

## Introduction

Advanced Search is used in the ImmPort model to combine two or more simple queries using the Boolean operator 'AND' on metadata. The combined search is used to enhance the simple search capability for Reference Data analysis. This feature supplements and does not replace previous reference data search functionality. Advanced Reference Data is available from the homepage under the Reference Data tab.

This capability is available for the following categories of the ImmPort data:

- Gene
- SNP
- Protein
- MHC Allele

If you have any questions or comments contact helpdesk at [helpdesk@import.org](mailto:helpdesk@import.org).

## Goals of Advanced Search

Advanced Search can be used to support various items or activities in the ImmPort data model including:

- Apply multiple attributes from a single data category as filters
- Use multiple attributes from multiple data category as filters
- Facilitate searches for specific types of data
- Apply lists of records saved from previous queries as filter attributes

The current implementation of advanced search in ImmPort supports a Boolean 'AND' among filter attributes. Future implementations may support an 'OR' option with the Boolean operator applied to all filters. Lists previously created and saved from the Research Data Management module can be used by the Advanced Search module and vice versa.

## Types of Advanced Search

Advanced Search supports a wide spectrum of search strategies, technologies, and interfaces. Among the search strategies, the possibilities include:

- Keyword searches
- Data browsing
- Specific attributes search

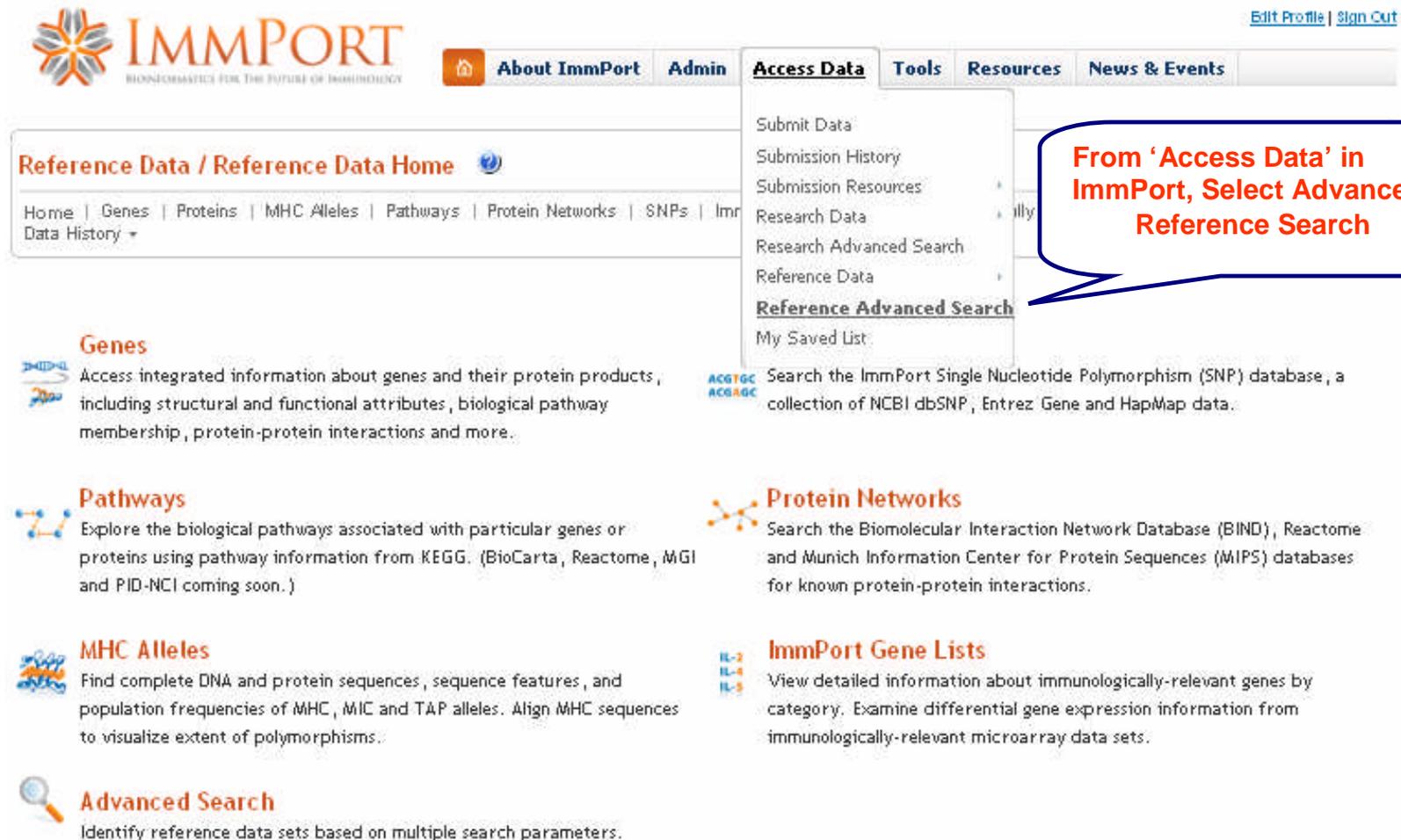
Browsing and simple text searches require little knowledge of the stored data. Searching with specific attributes assumes that the user has some prior knowledge of the topic and would like to focus their results.

Examples of searches include:

1. Using specific attributes of an entity to find a topic or category of interest. As additional filter categories are added, a form of browsing will continue to be supported with the advantage that more attributes may be used to browse and filter results.
2. Keyword Searching is used extensively for searching paradigms. A 'LIKE' match can be used to extend the 'EXACT' match queries.
3. A 'NOT EQUAL' filter term is used to obtain results that do not return the search term specified. This term is sometimes used closely with the term 'NOT MATCH' that is not currently supported in the ImmPort model.

To use Advanced Reference Data, go to the Search tab and scroll to Advanced Reference Data, ImmPort will take you to Project Selection.

- Advanced reference search can be used to find SNPs in a gene list.



**IMMPORT**  
BIOINFORMATICS FOR THE FUTURE OF IMMUNOLOGY

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**Reference Data / Reference Data Home**

[Home](#) | [Genes](#) | [Proteins](#) | [MHC Alleles](#) | [Pathways](#) | [Protein Networks](#) | [SNPs](#) | [ImmPort Data History](#)

**Genes**  
Access integrated information about genes and their protein products, including structural and functional attributes, biological pathway membership, protein-protein interactions and more.

**Pathways**  
Explore the biological pathways associated with particular genes or proteins using pathway information from KEGG. (BioCarta, Reactome, MGI and PID-NCI coming soon.)

**MHC Alleles**  
Find complete DNA and protein sequences, sequence features, and population frequencies of MHC, MIC and TAP alleles. Align MHC sequences to visualize extent of polymorphisms.

**Advanced Search**  
Identify reference data sets based on multiple search parameters.

**Protein Networks**  
Search the Biomolecular Interaction Network Database (BIND), Reactome and Munich Information Center for Protein Sequences (MIPS) databases for known protein-protein interactions.

**ImmPort Gene Lists**  
View detailed information about immunologically-relevant genes by category. Examine differential gene expression information from immunologically-relevant microarray data sets.

**ACGTGC**  
**ACGAGC**

**IL-2**  
**IL-4**  
**IL-5**

**From 'Access Data' in ImmPort, Select Advanced Reference Search**



# Reference Data Advanced Search

Once projects have been selected, the user has the option to browse projects by attributes or use attributes to filter for a more definitive search. The example below is a general search through selected projects for Gene defined only by the Entrez gene ID.

**Reference Data / Reference Advanced Search**

Home | Genes | Proteins | MHC Alleles | MHC Sequence Feature | Pathways | Protein Network Structure Viewer

**Using Advanced Search:**

- Choose the type of data you want to find (e.g. genes, proteins) from the drop down list.
- Choose a folder to refine your search. It can be the same or different data type from the data you want to find.
- Click on the data feature(s) you want to search.
- Enter search terms for one or more features.

**Notes:**  
Advanced search uses Genes as the link to the other data types (SNPs, MHC Alleles, Proteins) based on public sources.

**Use Display Columns to select data columns for table view**

**Advanced Search - Selected Return Data Type : Gene**

Please Choose Data Type to Find: Gene | Results per page: 25 | **Display Columns** | Submit | Cancel

**The category of data to find is selected here.**

**Select Attributes from Attribute Tree- Immune-Related Gene**

Gene: Name: IL2 | Remove

In this example, the data found in the search includes only data which met the defined criteria of species--*Homo sapiens* and which resided within the projects selected by the user.

Clicking the boxes which appear on the left side of the view will enable the user to select items and

- View details (click on View Details) or
- Save to a list (click Save Items).

You can also save all of the found items from a search to a list (Save All).

To further refine the search, click on the 'arrow button' to return to the Advanced Search Tree.

## Advanced Search

### Using Advanced Search:

1. Choose the type of data you want to find (e.g. genes, proteins) from the drop down list.
2. Choose a folder to refine your search. It can be the same or different data type from the data you want to find.
3. Click on the data feature(s) you want to search.
4. Enter search terms for one or more features.

### Hints:

When possible, do "exact match" searches or "starts with" instead of like or use saved lists for filtering, especially when returning SNPs.

### Notes:

Advanced search uses Genes as the link to the other data types (SNPs, MHC Alleles, Proteins) based on public sources.

To modify your search, please expand the search box 

**Select the arrow to return to the Attribute Tree for editing your search criteria**

Tip: You can select a range of items by clicking the first and last rows you wish to select. [More tips.](#)

**Select View Details, or Save**

Selected items: 3702

Page 1 of 1 |   View Details  Save Items  Save All  Export

<input checked="" type="checkbox"/>	Entrez Gene Id 	Symbol	Synonyms	Name	Taxonomy Name	Import Gene
<input checked="" type="checkbox"/>	3702	ITK	EMTJLYK MGC126257 MGC12	Inducible T-cell kinase	Homo sapiens	Y

**Select any or all boxes for detailed viewing or saving to a list**

**Save selected items to a list**

Displaying 1 - 1 of 1

## Data Returned from Advanced Search

This screen presents the data retrieved from ImmPort based upon the criteria selected by the user. From the Options Bar, the user has the option to view the details of each data type returned, save specific items or save all data. Click on the box next to the item to be viewed (multiple items can be retrieved by selecting individual boxes), then select 'View Details'. The Details view will include selected items in tab format. Click on each tab to view.

**Advanced Search - Selected Return Data Type : Gene**

Page 1 of 33 | View Details | Save Items | Save All | Export | Displaying 1 - 25 of 817

Entrez Gene ID	Gene Symbol	Name	Taxonomy Name	Import Gene
<input type="checkbox"/> 10000		4NQ250PK(B-GAMM)	v-akt murine thymoma viral on	Homo sapiens
<input type="checkbox"/> 100101119			S-phase kinase-associated pr	Homo sapiens
<input type="checkbox"/> 100101438	LOC100101438	MGC87444	phosphatidylinositol-4-phosph	Homo sapiens
<input type="checkbox"/> 100113306	UCKL10S	FLJ46647	uridine-cytidine kinase 1-like 1	Homo sapiens
<input type="checkbox"/> 100126691	SKP1P1	-	S-phase kinase-associated pr	Homo sapiens
<input type="checkbox"/> 100127883	LOC100127883	-	similar to inhibitor of Bruton ty	Homo sapiens
<input type="checkbox"/> 100128458	LOC100128458	-	similar to S-phase kinase-ass	Homo sapiens
<input type="checkbox"/> 100128764	LOC100128764	-	similar to protein-kinase, interf	Homo sapiens
<input type="checkbox"/> 100128834	LOC100128834	-	CDC-like kinase 3 pseudogene	Homo sapiens
<input type="checkbox"/> 100129074	LOC100129074	-	similar to protein-kinase, interf	Homo sapiens
<input type="checkbox"/> 100129267	LOC100129267	-	similar to activator of S phase	Homo sapiens
<input type="checkbox"/> 100129359	LOC100129359	-	similar to Riboflavin kinase	Homo sapiens
<input type="checkbox"/> 100129824	LOC100129824	-	similar to 68 kDa type I phosph	Homo sapiens
<input type="checkbox"/> 100129843	LOC100129843	-	similar to Dinucleoside diphosph	Homo sapiens

**View Details**

[Back to Advanced Search](#)  
[Gene Detailed Report](#)

**ITK** | **Select tabs to view each item.**

**Gene Summary**

Entrez Gene ID	3702	UniGene ID	Hs.558348
Entrez Gene Symbol	ITK	Entrez Gene Name	IL2-inducible T-cell kinase
Also known as	EMT; LYK; MGC126257; MGC126258; PSCTK2	Organism (Taxon ID)	Homo sapiens (9606)
Chromosome Location	5q31-q32	Genome Build	Build 36.1, hg18

**Gene Expression** [GEO](#)

**Transcripts**

chr5  
156550k 156560k 156570k 156580k 156590k 156600k 156610k

**RefSeq Genes**  
NM\_005546 (ImmPort Gene)  
ITK

[\[Click Here to View Reference Sequence Details\]](#)

**Protein** | **These can be expanded to view detailed information**

**Gene Ontology**

**Protein Interactions**

**Pathways**

**Phenotypes and Diseases**

**Polymorphism**

**Homologs**

**Related Sequences**

**References**

**Export** | **The data can be exported for further analysis**



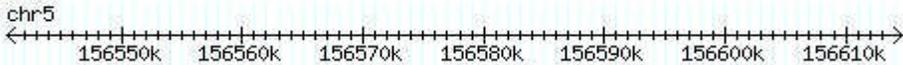
Items selected with 'View Details' will provide all relevant identifiers as defined by the original author. Multiple tabs will appear if multiple items are selected for viewing.

**ITK**
Collapse All:  Expand All:

**Gene Summary** ▾

Entrez Gene ID: <a href="#">3702</a> <span style="color: blue;">1</span>	UniGene ID: <a href="#">Hs.558348</a>
Entrez Gene Symbol: ITK	Entrez Gene Name: IL2-inducible T-cell kinase
Also known as: EMT; LYK; MGC126257; MGC126258; PSCTK2	Organism (Taxon ID): Homo sapiens (9606)
Chromosome Location: 5q31-q32	Genome Build: Build 36.1, hg18
Gene Expression: <a href="#">GEO</a>	

**Transcripts**

chr5  


**RefSeq Genes**  
 NM\_005546 (ImmPort Gene)  
  
[ITK](#)

[Click Here to View Reference Sequence Details](#)

RefSeq mRNA:	<a href="#">NM_005546.3</a>
RefSeq mRNA gi:	21614549
Chromosome (strand):	chr5 (+)
Transcript Span (length):	156540484...156614687 (74204 bp)
CDS Span (length):	156540566...156612266(71701 bp)
Exon Count:	17
Exon Spans (length):	156540484...156540704 (221 bp) / 156568477...156568582 (106 bp) / 156570875...156570957 (83 bp) / 156573779...156573908 (130 bp) / 156577454...156577495 (42 bp) / 156582450...156582602 (153 bp) / 156587883...156587949 (67 bp) / 156591927...156591982 (56 bp) / 156597696...156597779 (84 bp) / 156599649...156599783 (135 bp) / 156601233...156601308 (76 bp) / 156603210...156603382 (173 bp) / 156603849...156604066 (218 bp) / 156605313...156605378 (66 bp) / 156605468...156605587 (120 bp) / 156608437...156608595 (159 bp) / 156612194...156614687 (2494 bp) /
Sequence:	<a href="#">[View]</a>

Click to view the details of the Reference Sequence



The user has the option to refine the search by selecting additional attributes from the attribute tree which will result in fewer and more targeted data returned. Click 'Submit' when selecting or editing has been completed.



## Reference Advanced Search

Selected Projects

Change Projects

### Using Advanced Search:

1. Choose the type of data you want to find (e.g. genes, proteins) from the drop down list.
2. Choose a folder to refine your search. It can be the same or different data type from the data you want to find.
3. Click on the data feature(s) you want to search.
4. Enter search terms for one or more features.

### Hints:

When possible, do "exact match" searches or "starts with" instead of like or use saved lists for filtering, especially when returning SNPs.

### Notes:

Advanced search uses Genes as the link to the other data types (SNPs, M...

Select the arrow button to return to the Attribute Tree for editing

**Advanced Search - Selected Return Data Type : Gene**

Please Choose Data Type to Find :  Results per page :

<ul style="list-style-type: none"> <li>Advanced Search Attribute Tree           <ul style="list-style-type: none"> <li>Gene</li> <li>SNP               <ul style="list-style-type: none"> <li>dbSNP ID</li> <li>Saved List</li> <li>Function</li> <li>HapMap</li> <li>Chromosome</li> </ul> </li> <li>Protein               <ul style="list-style-type: none"> <li>Accession</li> <li>Saved List</li> <li>Accession Name</li> <li>Protein Name</li> </ul> </li> <li>MHC Allele</li> </ul> </li> </ul>	<p>Gene: Entrez Gene Id <input type="text" value="Like"/> <input type="button" value="Remove"/></p> <p>SNP: dbSNP ID <input type="text" value="Exact Match"/> <input type="button" value="Remove"/></p>
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The user has the option to refine the search by selecting additional attributes from the attribute tree which will result in fewer and more targeted data returned. Click 'Submit' when selecting or editing has been completed.

## Advanced Search

### Using Advanced Search:

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### Hints:

When possible, do "exact match" searches or "starts with" instead of like or use saved lists for filtering, especially when returning SNPs.

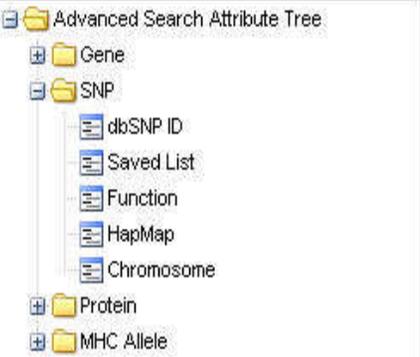
### Notes:

Advanced search uses Genes as the link to the other data types (SNPs, MHC Alleles, Proteins) based on public sources.

**Select the arrow button to return to the Attribute Tree for editing**

**Advanced Search - Selected Return Data Type : Gene**

Please Choose Data Type to Find :  Results per page :

	Gene: Name	<input type="text" value="il2"/>	<input type="button" value="Remove"/>
	Gene: Species	<input type="text" value="Drosophila melanogaster"/> <input type="text" value="Gallus gallus"/>	<input type="button" value="Remove"/>

The greater the number of attributes selected, the greater the filtering of selected project data. From the 'Returned Data Type' screen the user has the option to continue with data refinement by clicking on the arrow button, changing projects, viewing details of selected returned data or saving selected data to a project.



## Reference Advanced Search

### Using Advanced Search:

1. Choose the type of data you want to find in the list.
2. Choose a folder to refine your search. If you are not sure, click on the 'All' folder from the left-hand side of the screen.
3. Click on the data feature(s) you want to search.
4. Enter search terms for one or more features.

A maximum of 10,000 records will be saved to the list.

Select a project to save the list\*

List Name\*

Description

Note: The project determines who else can see your list.

### Notes:

Advanced search uses Genes as the link to the other data types (SNPs, MHC Alleles, Proteins) based on public sources.

Select 'Save Items' or 'Save All' and a 'Save' option box (see above) will appear. The user can define the project to which the data list is to be saved. Data saved in this way can be retrieved at a later date.

Advanced Search - Selected Return Data Type : Gene

Tip: You can select a range of rows by holding down the 'Shift' key and then clicking on the first and last rows. [More tips.](#)

Selected items: 1, 10, 100

Page 1 of 8628 | View Details | Save Items | Save All | Export | Displaying 1 - 25 of 215684

<input type="checkbox"/>	Entrez Gene Id	Symbol	Synonyms	Name	Taxonomy Name	Import Gene
<input checked="" type="checkbox"/>	1	A1BG	A1B ABG DKFZp686F0970 G.	alpha-1-B glycoprotein	Homo sapiens	
<input checked="" type="checkbox"/>	10	NAT2	AAC2 PNAT	N-acetyltransferase 2 (arylami	Homo sapiens	
<input checked="" type="checkbox"/>	100	ADA	-	adenosine deaminase	Homo sapiens	Y
<input type="checkbox"/>	1000	CDH2	CD325 CDHN CDw325 NCAD	cadherin 2, type 1, N-cadherin	Homo sapiens	Y
<input type="checkbox"/>	10000	AKT3	DKFZp434N0250 PKB-GAMM	v-akt murine thymoma viral or	Homo sapiens	
<input type="checkbox"/>	100008564	Gm14018	OTTMUSG00000015378 Wdr	predicted gene 14018	Mus musculus	
<input type="checkbox"/>	100008565	Slc39a4l	Slc39a10 Zip10	solute carrier family 39 (zinc tr	Rattus norvegicus	

The greater the number of attributes selected, the greater the filtering of selected project data. From the 'Returned Data Type' screen the user has the option to continue with data refinement by clicking on the arrow button, changing projects, viewing details of selected returned data or saving selected data to a project.

## Advanced Search

### Using Advanced Search:

1. Choose the type of data you want to find down list.
2. Choose a folder to refine your search, from the data you want to find.
3. Click on the data feature(s) you want to search.
4. Enter search terms for one or more features.

Select a project to save the list \*

List Name \*

Description

### Notes:

Advanced search uses Genes as the link to the other data types (SNPs, MHC Alleles, Proteins) based on public sources.

To modify your search, please expand the search box →

Advanced Search - Selected Return Data Type : Gene

Tip: You can select a range of rows by holding down the 'Shift' key

Selected items: 16428, 363577, 3702

**Select 'Save Items' or 'Save All' and a 'Save' option box (see above) will appear. The user can define the project to which the data list is to be saved. Data saved in this way can be retrieved at a later date.**

Page 1 of 1 |   View Details  Save Items  Save All  Export Displaying 1 - 5 of 5

<input type="checkbox"/>	Entrez Gene Id ▲	Symbol	Synonyms	Name	Taxonomy Name	Import Gene
<input checked="" type="checkbox"/>	16428	Itk	Emt Tcsk Tsk	IL2-inducible T-cell kinase	Mus musculus	
<input checked="" type="checkbox"/>	363577	Itk	-	IL2-inducible T-cell kinase	Rattus norvegicus	
<input checked="" type="checkbox"/>	3702	ITK	EMT LYK MGC126257 MGC12	IL2-inducible T-cell kinase	Homo sapiens	Y
<input type="checkbox"/>	416247	ITK	-	IL2-inducible T-cell kinase	Gallus gallus	
<input type="checkbox"/>	715471	LOC715471	-	similar to IL2-inducible T-cell k	Macaca mulatta	

The greater the number of attributes selected, the greater the filtering of selected project data. From the 'Returned Data Type' screen the user has the option to continue with data refinement by clicking on the arrow button, changing projects, viewing details of selected returned data or saving selected data to a project.

## Advanced Search

Selected Projects

Change Projects

### Using Advanced Search:

1. Choose the type of data you want to find (e.g. subjects, samples) from the drop down list.
2. Choose a folder to refine your search. It can be the same or different data type from the data you want to find.
3. Click on the data feature(s) you want to search.
4. Enter search terms for one or more features.

To modify your search, please expand the search box 

Advanced Search - Selected Return Data Type : Subject 

View details or save

Arrow button

Page 1 of 1   View Details  Save Items  Save All Displaying 1 - 10 of 10

Sub Org Accession	User-Defined ID	Species	Race/Strain	Gender	Upload Ticket	Project Title	Submitter	Submit Date
<input type="checkbox"/> SUB209767	PatientSample_1	Homo sapiens	Caucasian	male	pi1_20080728_2963	Jane Doe Project	pi1	2008-07-28
<input type="checkbox"/> SUB209768	PatientSample_2	Homo sapiens	Caucasian	female	pi1_20080728_2963	Jane Doe Project	pi1	2008-07-28
<input type="checkbox"/> SUB209769	PatientSample_3	Homo sapiens	African-American	male	pi1_20080728_2963	Jane Doe Project	pi1	2008-07-28
<input type="checkbox"/> SUB209770	PatientSample_4	Homo sapiens	Asian	female	pi1_20080728_2963	Jane Doe Project	pi1	2008-07-28
<input type="checkbox"/> SUB209772	PatientSample_6	Homo sapiens	African-American	male	pi1_20080728_2963	Jane Doe Project	pi1	2008-07-28
<input type="checkbox"/> SUB209773	PatientSample_7	Homo sapiens	Caucasian	male	pi1_20080728_2963	Jane Doe Project	pi1	2008-07-28
<input type="checkbox"/> SUB209774	PatientSample_8	Homo sapiens	Non-Hispanic	female	pi1_20080728_2963	Jane Doe Project	pi1	2008-07-28
<input type="checkbox"/> SUB209775	PatientSample_9	Homo sapiens	Caucasian	male	pi1_20080728_2963	Jane Doe Project	pi1	2008-07-28
<input type="checkbox"/> SUB209776	PatientSample_10	Homo sapiens	Caucasian	male	pi1_20080728_2963	Jane Doe Project	pi1	2008-07-28
<input type="checkbox"/>	Sample_11	Homo sapiens	Caucasian	male	pi1_20080728_2963	Jane Doe Project	pi1	2008-07-28

Select data

The greater the number of attributes selected, the greater the filtering of selected project data. From the 'Returned Data Type' screen the user has the option to continue with data refinement by clicking on the arrow button, changing projects, viewing details of selected returned data or saving selected data to a project.

**Advanced Search** - Selected Return Data Type : Gene ▼

Tip: You can select a range of items by clicking the first and last items you wish to select. [more tips.](#)

Selected items: 16428, 363577

**View details or save**

Page 1 of 1 | View Details | Save Items | Save All | Export | Displaying 1 - 5 of 5

<input type="checkbox"/>	Entrez Gene Id ▲	Symbol	Synonyms	Name	Taxonomy Name	Import Gene
<input checked="" type="checkbox"/>	16428	Itk	Ent Tcsk Tsk	IL2-inducible T-cell kinase	Mus musculus	
<input checked="" type="checkbox"/>	363577	Itk	-	IL2-inducible T-cell kinase	Rattus norvegicus	
<input checked="" type="checkbox"/>	3702	ITK	EMT LYK MGC126257 MGC12	IL2-inducible T-cell kinase	Homo sapiens	Y
<input type="checkbox"/>	416247	ITK	-	IL2-inducible T-cell kinase	Gallus gallus	
<input type="checkbox"/>	715471	LOC715471	-	similar to IL2-inducible T-cell k	Macaca mulatta	

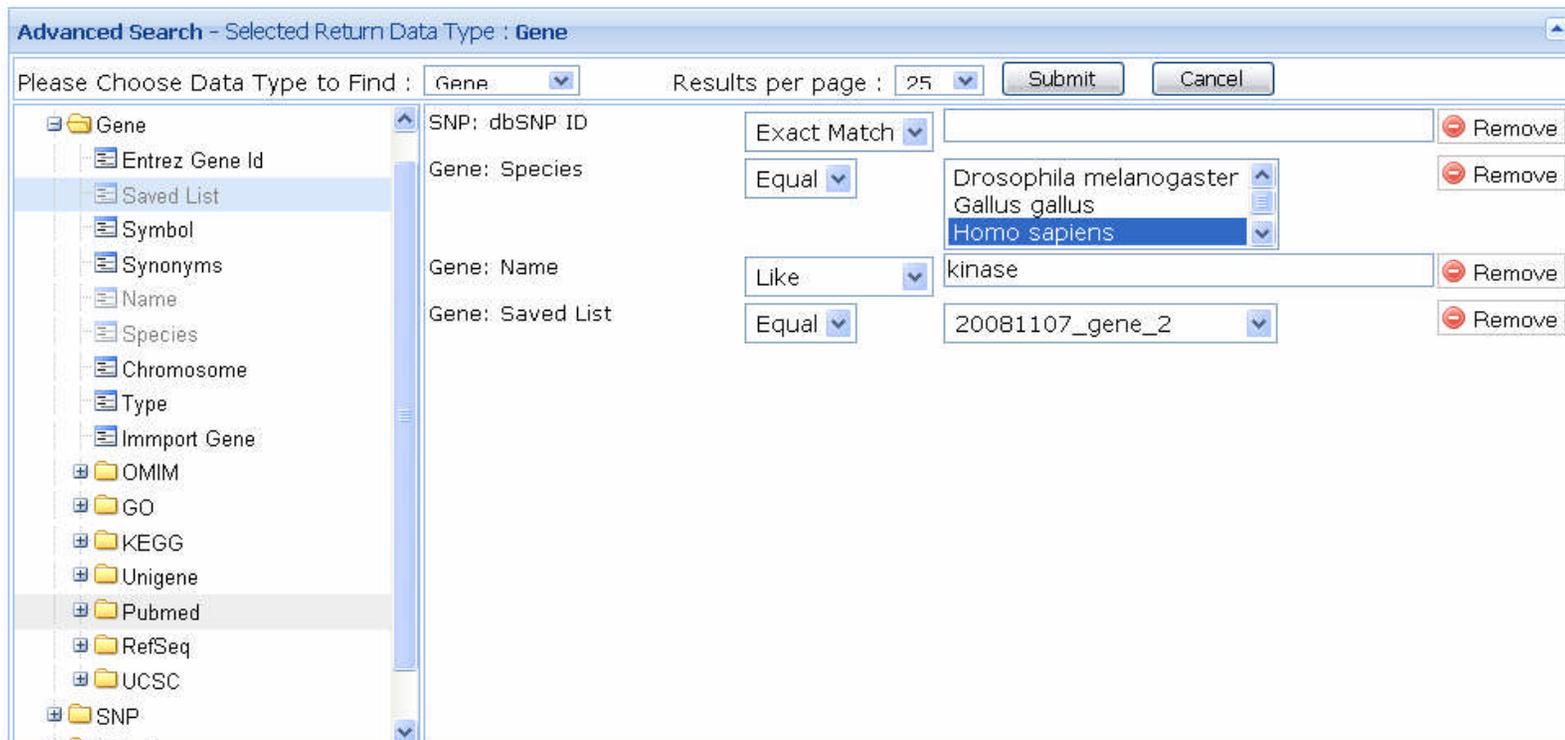
**Select data**

**Arrow button**

To retrieve 'Saved' lists, return to Advanced Search, reselect the project to which the list was saved, click 'Select Projects'. From the Advance Search Attributes Tree view, select the data type of contained within the save listed (i.e. subject, biological samples, etc.) and go to 'Saved List'. A drop down menu will appear with the user's saved list contained within. Select the list and click 'Submit' to view the data within the list.

**Using Advanced Search:**

1. Choose the type of data you want to find (e.g. subjects, samples) from the drop down list.
2. Choose a folder to refine your search. It can be the same or different data type from the data you want to find.
3. Click on the data feature(s) you want to search.
4. Enter search terms for one or more features.



**Advanced Search - Selected Return Data Type : Gene**

Please Choose Data Type to Find :  Results per page :

Gene	SNP: dbSNP ID	Exact Match		Remove
Entrez Gene Id	Gene: Species	Equal	Drosophila melanogaster Gallus gallus Homo sapiens	Remove
Saved List	Gene: Name	Like	kinase	Remove
Symbol	Gene: Saved List	Equal	20081107_gene_2	Remove