

# Ontology services for data interoperability

## Useful links

<b>Workshop Page</b>	<a href="http://www.ebi.ac.uk/spot/Workshops">www.ebi.ac.uk/spot/Workshops</a>
SPOT Ontology Tooling Page	<a href="http://www.ebi.ac.uk/spot/ontology">www.ebi.ac.uk/spot/ontology</a>
The Ontology Lookup Service (OLS)	<a href="http://www.ebi.ac.uk/ols">www.ebi.ac.uk/ols</a>
Zooma (Ontology term annotator)	<a href="http://www.ebi.ac.uk/spot/zooma">www.ebi.ac.uk/spot/zooma</a>
Ontology Xref Service (OxO)	<a href="http://www.ebi.ac.uk/spot/oxo">www.ebi.ac.uk/spot/oxo</a>

## PART I: Data annotation (FAQs)

What we will try to answer today

[Optional] click on ontology workshop page to click along with us

1. Which ontologies should I use?
2. How do I access ontologies?
3. How do I map data to ontologies?
4. How can I translate from one ontology to another?
5. What about data that doesn't map?
6. How can I extend an ontology?
7. How do I build "ontology aware" search applications?

### How do I access ontologies / Which ontologies should I use?

We will try and answer these questions using the Ontology Lookup Service: [www.ebi.ac.uk/ols](http://www.ebi.ac.uk/ols)

### Which ontologies should I use / How do I map data to ontologies?

We will try and answer these questions using Zooma: [www.ebi.ac.uk/spot/zooma](http://www.ebi.ac.uk/spot/zooma)

Copy and paste the below data into Zooma. They are all respiratory system diseases. Your data can be anything, doesn't need to be related to disease!

Age at smoking initiation in chronic obstructive pulmonary disease  
Airway responsiveness in chronic obstructive pulmonary disease  
Asthma or chronic obstructive pulmonary disease  
Body mass in chronic obstructive pulmonary disease  
Chronic obstructive pulmonary disease  
Crohn's disease and sarcoidosis (combined)  
Cystic fibrosis severity  
Gene methylation in lung tissue  
Idiopathic pulmonary fibrosis  
Interstitial lung disease  
Lung Cancer (DNA repair capacity)  
Lung adenocarcinoma  
Lung cancer  
Non-small cell lung cancer  
Pneumoconiosis in silica exposure  
Pulmonary Emphysema  
Pulmonary function  
Sarcoidosis  
Sepsis from pneumonia (survival)  
Squamous cell carcinoma  
YKL-40 levels  
Chronic bronchitis

## How can I translate from one ontology to another?

We will try and answer these questions using OxO: [www.ebi.ac.uk/spot/oxo](http://www.ebi.ac.uk/spot/oxo)

Copy and paste the below data into OxO. They are the mappings we managed to find via Zooma for the data above.

[http://www.ebi.ac.uk/efo/EFO\\_0000341](http://www.ebi.ac.uk/efo/EFO_0000341)  
[http://www.ebi.ac.uk/efo/EFO\\_0000341](http://www.ebi.ac.uk/efo/EFO_0000341)  
[http://www.ebi.ac.uk/efo/EFO\\_0000270](http://www.ebi.ac.uk/efo/EFO_0000270)  
[http://www.ebi.ac.uk/efo/EFO\\_0000341](http://www.ebi.ac.uk/efo/EFO_0000341)  
[http://www.ebi.ac.uk/efo/EFO\\_0000341](http://www.ebi.ac.uk/efo/EFO_0000341)  
[http://www.orpha.net/ORDO/Orphanet\\_797](http://www.orpha.net/ORDO/Orphanet_797)  
[http://purl.obolibrary.org/obo/NCIT\\_C2975](http://purl.obolibrary.org/obo/NCIT_C2975)  
[http://purl.obolibrary.org/obo/NCIT\\_C33024](http://purl.obolibrary.org/obo/NCIT_C33024)

[http://www.ebi.ac.uk/efo/EFO\\_0000768](http://www.ebi.ac.uk/efo/EFO_0000768)  
[http://purl.obolibrary.org/obo/DOID\\_3082](http://purl.obolibrary.org/obo/DOID_3082)  
[http://purl.obolibrary.org/obo/NCIT\\_C127142](http://purl.obolibrary.org/obo/NCIT_C127142)  
[http://www.ebi.ac.uk/efo/EFO\\_0000571](http://www.ebi.ac.uk/efo/EFO_0000571)  
[http://www.ebi.ac.uk/efo/EFO\\_0001071](http://www.ebi.ac.uk/efo/EFO_0001071)  
[http://www.ebi.ac.uk/efo/EFO\\_0003060](http://www.ebi.ac.uk/efo/EFO_0003060)  
[http://www.ebi.ac.uk/efo/EFO\\_0005853](http://www.ebi.ac.uk/efo/EFO_0005853)  
[http://purl.obolibrary.org/obo/NCIT\\_C3348](http://purl.obolibrary.org/obo/NCIT_C3348)  
[http://purl.obolibrary.org/obo/OMIM\\_608852](http://purl.obolibrary.org/obo/OMIM_608852)  
[http://purl.obolibrary.org/obo/NCIT\\_C34995](http://purl.obolibrary.org/obo/NCIT_C34995)  
[http://purl.obolibrary.org/obo/IDO\\_0000636](http://purl.obolibrary.org/obo/IDO_0000636)  
[http://www.ebi.ac.uk/efo/EFO\\_0000707](http://www.ebi.ac.uk/efo/EFO_0000707)  
[http://www.ebi.ac.uk/efo/EFO\\_0004869](http://www.ebi.ac.uk/efo/EFO_0004869)  
[http://purl.obolibrary.org/obo/NCIT\\_C26722](http://purl.obolibrary.org/obo/NCIT_C26722)

## PART II: Ontology Tools API session

### OLS API

**OLS API documentation** can be found here: <https://www.ebi.ac.uk/ols/docs/api>

#### Common scenarios

- Showing ontology term information in your own application
- Getting labels for a list of terms

**Terms API endpoint:** Comparing e.g. diabetes mellitus in EFO in the OLS UI and OLS API

[https://www.ebi.ac.uk/ols/ontologies/efo/terms?iri=http://www.ebi.ac.uk/efo/EFO\\_0000400](https://www.ebi.ac.uk/ols/ontologies/efo/terms?iri=http://www.ebi.ac.uk/efo/EFO_0000400)

[https://www.ebi.ac.uk/ols/api/ontologies/efo/terms?iri=http://www.ebi.ac.uk/efo/EFO\\_0000400](https://www.ebi.ac.uk/ols/api/ontologies/efo/terms?iri=http://www.ebi.ac.uk/efo/EFO_0000400)

#### What type of id do you have?

If you have an id but you don't know the format of your id? Our terms lookup endpoint can help

<https://www.ebi.ac.uk/ols/api/terms?id=EFO:0000400>

[https://www.ebi.ac.uk/ols/api/terms?id=EFO\\_0000400](https://www.ebi.ac.uk/ols/api/terms?id=EFO_0000400)

[https://www.ebi.ac.uk/ols/api/terms?id=http://www.ebi.ac.uk/efo/EFO\\_0000400](https://www.ebi.ac.uk/ols/api/terms?id=http://www.ebi.ac.uk/efo/EFO_0000400)

Can return multiple hits as terms get re-used in other ontologies. Luckily OLS will redirect you to the correct ontology. In the API we also have `defining_ontology = true` in the JSON to detect.

## HATEOAS links in the ReSTFUL API

The json contains “\_links” to perform certain action like getting parents of a term

### Common scenarios

- Finding all parents of a term when building a search index
- Validating a term is a child or another term

[https://www.ebi.ac.uk/ols/api/ontologies/efo/terms?iri=http://www.ebi.ac.uk/efo/EFO\\_0000400](https://www.ebi.ac.uk/ols/api/ontologies/efo/terms?iri=http://www.ebi.ac.uk/efo/EFO_0000400)

parents: Link to the direct parent resources for this term

ancestors: Link to all parent resources for this term

children: Link to the direct children resources for this term

## OLS search API endpoint

### Common scenarios

- Mapping text to ontology terms
- Building a term suggestion service

Search for diabetes: <https://www.ebi.ac.uk/ols/api/search?q=diabetes>

Restrict to...

... an ontology <https://www.ebi.ac.uk/ols/api/search?q=diabetes&ontology=efo>

... to label <https://www.ebi.ac.uk/ols/api/search?q=diabetes&ontology=efo&queryFields=label>

... to exact match <https://www.ebi.ac.uk/ols/api/search?q=diabetes&ontology=efo&exact=true>

### **Additional Query Syntax:**

exact phrase match	"point mutation"
Boolean queries	"point mutation" <b>and</b> "Familial clubfoot"
	"point mutation" <b>or</b> "Familial clubfoot"
negation with - e.g.	"point mutation" -"Familial clubfoot"
Partial regex with *	gynec*
fuzzy match with ~	hemopoiesis~ [diff spelling: hemopoiesis vs haemopoiesis]

**SPARQL** access to OLS through the EBI RDF platform (<https://www.ebi.ac.uk/rdf/>):

“Get all terms and labels from the Gene Ontology”

“Get all children of “cellular process” from the Gene Ontology “

“Find all terms that mention 'alzheimer' in the label”

# OxO API

Base URL: <https://www.ebi.ac.uk/spot/oxo/api/>

## Common scenarios

- Looking up an id for non ontology based resources (e.g. MeSH id)
- Finding mappings between ids

## **Terms lookup in OxO**

Why would I want to do that in OxO and not in OLS? Because OxO includes also resources that are not an ontology (e.g. MeSH) which can not be found in OLS.

**UI** - <https://www.ebi.ac.uk/spot/oxo/terms/EFO:0000400>

**API** - <https://www.ebi.ac.uk/spot/oxo/api/terms/EFO:0000400>

## **Follow links to get mappings**

"Mappings" - <https://www.ebi.ac.uk/spot/oxo/api/mappings?fromId=EFO:0000400>

Doing batch lookups with the search mappings endpoint:

- Specify a target
- Specify a source
- Specify a distance

<https://www.ebi.ac.uk/spot/oxo/api/search?ids=EFO:0000400&mappingTarget=doid&distance=3>

Only find mappings from a particular source e.g. EFO

<https://www.ebi.ac.uk/spot/oxo/api/search?ids=EFO:0000400&mappingTarget=doid&distance=3&mappingSource=EFO>