

Using RGD to find a rat model of obesity

Resources Workshop, Use Case 2

Jennifer Smith and Mary Kaldunski

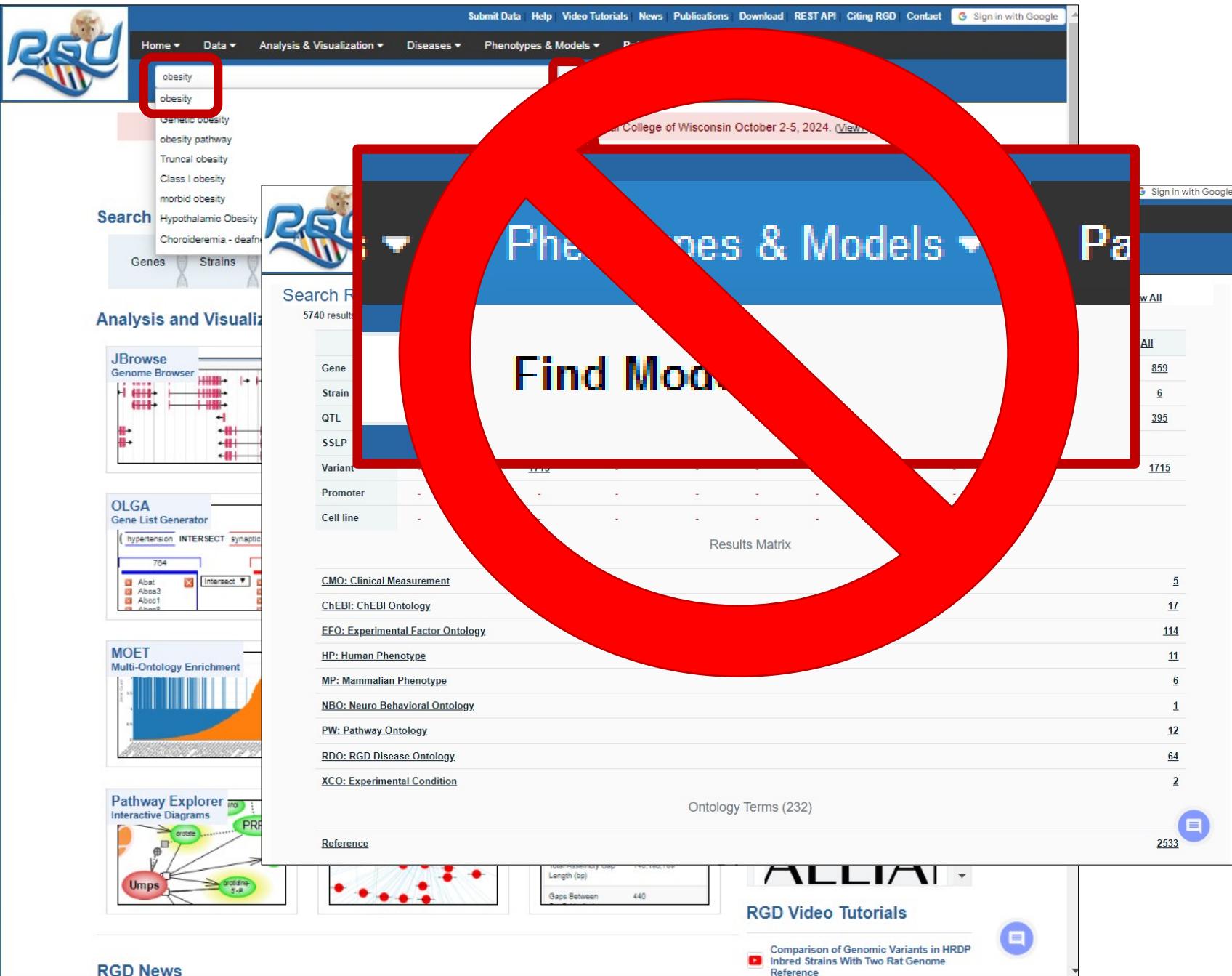
Rat Genome Database
Medical College of Wisconsin

Complex Trait Community and Rat Genomics Meeting



GLOBAL
CORE
BIODATA
RESOURCE





- For the "Find Models" portal, see the poster by M. Kaldunski, et al.
- **Method 1: Keyword/general search**
 - Search bar at the top of most RGD pages
 - Simple
 - Straightforward
 - Returns results in multiple different categories
- Enter “obesity” and click the magnifying glass search icon button to open a results page with a categorized table of data for the term.
- Note this is a keyword search, not a search of the ontology annotations.

The screenshot shows the RGD (Mouse Genome Database) website. At the top, there's a navigation bar with links for 'Submit Data', 'Help', 'Video Tutorials', 'News', 'Publications', 'Download', 'REST API', 'Citing RGD', 'Contact', and 'Sign in with Google'. Below the navigation is a search bar containing the term 'obesity' with a magnifying glass icon. To the right of the search bar are social media links for Facebook, Twitter, LinkedIn, YouTube, GitHub, and Mendeley. The main title 'Search Results for.. "obesity"' is displayed above a table of results. The table has columns for Rat, Mouse, Human, Chinchilla, Bonobo, Dog, Squirrel, Pig, Green Monkey, Naked Mole-rat, and All. The 'Strain' row shows a value of 6 for Rat, which is highlighted with a red box and a red arrow pointing down to the detailed search results page. The detailed search results page for 'obesity Rat Strain' shows a table with columns for Symbol, Name, Assembly, Chromosome, Start, Stop, Annotations, RGD ID / Term_acc, and a small blue square icon. One row in the table is circled in red. The sidebar on the left lists various ontologies: CMO: Clinical Measurement, ChEBI: ChEBI Ontology, EFO: Experimental Factor Ontology, HP: Human Phenotype, MP: Mammalian Phenotype, NBO: Neuro Behavioral Ontology, PW: Pathway Ontology, RDO: RGD Disease Ontology, and XCO: Experimental Condition. The bottom right corner shows a blue speech bubble icon with the number 2533.

	Rat	Mouse	Human	Chinchilla	Bonobo	Dog	Squirrel	Pig	Green Monkey	Naked Mole-rat	All
Gene	120	114	86	75	81	78	74	79	77	75	859
Strain	6	-	-	-	-	-	-	-	-	-	6
QTL	8	133	254	-	-	-	-	-	-	-	395
SSLP	-	-	-	-	-	-	-	-	-	-	-
Variant	-	-	-	-	-	-	-	-	-	-	-
Promoter	-	-	-	-	-	-	-	-	-	-	-
Cell line	-	-	-	-	-	-	-	-	-	-	-

Search Results for.. "obesity"

5740 results found for "obesity".

	Rat	Mouse	Human	Chinchilla	Bonobo	Dog	Squirrel	Pig	Green Monkey	Naked Mole-rat	All
Gene	120	114	86	75	81	78	74	79	77	75	859
Strain	6	-	-	-	-	-	-	-	-	-	6
QTL	8	133	254	-	-	-	-	-	-	-	395
SSLP	-	-	-	-	-	-	-	-	-	-	-
Variant	-	-	-	-	-	-	-	-	-	-	-
Promoter	-	-	-	-	-	-	-	-	-	-	-
Cell line	-	-	-	-	-	-	-	-	-	-	-

Search Results for.. "obesity Rat Strain"

6 results found for search... [Term:obesity] | Category:Strain | Assembly all

Strain Search: obesity

Assembly: all Sort By: Relevance Go To Page: 1 View Results Page 1 of 1

Filters

View All Results

Assembly: all Sort By: Relevance Go To Page: 1 View Results Page 1 of 1

6 results found for search.. Term:obesity | species: Rat | Category: Strain

Showing results 1 - 6 of 6 results

Symbol	Name	Assembly	Chromosome	Start	Stop	Annotations	RGD ID / Term_acc
LA/N-cp						1	68063
SHR/N-cp						1	728195
W-Lep ^{rfaNin}						17	8655992
PM							
ZLCP(CD)	Leese Prone Rats					1	2308851
Beta IIM						4	40924649
ZSF1-Lep ^{rfa}						1	2312512
Lep ^{rfa/Crl}							

Ontology Terms (232)

Legend

Phenominer

Genome Viewer

Excel Download

Indicates sample data exists in Variant Visualizer

Indicates Phenominer data is available

Reference 2533

- Primary results
 - Genes for all RGD species
 - Rat strains
 - Rat/human/mouse QTL
 - Variants
 - Ontology terms
 - References
 - Note the over 2500 references in RGD for this disease term.
 - Click the number for Rat+Strain to open a table with the rat strains related to “obesity”.
 - Each strain symbol is clickable and will open the rat strain report page.
 - A blue PM icon denotes quantitative phenotype data in PhenoMiner.
 - A purple VV icon denotes variant data in RGD's Variant Visualizer.

The strain report page is the primary comprehensive location for any information in RGD for that strain. Strain nomenclature, IDs, and available information for the provenance of strain creation are described. RGD manual annotations for disease and phenotype, evidence codes for the annotations, and clickable links to related references are listed. Available information related to PhenoMiner quantitative data and related QTL are given.



General

RGD Manual Disease Annotations [Click to see Annotation Summary View](#)

Only show annotations with direct experimental evidence (0 objects hidden)

Object Symbol	Species	Term	Qualifier	Evidence	With	Reference	Notes	Source
W-Lepr^{fa}Nin	Rat	obesity	susceptibility	IAGP		8655976	compared to W-Lepr+/+ Nin	RGD
W-Lepr^{fa}Nin	Rat	retinal degeneration	MODEL: spontaneous	IAGP		8655976	associated with aging and compared to W-Lepr+/+ Nin	RGD
W-Lepr^{fa}Nin	Rat	retinal degeneration	MODEL: spontaneous	IAGP		8657053	compared to W-Lepr+/+ Nin	RGD
W-Lepr^{fa}Nin	Rat	Weight Gain	susceptibility	IAGP		8655976		RGD

[oxidative stress \(IAGP\)](#) [retina degeneration \(IAGP\)](#) [thin retina outer nuclear layer \(IAGP\)](#)
[thin retina outer plexiform layer \(IAGP\)](#)

Strain Registration

[Annotation Detail View](#)

[Citation](#)

RR, et al., PLoS One. 2013 Oct 679. doi: 10.1371/journal.pone.0077679. 2013.

etal., Invest Ophthalmol Vis Sci. 2009 50:66-63. doi: 10.1167/iovs.08-2498. Epub 2009

ated Pipelines

al., Neuroscience. 2014 Jun 6 269:256-64. j.neuroscience.2014.03.040. Epub 2014 Apr

J, et al., Nutrition. 2013 Jan 29(1):298-304. j.nut.2012.06.006. Epub 2012 Oct 2.

Search table

The 21st annual meeting of the Complex Trait Community
(View Agenda)

Other Species Portals

Search

Genes Strains Ontology & Annotation Ontomate (Literature) QTL

Analysis and Visualization

JBrowse
Genome Browser

Variant Visualizer

	C	A
ACI/N (KNAW)	A	C
BBDP/WorN (ICL)	G	C
ACI/EurMcwi (ICL)	A	C
BN-Lx/Cub (ICL)	G	A

OLGA
Gene List Generator

Disease Portals

Rat Mouse

Genes: 3202 Genes: 3232
QTL: 715 QTL: 0
strains: 301 strains: 350

- **Method 2: The RGD Disease Portals.**
- Organize information for the most highly annotated disease categories.
- For today's example of OBESITY, look at the Obesity and Metabolic Syndrome Portal

- On the Disease Portal page are toggles to alter the page information to be focused on each possible ontology:
 - Diseases
 - Mammalian Phenotypes
 - Human Phenotypes
 - Biological Processes
 - Pathways
 - Chemicals and Drugs
 - Vertebrate Traits
 - Clinical Measurements
 - Experimental Conditions
 - Click a toggle to update the information on the page accordingly
 - The appropriate ontology browser will be displayed allowing selection of a more specific term if desired.
 - Any of the 10 species for which RGD carries data can be selected and the page will update with the relevant data.

obesity (DOID:9970)

Parent Terms	Term With Siblings	Child Terms
overnutrition Overweight	obesity <small>An overnutrition that is characterized by excess body fat, traditionally defined as an elevated ratio of weight to height (specifically 30 kilograms per meter squared), has material basis in a multifactorial etiology related to excess nutrition intake, decreased caloric utilization, and genetic susceptibility, and possibly medications and certain disorders of metabolism, endocrine function, and mental illness. (DOI)</small>	Abdominal Obesity Barlow-Forsman-Lehmann syndrome CHOPS Syndrome Clark-Baraitser syndrome Cohen syndrome DEVELOPMENTAL DELAY, INTELLECTUAL DISABILITY, OBESITY, AND DYSMORPHIC FEATURES MEHMO syndrome Metabolically Benign Obesity morbid obesity MORM syndrome Obesity and Hypopigmentation Obesity, Hyperphagia, and Developmental Delay Pediatric Obesity Prader-Willi syndrome Pronomelanocortin Deficiency

Obesity & Metabolic Syndrome AND obesity

Genes: 635	QTL: 131	Strains: 32
Aacs Abca1 Abcb11 Abcg5 Abcg8 Acacb Acadm Acoe Ady Acox1 Acp1 Acp5 Ascl1	BB SHR-(D4Gm41-Taor1)K BBDR LA-(D5Rat98-D5Rw223), BBDP-(D4Mm6-D4Mm7)Rw BBOR LA-(D5Rat98-D5Rw223) Beta IIM F344-Lep ^{m1Kyo}	BB SHR-(D4Gm41-Taor1)K BBDR LA-(D5Rat98-D5Rw223), BBDP-(D4Mm6-D4Mm7)Rw BBOR LA-(D5Rat98-D5Rw223) Beta IIM F344-Lep ^{m1Kyo}

Rattus norvegicus (Rat)

F344-Lep^{m1Kyo}

- The default ontology displayed is the Disease Ontology.
- The page default term will be for the least granular term that fits the Portal category, in this case, "Nutritional and Metabolic Diseases".
- For "Nutritional and Metabolic Diseases", 204 strains are listed
- For the more specific term "obesity" (selected by drilling into the ontology tree), there are 32 strains.
- Note that these include those that are models for the disease, and also strains used as controls.
- Click a gene, QTL, or strain symbol to access the appropriate report page.

**General**Strain: F344-Lep^{m1Kyo}**Summary**

Congenic Strains

Mutant Strains

Annotation

RGD Manual Disease

Phenotype

Mammalian Phenotype

References

References - curated

Region

Allelic Variants

Symbol:	F344-Lep ^{m1Kyo}			
Strain:	F344-Lep ^{m1}			
Substrain:	Kyo			
Full Name:	F344 OB rat			
RGD ID:	8549776			
Citation ID:	RRID:RGD_8549776			
Ontology ID:	RS:0003644			
Alleles:	Lep ^{m1Kyo} ; Lep			
Also Known As:	F344-Lep ^{m1} Kyo; F344 OB rat; NBRP Rat No: 0628; F344-Lep ^{m1} [m1Kyo]			
Type:	mutant			
Available Source:	National BioResource Project for the Rat in Japan			
Origination:	National BioResource Project for the Rat in Japan			
Description:	Established by ENU mutagenesis in F344/NSIc rats. This strain has Lep missense mutation (Q82X).			
Coat Color:	albino			
Inbred Generations:	N10			
Last Known Status:	Live Animals (as of 2017-03-17)			
Research Usage:	Diabetes Obesity			
Position				
Rat Assembly	Chr	Position (strand)	Source	JBrowse
mRatBN7.2	4	57,672,294 - 57,672,294	RGD_MAPPER_PIPELINE	mRatBN7.2
Rnor_6.0	4	66,348,850 - 66,348,850	RGD_MAPPER_PIPELINE	Rnor6.0
Rnor_5.0	4	66,085,079 - 66,099,209	RGD_MAPPER_PIPELINE	Rnor5.0
RGSC_v3.4	4	55,943,837 - 55,945,938	RGD_MAPPER_PIPELINE	RGSC3.4

Congenic Strains

F344.NER-(D1Mgh6-D1Rat73)(D5Mgh4-D5Rat38)Lgi1m1/Kyo

Mutant Strains

F344.NER-(D1Mgh6-D1Rat73)(D5Mgh4-D5Rat38)Lgi1m1/Kyo

Annotation[Click to see Annotation Summary View](#)**RGD Manual Disease Annotations**[Click to see Annotation Summary View](#) Only show annotations with direct experimental evidence (0 objects hidden)

Object Symbol	Species	Term	Qualifier	Evidence	With	Reference	Notes	Source	Original Reference(s)
F344-Lep ^{m1Kyo}	Rat	Insulin Resistance		IMP		8549777		RGD	
F344-Lep ^{m1Kyo}	Rat	obesity		IMP		8549777		RGD	

Strain Registration

- As mentioned before, the strain report page is formatted to provide access to all information in RGD for that strain.
 - Persistent identifiers
 - Allele and gene information
 - Strain type (mutant, inbred, etc)
 - Source where the strain is available**
 - Strain description
 - Related strains
- Annotations include clickable links to related references for data provenance.

Summary

Annotation

RGD Manual Disease
Phenotype
Mammalian Phenotype
Objects Annotated

General

Generation of leptin-deficient Lepmkyo/Lepmkyo rats and identification of leptin-responsive genes in the liver.

Authors: Aizawa-Abe, M Ebihara, K Ebihara, C Mashimo, T Takizawa, A Tomita, T Kusakabe, T Yamamoto, Y Aotani, D Yamamoto-Kataoka, S Sakai, T Hosoda, K Serikawa, T Nakao, K
Citation: Aizawa-Abe M, et al., Physiol Genomics. 2013 Sep 3;45(17):788-93. doi: 10.1152/physiolgenomics.00040.2013. Epub 2013 Jun 25.
RGD ID: 8549777
Pubmed: PMID:23800849 ([View Abstract at PubMed](#))
DOI: DOI:10.1152/physiolgenomics.00040.2013 ([Journal Full-text](#))

Leptin is one of the key molecules in maintaining energy homeostasis. Although genetically leptin-deficient Lep(ob)/Lep(ob) mice have greatly contributed to elucidating leptin physiology, the use of more than one species can improve the accuracy of analysis results. Using the N-ethyl-N-nitrosourea mutagenesis method, we generated a leptin-deficient Lep(mkyo)/Lep(mkyo) rat that had a nonsense mutation (Q92X) in leptin gene. Lep(mkyo)/Lep(mkyo) rats showed obese phenotypes including severe fatty liver, which were comparable to Lep(ob)/Lep(ob) mice. To identify genes that respond to leptin in the liver, we performed microarray analysis with Lep(mkyo)/Lep(mkyo) rats and Lep(ob)/Lep(ob) mice. We sorted out genes whose expression levels in the liver of Lep(mkyo)/Lep(mkyo) rats were changed from wild-type (WT) rats and were reversed toward WT rats by leptin administration. In this analysis, livers were sampled for 6 h, a relatively short time after leptin administration to avoid the secondary effect of metabolic changes such as improvement of fatty liver. We did the same procedure in Lep(ob)/Lep(ob) mice and selected genes whose expression patterns were common in rat and mouse. We verified their gene expressions by real-time quantitative PCR. Finally, we identified eight genes that primarily respond to leptin in the liver commonly in rat and mouse. These genes might be important for the effect of leptin in the liver.

Annotation

[Click to see Annotation Detail View](#)

RGD Manual Disease Annotations

[Click to see Annotation Detail View](#)

1 to 10 of 10 rows 20

Search table

Only show annotations with direct experimental evidence (0 objects hidden)

Object Symbol	Species	Term	Qualifier	Evidence	With	Notes	Source	Original Reference(s)
F344-Lep ^{m1Kyo}	Rat	Insulin Resistance		IMP			RGD	
LEP	Human	Insulin Resistance		ISO	Lep (Rattus norvegicus)	DNA:nonsense mutation:cds;	RGD	
Lep	Rat	Insulin Resistance		IMP		DNA:nonsense mutation:cds;	RGD	
Lep	Mouse	Insulin Resistance		ISO	Lep (Rattus norvegicus)	DNA:nonsense mutation:cds;	RGD	
Lep ^{m1Kyo}	Rat	Insulin Resistance		IMP			RGD	
F344-Lep ^{m1Kyo}	Rat	obesity		IMP			RGD	
LEP	Human	obesity		ISO	Lep (Rattus norvegicus)	DNA:nonsense mutation:cds;	RGD	
Lep	Rat	obesity		IMP		DNA:nonsense mutation:cds;	RGD	
Lep	Mouse	obesity		ISO	Lep (Rattus norvegicus)	DNA:nonsense mutation:cds;	RGD	
Lep ^{m1Kyo}	Rat	obesity		IMP			RGD	

1 to 10 of 10 rows 20

Phenotype Annotations

[Click to see Annotation Detail View](#)

Mammalian Phenotype

1 to 9 of 9 rows 20

Search table

Object Symbol	Species	Term	Qualifier	Evidence	With	Notes	Source	Original Reference(s)
F344-Lep ^{m1Kyo}	Rat	increased circulating cholesterol level		IMP			RGD	

The reference report shows all the annotations for that paper, not just those of the strain that provided the link to the reference.

Here annotations were made for insulin resistance and obesity to the strain, the allele and the rat gene, plus annotations were assigned to the corresponding human and mouse genes based on orthology.

Select a category

Diseases
Obesity & Metabolic Syndrome

Mammalian Phenotype
Obesity & Metabolic Syndrome

Human Phenotype
Obesity & Metabolic Syndrome

Biological Processes
Obesity & Metabolic Syndrome

Pathways
Obesity & Metabolic Syndrome

Chemicals and Drugs
Obesity & Metabolic Syndrome

Vertebrate Traits
Obesity & Metabolic Syndrome

Clinical Measurements
Obesity & Metabolic Syndrome

Experimental Conditions
Obesity & Metabolic Syndrome

Select a species



Mouse
Strains: 204
Genes: 7612
qTL: 707
Strains: 204



Human
Strains: 3578
Genes: 10096
qTL: 0



Chimpanzee
Strains: 0
Genes: 6972
qTL: 0



Bonobo
Strains: 0
Genes: 7477
qTL: 0



Dog
Strains: 0
Genes: 7468
qTL: 0



Squirrel
Strains: 0
Genes: 7056
qTL: 0



Pig
Strains: 0
Genes: 7363
qTL: 0



Green Monkey
Strains: 0
Genes: 7364
qTL: 0



Netherland-Pig
Strains: 0
Genes: 6935
qTL: 0

Select a term

[» Back](#)

Nutritional and Metabolic Diseases (DOID:9009231)

Parent Terms

Term Web Sidebar

Child Terms

Disease of metabolism

disease of nutritional origin

Nutritional and metabolic diseases

A collective term for nutritional disorders resulting from poor absorption or nutritional imbalance, and metabolic disorders resulting from defects in biosynthesis (AKABDOL3H) or breakdown (CATABOL3H) of nutrients.

Occupational Diseases

Extratherapeutic Compounds, Signs and Symptoms

sensor system disease

sensori-neurotic disease

Stomatognathic Diseases

gastroenteritis

Urinary and Injuries

Rattus norvegicus (Rat)

Obesity & Metabolic Syndrome

Genes: Calculating

Strains: 204

Genes: 707

Strains: 204

Genes: 707

Strains: 204

Genes: Calculating

Strains: 204

Genome View



List All Objects | CSV Export | Add Objects | Close

Gene Set Enrichment

DO: Diseases Ontology Enrichment

PW: Pathway Ontology Enrichment

MP: Phenotype Ontology Enrichment

GO: Biological Process Enrichment

GO: Cellular Component Enrichment

GO: Molecular Function Enrichment

CHEBI Chemical/Drug Enrichment

Additional Resources



Analysis Tools



Rat Strain Models

NIH GLOBAL ALLIANCE FOR MODEL ORGANISM DATA RESOURCES

Going back to the Disease Portal page, in addition to the strains given in the interactive list, there is a link at the bottom of the page to RGD's Find Models tool.

Index	Name	Type	No. of Models	Accepting Model	Model Status	No. of Assets	No. of Models	No. of Accepted Models	Accepted Rate	Deployment Status	Description
1	Model A	Optimal Control Model	1	Planned	2024-01-01	1000000	1000000	1000000	100%	Deployed	Test Environment & Functional Valid.
2	Model B	Optimal Control Model	1	Planned	2024-01-01	1000000	1000000	1000000	100%	Not Deployed	Test Environment & Functional Valid.
3	Model C	Optimal Control Model	1	Planned	2024-01-01	1000000	1000000	1000000	100%	Not Deployed	Test Environment & Functional Valid.
4	Model D	Optimal Control Model	1	Planned	2024-01-01	1000000	1000000	1000000	100%	Not Deployed	Test Environment & Functional Valid.
5	Model E	Optimal Control Model	1	Planned	2024-01-01	1000000	1000000	1000000	100%	Not Deployed	Test Environment & Functional Valid.
6	Model F	Optimal Control Model	1	Planned	2024-01-01	1000000	1000000	1000000	100%	Not Deployed	Test Environment & Functional Valid.

Rat Strain Models

Rat Models Results

Enter a Disease or Phenotype or Strain or Condition to find the rat models

obesity



Examples: Hypertension Cancer MHS/Gib

(OR) Browse Ontology Tree, Select Term & Search:

[Browse Disease Ontology](#)

[Browse Mammalian Phenotype Ontology](#)

[Browse Strain Ontology](#)

Filter by ...

50 results for term "obesity"

All Results(50)

Models

Disease (35)

- MODEL: spontaneous (9)
- MODEL: control (5)
- susceptibility (2)
- MODEL: induced (1)
- MODEL: treatment (1)
- disease_progression (1)
- sexual_dimorphism (1)
- treatment (1)

Phenotype (15)

- treatment (2)
- induced (1)
- susceptibility (1)

Strain Types

- mutant (17)
- inbred (18)
- congenic (9)
- hybrid (5)
- outbred (2)
- transgenic (1)

Conditions

- controlled calorie content diet (4)
- controlled fat content diet (1)
- dehydroepiandrosterone (1)
- guanaprol (1)
- rosiglitazone (1)

Strain	Considered as type	Disease/Phenotype	With conditions	Evidence Code	Reference
Search for strain...					
LA-^{ob/ob}NJor	MODEL: spontaneous	obesity		IAGP	1642391 21408584 21408581
ZSF1-Lep^{r/r}/Crl	MODEL: spontaneous	obesity		IAGP	401960103 401965413 401965414
WI-Mc4^m/Hubr	MODEL: spontaneous	obesity		IMP	13825242 6478803
SIC-ZUC-Lep^{r/r}	MODEL: spontaneous	obesity		IAGP	12850276 2300017
SDDR/Rrc	MODEL: control	obesity		IAGP	1302371 21408576
SDDIO/Rrc	MODEL: spontaneous	obesity		IAGP	1302371 21408576
ZSF1-Lep^{r/r}/Crl	MODEL: control	obesity		IAGP	401960103 401965414 401965413
FDIO/Rrc	MODEL: induced	obesity	controlled calorie content diet controlled fat content diet	IAGP	6482248 24922212
FDIO/Rrc	MODEL: spontaneous	obesity		IAGP	24922212
LETO	MODEL: control	obesity		IAGP	21408435
ZUC-Lep^{r/r}SteJsp^{r/r}	MODEL: spontaneous	obesity		IAGP	628438 24922198
ZUC-Lep^{r/r}	MODEL: control	obesity		IAGP	628581 628910
ZUC-Lep^{r/r}SteJsp^{r/r}	MODEL: spontaneous	obesity		IAGP	628581 628910
F344	MODEL: control	obesity		IAGP	6482248 24922212
OLETF	MODEL: treatment	obesity	rosiglitazone	IAGP	21408435
SDTCg-Lep^{r/r}Jtt	MODEL: spontaneous	obesity		IAGP	2314025 2314024 2314022
SHRSP.ZUC-(D5Rat4-D5Rat36)IzmDmc	susceptibility	obesity		IAGP	2300017
ZUC-Lep^{r/r}SteJsp^{r/r}	sexual_dimorphism	obesity		IAGP	7385117
LHMav		obesity		IAGP	1580389
SD-Lep^{r/r}		obesity		IMP	12910507
SD-Lep^{r/r}SteJsp^{r/r}		obesity		IMP	12904911
SS-Lep^{r/r}Mcr	disease_progression	obesity		IMP	12911217
ZSF1-Lep^{r/r}Crl	treatment	obesity		IAGP	401965412
SD-Lep^{r/r}		obesity		IMP	12910507
Beta IIIM		obesity		IAGP	724733

For more about the Find Models tool, see the poster presented by M. Kaldunski, later today.

Method 3: Search for strains for a specific disease or for the intersection of more than one disease using the **Object List Generator & Analyzer, or OLGA tool.**

- From the Analysis & Visualization menu in the top black bar, choose "OLGA"
- Or use the prominent button on the RGD home page

OLGA - Object List Generator & Analyzer

Options:

List Type: Gene ▾

- Gene
- QTL
- Strain

Assembly Version:

RAT Genome Assembly v7.2

Back

Reset

Welcome! To get started, select a list type from the options below

Ontology Annotation

Generate a list of strains
annotated to a term in one
of the RGD Ontologies

Genomic Region

Generate a list of
strains based on
chromosome, start,
and stop position

QTL Region

Generate a list of
strains that overlap a
QTL region

- Select Strain from the "List type" dropdown and "Ontology Annotation" from the options below.

OLGA - Object List Generator & Analyzer

Options:

List Type: Gene ▾

Assembly Version:

RAT Genome Assembly v7.2

Gene
QTL

Back Reset

OLGA - Object List Generator & Analyzer

Options:

List Type: Strain ▾

Assembly Version:

RAT Genome Assembly v7.2

Disease Ontology

Mammalian
Phenotype

Strain Ontology

- Select Strain from the "List type" dropdown and "Ontology Annotation" from the options below.
- Choose the Disease Ontology

OLGA - Object List Generator & Analyzer

Options:

List Type: Gene

Assembly Version:

RAT Genome Assembly v7.2

Gene
QTL

Back Reset

OLGA - Object List Generator & Analyzer

Options:

List Type: Strain

Assembly Version:

RAT Genome Assembly v7.2

List Type: Strain

Assembly Version:

RAT Genome Assembly v7.2

Enter a Disease Term or Browse the Ontology Tree

obesity

obesity

morbid obesity

Hypothalamic Obesity

Pediatric Obesity

Abdominal Obesity

Obesity Hypoventilation Syndrome

Obesity and Hypopigmentation

- Select Strain from the "List type" dropdown and "Ontology Annotation" from the options below.
- Choose the Disease Ontology
- Autocomplete options are provided. Choose "obesity" and click "Continue".

OLGA - Object List Generator & Analyzer

Options:

List Type: Strain ▾

Assembly Version:

RAT Genome Assembly v7.2 ▾

Back

Reset

Next Action:

Add Another Strain List



Analyze Result Set

WorkBench

obesity

32

- BB.SHR-(D4Got41-Tacr1)/K X
- BBDR.LA-(D5Rat98-D5Rat233), BBDP-(D4Mit6-D4Mit7)/Rhw
- BBDR.LA-(D5Rat98-D5Rat233)/Rhw
- Beta IIM
- F344
- F344-Lep^{m1Kyo}
- FDIO/Rrrc
- Ho:ZFDM-Lepr^fa
- LA-cp/NJcr
- LCR/Mco

Result Set (32)

BB.SHR-(D4Got41-Tacr1)/K
BBDR.LA-(D5Rat98-D5Rat233), BBDP-(D4Mit6-D4Mit7)/Rhw
BBDR.LA-(D5Rat98-D5Rat233)/Rhw
Beta IIM
F344
F344-Lep^{m1Kyo}
FDIO/Rrrc
Ho:ZFDM-Lepr^fa
LA-cp/NJcr
LCR/Mco

- Select Strain from the "List type" dropdown and "Ontology Annotation" from the options below.
- Choose the Disease Ontology
- Autocomplete options are provided. Choose "obesity" and click "Continue".
- The result set shows the same 32 strains found on the Disease Portal page for obesity.
- Select "Add Another Strain List" to bring back the term entry box.

OLGA - Object List Generator & Analyzer

Options:

List Type: Strain ▾

Assembly Version:

RAT Genome Assembly v7.2 ▾

Back Reset

Enter a Disease Term or Browse the Ontology Tree

diabetes mellitus

[Browse Ontology Tree](#)

Continue

WorkBench

[obesity](#)

32

BB.SHR-(D4Got41-Tacr1)/K
BBDR.LA-(D5Rat98-D5Rat233), BBDP-(D4Mit6-D4Mit7)/Rhw
BBDR.LA-(D5Rat98-D5Rat233)/Rhw
Beta IIM
F344
F344-Lep^{m1Kyo}

Result Set (32)

BB.SHR-(D4Got41-Tacr1)/K
BBDR.LA-(D5Rat98-D5Rat233), BBDP-(D4Mit6-D4Mit7)/Rhw
BBDR.LA-(D5Rat98-D5Rat233)/Rhw
Beta IIM
F344
F344-Lep^{m1Kyo}

- Enter "diabetes mellitus" (DM) in the search box.

OLGA - Object List Generator & Analyzer

Options:

List Type: Strain

Assembly Version:

RAT Genome Assembly v7.2

Back

Reset

Preview Count: 88

- ACI.BBDP-(RT1^u)(Gimap5)/Sunn
- BB.SHR-(Gnai-D18Mit9)/K
- BB.SHR-(D6Rat184-D6Rat3)/K
- BB/OK
- BBDP.AC1-(D2Mit8-D2Arb16)(D2Rat354-D2Rat69)/Sunn
- BBDP.AC1-(D2Mit8-D2Arb16)/Sunn
- BBDP.AC1-(D2Mit8-D2Rat354)/Sunn
- BBDP.AC1-(D2Mit8-D2Rat69)/Sunn
- BBDP.AC1-(D2Rat50-D2Rat63)/Sunn
- BBDP.WF-(D13Rat124-D13Mgh5)/Sunn

Generator & Analyzer

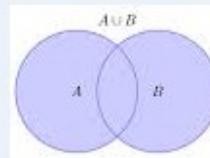
Assembly Version:

RAT Genome Assembly v7.2

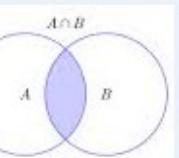
Back

Reset

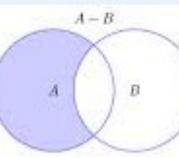
How would you like to append this list?



Union



Intersection



Subtract

- Enter "diabetes mellitus" (DM) in the search box.
- The tool gives a preview of the 88 strains for diabetes and options for how to combine the two lists
 - Union
 - Intersection
 - Subtraction

OLGA - Object List Generator & Analyzer

Options:

List Type: Strain

Assembly Version:

RAT Genome Assembly v7.2

Options:

List Type: Strain

Assembly Version:

RAT Genome Assembly v7.2

Back

Reset

Next Action:

Add Another Strain List



Analyze Result Set

WorkBench

(obesity INTERSECT diabetes mellitus)

32

- BB.SHR-(D4Got41-Tacr1)/K
- BBDR.LA-(D5Rat98-D5Rat233), BBDP-(D4Mit6-D4Mit7)/Rhw
- BBDR.LA-(D5Rat98-D5Rat233)/Rhw
- Beta IIM
- F344
- F344-Lep^{m1Kyo}
- FDIO/Rrrc
- Ho:ZFDM-Lep^{f_a}

Intersect ▾

88

- ACI.BBDP-(RT1^u)(Gimap5)/Sunn
- BB.SHR-(Gnat-D18Mit9)/K
- BB.SHR-(D6Rat184-D6Rat3)/K
- BB/OK
- BBDP.ACI-(D2Mit8-D2Arb16)(D2Rat354-D2Rat69)/Sunn
- BBDP.ACI-(D2Mit8-D2Arb16)/Sunn
- BBDP.ACI-(D2Mit8-D2Rat354)/Sunn
- BBDP.ACI-(D2Mit8-D2Rat69)/Sunn

Result Set (6)

- BBDR.LA-(D5Rat98-D5Rat233), BBDP-(D4Mit6-D4Mit7)/Rhw
- BBDR.LA-(D5Rat98-D5Rat233)/Rhw
- LHMav
- OLETF
- SDT.Cg-Lep^{f_a}/Jtt
- ZSF1-Lep^{f_a/cp}/Crl

- Enter "diabetes mellitus" (DM) in the search box.
- The tool gives a preview of the 88 strains for diabetes and options for how to combine the two lists
 - Union
 - Intersection
 - Subtraction
- Choose "Intersection" to get the list of six strains annotated to both obesity and diabetes.

The screenshot shows the RGD Data homepage. At the top, there is a navigation bar with links to "Submit Data", "Help", "Video Tutorials", "News", and "Publications". Below this, there is a main menu with "Home", "Data" (selected), "Analysis & Visualization", "Diseases", and "Phenotypes". A red box highlights the "Data" menu item. A sub-menu for "Data" is open, showing "Genes" (selected), "Variants", "Community Projects", "QTLs", and "Strains". A red arrow points from the "Genes" link in the sub-menu to the "Gene Search" page. On the left side, there is a sidebar with links to "GENES", "GENOME INFORMATION PAGE", "QTLs", and "MARKERS". The "GENES" link is highlighted with a red box. The "Gene Search" page itself has a header "Gene Search" and a sub-header "Gene reports include a comprehensive description of function and biological process as well as disease, expression, regulation, and more. Example searches: A2m, 2004 serine threonine kinase, NM_012488n, Adora2a". It features a search form with "Keyword: Contains" dropdown set to "Lepr", "Species: Rat", "Assembly: mRatBN7.2", and a "Limit Results (optional)" section with "Chr: All", "Start: ", "(bp)", and "Stop: ". A red box highlights the "Search Genes" button.

- **Method 4: Use a gene to find a model**
- To start with a gene of interest, enter a keyword such as all or part of a gene symbol or name in the search box
- Click Search Genes to open a search result page with all related genes.

The screenshot shows the RGD Data homepage. At the top, there is a logo of a rat and the text "RGD Data". The navigation menu includes links for "Submit Data", "Help", "Video Tutorials", "News", and "Publications". Below the menu, there are four main categories: "Home", "Data", "Analysis & Visualization", and "Diseases & Phenotypes". The "Data" category is expanded, showing sub-links for "Genes", "Variants", "Community Projects", "QTLs", and "Strains". A red box highlights the "Genes" link, and a red arrow points from it to the "Gene Search" button. The search bar contains the placeholder "Enter Search Term..." and a link to "Advanced Search (OLGA)".

- **Method 4: Use a gene to find a model**
- To start with a gene of interest, enter a keyword such as all or part of a gene symbol or name in the search box
- Click Search Genes to open a search result page with all related genes.

The screenshot shows the search results for "lepr Rat Gene". The search bar at the top shows the query "lepr". The results table has columns for "Symbol", "Name", "Assembly", "Chromosome Start", "Stop", "Annotations", and "RGD ID / Term_acc". The first result, "Lepr", is highlighted with a red box. The results table shows the following data:

Symbol	Name	Assembly	Chromosome Start	Stop	Annotations	RGD ID / Term_acc	
Lepr	leptin receptor	mRatBN7.2 Assembly	5	116294409	116477904	726	3001
Leprot	leptin receptor overlapping transcript	mRatBN7.2 Assembly	5	116289843	116301951	75	621034
Leprott1	leptin receptor overlapping transcript-like 1	mRatBN7.2 Assembly	16	58040934	58053602	63	1307168
Ccdc122	coiled-coil domain containing 122	mRatBN7.2 Assembly	15	52407717	52470163	34	2321506
Ripk2	receptor-interacting serine-threonine kinase 2	mRatBN7.2 Assembly	5	29630806	29662804	225	1309167

On the left, there is a "Filters" sidebar with categories for "Rat (102)", "Gene (102)", "protein-coding (102)", and "Other Categories". On the right, there is a "RGD Tools" sidebar with links for "Annotation Distribution", "Functional Annotation", "OLGA", "Annotation Comparison", and "Excel".

- Click the gene symbol to access the report page for that gene.

