
   "children": [
    {
     "data": {
      "id": "ALOvP_GaRv9",
      "name": "Vertebrates",
      "isLeaf": false,
      "count": 1
     },
     "children": [
      {
       "data": {
        "id": "XmQmVYkG9Q-",
        "name": "Birds",
        "parentID": "ALOvP_GaRv9",
        "isLeaf": false,
        "count": 1
       },
       "children": [
        {
         "data": {
          "id": "1IhqLnCEqW9",
          "name": "Galliformes",
          "parentID": "XmQmVYkG9Q-",
          "isLeaf": false,
          "count": 1
         },
         "children": [
          {
           "data": {
            "id": "qKkPCstA5tB",
            "name": "Turkey",
            "parentID": "1IhqLnCEqW9",
            "isLeaf": true,
            "count": 1
           }
          }
         ]
        }
       ]
      }
     ]
    }
```

```
    ]
   }
  }
}
```

The JSON response returned 1 record from Activity data ["countTotal": 1], and the list of data fields specified.

5. Chemistry search

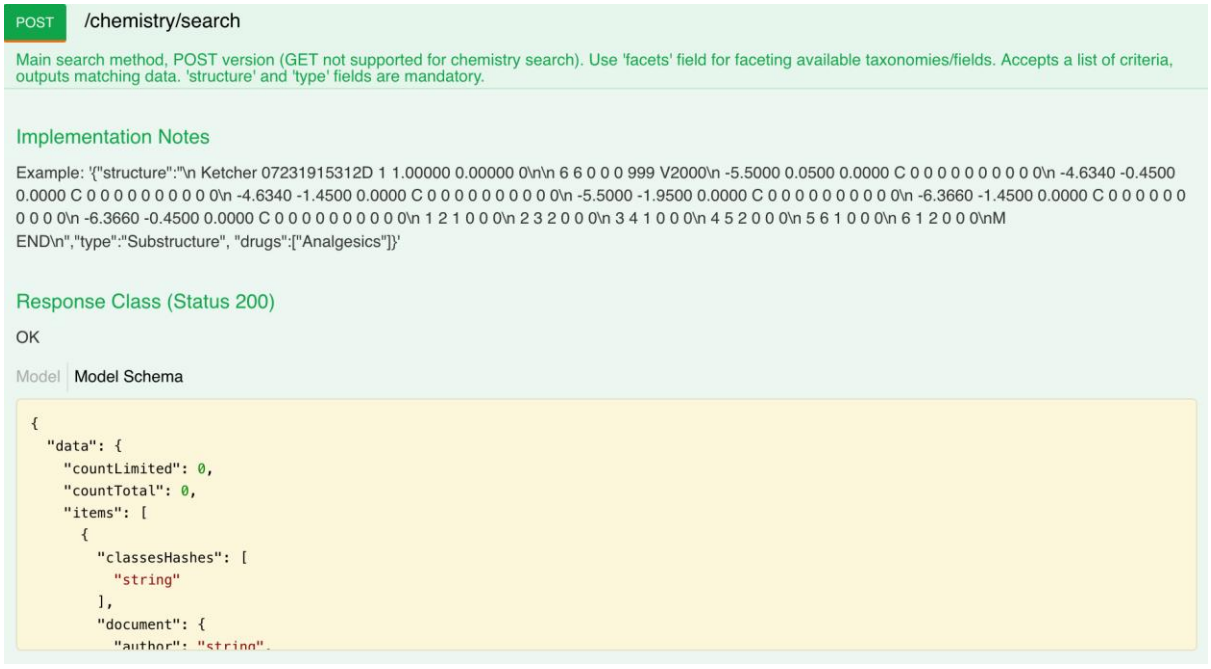
The PharmaPendium Chemistry API Module allows users to retrieve a list of drugs based on a given chemical structure or chemical substructure, and covers only FDA and EMA approved drugs. Users can then use the generated list in other PharmaPendium API Modules to retrieve all clinical (including FAERS) and preclinical drug safety, pharmacokinetic, metabolizing enzymes and transporters, efficacy and activity data for drugs that have that structure in common.

> **!** IMPORTANT: Unlike the other PharmaPendium API Modules, the main search method for the Chemistry Module is POST (GET is not supported). POST is the preferred method because MOL file formats are usually longer than the allowed URL length for web servers.

API Root-endpoint	https://api.elsevier.com/pharma/chemistry/
API Portal / Home Page	https://dev.elsevier.com/documentation/PharmaChemistryAPI.wadl Here you can find all the interfaces associated with PharmaPendium search and its auxiliary components.
Interactive Console URL	https://dev.elsevier.com/pharma.html#/Pharmapendium_Chemistry_Services

The response data can be faceted by drugs. The organizing structure of that facet is the PharmaPendium Drugs Taxonomy. Faceting avoids issues that may result from the length of MOL file formats and the ocassional problematic character.

The data fields included in a response are listed in Section 13. Use the interactive API to get an overview of the type of data to expect in each field (Model tab) and the structure of the response (Model Schema tab).



Note that empty data fields are excluded from JSON output. To create a data frame that retains empty data fields, parse the JSON output with a method that replaces empty fields with a default value.

Research question: What oxytocic drugs include the substructure CH_4?

Search strategy: Conduct a chemical "substructure" (type) search for CH4 (structure) and facet on "Oxytocics" (drugs).

Convert the structure into an MDL/Symyx Mol format (CH_4):

```
Ketcher 03112010022D 1   1.00000     0.00000     0 1  0  0     0  0   999 V2000 0.0000    0.0000    0.0000 C   0  0
0  0  0  0  0  0       0  0  0 M  END
```

Request URL:

```
'{"structure":"\n Ketcher 03112010022D 1 1.00000 0.00000 0 1 0 0 0 0 999 V2000 0.0000 0.0000  0.0000 C 0 0
0 0 0 0 0 000M END\n","type":"Substructure"}, "drugs":["Oxytocics"]}'
```

```
'{"structure":"\n Ketcher 03112010022D 1 1.00000 0.00000 0 1 0 0 0 0 999 V2000 0.0000 0.0000  0.0000 C 0 0
0 0 0 0 0 000M END\n","type":"Substructure"}, "drugs":["Oxytocics"]}' 'https://api.elsevier.com/pharma/chemist
ry/search'
```

Note: 'structure' and 'type' fields are mandatory.

Retrieve the response via the main search method POST. You can test the query using the "curl" utility instead of a browser.

6. Documents search

The PharmaPendium Documents API Module allows users to perform text searches for all documents in PharmaPendium. This includes FDA and EMA approval documents, FDA Advisory Committee documents, DESI (Drug Efficacy Study Implementation) documents, Mosby's Drug Consult (2006), and Meyler's Side Effects of Drugs (15th edition).

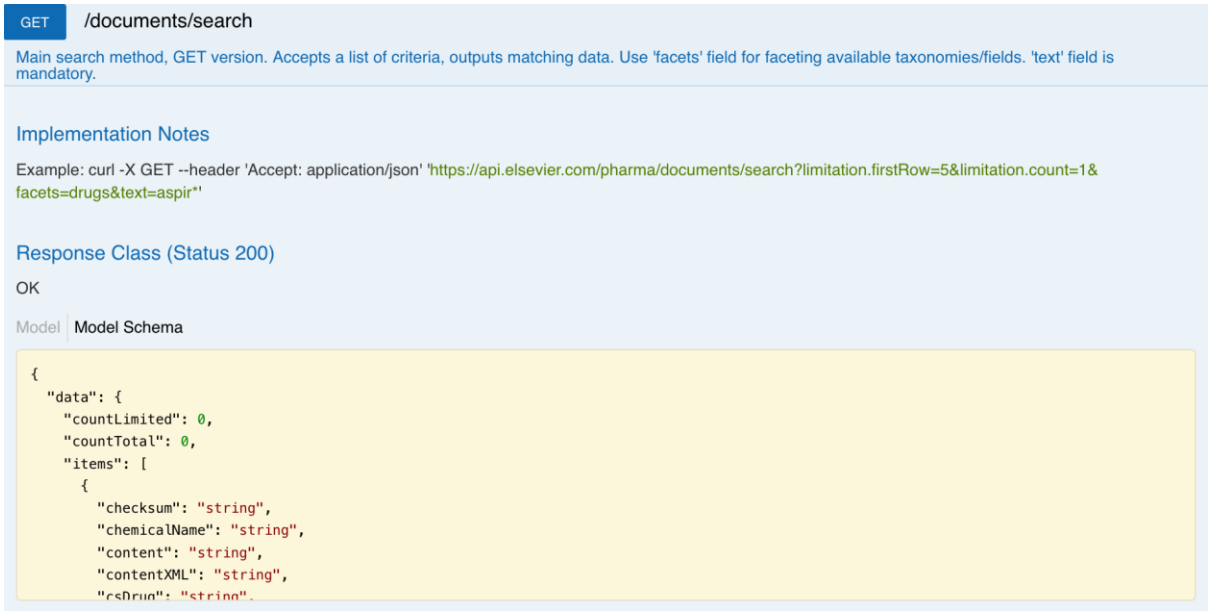
API Root-endpoint	https://api.elsevier.com/pharma/documents/
API Portal / Home Page	https://dev.elsevier.com/documentation/PharmaDocumentsAPI.wadl Here you can find all the interfaces associated with PharmaPendium search and its auxiliary components.
Interactive Console URL	https://dev.elsevier.com/pharma.html#/Pharmapendium_Documents_Services

The following table lists the facets available in the PharmaPendium Documents API Module and their underlying organizing structure.

Facets available	Organizing structure (taxonomy, list, used categories, etc.)	Strategy to explore terms (see Section 3.5)
drugs	PharmaPendium Drugs Taxonomy	1
sources	PharmaPendium Sources Taxonomy	3*
documentYear	Calendar year	3*

* Enter the term "drug" into the Quick Search field of the PharmaPendium Homepage and click Search. Browse the Filters in the left panel of the Results Page for sources and year.

The data fields included in a response are listed in Section 13. Use the interactive API to get an overview of the type of data to expect in each field (Model tab) and the structure of the response (Model Schema tab).



Note that empty data fields are excluded from JSON output. To create a data frame that retains empty data fields, parse the JSON output with a method that replaces empty fields with a default value.

Research question: What documents for Hydrocodone Bitartrate from 2014 reference the drug Dutasteride?

Request strategy: Request documents for “Hydrocodone Bitartrate” (drugs) limited to “2014” for year and including the term “Dutasteride” (text).

Request URL:

```
https://api.elsevier.com/pharma/ documents/search?drugs=Hydrocodone%20Bitartrate%20&years=2014&text=Dutasteride
```

JSON response via the main search method GET:


```
{
 "data": {
  "countTotal": 1,
  "countLimited": 1,
  "items": [
   {
    "id": "47598",
    "drug": "Hydrocodone Bitartrate",
    "document": {
     "id": "26033",
     "name": "Medical/Clinical Review 206627/S-000 Part 02",
     "sourceShort": "FDA",
     "source": "FDA approval packages",
     "sourceHash": "MFLyJWhSs79",
     "type": "Medical/Clinical Review",
     "date": 1401840000000,
     "year": 2014,
     "length": 15737439,
     "isHistoric": false,
     "file": "77b6aeb796fc5d2c2d37713ad6667247"
    },
    "smiles": "O.O[C@H]([C@@H](O)C(O)=O)C(O)=O.[H][C@@]12CCC(=O)[C@@H]3OC4=C(OC)C=CC5=C4[C@]13CCN(C)[C@@H]2C5",
    "csDrug": "Hydrocodone Bitartrate",
    "molecularWeight": 467.179,
    "chemicalName": "MORPHINAN-6-ONE, 4,5-ALPHA-EPOXY-3-METHOXY-17-METHYL-, TARTRATE (1:1)",
    "checksum": "77b6aeb796fc5d2c2d37713ad6667247",
    "snippets": [
     " chronic pain syndrome Concomitant medications included: <em>dutasteride</em>, cyclobenzaprine, diazepam, gabapentin"
    ],
    "downLoadLink": "https://d3uuoyw0x621p0.cloudfront.net/pdf/77b6aeb796fc5d2c2d37713ad6667247.pdf?Expires=1585600272&Signature=RkxNE-DZwiWfcL6dTRAOUUMKmg8zhXDh1wdJp0KIGCZ5ev4KzAozKjxdpB-4IlEIkEihZcUkf2ZK0wfcpSUNFc~AoJWO-JmkN7xDo5l-wtfUXY1ata92ERgkjs1IBHRsXuEcRxzR0r4lZoZ3c2mjJ3o7QgrJ9tbH8ZfF68YTKrSnxTxoBiSw9SuAdkSB0EJ09ukG2rW10~YZvcJbm6ssWy7LNjTYa8fk9wVGxCJvrBlPefbkiw3ygZyJA35lH2miI2HLZR7BsdpII~mPKJ4F9w2NfrcBeS7fR583RsTLtjAM~clRfJlOfZ9a4wkAUmE0-7DxVogScM5jGL5SCVmprg__&Key-Pair-Id=APKAIDMRG3N27JWPLIEQ",
    "documentSource": "FDA approval packages",
    "documentYear": 2014
   }
  ]
 },
 "facets": null
}
```


The JSON response returned 1 record from Documents data ["countTotal": 1] for the specified year (2014).

7. Efficacy data search

The PharmaPendium Efficacy API Module allows users to retrieve manually extracted efficacy data from FDA and EMA approval documents. Users can search data by drugs, drug class, targets, target class, indication, and endpoint of interest.

API Root-endpoint	https://api.elsevier.com/pharma/efficacy/
API Portal / Home Page	https://dev.elsevier.com/documentation/PharmaEfficacyAPI.wadl Here you can find all the interfaces associated with PharmaPendium search and its auxiliary components.
Interactive Console URL	https://dev.elsevier.com/pharma.html#/Pharmapendium_Efficacy_Services

The following table lists the facets available in the PharmaPendium Efficacy API Module and their underlying organizing structure.

Facets available	Organizing structure (taxonomy, list, used categories, etc.)	Strategy to explore terms (see Section 3.5)
drugs	PharmPendium Drugs Taxonomy	1
species	PharmPendium Species Taxonomy	2
sources	PharmPendium Sources Taxonomy	2
indications	PharmPendium Indications Taxonomy	2 or 3
endpoints	PharmPendium Endpoints Taxonomy	2
pathogens	Atypical, fungi, gram-negative, gram-positive, gram-variable, multiple, protozoal, not specified	3
route	PharmaPendium Routes of Administration List	3
monoCombination	Combination, combination/monotherapy, monotherapy, monotherapy or combination, monotherapy/combination	3
sampleSize	Number of study subjects	3
phase	I, I/II, I/II/III, I/IIa, I/IIa/II, I/III, Ia, Ia/II, Ib, Ib/II, Ib/IIa, Ib/III, II, II/IIb, II/III, II/IIIa, IIa, IIb, IIb/III, III, III/IV, IIIa, IIIb, IIIb/IV, IV, Not Specified	3
dataProvider	Literature, reviewer, sponsor, sponsor/reviewer, unreported	3
studyDesigns	Blind, controlled, crossover, double-blind, multicenter, non-controlled, open-label, randomized, single center, single-blind, triple-blind	3
endpointType	PharmPendium Endpoints Taxonomy	2 or 3
doseFrequency	Normalized list of terms	3
baseline	Baseline, not baseline	3
comparativeGroup	List of terms* (e.g., placebo, no treatment, name of comparative drug)	3
population	List of terms. Some commonly used terms: BOCF – Baseline Observation Carried Forward; FAS – Full Analysis Set; FITT – FDA adapted Intention To Treat population; FPP – FDA adapted Per Protocol population; ITT – Intention To Treat; LOCF – Last Observation Carried Forward; MITT – Modified Intention To Treat; MMRM – Mixed-Effect Repeated Measure; MVTF – Missing Value Treated as Failure; OC – Observed Cases; PP – Per Protocol; WOCF – Worst Observation Carried Forward; Completers; Non-Completers; Responders; Non-Responders; Dropouts	3

Facets available	Organizing structure (taxonomy, list, used categories, etc.)	Strategy to explore terms (see Section 3.5)
sex	Female, male, both	3
age	Adult, adolescent, aged, old, child, children, infant, preschool child, newborn, postmenopausal, preterm newborn (hyphenated combinations as well)	3
documentYear	Calendar year	3

* Typically includes terminology used in the source document. We have provided some examples.

The data fields included in a response are listed in Section 13. Use the interactive API to get an overview of the type of data to expect in each field (Model tab) and the structure of the response (Model Schema tab).

Note that empty data fields are excluded from JSON output. To create a data frame that retains empty data fields, parse the JSON output with a method that replaces empty fields with a default value.

7.1. Finding sample sizes for phase studies by endpoints

Research question: What sample sizes were used in Phase III studies of Abortifacients with the endpoint % of patients where overall clinical status improved/Hypertension (the "C-HT cohort")?

Let's breakdown the query using PharmaPendium native query Boolean syntax:

```
[Abortifacients] AND [% of patients where overall clinical status improved/Hypertension (the "C-HT cohort")] AND [III]
```

Request strategy: Request data for "Abortifacients" (drugs) limited to Phase "III" studies (phases) and the endpoints "% of patients where overall clinical status improved/Hypertension ("C-HT cohort")".

You can focus your results to include certain data fields ("displayColumns"). For this example, we are limiting our data fields to the following:


```
 "drug": "Drug",
 "sampleSize": "#N",
```


Request URL:


```
https://api.elsevier.com/pharma/efficacy/search?displayColumns=drug&displayColumns=sampleSize&drugs=Abortifacients%20&endpoints=%25%20of%20patients%20where%20overall%20clinical%20status%20improved%2FHypertension%20(the%20%E2%80%9CC-HT%20cohort%E2%80%9D)&phases=III%20
```


JSON response via the main search method GET:


```
{
 "data": {
  "countTotal": 2,
  "countLimited": 2,
  "items": [
   {
    "drug": "Mifepristone",
    "sampleSize": 21
   },
   {
    "drug": "Mifepristone",
    "sampleSize": 21
   }
  ]
 },
 "facets": null
}
```


The JSON response returned 2 records from Efficacy data ["countTotal": 2] displaying only the fields specified.

7.2. Search for drugs and a clinical endpoint

Research question: Is Misoprostol linked to incomplete abortion as a trial endpoint when taken 2 times per day?

Request strategy: Request data for "Misoprostol" (drugs), limited to "incomplete abortion" as endpoints and "2 times/day" as doseFrequencies. Facet results by "doseFrequency".

You can focus your results to include certain data fields (display columns). For this example, we are limiting our data fields to the following:


```
 "monoCombination": "Mono/Combination",
 "standardIndications": "Indication Type",
 "dose": "Dose Regimen",
```

Request URL:

```
https://api.elsevier.com/pharma/efficacy/search?displayColumns=dose&displayColumns=standardIndications&displayColumns=monoCombination&drugs=Misoprostol&facets=doseFrequency&endpoints=incomplete%20abortions%20&doseFrequencies=2%20times%2Fday
```

JSON response via the main search method GET:


```
{
 "data": {
  "countTotal": 2,
  "countLimited": 2,
  "items": [
   {
    "standardIndications": "Abortion induced",
    "dose": "400 ug BID",
    "monoCombination": "Monotherapy"
   },
   {
    "standardIndications": "Abortion induced",
    "dose": "400 ug BID",
    "monoCombination": "Monotherapy"
   }
  ]
 },
 "facets": {
  "doseFrequency": {
   "children": [
    {
     "data": {
      "id": "1",
      "name": "2 times/day",
      "count": 2
     }
    }
   ]
  }
 }
}
```


The JSON response returned 2 records from efficacy data ["countTotal": 2], and a list of data fields and facets specified.

8. FAERS data search

The PharmaPendium FAERS API Module enables users to access FAERS (FDA Adverse Event Reporting System) reports from 1997 onward. Users can search reports where drugs are reported as primary suspect, secondary suspect, concomitant and interacting.

API Root-endpoint	https://api.elsevier.com/pharma/faers/
API Portal / Home Page	https://dev.elsevier.com/documentation/PharmaFaersAPI.wadl Here you can find all the interfaces associated with PharmaPendium search and its auxiliary components.
Interactive Console URL	https://dev.elsevier.com/pharma.html#/Pharmapendium_Faers_Services

The following table lists the facets available in the PharmaPendium FAERS API Module and their underlying organizing structure.

Facets available	Organizing structure (taxonomy, list, used categories, etc.)	Strategy to explore terms (see Section 3.5)
drugs	PharmaPendium Drugs Taxonomy	1
secondarySuspectDrugsAndClasses	PharmaPendium Drugs Taxonomy	1
concomitantDrugsAndClasses	PharmaPendium Drugs Taxonomy	1
interactingDrugsAndClasses	PharmaPendium Drugs Taxonomy	1
effects	PharmaPendium Effects Taxonomy	1
secondarySuspectDrugs	PharmaPendium Drugs Taxonomy	1
concomintantDrugs	PharmaPendium Drugs Taxonomy	1
interactingDrugs	PharmaPendium Drugs Taxonomy	1
sex	Female, male	3
isSerious	Serious outcome, non-serious outcome	3
reporterOccupation	Consumer, HealthProfessional, Lawyer, OtherHealthProfessional, Pharmacist, Physician, RegisteredNurse, Salesperson	3
route	PharmaPendium Routes of Administration List	3
outcomes	CongenitalAnomaly, death, disablity, hospitalization, lifethreatening, requiredintervention, other	3
manufacturerName	List of terms* (e.g., Pfizer, AstraZeneca, Sandoz)	3

* Typically includes terminology used in the source document. We have provided some examples.

The data fields included in a response are listed in Section 13. Use the interactive API to get an overview of the type of data to expect in each field (Model tab) and the structure of the response (Model Schema tab).

Note that empty data fields are excluded from JSON output. To create a data frame that retains empty data fields, parse the JSON output with a method that replaces empty fields with a default value.

8.1. Adverse events search

Research question: What adverse events have been reported in FAERS for the drug Misoprostol and how many reports exist for each?

Request strategy: Request all reports for "Misoprostol" (drugs) faceted by "effects" but return no data, just the number of records for each adverse effect (limitation.count=0).

This will limit the result set to zero, so it returns only the facet (list of adverse events) and not the large volume of underlying data.

Request URL:

```
https://api.elsevier.com/pharma/faers/search?limitation.count=0&drugs=Misoprostol%20&facets=effects
```

JSON response via the main search method GET:

```
{
 "data": {
  "countTotal": 1577,
  "countLimited": 0,
  "items": []
 },
 "facets": {
  "effects": {
   "children": [
    {
```

```
"data": {
 "id": "RDr-FwfaFAE",
 "name": "Blood and lymphatic system disorders",
 "isLeaf": false,
 "count": 92
},
"children": [
 {
  "data": {
   "id": "KNgYqq758c_",
   "name": "Anaemias nonhaemolytic and marrow depression",
   "parentID": "RDr-FwfaFAE",
   "isLeaf": false,
   "count": 36
  },
  "children": [
   {
    "data": {
     "id": "lbM1tEFf4b5",
     "name": "Anaemias due to chronic disorders",
     "parentID": "KNgYqq758c_",
     "isLeaf": false,
     "count": 1
    },
    "children": [
     {
      "data": {
       "id": "XUQ7PeVXl96",
       "name": "Nephrogenic anaemia",
       "parentID": "lbM1tEFf4b5",
       "isLeaf": true,
       "count": 1
      }
     }
    ]
   },
   {
    "data": {
     "id": "c2GLJA2R2w-",
     "name": "Anaemias NEC",
     "parentID": "KNgYqq758c_",
     "isLeaf": false,
     "count": 30
    },
    "children": [
     {
      "data": {
       "id": "rFXaSRNx5OE",
       "name": "Anaemia",
       "parentID": "c2GLJA2R2w-",
       "isLeaf": true,
       "count": 18
      }
     },
```


Note: Body response with large “content-length” will list only part of the JSON results list.

The JSON response returned 1577 records from FAERS data ["countTotal": 1577].

The search response returns a list of adverse events along with the number of FAERS reports containing that event (e.g., for “Nephrogenic anaemia” the count was 1 time). Given the structure of data in this module, the “isLeaf”(true or false) designates whether the term is a MedDRA preferred term or a higher-level term classification.

Each leaf record also includes the parentID to identify the parent class, so you can search by a class and identify the members.

8.2. Adverse events drug interaction search

Research question: In what role has the drug Misoprostol been reported in adverse events of death, drug interaction with Mifepristone, bronchitis, dyspnoea at rest, hypoxic-ischemic encephalopathy, maternal exposure during pregnancy, or respiratory failure?

Request strategy: Request FAERS data for “Misoprostol” (drugs), limited to “death”, “bronchitis”, “drug interaction”, “dyspnoea at rest”, “hypoxic-ischemic encephalopathy”, “maternal exposure during pregnancy”, or “respiratory failure” as effects, “Mifepristone” as interactingDrugs, and “death” or “hospitalization” as outcomes.

Request URL:

```
https://api.elsevier.com/pharma/faers/search?drugs=Misoprostol%20&effects=Bronchitis&effects=Death&effects=Drug%20interaction&effects=Dyspnoea%20at%20rest&effects=Hypoxic-ischaemic%20encephalopathy&effects=Maternal%20exposure%20during%20pregnancy&effects=Respiratory%20failure&interactingDrugs=Mifepristone&outcomes=Death&outcomes=Hospitalization
```

JSON response via the main search method GET:


```
{
 "data": {
  "countTotal": 2,
  "countLimited": 2,
  "items": [
   {
    "id": "12902375",
    "image": "151541942",
    "caseID": 15154194,
    "eventDate": 1526428800000,
    "reportType": "Expedited",
    "manufacturerDate": 1549411200000,
    "manufacturerNumber": "SE-PFIZER INC-2018279392",
    "manufacturerName": "PFIZER",
    "FDADate": 1549497600000,
    "authorityNumber": "SE-MPA-2018-003887",
    "age": 22,
    "ageUnit": "Year",
    "displayAge": "22 Year(s)",
    "ageYears": 22,
    "age20": "20+",
    "sex": "Female",
    "electronicallySubmitted": true,
    "sendDate": 1549497600000,
    "reporterOccupation": "Physician",
    "location": "SE",
    "isSerious": "Serious outcomes",
    "primarySuspectDrugs": [
     "Misoprostol"
    ],
    "interactingDrugs": [
     "Mifepristone",
     "Naproxen"
    ],
    "otherAdministeredDrugs": [
```

```
        "Mifepristone",
        "Naproxen"
       ],
       "effectsRelated": [
        "Acute kidney injury",
        "Drug interaction",
        "Renal tubular necrosis"
       ],
       "outcomes": [
        "Hospitalization"
       ],
       "dose": "3 DF, UNK",
       "reportedIndications": [
        "ABORTION INDUCED"
       ]
      },
      {
       "id": "12152263",
       "image": "151541941",
       "caseID": 15154194,
       "eventDate": 1526688000000,
       "reportType": "Expedited",
       "manufacturerDate": 1531180800000,
       "manufacturerNumber": "SE-PFIZER INC-2018279392",
       "manufacturerName": "PFIZER",
       "FDADate": 1531785600000,
       "authorityNumber": "SE-MPA-2018-003887",
       "age": 22,
       "ageUnit": "Year",
       "displayAge": "22 Year(s)",
       "ageYears": 22,
       "age20": "20+",
       "sex": "Female",
       "electronicallySubmitted": true,
       "sendDate": 1531785600000,
       "reporterOccupation": "Physician",
       "location": "SE",
       "isSerious": "Serious outcomes",
       "primarySuspectDrugs": [
        "Misoprostol"
       ],
       "interactingDrugs": [
        "Mifepristone",
        "Naproxen"
       ],
       "otherAdministeredDrugs": [
        "Mifepristone",
        "Naproxen"
       ],
       "effectsRelated": [
        "Acute kidney injury",
        "Drug interaction"
       ],
       "outcomes": [
        "Hospitalization"
       ],
       "dose": "3 DF, UNK",
       "reportedIndications": [
        "ABORTION INDUCED"
       ]
      }
     ]
    },
    "facets": null
}
```

The JSON response returned 2 records from FAERS data ["countTotal": 2].

9. Metabolizing Enzymes data search

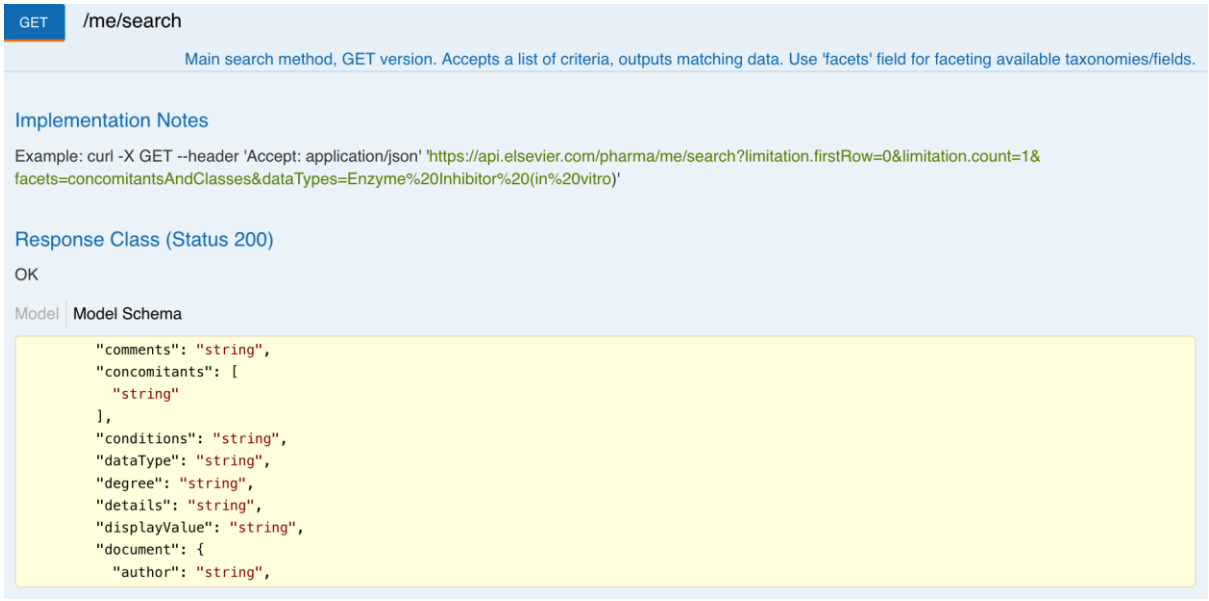
The PharmaPendium Metabolizing Enzymes (ME) API Module allows users to retrieve preclinical and clinical data on metabolizing enzymes and transporters from the FDA and EMA approval packages and FDA Advisory Committee Documents. It also allows users to access transporter data from the literature. If a subscription includes the PharmaPendium DMPK Solution, users can also access literature data on metabolizing enzymes.

API Root-endpoint	https://api.elsevier.com/pharma/me/
API Portal / Home Page	https://dev.elsevier.com/documentation/PharmaMeAPI.wadl Here you can find all the interfaces associated with PharmaPendium search and its auxiliary components.
Interactive Console URL	https://dev.elsevier.com/pharma.html#/Pharmapendium_Me_Services

The following table lists the facets available in the PharmaPendium Metabolizing Enzymes (ME) API Module and their underlying organizing structure.

Facets available	Organizing structure (taxonomy, list, used categories, etc.)	Strategy to explore terms (see Section 3.5)
drugs	PharmaPendium Drugs Taxonomy	1
species	PharmaPendium Species Taxonomy	2
sources	PharmaPendium Sources Taxonomy	2
enzymeTransporters	PharmaPendium MEEnzymeTransporters Taxonomy	2
concomitantsAndClasses	PharmaPendium Drugs Taxonomy	2
dataType	PharmaPendium MEDataTypes Taxonomy	2
concomitants	PharmaPendium Concomitants Taxonomy	2 or 3
route	PharmPendium Routes of Administration List	3
parent	Parent, metabolite, active metabolite, active vitamer, diastereomer, enantiomer, metabolite and parent, parent and active metabolite, prodrug, vitamer	3
testSystem	PharmaPendium Test Systems List	3
documentYear	Calendar year	3

The data fields included in a response are listed in Section 13. Use the interactive API to get an overview of the type of data to expect in each field (Model tab) and the structure of the response (Model Schema tab).



Note that empty data fields are excluded from JSON output. To create a data frame that retains empty data fields, parse the JSON output with a method that replaces empty fields with a default value.

9.1. Drug-drug interactions

Research question: Which enzyme-inducing drugs have been tested in microsomes for drug-drug interactions with Mephenytoin?

Request strategy: One approach is to request data with “microsomes” as testSystems, “Mephenytoin” as concomitants and “enzyme inducer (in vitro)” as dataTypes. Facet results by “drugs”. This is the strategy outlined below. In another approach, the results from this first request are combined with results from a request with “Mephenytoin” as drugs, faceted by “concomitants”. The combined data set has a broader scope.

Request URL:

```
https://api.elsevier.com/pharma/me/search?facets=drugs%20&testSystems=Microsomes&concomitants=Mephenytoin&dataTypes=Enzyme%20Inducer%20(in%20vitro)
```

JSON response via the main search method GET:


```
{
 "data": {
  "countTotal": 9,
  "countLimited": 9,
  "items": [
   {
    "id": "82675",
    "drug": "Methylnaltrexone Bromide",
    "document": {
     "id": "105459",
     "name": "Clinical Pharmacology and Biopharmaceutics Review 021964/S-000",
     "sourceShort": "FDA",
     "source": "FDA approval packages",
     "type": "Clinical Pharmacology and Biopharmaceutics Review",
     "year": 2008,
     "length": 6324600,
     "page": 31,
     "isHistoric": false,
     "file": "cf2b6a4f32e610596e3d1b8aa97deb70"
    },
    "smiles": "[Br-].C[N+]1(CC[C@]23[C@H]4OC5=C(O)C=CC(C[C@@H]1[C@]2(O)CCC4=O)=C35)CC1CC1",
    "studyNumber": "1.0",
    "studyNumberInternal": "1.0",
    "parent": "Parent",
    "substance": "Methylnaltrexone",
    "dataType": "Enzyme Inducer (in vitro)",
    "enzymeTransporter": "CYP2C19",
    "testSystem": "Microsomes",
    "specie": "Human",
    "dose": "33.3 uM",
    "route": "In Vitro",
    "substanceMeasured": "4'-hydroxymephenytoin",
    "concomitants": [
     "Mephenytoin"
    ],
    "parameter": "Activity (% of control)",
    "displayValue": "108 % of control",
    "valueOriginal": "108",
    "effectDegree": "No",
    "unitOriginal": "% of control",
    "effect": "No",
    "degree": "Blank (Unreported)",
    "documentYear": 2008,
    "source": "FDA approval packages",
    "drugsAndConcomitantDrugs": [
     "Stimulants, gastrointestinal",
     "Anticonvulsants",
     "Antidotes",
     "Methylnaltrexone Bromide",
     "Antagonists, narcotic",
     "Mephenytoin",
     "Hydantoins"
    ]
   },
```


Note: Body response with large “content-length” will list only part of the JSON results list.

The JSON response returned 9 records from ME data ["countTotal": 9].

9.2. DDI studies specific drug

Research question: What drug-drug interaction studies from 2019 show a decreased AUC for Everolimus in *in vivo* CYP3A4 studies?

Request strategy: Request data for “Everolimus” (drugs) limited to those with “2019” as years, “CYP3A4” as enzymeTransporters, “enzyme substrate (in vivo)” as dataTypes, and “AUC decrease” as parameters. Facet results by “drugs”.

Request URL:

```
https://api.elsevier.com/pharma/me/search?drugs=Everolimus&facets=drugs%20&enzymeTransporters=CYP3A4&dataTypes=Enzyme%20Substrate%20(in%20vivo)&parameters=AUC%20decrease%20&years=2019
```

JSON response via the main search method GET:


```
{
 "data": {
  "countTotal": 1,
  "countLimited": 1,
  "items": [
   {
    "id": "56810",
    "drug": "Everolimus",
    "document": {
     "id": "8174",
     "name": "ANNEX I",
     "sourceShort": "EMEA",
     "source": "EMA approval documents",
     "type": "ANNEX I",
     "year": 2019,
     "length": 883363,
     "page": 9,
     "isHistoric": false,
     "file": "d18afc3a361ac5b4a0276928b80ff152"
    },
    "smiles": "CO[C@@H]1C[C@@H](CC[C@H]1OCCO)C[C@@H](C)[C@@H]1CC(=O)[C@H](C)\\C=C(C)\\[C@@H](O)[C@@H](OC)C(=O)[C@H](C)C[C@H](C)\\C=C\\C=C\\C=C(C)\\[C@H](C[C@@H]2CC[C@@H](C)[C@@](O)(O2)C(=O)C(=O)N2CCCC[C@H]2C(=O)O1)OC",
    "studyNumberInternal": "7.0",
    "parent": "Parent",
    "substance": "Everolimus",
    "dataType": "Enzyme Substrate (in vivo)",
    "enzymeTransporter": "CYP3A4",
    "testSystem": "Not applicable",
    "specie": "Human",
    "dose": "Unreported",
    "route": "Oral",
    "substanceMeasured": "Parent",
    "concomitants": [
     "Rifampin"
    ],
    "parameter": "AUC decrease",
    "displayValue": "63%",
    "valueOriginal": "63",
    "effectDegree": "Yes",
    "unitOriginal": "%",
    "effect": "Yes",
    "degree": "Blank (Unreported)",
    "documentYear": 2019,
    "source": "EMA approval documents",
    "drugsAndConcomitantDrugs": [
     "Antineoplastics",
```

```
        "Antimycobacterials",
        "Antineoplastics, other",
        "Everolimus",
        "Immunosuppressives",
        "Rifampin"
       ]
      }
     ]
    },
    "facets": {
     "drugs": {
      "children": [
       {
        "data": {
         "id": "kfuUqxEGiRF",
         "name": "Antineoplastics",
         "isLeaf": false,
         "count": 1
        },
        "children": [
         {
          "data": {
           "id": "-rIVXZNYweC",
           "name": "Antineoplastics, other",
           "parentID": "kfuUqxEGiRF",
           "isLeaf": false,
           "count": 1
          },
          "children": [
           {
            "data": {
             "id": "6z6IlaJtpa5",
             "name": "Everolimus",
             "parentID": "-rIVXZNYweC",
             "isLeaf": true,
             "count": 1
            }
           }
          ]
         }
        ]
       },
       {
        "data": {
         "id": "CkZR4rXDctG",
         "name": "Immunosuppressives",
         "isLeaf": false,
         "count": 1
        },
        "children": [
         {
          "data": {
           "id": "-biiTx5wsgG",
           "name": "Everolimus",
           "parentID": "CkZR4rXDctG",
           "isLeaf": true,
           "count": 1
          }
         }
        ]
       }
      ]
     }
    }
}
```

The JSON response returned one record from metabolic enzymes data ["countTotal": 1], and a list of all available data fields.

10. Pharmacokinetic data search

The PharmaPendium Pharmacokinetics (PK) API Module allows users to retrieve preclinical and clinical pharmacokinetic data from FDA and EMA approval packages. If a subscription includes the PharmaPendium DMPK Solution, users can also access data from the literature. The data can be used to compare internally generated exposure data to data on similar FDA/EMA-approved drugs based on drug class, target class, indication, etc., and learn about potential pharmacokinetic responses to foods, concomitant drugs and other factors.

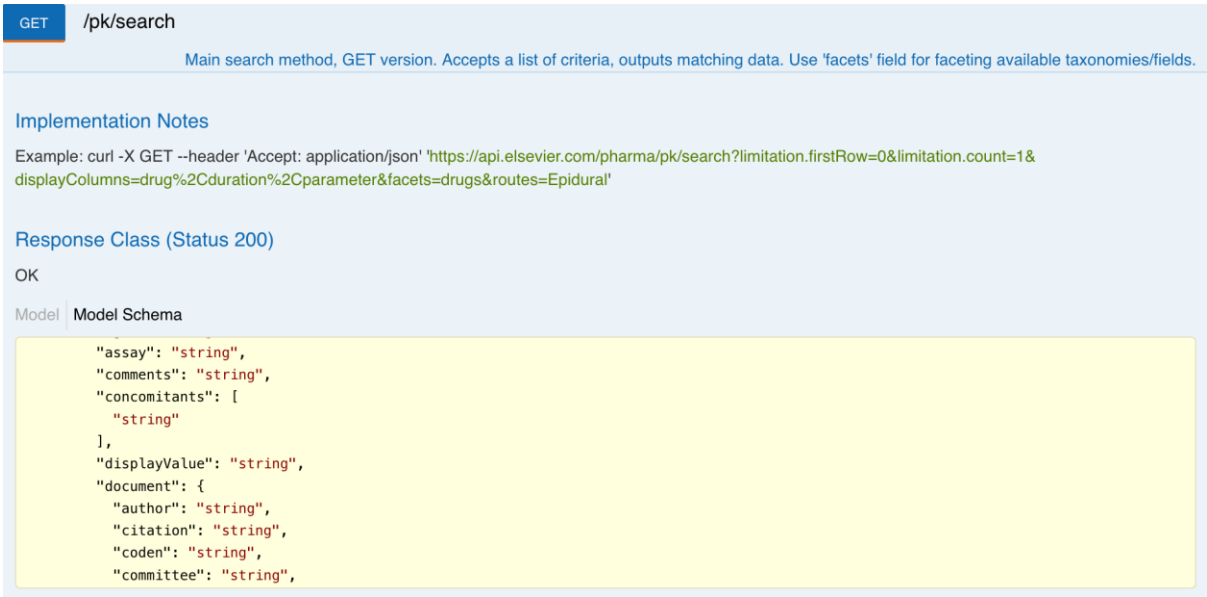
API Root-endpoint	https://api.elsevier.com/pharma/pk/
API Portal / Home Page	https://dev.elsevier.com/documentation/PharmaPkAPI.wadl Here you can find all the interfaces associated with PharmaPendium search and its auxiliary components.
Interactive Console URL	https://dev.elsevier.com/pharma.html#/Pharmapendium_Pk_Services

The following table lists the facets available in the PharmaPendium Pharmacokinetics API Module and their underlying organizing structure.

Facets available	Organizing structure (taxonomy, list, used categories, etc.)	Strategy to explore terms (see Section 3.5)
drugs	PharmaPendium Drugs Taxonomy	1
species	PharmaPendium Species Taxonomy	2
sources	PharmaPendium Sources Taxonomy	2
parameters	PharmaPendium PKParameters Taxonomy	3
concomitantsAndClasses	PharmaPendium Concomitants Taxonomy	3
route	PharmaPendium Routes of Administration List	3
concomitants	PharmaPendium Concomitants Taxonomy	3
studyGroup	List of terms* (e.g., healthy, disease model, slow metabolizer, pregnant)	3
radioLabel	Radiolabelled, not radiolabelled	3
metabolitesEnantiomers	Active metabolite, enantiomer, inactive metabolite, metabolites, not metabolites/enantiomers	3
tissueSpecific	Tissue-specfiic, not tissue-specific	3
documentYear	Calendar year	3

* Typically includes terminology used in the source document. We have provided some examples.

The data fields included in a response are listed in Section 13. Use the interactive API to get an overview of the type of data to expect in each field (Model tab) and the structure of the response (Model Schema tab).



Note that empty data fields are excluded from JSON output. To create a data frame that retains empty data fields, parse the JSON output with a method that replaces empty fields with a default value.

Research question: What label information is available about pharmacokinetic responses of the drug Misoprostol to Antacides as concomitant drugs?

Request strategy: Request data for “Misoprostol” (drugs) limited to “label” as sources and “Antacides” as concomitants. Facet results by “drugs”, “concomitants”, “tissueSpecific”, and “sources”.

Request URL:

```
https://api.elsevier.com/pharma/pk/search?drugs=Misoprostol%20&facets=drugs&facets=concomitants&facets=tissueSpecific&facets=sources&sources=label&concomitants=Antacides%20
```

JSON response via the main search method GET:


```
{
 "data": {
  "countTotal": 3,
  "countLimited": 3,
  "items": [
   {
    "id": "318829",
    "drug": "Misoprostol",
    "document": {
     "id": "81801",
     "name": "Label 019268/S-041",
     "sourceShort": "FDA",
     "source": "FDA approval packages",
     "type": "Label",
     "year": 2009,
```

```
      "length": 298962,
      "page": 3,
      "isHistoric": false,
      "file": "4f010a9796eef657ecacc23ac5a21507"
    },
    "structure": "MFCD00941433",
    "smiles": "CCCCC(C)(O)C\\C=C\\[C@H]1C(O)CC(=O)[C@@H]1CCCCCCC(=O)OC",
    "specie": "Human",
    "studyNumberInternal": "1",
    "dose": "200-400 ug",
    "duration": "Single",
    "route": "Oral",
    "parameter": "Cmax",
    "parameterDisplay": "Cmax",
    "displayValue": "689.0 pg/mL",
    "valueOriginal": "689",
    "valueNormalized": "0.0006889999999999999 (0.000374 to 0.001004)",
    "unitOriginal": "pg/mL",
    "unitNormalized": "ug/mL",
    "standardDeviation": 315,
    "concomitants": [
     "Antacides"
    ],
    "comments": "Cytotec",
    "metabolitesEnantiomers": "Not metabolites/enantiomers",
    "tissueSpecific": "Not tissue-specific",
    "source": "FDA approval packages",
    "documentYear": 2009
  },
```


Note: Body response with large “content-length” will list only part of the JSON results list.

The JSON response returned 3 records from PK data ["countTotal": 3].

11. Safety data search

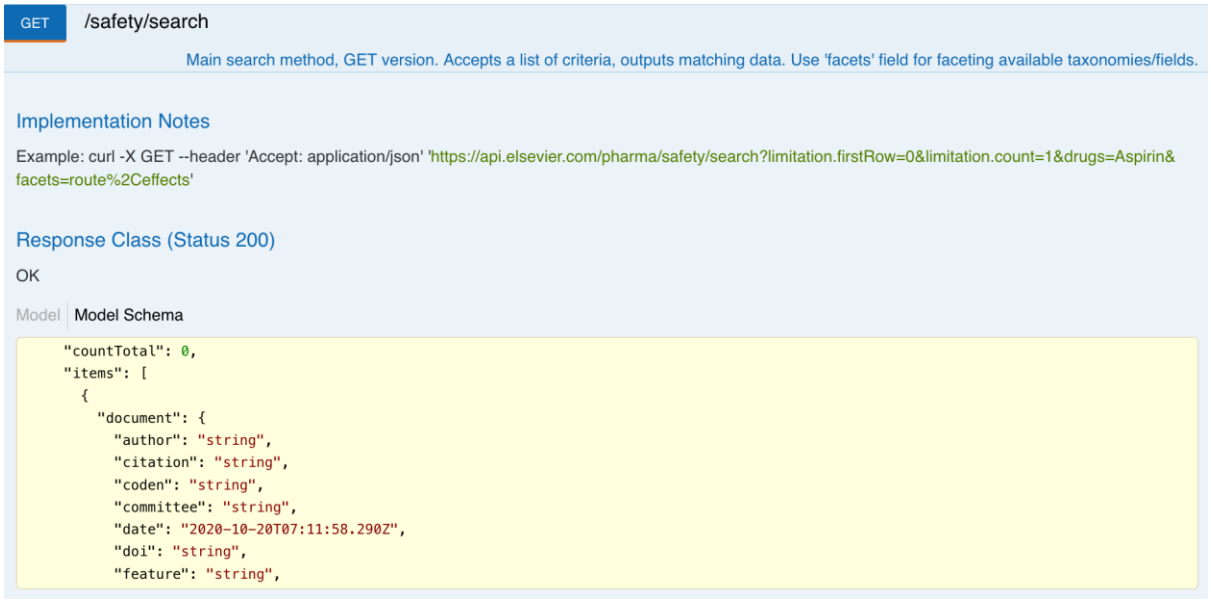
The PharmaPendium Safety API Module allows developers to retrieve adverse event preclinical and clinical data that is normalized to MedDRA . This data is manually extracted from FDA and EMA approval documents, Mosby's Drug Consult (2006), Meyler's Side Effects of Drugs (15th edition) and literature, and is linked to the dose, dose type, route of administration, drug, source document, and year.

API Root-endpoint	https://api.elsevier.com/pharma/safety/
API Portal / Home Page	https://dev.elsevier.com/documentation/PharmaSafetyAPI.wadl Here you can find all the interfaces associated with PharmaPendium search and its auxiliary components.
Interactive Console URL	https://dev.elsevier.com/pharma.html#/Pharmapendium_Safety_Services

The following table lists the facets available in the PharmaPendium Safety API Module and their underlying organizing structure.

Facets available	Organizing structure (taxonomy, list, used categories, etc.)	Strategy to explore terms (see Section 3.5)
drugs	PharmaPendium Drugs Taxonomy	1
species	PharmaPendium Species Taxonomy	2
sources	PharmaPendium Sources Taxonomy	2
effects	PharmaPendium Effects (MedDRA) Taxonomy	1 or 2
route	PharmaPendium Routes of Administration List	3
doseType	ID, ID50, overdose, repeated, single, single/intermittent, single/repeated, single/twice, twice, twice/repeated	3
documentYear	Calendar year	3

The data fields included in a response are listed in Section 13. Use the interactive API to get an overview of the type of data to expect in each field (Model tab) and the structure of the response (Model Schema tab).



Note that empty data fields are excluded from JSON output. To create a data frame that retains empty data fields, parse the JSON output with a method that replaces empty fields with a default value.

Research question: What do we know about endocrine disorder adverse events linked to the drug Misoprostol?

Request strategy: Request data for “Misoprostol” (drugs) with “endocrine disorders” as effects.

You can focus your results to include certain data fields (“displayColumns”). For this example, we are limiting our data fields to the following:

```
"document": "Source",
"documentYear": "Year",
"drug": "Drug",
"dose": "Dose",
"route": "Route"
"effect": "Adverse Effect / Toxicity",
"specie": "Species",
```

Request URL:

```
https://api.elsevier.com/pharma/safety/search?displayColumns=document&displayColumns=documentYear&displayColumns=drug&displayColumns=source&displayColumns=route&displayColumns=effect&displayColumns=species&drugs=Misoprostol%20&effects=Endocrine%20disorders%20
```

JSON response via the main search method GET:


```
{
  "data": {
    "countTotal": 1,
    "countLimited": 1,
    "items": [
      {
        "drug": "Misoprostol",
        "document": {
          "id": "81824",
          "name": "Approval Package 019268/S-012, S-001, S-001, S-002, S-004, S-006, S-008, S-010, S-013, S-014, S-007 Part 14",
          "sourceShort": "FDA",
          "source": "FDA approval packages",
          "type": "Approval Package",
          "year": 1988,
          "length": 731467,
          "page": 2,
          "isHistoric": true,
          "file": "3c9625bfcbc0d3d8006f1c496939ebdb"
        },
        "route": "Oral",
        "effect": "Thyroid disorder",
        "specie": "Dog",
        "source": "Approval Package",
        "documentYear": 1988
      }
    ]
  },
  "facets": null
}
```


The JSON response returned 1 record from Safety data ["countTotal": 1], and a list of data fields we specified.

12. Drugs indications search

The PharmaPendium Drugs Indications Module is a quick way to extract a list of indications associated with a drug and a list of drugs found for a given indication. Indications are controlled based on the PharmaPendium Indications Taxonomy and extracted from FDA lables, EMA annexes, FDA and EMA approval documents, FDA Classic collection, FDA Drug Efficacy Study Implementation (DESI) documents, and Mosby's Drug Consult (2006).

API Root-endpoint	https://api.elsevier.com/pharma/drugsindications/
API Portal / Home Page	https://dev.elsevier.com/documentation/PharmaDrugsIndicationsAPI.wadl Here you can find all the interfaces associated with PharmaPendium search and its auxiliary components.
Interactive Console URL	https://dev.elsevier.com/pharma.html#/Pharmapendium_Drugsindications_Services

The following table lists the facet available in the PharmaPendium Drugs Indications Module and its underlying organizing structure.

Facets available	Organizing structure (taxonomy, list, used categories, etc.)	Strategy to explore terms (see Section 3.5)
indications	PharmaPendium Indications Taxonomy	1
sourcesShort	PharmaPendium Sources Taxonomy	2
drugs	PharmaPendium Drugs Taxonomy	1

The data fields included in a response are listed in Section 13. Use the interactive API to get an overview of the type of data to expect in each field (Model tab) and the structure of the response (Model Schema tab).

Note that empty data fields are excluded from JSON output. To create a data frame that retains empty data fields, parse the JSON output with a method that replaces empty fields with a default value.

Research question: For which indications is Alprazolam approved as a drug?

Request strategy: Request data for “Alprazolam” as drugs.

Request URL:

```
https://api.elsevier.com/pharma/drugsindications/search?drugs=Alprazolam
```

JSON response via the main search method GET:


```
{
 "data": {
  "countTotal": 7,
  "countLimited": 7,
  "items": [
   {
    "id": "12859",
    "drug": "Alprazolam",
    "indication": "Anxiety disorder generalized",
    "source": "Mosby",
    "sourceShort": "MOSBY'S",
    "indicationAdjunct": "Alprazolam",
    "drugIDs": [
     "0edciOWbaE-",
     "HjBbXih-gEH",
     "Nm2VXetyrg6"
    ],
    "indicationIDs": [
     "EQFwAKK4s9G"
    ]
   },
   {
    "id": "12860",
    "drug": "Alprazolam",
    "indication": "Anxiety disorder generalized",
    "source": "FDA Label",
    "sourceShort": "FDA Label",
    "indicationAdjunct": "Alprazolam",
    "drugIDs": [
     "0edciOWbaE-",
     "HjBbXih-gEH",
     "Nm2VXetyrg6"
    ],
    "indicationIDs": [
     "EQFwAKK4s9G"
    ]
   },
```

```
   {
    "id": "20860",
    "drug": "Alprazolam",
    "indication": "Panic disorder",
    "source": "Mosby",
    "sourceShort": "MOSBY'S",
    "indicationAdjunct": "Alprazolam",
    "drugIDs": [
     "0edciOWbaE-",
     "HjBbXih-gEH",
     "Nm2VXetyrg6"
```

```
  ],
  "indicationIDs": [
   "NPr_bc8wa7B"
  ]
 },
 {
  "id": "20862",
  "drug": "Alprazolam",
  "indication": "Panic disorder",
  "source": "FDA Label",
  "sourceShort": "FDA Label",
  "indicationAdjunct": "Alprazolam",
  "drugIDs": [
   "0edciOWbaE-",
   "HjBbXih-gEH",
   "Nm2VXetyrg6"
  ],
  "indicationIDs": [
   "NPr_bc8wa7B"
  ]
 },
 {
  "id": "20861",
  "drug": "Alprazolam",
  "indication": "Panic disorder",
  "source": "FDA Efficacy Data",
  "sourceShort": "Efficacy (FDA)",
  "indicationAdjunct": "Alprazolam",
  "drugIDs": [
   "0edciOWbaE-",
   "HjBbXih-gEH",
   "Nm2VXetyrg6"
  ],
  "indicationIDs": [
   "NPr_bc8wa7B"
  ]
 },
 {
  "id": "27958",
  "drug": "Alprazolam",
  "indication": "Anxiety",
  "source": "FDA Label",
  "sourceShort": "FDA Label",
  "indicationAdjunct": "Alprazolam",
  "drugIDs": [
   "0edciOWbaE-",
   "HjBbXih-gEH",
   "Nm2VXetyrg6"
  ],
  "indicationIDs": [
   "hjAzoWYN-tD"
  ]
 },
```

```
 {
  "id": "27957",
  "drug": "Alprazolam",
  "indication": "Anxiety",
  "source": "FDA Efficacy Data",
  "sourceShort": "Efficacy (FDA)",
  "indicationAdjunct": "Alprazolam",
  "drugIDs": [
   "0edciOWbaE-",
   "HjBbXih-gEH",
   "Nm2VXetyrg6"
```

```
      ],
      "indicationIDs": [
        "hjAzoWYN-tD"
      ]
    }
  ]
},
"facets": null
```


The JSON response returned 7 records from drugs-indications data ["countTotal": 7].

13. Mechanism of Action (MoA) API

The Pharmapendium MoA API is a powerful tool designed to help users access detailed information about drugs and their mechanisms of action. Here's a breakdown of what the API offers:

Target profile data

You can retrieve comprehensive data about specific targets associated with a drug. This includes information on how the drug interacts with its target.

Active substances

The API allows you to find drugs that contain active substances which act on a particular target. This helps in understanding the relationship between drugs and their therapeutic targets.

Mechanism of Action

You can explore the mechanisms through which drugs exert their effects, providing insights into how they work at a biological level.

Additional information

The API provides extra details such as:

- Source: Information about where the data originates.
- Target Classification: Whether a target is classified as primary (the main target) or secondary (an additional target).

This API is particularly useful for researchers, healthcare professionals, and developers looking to enhance their understanding of drug interactions and pharmacology.

13.1. Endpoints

The MoA API has the following endpoints:

API Root-endpoint	https://api.elsevier.com/pharma/moa/
API Portal / Home Page	https://dev.elsevier.com/documentation/PharmaSafetyAPI.wadl Here you can find all the interfaces associated with PharmaPendium search and its auxiliary components.
Interactive Console URL	https://dev.elsevier.com/pharma.html#/

GET moa/search:

Search with GET method for MoA data using parameters like drug Name, target name, oA etc.

POST moa/search:

Search with POST method for MoA data using parameters like drugs, targetname, MoA,Primary or secondary target of a drug, etc.

GET moa/lookupFuzzy:

Search with GET method to request to lookup elements of a taxonomy specific for an API service. This method allows wildcards.

POST moa/lookupFuzzy:

Search with POST method to request to lookup elements of a taxonomy specific for an API service. This method allows wildcards.

GET moa/suggest:

Use suggest requesting elements of a taxonomy matching prefix. For eg, under Drugs taxonomy if we search with matching prefix “ra”, you get drugs like radox, ranin, racep etc.

GET moa/listTaxonomies:

List all the available taxonomies available for MoA API.

GET moa/listFacetFields:

List of facet fields (drug, target, activeSubstance, primarySecondary, MoA, targetType, sources).

GET moa/listDataFields:

List of target profile fields (drug, target, structureUrl, sources, drugsIds, targetIds, activeSubstance, primarySecondary, MoA, targetType, descriptions).

13.2. Filter parameters

You can use any of the following filters to narrow down your search. They can be used either on their own or together.

Parameters	Organizing structure (for example, taxonomy, list, used categories)
Drug name	PharmaPendium Drugs
Target name	PharmaPendium TargetsTaxonomy
MoA	Pharmapendium Mechanism of Action Taxonomy like “Agonist”, “Antagonist”, “Inverse agonist”,“Inhibitor”
PrimarySecondary	Primary target use “Primary”, Secondary targets use “secondary”
Sources	“FDA” or “EMA” from PharmaPendium Sources Taxonomy

Faceting your response

Faceting a response allows you to partition data from a response into categories, effectively narrowing down results along a relevant classification system. By faceting, you can view data from different perspectives, or facets, and reduce the payload prior to data download instead of via post-processing.

Facets available	Organizing structure (taxonomy, list, used categories, etc.)
drugs	Drugs Names from PharmaPendium Drugs Taxonomy
sources	“FDA” or “EMA” PharmaPendium Sources Taxonomy
targets	Target names from PharmaPendium TargetsTaxonomy
MoA	Pharmapendium Mechanism of Action Taxonomy
PrimarySecondary	Primary target use “Primary”, Secondary targets use “secondary”

13.3. Example use cases and request strategies

This section provides example use cases to show how different APIs can be combined to answer common research questions. Each example outlines the question and the steps to retrieve the relevant data.

Use Case 1: Identify potential adverse effects of 5-HT-1B receptor agonists

What potential adverse effects are associated with Agonist of 5-HT-1B Receptor?

Request strategy

1. Use the MoA API to search for drugs linked to the target "5-HT-1B Receptor" with the mechanism of action "Agonist". This will return a list of relevant drug names.

   Request URL:

   ```
   pharmapendium//v1/moa/search?targets=5-HT-1B%20Receptor&moa=agonist&displayColumns=drug
   ```

   JSON response:


```
{{
  "data": {
    "countTotal": 11,
    "countLimited": 11,
    "items": [
     {
      "drug": "Almotriptan Malate"
          },
     {
      "drug": "Eletriptan Hydrobromide"
           },
     {
      "drug": "Eletriptan Hydrobromide"
          },
     {
      "drug": "Frovatriptan Succinate"
          },
     {
      "drug": "Meloxicam; Rizatriptan Benzoate"
          },
     {
      "drug": "Naproxen Sodium; Sumatriptan Succinate"

     },
     {
      "drug": "Naratriptan Hydrochloride"
           },
     {
      "drug": "Rizatriptan Benzoate"
          },
     {
      "drug": "Sumatriptan Succinate"
           },
     {
      "drug": "Vortioxetine Hydrobromide"
          },
     {
      "drug": "Zolmitriptan"
          }
    ]
```

```
    },
    "facets": null
```


2. Use the drug names to query the Safety API and retrieve the adverse effects associated with each drug.

   Request URL:


```
pharmapendium// v1/safety/search?drugs=Almotriptan%20Malate%2CEletriptan%20Hydrobromide%2CFrovatriptan%20Succinate%2CMeloxicam%3B%20Rizatriptan%20Benzoate%2CNaproxen%20Sodium%2CNaratriptan%20Hydrochloride%2CRizatriptan%20Benzoate%2CSumatriptan%20Succinate%2CVortioxetine%20Hydrobromide%2CZolmitriptan&limitation.count=3
```


   JSON response:


```
"data": {
  "countTotal": 16868,
  "countLimited": 3,
  "items": [
   {
    "id": "268977",
    "hash": "2fd0d0cbbd0fac75d5bbcae56450a8c735c44c8f",
    "drug": "Sumatriptan Succinate",
    "document": {
     "id": "2042807",
     "name": "Label 022239/S-000",
     "sourceShort": "FDA",
     "source": "FDA approval packages",
     "type": "Label",
     "year": 2009,
     "length": 478882,
     "page": 7,
     "isHistoric": false,
     "file": "ee44de6c4dc92d61bb57f7141d296979"
    },
    "dose": "Therapeutic",
    "doseType": "Repeated",
    "route": "Oral",
    "effect": "Intracranial pressure increased",
    "specie": "Human",
    "source": "Label",
    "smiles": "OC(=O)CCC(O)=O.CNS(=O)(=O)CC1=CC2=C(NC=C2CCN(C)C)C=C1",
    "duration": "Not specified",
    "systemOrganClass": "Nervous system disorders",
    "documentYear": 2009,
    "documentType": "Label"
   },
   {
    "id": "265579",
    "hash": "4d2ffb03b243fb8a516c65d8b25b81fd21df0a38",
    "drug": "Naratriptan Hydrochloride",
    "document": {
     "id": "19769119",
     "name": "Naratriptan Hydrochloride",
     "sourceShort": "MOSBY",
     "source": "Mosby's Drug Consult™",
     "year": 2006,
     "section": "s003386-ar"
    },
    "dose": "Therapeutic",
    "doseType": "Repeated",
    "route": "Oral",
    "effect": "Cranial nerve paralysis",
    "specie": "Human",
    "source": "Mosby's Drug Consult™",
```

```
      "smiles": "Cl.CNS(=O)(=O)CCC1=CC2=C(NC=C2C2CCN(C)CC2)C=C1",
      "systemOrganClass": "Nervous system disorders",
      "documentYear": 2006
     },
     {
      "id": "269770",
      "hash": "0c04a75133770b38e02cf3279b43433ebcbc89d8",
      "drug": "Zolmitriptan",
      "document": {
       "id": "19769884",
       "name": "Zolmitriptan",
       "sourceShort": "MOSBY",
       "source": "Mosby's Drug Consult™",
       "year": 2006,
       "section": "s003375-ar"
      },
      "dose": "Therapeutic",
      "doseType": "Repeated",
      "route": "Unreported",
      "effect": "Diplopia",
      "specie": "Human",
      "source": "Mosby's Drug Consult™",
      "smiles": "CN(C)CCC1=CNC2=C1C=C(C[C@H]1COC(=O)N1)C=C2",
      "systemOrganClass": "Eye disorders",
      "documentYear": 2006
     }
    ]
   },
   "facets": null
}
```

Use Case 2: Find animal studies on ER Estrogen receptor agonists in rats

What animal studies (animal efficacy or animal models) have been performed on rats for agonists of ER Estrogen receptors?

Request strategy

1. Use the MoA API to search for drugs linked to the target “ER Estrogen receptors “ and mechanism of action "Agonist". This will return a list of relevant drug names.

   Request URL:

```
pharmapendium//v1/moa/search?targets=ER%20Estrogen%20Receptors&moa=agonist&limitation.count=30
```

   JSON response:


```
{
 "data": {
  "countTotal": 86,
  "countLimited": 5,
  "items": [
   {
    "drug": "Estradiol Acetate",
        },
   {
    "drug": "Estradiol; Levonorgestrel",
        },
   {
    "drug": "Estrogens, Conjugated; Medroxyprogesterone Acetate",

   },
   {
    "drug": "Estradiol; Norethindrone Acetate",
       },
   {
    "drug": "Estrogens, Conjugated",
       }
  ]
 },
 "facets": null
}
```


2. Use the resulting drug list to query the Efficacy API, specifying "rat" as the species. This will return study designs, tested endpoints and other related data.

   Request URL:

```
pharmapendium//v1/efficacy/search?species=rat&drugsAndSynonyms=Estradiol%20Acetate%2CEstradiol%3B%20Levonorgestrel%2CEstrogens%2C%20Conjugated%3B%20Medroxyprogesterone%20Acetate%2CEstradiol%3B%20Norethindrone%20Acetate%2CEstrogens%2C%20Conjugated
```

JSON response via the main search method GET:


```
{
 "data": {
  "countTotal": 298,
  "countLimited": 5,
  "items": [
   {
    "id": "161613",
    "hash": "f536b46952121e142c0b75cbaed7a67151de618a",
    "drug": "Ethinyl Estradiol; Etonogestrel",
    "indications": [
     "Contraception",
     "Contraceptive methods female",
     "Obstetric and gynaecological therapeutic procedures",
     "Surgical and medical procedures"
    ],
    "document": {
     "id": "48611",
     "name": "Pharmacology Review 021187/S-000",
     "sourceShort": "FDA",
     "source": "FDA approval packages",
     "type": "Pharmacology Review",
     "date": "2000-09-18T00:00:00.000+00:00",
     "year": 2000,
     "length": 1453767,
     "page": 4,
     "isHistoric": false,
     "file": "7efb0e786c0592432b5cd94eaaee897b"
    },
    "source": "FDA approval packages",
    "standardIndications": "Contraception",
    "specie": "Rat",
    "dose": "0/0.18 mg/kg BID (Desogestrel)",
    "doseFrequency": "2 times/day",
    "indication": "Contraception",
    "monoCombination": "Monotherapy",
    "studyNumber": "SDGRR Nos. 836, 1743 and 4553",
    "studyNumberInternal": "SDGRR Nos. 836, 1743 and 4553",
    "sex": "Female",
    "age": "Adult",
    "route": "Oral",
    "comparativeGroup": "Norethisterone",
    "endpointHigh": "Gynecology",
    "endpointMid": "Fertility-related events/measurements",
    "endpointLow": "Ovulation",
    "endpoint": "Number of animals with Postponed ovulation",
    "valueOriginal": "0",
    "unitOriginal": "number",
    "displayValue": "0 number",
    "dataProvider": "Sponsor",
    "phase": "Not specified",
    "placebo": "Not placebo",
    "baseline": "Not baseline",
    "documentYear": 2000
   },
   {
    "id": "162524",
    "hash": "e3edb5a263238498435b026eb255acc8ed99287e",
    "drug": "Ethinyl Estradiol; Etonogestrel",
    "indications": [
     "Contraception",
     "Contraceptive methods female",
     "Obstetric and gynaecological therapeutic procedures",
     "Surgical and medical procedures"
    ],
```

```
    "document": {
     "id": "48639",
     "name": "Pharmacology Review 021187",
     "sourceShort": "FDA",
     "source": "FDA approval packages",
     "type": "Pharmacology Review",
     "date": "2000-09-18T00:00:00.000+00:00",
     "year": 2000,
     "length": 1420090,
     "page": 8,
     "isHistoric": false,
     "file": "5299ad591eb7194038f7031b311e9ea6"
    },
    "source": "FDA approval packages",
    "standardIndications": "Contraception",
    "specie": "Rat",
    "dose": "0/0.016 mg/kg QD (3a-OH-Desogestrel)",
    "doseFrequency": "Once a day",
    "indication": "Contraception",
    "monoCombination": "Monotherapy",
    "studyNumber": "SDGRR 4371",
    "studyNumberInternal": "SDGRR 4371",
    "sex": "Female",
    "age": "Adult",
    "route": "Oral",
    "experimentalDetail": "ovariectomized rats",
    "endpointHigh": "Gynecology",
    "endpointMid": "Histological/Cytological",
    "endpointLow": "Vaginal cornification inhibition",
    "endpoint": "Percent of smears with anti-estrogenic activity by their effect on vaginal cornification estrogen response",
    "valueOriginal": "68",
    "unitOriginal": "%",
    "displayValue": "68%",
    "dataProvider": "Sponsor",
    "phase": "Not specified",
    "placebo": "Not placebo",
    "baseline": "Not baseline",
    "sampleSize": 8,
    "documentYear": 2000
   },
   {
    "id": "168290",
    "hash": "7235b4710b3a172787c15e92769134b8a740f2d5",
    "drug": "Ethinyl Estradiol; Etonogestrel",
    "indications": [
     "Contraception",
     "Contraceptive methods female",
     "Obstetric and gynaecological therapeutic procedures",
     "Surgical and medical procedures"
    ],
    "document": {
     "id": "48639",
     "name": "Pharmacology Review 021187",
     "sourceShort": "FDA",
     "source": "FDA approval packages",
     "type": "Pharmacology Review",
     "date": "2000-09-18T00:00:00.000+00:00",
     "year": 2000,
     "length": 1420090,
     "page": 4,
     "isHistoric": false,
     "file": "5299ad591eb7194038f7031b311e9ea6"
    },
    "source": "FDA approval packages",
    "standardIndications": "Contraception",
    "specie": "Rat",
    "dose": "0 mg/kg BID (3-keto-desogestrel)",
```

```
  "doseFrequency": "2 times/day",
  "indication": "Contraception",
  "monoCombination": "Monotherapy",
  "studyNumber": "SDGRR Nos. 836, 1743 and 4553",
  "studyNumberInternal": "SDGRR Nos. 836, 1743 and 4553",
  "sex": "Female",
  "age": "Adult",
  "route": "Subcutaneous",
  "comparativeGroup": "Norethisterone",
  "endpointHigh": "Gynecology",
  "endpointMid": "Fertility-related events/measurements",
  "endpointLow": "Ovulation",
  "endpoint": "Number of animals with Postponed ovulation",
  "valueOriginal": "0",
  "unitOriginal": "number",
  "displayValue": "0 number",
  "dataProvider": "Sponsor",
  "phase": "Not specified",
  "placebo": "Placebo",
  "baseline": "Not baseline",
  "documentYear": 2000
 },
 {
  "id": "174730",
  "hash": "aa20b5e51aabd4009d1f09539f3a9dee8da952b3",
  "drug": "Ethinyl Estradiol; Etonogestrel",
  "indications": [
   "Contraception",
   "Contraceptive methods female",
   "Obstetric and gynaecological therapeutic procedures",
   "Surgical and medical procedures"
  ],
  "document": {
   "id": "48611",
   "name": "Pharmacology Review 021187/S-000",
   "sourceShort": "FDA",
   "source": "FDA approval packages",
   "type": "Pharmacology Review",
   "date": "2000-09-18T00:00:00.000+00:00",
   "year": 2000,
   "length": 1453767,
   "page": 8,
   "isHistoric": false,
   "file": "7efb0e786c0592432b5cd94eaaee897b"
  },
  "source": "FDA approval packages",
  "standardIndications": "Contraception",
  "specie": "Rat",
  "dose": "0/0.15 mg/kg/0 QD",
  "doseFrequency": "Once a day",
  "indication": "Contraception",
  "monoCombination": "Monotherapy",
  "studyNumber": "SDGRR 1743",
  "studyNumberInternal": "SDGRR 1743",
  "sex": "Female",
  "age": "Adult",
  "route": "Oral",
  "experimentalDetail": "ovariectomized rats",
  "endpointHigh": "Gynecology",
  "endpointMid": "Histological/Cytological",
  "endpointLow": "Vaginal epithelium cornification",
  "endpoint": "Number of Animals with estrogenic activity induce development of the vaginal epithelium (especially cornification)",
  "valueOriginal": "0",
  "unitOriginal": "number",
  "displayValue": "0 number",
  "dataProvider": "Sponsor",
  "phase": "Not specified",
```

```
      "placebo": "Not placebo",
      "baseline": "Not baseline",
      "sampleSize": 8,
      "documentYear": 2000
     },
     {
      "id": "179568",
      "hash": "46d633e5a3043f816256f9dab771ced575b6a37b",
      "drug": "Ethinyl Estradiol; Etonogestrel",
      "indications": [
       "Contraception",
       "Contraceptive methods female",
       "Obstetric and gynaecological therapeutic procedures",
       "Surgical and medical procedures"
      ],
      "document": {
       "id": "48611",
       "name": "Pharmacology Review 021187/S-000",
       "sourceShort": "FDA",
       "source": "FDA approval packages",
       "type": "Pharmacology Review",
       "date": "2000-09-18T00:00:00.000+00:00",
       "year": 2000,
       "length": 1453767,
       "page": 4,
       "isHistoric": false,
       "file": "7efb0e786c0592432b5cd94eaaee897b"
      },
      "source": "FDA approval packages",
      "standardIndications": "Contraception",
      "specie": "Rat",
      "dose": "0/0.75 mg/kg BID (3-keto-desogestrel)",
      "doseFrequency": "2 times/day",
      "indication": "Contraception",
      "monoCombination": "Monotherapy",
      "studyNumber": "SDGRR Nos. 836, 1743 and 4553",
      "studyNumberInternal": "SDGRR Nos. 836, 1743 and 4553",
      "sex": "Female",
      "age": "Adult",
      "route": "Subcutaneous",
      "comparativeGroup": "Norethisterone",
      "endpointHigh": "Gynecology",
      "endpointMid": "Fertility-related events/measurements",
      "endpointLow": "Ovulation",
      "endpoint": "Number of animals with Inhibited ovulation",
      "endpointType": "primary",
      "valueOriginal": "5",
      "unitOriginal": "number",
      "displayValue": "5 number",
      "dataProvider": "Sponsor",
      "phase": "Not specified",
      "placebo": "Not placebo",
      "baseline": "Not baseline",
      "documentYear": 2000
     }
    ]
   },
   "facets": null
}
```

14. Recommended dose API

Pharmapendium has introduced a new feature that includes Recommended dose information on its API. This enhancement aims to provide accurate dosing recommendations essential for pharmaceutical research and clinical practice. Users can now access dosing recommendations based on various parameters, including population, indication, and gender, derived from regulatory documents from the FDA and EMA.

This addition will assist users in comparing therapeutic doses and potential safety concerns related to existing drugs, aiding in the development strategies for drug candidates.

14.1. Endpoints

API Root-endpoint	https://api.elsevier.com/pharma/recommendedDose/
API Portal / Home Page	
Interactive Console URL	

GET /v1/recommendedDose/search

Search for recommended dose data using query parameters:

- Accepts multiple search criteria as URL parameters.
- Use the facets field to group results by taxonomy or field.
- Commas separate list items, so replace commas within individual items with a vertical bar (|).

POST /v1/recommendedDose/search

Search for recommended dose data using a request body:

- Same functionality as the GET version, but allows complex queries in the body.
- Use the facets field to group results by taxonomy or field.

GET /v1/recommendedDose/lookupFuzzy

Look up taxonomy terms using approximate matches or wildcards.

POST /v1/recommendedDose/lookupFuzzy

Same as the GET version but uses a request body to pass search terms.

GET /v1/recommendedDose/suggest

Returns a list of suggested taxonomy terms based on a given prefix.

GET /v1/recommendedDose/listTaxonomies

Returns all available taxonomies in the recommended dose module.

Use these values with the lookup and suggest endpoints.

GET /v1/recommendedDose/listFacets

Returns a list of available facets (fields you can group or filter by) for use in the facets field of the search endpoint.

GET /v1/recommendedDose/listDataFields

Returns all field names available in the recommended dose module.

Use these with the displayColumns field to customise the output of search results.

14.2. Example use cases and request strategies

This section provides example use cases to show how different APIs can be combined to answer common research questions. Each example outlines the question and the steps to retrieve the relevant data.

Use case: Find the recommended dose of Cabozantinib for liver-impaired patients with advanced renal cell carcinoma

What is the recommended dose for Cabozantinib in liver-impaired patients with advanced renal cell carcinoma?

Request strategy

1. Use the Recommended Dose API to search for the drug Cabozantinib.
2. Specify the indication as "Advanced renal cell carcinoma" (using fuzzy lookup).
3. Filter the population to "Impaired Liver" (also using fuzzy lookup) to get the relevant dose recommendation.

   Request URL:

```
pharmapendium//v1/recommendedDose/search?conditions=impaired%20liver%20function%20mild%20&indications=Advanced%20renal%20cell%20carcinoma&drugs=Cabozantinib
```

   JSON response via the main search method GET:


```
{
 "data": {
  "countTotal": 1,
  "countLimited": 1,
  "items": [
   {
    "id": "12744",
    "drug": "Cabozantinib",
    "indications": [
     "Advanced renal cell carcinoma",
     "Bone sarcoma",
     "Bone sarcomas",
     "Breast and nipple neoplasms malignant",
```

"Breast cancer",
"Breast neoplasms malignant and unspecified (incl nipple)",
"Cancer",
"Carcinoma hepatocellular",
"Carcinoma lung",
"Carcinoma thyroid",
"Clear cell sarcoma",
"Clear cell sarcoma of soft tissue",
"Endocrine neoplasms malignant and unspecified",
"Ewing's sarcoma",
"Genitourinary neoplasms malignancy and gender unspecified",
"Genitourinary tract cancer",
"Genitourinary tract neoplasm",
"Glioma",
"Hepatic cancer",
"Hepatic neoplasms malignant",
"Hepatobiliary neoplasms malignant and unspecified",
"Lung neoplasm malignant",
"Miscellaneous and site unspecified neoplasms malignant and unspecified",
"Neoplasm",
"Neoplasm malignant",
"Neoplasms benign, malignant and unspecified (incl cysts and polyps)",
"Neoplasms malignant site unspecified NEC",
"Neoplasms unspecified malignancy and site unspecified NEC",
"Nephroblastoma",
"Nervous system neoplasms malignant and unspecified NEC",
"Nervous system neoplasms unspecified malignancy NEC",
"Non-renal cell kidney neoplasms malignant",
"Osteosarcoma",
"Renal and urinary tract neoplasms malignant and unspecified",
"Renal cell carcinoma",
"Renal cell carcinoma advanced",
"Renal cell carcinoma advanced or metastatic",
"Renal cell carcinoma metastatic",
"Renal cell carcinomas",
"Reproductive and genitourinary neoplasms gender unspecified NEC",
"Respiratory and mediastinal neoplasms malignant and unspecified",
"Respiratory tract and pleural neoplasms malignant cell type unspecified NEC",
"Rhabdomyosarcoma",
"Rhabdomyosarcomas",
"Sarcoma Ewing's",
"Sarcoma soft tissue",
"Sarcomatosis",
"Skeletal neoplasms malignant and unspecified",
"Soft tissue neoplasms malignant and unspecified",
"Soft tissue sarcomas",
"Soft tissue sarcomas histology unspecified",
"Solid tumour",
"Solid tumours",
"Thyroid cancer",
"Thyroid cancer advanced, metastatic",
"Thyroid cancer metastatic",
"Thyroid neoplasms malignant",
"Wilms' tumor"
],
"recordId": 2378,
"documentName": "Annex I",
"page": "3",
"linkToSource": "https://www.pharmapendium.com/browse/ema/Cabozantinib/a6c8bf812d52ecfa1ce697feb60ad1d1",
"documentDate": "2020-12-27T00:00:00.000+00:00",
"source": "EMA approval documents",
"drugIDs": [
"3FFCNqKIr_-",
"UiuCko4C9xA",
"kfuUqxEGiRF"
],

"indicationDescription": "COMETRIQ is indicated for the treatment of adult patients with progressive, unresectable locally advanced or metastatic medullary thyroid carcinoma",
"standardIndication": "Medullary thyroid cancer locally advanced; Medullary thyroid cancer metastatic",
"route": "oral",
"dosageForm": "capsule",
"dosageType": "repeated",
"dose1Value": 60,
"dose1Unit": "mg",
"doseFrequency": "once a day",
"totalDailyDose": "60 mg/day",
"condition": "impaired liver function mild"
}
]
},
"facets": null

15. Required and optional input fields for requests in each module

Use these fields for the search criteria of your request. Fields marked with “R” are required in a module and those marked with “O” are optional.

	Modules: Activity, Chemistry, Documents, Efficacy, FAERS, Metabolic Enzyme, Pharmacokinetics, Safety, Drugs Indications							Activity		Chemistry	Documents	Efficacy	FAERS		Metabolizing enzymes	Pharmacokinetics		Safety	Drugs indications	MoA	Recommended dose	
Field name	listDataFields	listFacets	listTaxonomies	lookupFuzzy	lookupFuzzy	search	suggest	getUnits	search	search	search	search	search	{image}	search	search	getUnits	search	search			Brief description (Definitions in Section 13 may include additional entry examples)
Method	GET	GET	GET	GET	POST	POST	GET	GET	GET	GET	POST	GET	GET	GET	GET	GET	GET	GET	GET			
APIKey	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R			A currently active API key
Insttoken	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O			A granted institutional token
name								R									R					Name of the activity or pharmacokinetic parameter for which units should be retrieved with getUnits
taxonomy				R			R															PharmaPendium Taxonomy to query with suggest or lookupFuzzy
query				R																		Term(s) to query in a taxonomy with suggest or lookupFuzzy. lookupFuzzy allows wildcards.
filter					R	R					R											Field to enter the body of a POST request. Relevant only for the interactive API.
prefix							R															Prefix of term(s) to query in a taxonomy with suggest

limitation.firstRow									O	O		O	O		O	O		O	O			Number of the first row to include in response. The JSON response is limited to 500 records (rows 0–499). Use this field and limitation.count to loop over the response and download the complete set of results.
	Modules: Activity, Chemistry, Documents, Efficacy, FAERS, Metabolic Enzyme, Pharmacokinetics, Safety, Drugs Indications							Activity		Chemistry	Documents	Efficacy	FAERS		Metabolizing enzymes	Pharmacokinetics		Safety	Drugs indications			
Field name	listDataFields	listFacets	listTaxonomies	lookupFuzzy	lookupFuzzy	search	suggest	getUnits	search	search	search	search	search	{image}	search	search	getUnits	search	search			**Brief description** (Definitions in Section 13 may include additional entry examples)
limitation.count									O	O		O	O		O	O		O	O			Number of data records to include in response
displayColumns									O	O		O	O		O	O		O	O			Name(s) of data fields to include in response. Default is all fields.
drugs									O	O		O	O		O	O		O	O			Drug name(s) to include in response. Use suggest or lookupFuzzy to identify terms from the *PharmaPendium Drugs Taxonomy*.
drugsFuzzy									O	O		O	O		O	O		O	O			Drug names with wildcards. Also allows searching drug classes (e.g., 'anesth*' returns results with 'Lidocaine; Prilocaine').
drugsAndSynonyms																			O			Drug name(s) and/or synonyms to include in response. Uses exact match and synonyms from *PharmaPendium Drugs Taxonomy*.
facets									O	O		O	O		O	O		O	O			Facet(s) to apply to data in response; listed below results

sources									O	O		O	O		O	O		O				Source(s) to query. Use suggest or lookupFuzzy to identify terms from the *PharmaPendium Sources Taxonomy*. Default is all sources.
sourcesShort																			O			Source(s) to query. Restricted to: DESI, MOSBY'S, FDA Label, Efficacy (FDA), Efficacy (EMA), EMA ANNEX, FDA Classic.
species									O	O			O			O		O				Species to include in response. Use suggest or lookupFuzzy to identify terms from the *PharmaPendium Species Taxonomy*. Default is all species.
targets										O												Targets to query for activity data. Use suggest or lookupFuzzy to identify terms from the *PharmaPendium ActivityTargets Taxonomy*. Default is all targets.
years									O	O		O	O			O		O				Publication year(s) of source documents to include in response. Default is all years.

	Modules: Activity, Chemistry, Documents, Efficacy, FAERS, Metabolic Enzyme, Pharmacokinetics, Safety, Drugs Indications							Activity		Chemistry	Documents	Efficacy	FAERS		Metabolizing enzymes	Pharmacokinetics		Safety	Drugs indications	MoA	Recommended dose	
Field name	listDataFields	listFacets	listTaxonomies	lookupFuzzy	lookupFuzzy	search	suggest	getUnits	search	search	search	search	search	{image}	search	search	getUnits	search	search			**Brief description** (Definitions in Section 13 may include additional entry examples)
leaf									O	O		O	O		O			O	O			Set to 'True' to include only taxonomy end terms and not higher-level categories.

parameters										O						O		O				Measured parameter(s) to include in response. In the Pharmacokinetics Module, use suggest or lookupFuzzy to identify terms from the *PharmaPendium PKParameters Taxonomy*.
targetTypes										O												Types of targets to query for activity data. Use suggest or lookupFuzzy to identify terms from the *PharmaPendium ActivityTargets Taxonomy*.
primary										O												Set to 'Primary' to include only data from primary targets. 'Non-Primary' returns data from secondary and other targets.
radioLabels										O								O				Limit response to studies using specific radioactive labels (e.g., 125I, 2H, 3H)
transfections										O												Limit response to studies using specific transfection forms (e.g, infected, injected, synthetized)
cellOrigins										O												Limit response to studies using cells of a particular species (e.g., rat, human, mouse)
testSystems										O						O						Limit response to studies using particular organ or cell systems (e.g., brain, astrocytes, HeLa, HEK, arteries, vas deferens)
studyTypes										O												Limit response to particular study types, according to *PharmaPendium Study Types List* (e.g., binding, expression)

	Modules: Activity, Chemistry, Documents, Efficacy, FAERS, Metabolic Enzyme, Pharmacokinetics, Safety, Drugs Indications							Activity		Chemistry	Documents	Efficacy	FAERS		Metabolizing enzymes	Pharmacokinetics		Safety	Drugs indications	MoA	Recommended dose	
Field name	listDataFields	listFacets	listTaxonomies	lookupFuzzy	lookupFuzzy	search	suggest	getUnits	search	search	search	search	search	{image}	search	search	getUnits	search	search			**Brief description** (Definitions in Section 13 may include additional entry examples)
experimentTypes										O												Limit response to studies using particular experiment types (e.g., cAMP production, Ca^{2+} mobilization)
agonistAntagonists										O												Limit response to particular effect on target (e.g., activator, allosteric modulator, radioligand)
actionsTested										O												Limit reponse to specific tested actions (e.g., inhibitor, stimulator)
includeSynonyms												O										Set to 'True' to enrich query with synonyms of search criteria in 'text' field. Synonyms come from the *PharmaPendium Taxonomies* for *Drugs, Effects (MedDRA), ActivityTargets* and *Indications*.
routes									O				O		O	O		O				Limit response to specific route(s) of administration according to the *PharmaPendium Routes of Administration List* (e.g., oral)
indications													O						O			Limit response to specific indication(s). Use suggest or lookupFuzzy to identify terms from

																						the *PharmaPendium Indications Taxonomy*. Default is all indications.
pathogens													O									Limit response to data involving infections (atypical, fungi, gram-negative, gram-positive, gram-variable, multiple, protozoal, not specified)
endpoints													O									Limit response to specific endpoint(s). Use suggest or lookupFuzzy to identify terms from the *PharmaPendium Endpoints Taxonomy*. Default is all endpoints.
monoCombinations													O									Limit response to monotherapies, combination therapies or both (e.g., monotherapy, combination, combination/montherapy)
	Modules: Activity, Chemistry, Documents, Efficacy, FAERS, Metabolic Enzyme, Pharmacokinetics, Safety, Drugs Indications							Activity		Chemistry	Documents	Efficacy	FAERS		Metabolizing enzymes	Pharmacokinetics		Safety	Drugs indications			
Field name	listDataFields	listFacets	listTaxonomies	lookupFuzzy	lookupFuzzy	search	suggest	getUnits	search	search	search	search	search	{image}	search	search	getUnits	search	search			**Brief description** (Definitions in Section 13 may include additional entry examples)
phases													O									Clinical trial phases to query for efficacy data (e.g., I, I/II, III)
dataProviders													O									Limit response to specific providers of data (e.g., literature, reviewer)

studyDesigns													O									Type of study design to query for efficacy data (e.g., blind, controlled, multicenter)
endpointTypes													O									Narrow down response by relevance of the endpoint to the study objective (e.g., primary, secondary, auxiliary)
doseFrequencies													O									Limit response to particular dose regimes (e.g., twice per day)
baselines													O									Set to 'baseline' to include only data taken as baseline measures
comparativeGroups													O									Limit response to data from particular comparative groups (e.g., placebo, control, name of compared drug)
populations													O									Study populations to include in query (e.g., completers, non-responders, BOCF, FITT)
sexes													O		O							Sex(es) to query for efficacy data (e.g., female, male, both)
ageGroups													O									Age groups to query for efficacy data (e.g., adult, infant, aged)
image														R								Initiitial report image ID number
effects									O						O							Adverse effects to query. Use suggest or lookupFuzzy to identify terms from the *PharmaPendium Effects (MedDRA) Taxonomy*.
secondarySuspectDrugs															O							Drug name(s) to query as secondary suspect drugs in adverse event reports. Use suggest or lookupFuzzy to identify terms from the *PharmaPendium Drugs Taxonomy*.

	Modules: Activity, Chemistry, Documents, Efficacy, FAERS, Metabolic Enzyme, Pharmacokinetics, Safety, Drugs Indications							Activity		Chemistry	Documents	Efficacy	FAERS		Metabolizing enzymes	Pharmacokinetics		Safety	Drugs indications	MoA	Recommended dose	
Field name	listDataFields	listFacets	listTaxonomies	lookupFuzzy	lookupFuzzy	search	suggest	getUnits	search	search	search	search	search	{image}	search	search	getUnits	search	search			**Brief description** (Definitions in Section 13 may include additional entry examples)
concomitantDrugs															O							Drug name(s) to query as concomitant drugs in adverse event reports. Use suggest or lookupFuzzy to identify terms from the *PharmaPendium Drugs Taxonomy*.
interactingDrugs															O							Drug name(s) to query as interacting drugs in adverse event reports. Use suggest or lookupFuzzy to identify terms from the *PharmaPendium Drugs Taxonomy*.
seriousness															O							Limit response to "serious outcomes" or "non-serious outcomes"
reporterOccupations															O							Limit response to data from reports submitted by people of a specific occupation (e.g., consumer, lawyer, physician)
outcomes															O							Limit response to specific outcomes (e.g., death, hospitalization)
manufacturerNames															O							Name of manufacturer(s) to query in adverse event reports

enzymeTransporters																O						Name of metabolizing enzyme(s) or transporter(s) to query. Use suggest or lookupFuzzy to identify terms from the *PharmaPendium MEEnzymeTransporters Taxonomy*.
parentsMetabolites																O						Limit reponse to data on parent drug, prodrug, metabolite, enantiomer, vitamer, diastereomer
concomitants																O		O				Name(s) of non-drug concomitants used in study. Use suggest or lookupFuzzy to identify terms from the *PharmaPendium ConcomitantSubstances Taxonomy*.
dataTypes																O						Limit reponse to data on drug type in relation to enzyme/transporter function (e.g., inducer, substrate, inhibitor)
studyGroups																		O				Limit response according to a particular characteristic of the study group (e.g., fast metabolism, smoker, breed, disease model)
	Modules: Activity, Chemistry, Documents, Efficacy, FAERS, Metabolic Enzyme, Pharmacokinetics, Safety, Drugs Indications							Activity		Chemistry	Documents	Efficacy	FAERS		Metabolizing enzymes	Pharmacokinetics		Safety	Drugs indications	MoA	Recommended dose	
Field name	listDataFields	listFacets	listTaxonomies	lookupFuzzy	lookupFuzzy	search	suggest	getUnits	search	search	search	search	search	{image}	search	search	getUnits	search	search			**Brief description** (Definitions in Section 13 may include additional entry examples)

metaboliteEnantiomers																		O				Limit response to data on metabolites, enantiomers, etc.
tissueSpecifics																		O				Limit response to data categorized as tissue-specific or not
doseTypes									O													Limit response according to dose type (e.g., twice, single, repeated, ID, ID50, overdose)
text												R										Text search terms. Allows wildcards.

16. Data fields included in responses of each module

Note that empty fields are omitted from responses in JSON format.

> **!** To create a data frame that retains empty fields, parse the JSON output with a method that replaces empty data fields with default content. For example, use the Python Dictionary get() method:
>
> **get(key[, default])**
> This returns the value for a key if the key is in the dictionary. Otherwise, an entered default (or 'None' if no default is given) is returned.

	Activity	Chemistry	Documents	Efficacy	FAERS	Metabolizing enzymes	Pharmacokinetics	Safety	Drugs indications	MoA	Recommended dose	Brief description
actionTested	•											Action tested in activity study (e.g., inhibitor, stimulator, basal condition, stimulator/protector)
age				•			•					Age category of study subjects. If age of study subjects spans more than one category, the categories appear connected with a hyphen. The used categories are: newborn, infant, preschool child, school child, child, adolescent, adult, aged.
age					•							Numeric age of the subject as given in the adverse event report
ageUnit					•							Units of the subject's age as given in the adverse event report (e.g., years, months)
ageYears					•							Subject's age in years, if provided
agonistAntagonist	•											Indication if the activity recorded is agonistic, antagonistic or mixed
assay							•					Technique used for the measurement of the pharmacokinetic parameter, as written in the source (e.g., ELISA, HPLC, GC-MS, cysteine-added urine collection)

	Activity	Chemistry	Documents	Efficacy	FAERS	Metabolizing enzymes	Pharmacokinetics	Safety	Drugs indications	MoA	Recommended dose	Brief description
baseline				•								Indicates if the parameter value is a baseline measurement or not
caseID					•							Case ID as listed on the adverse event report
cellOrigin	•											Species origin of cells used to test activity (e.g., rat, human, mouse)
chemicalName			•									Chemical name of drug to be queried in Documents Module
cmmnt	•											Additional information considered important
comments						•	•					Additional information considered important
comparativeGroup				•								Description of control or comparative group (e.g., placebo, no treatment, name of comparative drug)
concomitants						•	•					Substances or factors concomitant to a tested drug that affect parameter values (e.g., name of concomitant drug, enzyme or transporter inhibitors, alcohol, nicotine, grapefruit juice)
concomitantDrugs					•							Drug(s) taken by report subject in addition to title drug
csDrug			•									Nonproprietary name of drug
dataProvider				•								Provider of efficacy data (literature, reviewer, sponsor, sponsor/reviewer, unreported)
dataTypes						•						Duug type in relation to the enzyme or transporter function, according to *PharmaPendium MEDataTypes Taxonomy* (e.g., substrate, inducer, inhibitor, no activity)
deathDate					•							Date of subject death as given in adverse event report
degree						•						Degree of effect of qualitative result according to *PharmaPendium Degree (Qualitative) List*
displayAge					•							Age of the subject as given in adverse event report, displayed with units
displayDose	•											Dose tested in study displayed with corresponding units

	Activity	Chemistry	Documents	Efficacy	FAERS	Metabolizing enzymes	Pharmacokinetics	Safety	Drugs indications	MoA	Recommended dose	Brief description
displayValue	•			•		•	•					Reported value of measured parameter displayed with corresponding units
displayWeight					•							Weight of the subject as given in adverse event report, displayed with reported units
document	•		•	•			•	•				Source document with context of excerption
documentYear	•		•	•			•	•				Calendar year of source document publication
documentSource			•									Source of the document (FDA and EMA approval documents, FDA Advisory Committee documents, DESI documents, Mosby's Drug Consult, Meyler's Side Effects of Drugs)
dose	•			•	•	•	•	•				Dose regimen of a drug as given in source document
doseFrequency				•								Dose frequency of drug studied according to a normalized list of terms (e.g., 3 times/day, every 2 weeks, once a day)
doseTypes								•				Type of dosing regime used in study (e.g., ID, ID50, overdose, repeated, single, single/intermittent, single/repeated, single/twice, twice, twice/repeated)
doseUnit	•											Units used to report dose of the studied drug
drug	•		•	•			•	•	•			Drug name according to *Pharmapendium Drugs Taxonomy*
drugIDs									•			Internal identification codes assigned to a drug.
duration							•					Duration of the administered treatment (e.g., 14 days, single, unreported)
effect						•						Indication coming from the source document of whether there is or is not a drug-drug interaction and/or a clinical effect
effect								•				Adverse effect/toxicity according to *PharmaPendium Effects (MedDRA) Taxonomy*
effectsRelated					•							Adverse effect/toxicity reported according to *PharmaPendium Effects (MedDRA) Taxonomy*

	Activity	Chemistry	Documents	Efficacy	FAERS	Metabolizing enzymes	Pharmacokinetics	Safety	Drugs indications	MoA	Recommended dose	Brief description
endpoint				•								Endpoint as given in source document
endpointHigh				•								Disease area of endpoint according to *PharmaPendium Endpoint Taxonomy* (e.g., metabolic diseases)
endpointLow				•								Subtype of endpoint according to *PharmaPendium Endpoint Taxonomy* (e.g, blood pressure change)
endpointMid				•								Type of endpoint according to *PharmaPendium Endpoint Taxonomy* (e.g., blood pressure)
endpointType				•								Indicates relevance of the endpoint relative to study objective (e.g., primary, secondary, tertiary, auxilliary, discontinuation)
enzymesTransporters						•						Name of metabolizing enzyme or transporter according to *PharmaPendium MEEnzymeTransporters Taxonomy*
errorType	•											Type of variation/error reported for the measured activity parameter (e.g., SD, SEM)
errorValue	•											Value of the error or variation mesure reported for the measured activity parameter
eventDate					•							Date on which reported event occured
experimentalConditions						•						Excerpted details about the experimental conditions (e.g., coenzymes)
experimentalDetail				•		•						Excerpted details about the experiment (e.g., labeling, incubation order)
experimentType	•											Type of experiment used to measure activity parameter (e.g., e.g., adenylate cyclase activity, aggregation, cAMP production, Ca2+ mobilization, electrophysiology, enzymology inhibition, flux release, flux uptake, two electrode clamp)
FDADate					•							FDA date assigned to adverse event report
Formula		•										Compound formula of compound
id		•					•	•	•			Internal identifier

	Activity	Chemistry	Documents	Efficacy	FAERS	Metabolizing enzymes	Pharmacokinetics	Safety	Drugs indications	MoA	Recommended dose	Brief description
image					•							Initial report image ID number
indication				•					•			Indication as given in source document
indicationAdjunct									•			Drug not used as monotherapy but in combination with other drug(s). Information excerpted from FDA/EMA efficacy, drug labels, and annexes.
indicationIDs									•			Internal idenfication codes assigned to an indication.
interactingDrugs					•							Name of drug(s) given as interacting drugs in adverse event report, according to *PharmaPendium Drugs Taxonomy*
isPrimaryTarget	•											Indicates if target is primary or non-primary target of study compound
location					•							Location of event as given in adverse event report
manufacturerDate					•							Manufacturer's date of adverse event report
manufacturerName					•							Name of manufacturer of title drug in adverse event report
manufacturerNumber					•							Number assigned by Manufacturer to adverse event report
metabolism		•										Details about how the compound is metabolized
metabolitesEnantiomers							•					Indicates if substance tested is an active metabolite, enantiomer, inactive metabolite, metabolites, or not metabolites/enantiomers
molecularWeight		•	•									Molecular weight of compound
moleculeFile		•										Molecule file of compound
monoCombinations				•								Indicates in the drug was given as a monotherapy, drug combination, or permutations thereof
mutationDetail	•											Details about any recorded mutagenic effects

	Activity	Chemistry	Documents	Efficacy	FAERS	Metabolizing enzymes	Pharmacokinetics	Safety	Drugs indications	MoA	Recommended dose	Brief description
name		•										Substance name
otherAdministeredDrugs					•							Other drugs administered to subject as given in adverse event report
otherExpDetails	•											Description of important experimental details in additon to experiment type
outcomes					•							Outcomes as given in adverse event report
parameter	•					•	•					Parameter(s) measured. In the Pharmacokinetics Module, entry follows the *PharmaPendium PKParameters Taxonomy*. In the Activity and Metabolizing Enzymes Modules, entry as given in source document.
parameterDisplay							•					Parameter measured plus additional descriptive information provided in the source document
parentsMetabolites						•						Indicates if the drug studied is a parent drug, metabolite, active metabolite, active vitamer, diastereomer, enantiomer, metabolite and parent, parent and active metabolite, prodrug, vitamer
pathogen				•								Provides information about pathogenic infection considered in a study (e.g., atypical, fungi, gram-negative, gram-positive, gram-variable, multiple, protozoal, not specified)
phase				•								Phase of clinical study (I, I/II, I/II/III, I/IIa, I/IIa/II, I/III, Ia, Ia/II, Ib, Ib/II, Ib/IIa, Ib/III, II, II/IIb, II/III, II/IIIa, IIa, IIb, IIb/III, III, III/IV, IIIa, IIIb, IIIb/IV, IV, not specified)
pkAnalysis							•					Calculation model used for the analysis of the pharmacokinetic parameter, as given in the source document (e.g., one-compartmental model, three-compartmental model, none-compartmental model, population PK model)
placebo				•								Indicates if a placebo treatment or not
primarySuspectDrugs					•							Primary suspect drug(s) given in adverse event report according to *PharmaPendium Drugs Taxonomy*.
population				•								Abbreviated descriptor of the type of population studied. Follows often used terms to describe populations but may also be excerpted as given in the source document. Some commonly used terms: BOCF – Baseline Observation Carried Forward; FAS – Full Analysis Set; FITT – FDA adapted Intention To Treat population; FPP – FDA adapted Per Protocol population; ITT – Intention To Treat; LOCF – Last Observation Carried Forward; MITT – Modified Intention To Treat; MMRM – Mixed-Effect Repeated Measure; MVTF – Missing Value

	Activity	Chemistry	Documents	Efficacy	FAERS	Metabolizing enzymes	Pharmacokinetics	Safety	Drugs indications	MoA	Recommended dose	Brief description
												Treated as Failure; OC – Observed Cases; PP – Per Protocol; WOCF – Worst Observation Carried Forward; Completers; Non-Completers; Responders; Non-Responders; Dropouts
pValue				•								Probability value of the endpoint result; may be an actual value or a qualitative entry (e.g., significant, not significant, 0.021)
radioLabel	•						•					Name of radioactive label(s), if used in the study (e.g., 125I, 2H, 3H)
reaction						•						Excerpted chemical metabolic reaction, if available in source document (e.g., oxidation, hydroxylation, deacetylation, demethylation)
reportedIndications					•							Indication(s) as given in the adverse event report
reporterOccupation					•							Occupation of the reporting party (Consumer, HealthProfessional, Lawyer, OtherHealthProfessional, Pharmacist, Physician, RegisteredNurse, Salesperson)
resultQualitative						•						Indicates the presence or absence of qualitative results as expressed by the source author (yes, no, ambiguous, unreported)
route				•	•	•	•	•				Route of administration of the study drug according to *PharmaPendium Routes of Administration List*
sampleSize				•			•					#N; number of subjects in a study group
secondarySuspectDrugs					•							Secondary suspect drug(s) given in the adverse event report according to *PharmaPendium Drugs Taxonomy*
sendDate					•							Date on which report was sent
sex				•	•		•					Sex of subject(s)
sharpN	•											Number of repeats for the assay
smiles	•	•	•	•		•	•	•				Chemical structure of the compound
source	•			•		•	•	•	•			Source of the excerpted data; may include exact location in the document from which data were excerpted

	Activity	Chemistry	Documents	Efficacy	FAERS	Metabolizing enzymes	Pharmacokinetics	Safety	Drugs indications	MoA	Recommended dose	Brief description
sourcesShort									•			Abbreviated source designations DESI, MOSBY'S, FDA Label, Efficacy (FDA), Efficacy (EMA), EMA ANNEX, FDA Classic
specie	•			•		•	•	•				Species used in a study
standardDeviation							•					Standard deviation of the parameter value (SD), if available
standardIndications				•								Reported indication translated to a standard indication according to the *PharmaPendium Indications Taxonomy*
strainRace	•											Strain and/or race of the study organism (e.g., Wistar, Sprague-Dawley)
studyDesign				•								Design characteristics of the study or the study type, typically listed as single words separated by a comma (blind, controlled, crossover, double-blind, multicenter, non-controlled, open-label, randomized, single center, single-blind, triple-blind)
studyGroup							•					Listed descriptors of the group studied (e.g., health status, poplation, breed, type of metabolism, smoker, pregnant, disease model)
studyName							•					Name of study as given in source document
studyNumber				•		•	•					Official number of study given in the source document, if available. If not, assigned serial number
studyType	•											Type of study conducted (binding, cell behavior, DNA assay, enzymology, expression, flux, functional assay, in vitro (others), in vitro electrophysiology, isolated organs, protein interactions, second messenger, signaling, transactivation assay, unreported)
substanceMeasured						•						Name of substance(s) measured in the study as it appears in the source document. This may be a metabolite, substrate, a substance pair or other and can be given as a name, lab code, chemical name or author-specific desigation.
substanceStudied						•						Name of the parent drug, metabolite, prodrug or enantiomer studied as it appears in the document (may also be a lab code or a chemical name)

	Activity	Chemistry	Documents	Efficacy	FAERS	Metabolizing enzymes	Pharmacokinetics	Safety	Drugs indications	MoA	Recommended dose	Brief description
target	•											Target(s) of the studied compound according to the *PharmaPendium ActivityTargets Taxonomy*
targetType	•											Type of the target linked to the studied compound according the the *PharmaPendium ActivityTargets Taxonomy*
testSystem	•					•						Organ or cell test system used in a study according to *PharmaPendium Test Systems List* (e.g., brain, astrocytes, HeLa, HEK, arteries, vas deferens)
time						•						Excerpted point of time after last treatment dose, or the period during which, the measurement of the metabolizing enzyme parameter was made (e.g., end of infusion, 6 h)
timeOfMeasurement							•					Excerpted point of time after last dose at which, or the period during which, the measurement of the PK parameter was made (e.g., end of infusion, 0–24 h, 6 h)
timepoint				•								Excerpted time from the first treatment dose to the time of measurement of the efficacy endpoint. May be a single timepoint, multiple timepoints separated with a comma, a range, or descriptive (e.g., 15 days, follow-up, 130-155 h)
tissueSpecifics							•					Indicates if parameter measured is tissue-specific or not
transfection	•											Indicates the form of transfection used in a study (infected, injected, non-transfected, synthetized, transfected, undefined)
treatment				•								Duration of the administered treatment from first treatment dose to end of dosing. If exact duration is unknown, an indication of dose counts may be given (e.g., 14 days, single, repeated, unreported)
unitNormalized	•						•					Units of the parameter once normalized; this is done only for parameters with standard units
unitOriginal	•			•		•	•					Units of the parameter as originally given in the soure document
valueAverageNormalized	•						•					Normalized average value of the parameter; this is done only for parameters with standard units
valueNormalized	•						•					Normalized value of the parameter; this is done only for parameters with standard units

	Activity	Chemistry	Documents	Efficacy	FAERS	Metabolizing enzymes	Pharmacokinetics	Safety	Drugs indications	MoA	Recommended dose	Brief description
valueOriginal	•			•		•	•					Value of the parameter as originally given in the source document
weight					•							Weight of subject as given in adverse event report. Units are excerpted in a separate field.
weightNormalized					•							Weight of subject of adverse event report translated to a normalized weight value
weightUnit					•							Units of the subject's weight as given in adverse event report
weightUnitNormalized					•							Units of the normalized weight of the subject in adverse event report
year						•						Publication year of source document