

# MyGene.info R Client

Adam Mark, Ryan Thompson, Chunlei Wu

October 20, 2014

## Contents

---

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

## 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] 36

> gene$name
[1] "cyclin-dependent kinase 2"

> gene$taxid
[1] 9606

> gene$uniprot
$`Swiss-Prot`
[1] "P24941"

$TrEMBL
[1] "B4DDL9" "E7ESI2" "G3V317" "G3V5T9"

> gene$refseq

$genomic
[1] "AC_000144" "NC_000012" "NC_018923" "NG_034014" "NT_029419"
[6] "NW_001838059" "NW_004929384"

$rna
[1] "NM_001290230" "NM_001798" "NM_052827"

$protein
[1] "NP_001277159" "NP_001789" "NP_439892"
```

### 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"))
```

```
chr "symbol,name,taxid,entrezgene"
DataFrame with 3 rows and 6 columns
```

	name	symbol	taxid	entrezgene
--	------	--------	-------	------------

	<character>	<character>	<integer>	<integer>
1	cyclin-dependent kinase	2	CDK2	9606
2	cyclin-dependent kinase	3	CDK3	9606
3	cytochrome P450, family 17, subfamily A, polypeptide	1	CYP17A1	9606

  

	query	_id
	<character>	<character>
1	1017	1017
2	1018	1018
3	ENSG00000148795	1586

## 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)
```

```
$hits
```

	entrezgene	name	_score	symbol	_id	taxid
1	1017	cyclin-dependent kinase	2 363.16687	CDK2	1017	9606
2	12566	cyclin-dependent kinase	2 349.61835	Cdk2	12566	10090
3	362817	cyclin dependent kinase	2 257.73132	Cdk2	362817	10116
4	52004	CDK2-associated protein	2 20.93741	Cdk2ap2	52004	10090
5	143384	CDK2-associated, cullin domain	1 18.94402	CACUL1	143384	9606

```
$max_score
```

```
[1] 363.1669
```

```
$took
```

```
[1] 27
```

```
$total
```

```
[1] 27
```

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

```
$hits
```

	entrezgene	name	_score	symbol	_id	taxid
1	780	discoidin domain receptor tyrosine kinase	1 0.5271054	DDR1	780	9606

```
$max_score
```

```
[1] 0.5271054
```

```
$took
```

```
[1] 74
```

```
$total
```

```
[1] 1
```

### 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
```

```
DataFrame with 5 rows and 6 columns
```

	name	symbol	taxid	entrezgene
	<character>	<character>	<integer>	<integer>
1	replication factor C (activator 1) 2, 40kDa	RFC2	9606	5982
2	heat shock 70kDa protein 6 (HSP70B')	HSPA6	9606	3310
3	paired box 8	PAX8	9606	7849
4	guanylate cyclase activator 1A (retina)	GUCA1A	9606	2978
5	ubiquitin-like modifier activating enzyme 7	UBA7	9606	7318

  

	query	_id
	<character>	<character>
1	1053_at	5982
2	117_at	3310
3	121_at	7849
4	1255_g_at	2978
5	1294_at	7318

## 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('DDX26B',
+          'CCDC83',
+          'MAST3',
+          'RPL11',
+          'ZDHHC20',
+          'LUC7L3',
+          'SNORD49A',
+          'CTSH',
+          'ACOT8')
```

```
> txdb <- makeTxDbFromMyGene(xli,
+                             scopes="symbol", species="human")
> transcripts(txdb)
```

GRanges object with 15 ranges and 2 metadata columns:

	seqnames	ranges	strand	tx_id	tx_name
	<Rle>	<IRanges>	<Rle>	<integer>	<character>
[1]	1	[24018268, 24022915]	+	5	NM_001199802
[2]	1	[24018268, 24022915]	+	6	NM_000975
[3]	11	[85566143, 85631063]	+	2	NM_001286159
[4]	11	[85566143, 85631063]	+	3	NM_173556
[5]	13	[21946709, 22033508]	-	10	NM_153251
...	...	...	...	...	...
[11]	17	[48796925, 48830072]	+	11	NM_016424
[12]	17	[48796925, 48830072]	+	12	NM_006107
[13]	19	[18208602, 18262499]	+	4	NM_015016
[14]	20	[44470359, 44486048]	-	15	NM_005469
[15]	X	[134654554, 134716460]	+	1	NM_182540

-----  
seqinfo: 8 sequences from an unspecified genome; no seqlengths

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

DataFrame with 10 rows and 3 columns

	query	entrezgene	_id
	<character>	<integer>	<character>
1	DDX26B	203522	203522
2	CCDC83	220047	220047
3	MAST3	23031	23031
4	FLOT1	10211	10211
5	RPL11	6135	6135
6	ZDHHC20	253832	253832
7	LUC7L3	51747	51747
8	SNORD49A	26800	26800
9	CTSH	1512	1512
10	ACOT8	10005	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

```
> out
```

DataFrame with 10 rows and 3 columns

	ensembl.gene	_id	query
	<CharacterList>	<character>	<character>
1	ENSG00000165359	203522	DDX26B
2	ENSG00000150676	220047	CCDC83
3	ENSG00000099308	23031	MAST3
4	ENSG00000137312,ENSG00000206379,ENSG00000206480,...	10211	FLOT1
5	ENSG00000142676	6135	RPL11
6	ENSG00000180776	253832	ZDHHC20
7	ENSG00000108848	51747	LUC7L3
8	ENSG00000277370,ENSG00000175061	26800	SNORD49A
9	ENSG00000103811	1512	CTSH
10	ENSG00000101473	10005	ACOT8

```
> out$ensembl.gene[[4]]
[1] "ENSG00000137312" "ENSG00000206379" "ENSG00000206480" "ENSG00000223654"
[5] "ENSG00000224740" "ENSG00000230143" "ENSG00000232280" "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 4 columns

	query	entrezgene	_id	notfound
	<character>	<integer>	<character>	<logical>
1	DDX26B	203522	203522	NA
2	CCDC83	220047	220047	NA
3	MAST3	23031	23031	NA
4	FLOT1	10211	10211	NA
5	RPL11	6135	6135	NA
6	Gm10494	NA	NA	TRUE

### 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 6 columns

	query	entrezgene	uniprot.Swiss-Prot	uniprot.TrEMBL	_id	notfound
	<character>	<integer>	<character>	<List>	<character>	<logical>
1	DDX26B	203522	Q5JSJ4	#####	203522	NA
2	CCDC83	220047	Q8IWF9	#####	220047	NA
3	MAST3	23031	O60307	#####	23031	NA
4	FLOT1	10211	O75955	#####	10211	NA
5	RPL11	6135	P62913	#####	6135	NA
6	Gm10494	NA	NA	#####	NA	TRUE
7	1007_s_at	780	Q08345	#####	780	NA
8	1007_s_at	100616237	NA	#####	100616237	NA
9	AK125780	2978	P43080	#####	2978	NA

```
> 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 6 columns

	query	entrezgene	uniprot.Swiss-Prot	uniprot.TrEMBL	_id	notfound
	<character>	<integer>	<character>	<List>	<character>	<logical>
1	DDX26B	203522	Q5JSJ4	#####	203522	NA
2	CCDC83	220047	Q8IWF9	#####	220047	NA
3	MAST3	23031	O60307	#####	23031	NA
4	FLOT1	10211	O75955	#####	10211	NA
5	RPL11	6135	P62913	#####	6135	NA
6	Gm10494	NA	NA	#####	NA	TRUE
7	1007_s_at	780	Q08345	#####	780	NA
8	1007_s_at	100616237	NA	#####	100616237	NA



```
9      AK125780      2978      P43080      #####      2978      NA
```

```
$duplicates
  X1007_s_at
1          2
```

```
$missing
[1] "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](mailto:help@mygene.info)