

MyGene.info R Client

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Contents

1	Overview	2
2	Gene Annotation Service	2
2.1	<code>getGene</code>	2
2.2	<code>getGenes</code>	2
3	Gene Query Service	3
3.1	<code>query</code>	3
3.2	<code>queryMany</code>	4
4	<code>makeTxDbFromMyGene</code>	5
5	Tutorial, ID mapping	6
5.1	Mapping gene symbols to Entrez gene ids	6
5.2	Mapping gene symbols to Ensembl gene ids	7
5.3	When an input has no matching gene	8
5.4	When input ids are not just symbols	9
5.5	When an input id has multiple matching genes	10
5.6	Can I convert a very large list of ids?.	11
6	References	11

1 Overview

MyGene.Info provides simple-to-use REST web services to query/retrieve gene annotation data. It's designed with simplicity and performance emphasized. *mygene* is an easy-to-use R wrapper to access MyGene.Info services.

2 Gene Annotation Service

2.1 `getGene`

- Use `getGene`, the wrapper for GET query of `"/gene/<geneid>"` service, to return the gene object for the given geneid.

```
> gene <- getGene("1017", fields="all")
> length(gene)

[1] 1

> gene["name"]

[[1]]
NULL

> gene["taxid"]

[[1]]
NULL

> gene["uniprot"]

[[1]]
NULL

> gene["refseq"]

[[1]]
NULL
```

2.2 `getGenes`

- Use `getGenes`, the wrapper for POST query of `"/gene"` service, to return the list of gene objects for the given character vector of geneids.

```
> getGenes(c("1017", "1018", "ENSG00000148795"))
```

DataFrame with 3 rows and 7 columns

	query	_id	X_score	entrezgene			
	<character>	<character>	<numeric>	<character>			
1	1017	1017	24.1819	1017			
2	1018	1018	24.1816	1018			
3	ENSG00000148795	1586	22.8137	1586			

		name	symbol	taxid
		<character>	<character>	<integer>
1		cyclin dependent kinase 2	CDK2	9606
2		cyclin dependent kinase 3	CDK3	9606
3	cytochrome P450 family 17 subfamily A member 1		CYP17A1	9606

3 Gene Query Service

3.1 query

- Use `query`, a wrapper for GET query of `"/query?q=<query>"` service, to return the query result.

```
> query(q="cdk2", size=5)
```

```
$max_score
[1] 440.2867
```

```
$took
[1] 43
```

```
$total
[1] 916
```

```
$hits
```

	_id	_score	entrezgene	name	symbol	taxid
1	1017	440.2867	1017	cyclin dependent kinase 2	CDK2	9606
2	12566	372.5758	12566	cyclin-dependent kinase 2	Cdk2	10090
3	362817	312.4615	362817	cyclin dependent kinase 2	Cdk2	10116
4	ENSOABG00000013079	286.5968	<NA>	cyclin-dependent kinase 2	cdk2	47969
5	100592796	286.5968	100592796	cyclin dependent kinase 2	CDK2	61853

MyGene.info R Client

```
> query(q="NM_013993")

$max_score
[1] 7.549415

$took
[1] 20

$total
[1] 1

$hits
  _id  _score entrezgene          name symbol
1 780 7.549415      780 discoidin domain receptor tyrosine kinase 1  DDR1
  taxid
1 9606
```

3.2 queryMany

- Use `queryMany`, a wrapper for POST query of `"/query"` service, to return the batch query result.

```
> queryMany(c('1053_at', '117_at', '121_at', '1255_g_at', '1294_at'),
+           scopes="reporter", species="human")

Finished
Pass returnall=TRUE to return lists of duplicate or missing query terms.
DataFrame with 6 rows and 7 columns
  query      _id  X_score  entrezgene
<character> <character> <numeric> <character>
1 1053_at    5982  13.1638    5982
2 117_at     3310  13.1367    3310
3 121_at     7849  13.1367    7849
4 1255_g_at  2978  13.1638    2978
5 1294_at    7318  13.1638    7318
6 1294_at  100847079  13.1570  100847079
  name          symbol  taxid
<character> <character> <integer>
1 replication factor C subunit 2  RFC2  9606
2 heat shock protein family A (Hsp70) member 6  HSPA6  9606
3 paired box 8  PAX8  9606
```

4	guanylate cyclase activator 1A	GUCA1A	9606
5	ubiquitin like modifier activating enzyme 7	UBA7	9606
6	microRNA 5193	MIR5193	9606

4 makeTxDbFromMyGene

TxDb is a container for storing transcript annotations. `makeTxDbFromMyGene` allows the user to make a TxDb object in the Genomic Features package from a mygene "exons" query using a default mygene object.

```
> xli <- c('CCDC83',
+         'MAST3',
+         'RPL11',
+         'ZDHHC20',
+         'LUC7L3',
+         'SNORD49A',
+         'CTSH',
+         'ACOT8')
> txdb <- makeTxDbFromMyGene(xli,
+                            scopes="symbol", species="human")
> transcripts(txdb)
```

GRanges object with 17 ranges and 2 metadata columns:

	seqnames	ranges	strand	tx_id	tx_name
	<Rle>	<IRanges>	<Rle>	<integer>	<character>
[1]	11	85855100-85920020	+	1	NM_001286159
[2]	11	85855100-85920020	+	2	NM_173556
[3]	19	18097777-18151686	+	3	NM_015016
[4]	1	23691805-23696835	+	4	NM_000975
[5]	1	23691778-23696426	+	5	NM_001199802
...
[13]	17	50719602-50756215	+	13	NM_016424
[14]	17	16440035-16440106	+	14	NR_002744
[15]	15	78921749-78945098	-	15	NM_001319137
[16]	15	78921059-78945046	-	16	NM_004390
[17]	20	45841720-45857392	-	17	NM_005469

```
-----
seqinfo: 7 sequences from an unspecified genome; no seqlengths
```

MyGene.info R Client

`makeTxDbFromMyGene` invokes either the `query` or `queryMany` method and passes the response to construct a `TxDb` object. See `?TxDb` for methods to utilize and access transcript annotations.

5 Tutorial, ID mapping

ID mapping is a very common, often not fun, task for every bioinformatician. Supposedly you have a list of gene symbols or reporter ids from an upstream analysis, and then your next analysis requires to use gene ids (e.g. Entrez gene ids or Ensembl gene ids). So you want to convert that list of gene symbols or reporter ids to corresponding gene ids.

Here we want to show you how to do ID mapping quickly and easily.

5.1 Mapping gene symbols to Entrez gene ids

Suppose `xli` is a list of gene symbols you want to convert to entrez gene ids:

```
> xli <- c('DDX26B',
+         'CCDC83',
+         'MAST3',
+         'FLOT1',
+         'RPL11',
+         'ZDHHC20',
+         'LUC7L3',
+         'SNORD49A',
+         'CTSH',
+         'ACOT8')
```

You can then call `queryMany` method, telling it your input is `symbol`, and you want `entrezgene` (Entrez gene ids) back.

```
> queryMany(xli, scopes="symbol", fields="entrezgene", species="human")
Finished
Pass returnall=TRUE to return lists of duplicate or missing query terms.
DataFrame with 11 rows and 5 columns
```

	query	notfound	_id	X_score	entrezgene
	<character>	<logical>	<character>	<numeric>	<character>
1	DDX26B	TRUE	NA	NA	NA
2	CCDC83	NA	220047	89.2326	220047

3	MAST3	NA	23031	89.7272	23031
4	FLOT1	NA	10211	91.0142	10211
5	RPL11	NA	6135	82.8755	6135
6	ZDHHC20	NA	253832	89.2326	253832
7	LUC7L3	NA	51747	87.2761	51747
8	SNORD49A	NA	ENSG00000277370	103.0028	NA
9	SNORD49A	NA	26800	100.9490	26800
10	CTSH	NA	1512	87.6581	1512
11	ACOT8	NA	10005	87.9893	10005

5.2 Mapping gene symbols to Ensembl gene ids

Now if you want Ensembl gene ids back:

```
> out <- queryMany(xli, scopes="symbol", fields="ensembl.gene", species="human")
Finished
Pass returnall=TRUE to return lists of duplicate or missing query terms.
> out
DataFrame with 11 rows and 5 columns
  query notfound      _id X_score
<character> <logical> <character> <numeric>
1   DDX26B      TRUE      NA      NA
2   CCDC83      NA      220047  89.2326
3   MAST3       NA      23031   89.7272
4   FLOT1       NA      10211   91.0142
5   RPL11       NA      6135    82.8755
6   ZDHHC20     NA      253832  89.2326
7   LUC7L3     NA      51747   87.2761
8   SNORD49A    NA      ENSG00000277370 103.0028
9   SNORD49A    NA      26800   100.9490
10  CTSH        NA      1512    87.6581
11  ACOT8       NA      10005   87.9893
      ensembl
      <list>
1
2
3
4  ENSG00000223654, ENSG00000206480, ENSG00000224740
5  ENSG00000142676
```

MyGene.info R Client

```
6           ENSG00000180776
7           ENSG00000108848
8           ENSG00000277370
9
10          ENSG00000103811
11          ENSG00000101473

> out$ensembl[[4]]$gene

[1] "ENSG00000223654" "ENSG00000206480" "ENSG00000224740" "ENSG00000230143"
[5] "ENSG00000137312" "ENSG00000232280" "ENSG00000206379" "ENSG00000236271"
```

5.3 When an input has no matching gene

In case that an input id has no matching gene, you will be notified from the output. The returned list for this query term contains `notfound` value as `True`.

```
> xli <- c('DDX26B',
+         'CCDC83',
+         'MAST3',
+         'FLOT1',
+         'RPL11',
+         'Gm10494')
> queryMany(xli, scopes="symbol", fields="entrezgene", species="human")
```

Finished

Pass `returnall=TRUE` to return lists of duplicate or missing query terms.

DataFrame with 6 rows and 5 columns

	query	notfound	_id	X_score	entrezgene
	<character>	<logical>	<character>	<numeric>	<character>
1	DDX26B	TRUE	NA	NA	NA
2	CCDC83	NA	220047	89.2326	220047
3	MAST3	NA	23031	89.7272	23031
4	FLOT1	NA	10211	91.0142	10211
5	RPL11	NA	6135	82.8755	6135
6	Gm10494	TRUE	NA	NA	NA

5.4 When input ids are not just symbols

```
> xli <- c('DDX26B',
+         'CCDC83',
+         'MAST3',
+         'FLOT1',
+         'RPL11',
+         'Gm10494',
+         '1007_s_at',
+         'AK125780')
>
```

Above id list contains symbols, reporters and accession numbers, and supposedly we want to get back both Entrez gene ids and uniprot ids. Parameters `scopes`, `fields`, `species` are all flexible enough to support multiple values, either a list or a comma-separated string:

```
> out <- queryMany(xli, scopes=c("symbol", "reporter", "accession"),
+                 fields=c("entrezgene", "uniprot"), species="human")
```

Finished

Pass `returnall=TRUE` to return lists of duplicate or missing query terms.

```
> out
```

DataFrame with 9 rows and 7 columns

	query	notfound	_id	X_score	entrezgene	uniprot.Swiss.Prot
	<character>	<logical>	<character>	<numeric>	<character>	<character>
1	DDX26B	TRUE	NA	NA	NA	NA
2	CCDC83	NA	220047	89.2326	220047	Q8IWF9
3	MAST3	NA	23031	89.7272	23031	060307
4	FLOT1	NA	10211	91.0142	10211	075955
5	RPL11	NA	6135	82.8755	6135	P62913
6	Gm10494	TRUE	NA	NA	NA	NA
7	1007_s_at	NA	780	13.1638	780	Q08345
8	1007_s_at	NA	100616237	13.1570	100616237	NA
9	AK125780	NA	2978	16.2995	2978	P43080
						uniprot.TrEMBL
						<list>
1						
2						H0YDV3
3						V9GYV0
4						A2AB10, Q5ST80, A2AB09, ...

MyGene.info R Client

```
5           Q5VVC8,Q5VVD0,A0A2R8Y447
6
7 A0A0A0MSX3,A0A024RCJ0,A0A024RCL1,...
8
9           A0A0A0MTF5,B2R9P6

> out$uniprot.Swiss.Prot[[5]]

[1] "P62913"
```

5.5 When an input id has multiple matching genes

From the previous result, you may have noticed that query term `1007_s_at` matches two genes. In that case, you will be notified from the output, and the returned result will include both matching genes.

By passing `returnall=TRUE`, you will get both duplicate or missing query terms

```
> queryMany(xli, scopes=c("symbol", "reporter", "accession"),
+           fields=c("entrezgene", "uniprot"), species='human', returnall=TRUE)

Finished
$response
DataFrame with 9 rows and 7 columns
  query  notfound  _id  X_score  entrezgene  uniprot.Swiss.Prot
<character> <logical> <character> <numeric> <character> <character>
1  DDX26B      TRUE      NA      NA      NA      NA
2  CCDC83      NA    220047  89.2326  220047  Q8IWF9
3  MAST3       NA    23031  89.7272  23031  060307
4  FLOT1       NA    10211  91.0142  10211  075955
5  RPL11       NA    6135  82.8755  6135  P62913
6  Gm10494     TRUE      NA      NA      NA      NA
7  1007_s_at   NA     780  13.1638  780  Q08345
8  1007_s_at   NA  100616237  13.1570  100616237  NA
9  AK125780    NA     2978  16.2995  2978  P43080

          uniprot.TrEMBL
          <list>
1
2
3
4           A2AB10,Q5ST80,A2AB09,...
5           Q5VVC8,Q5VVD0,A0A2R8Y447
```

MyGene.info R Client

```
6
7 A0A0A0MSX3,A0A024RCJ0,A0A024RCL1,...
8
9                A0A0A0MTF5,B2R9P6

$duplicates
  X1007_s_at
1           2

$missing
[1] "DDX26B" "Gm10494"
```

The returned result above contains `out` for mapping output, `missing` for missing query terms (a list), and `dup` for query terms with multiple matches (including the number of matches).

5.6 Can I convert a very large list of ids?

Yes, you can. If you pass an id list (i.e., `xli` above) larger than 1000 ids, we will do the id mapping in-batch with 1000 ids at a time, and then concatenate the results all together for you. So, from the user-end, it's exactly the same as passing a shorter list. You don't need to worry about saturating our backend servers. Large lists, however, may take a while longer to query, so please wait patiently.

6 References

Wu C, MacLeod I, Su AI (2013) BioGPS and MyGene.info: organizing online, gene-centric information. *Nucl. Acids Res.* 41(D1): D561-D565. help@mygene.info