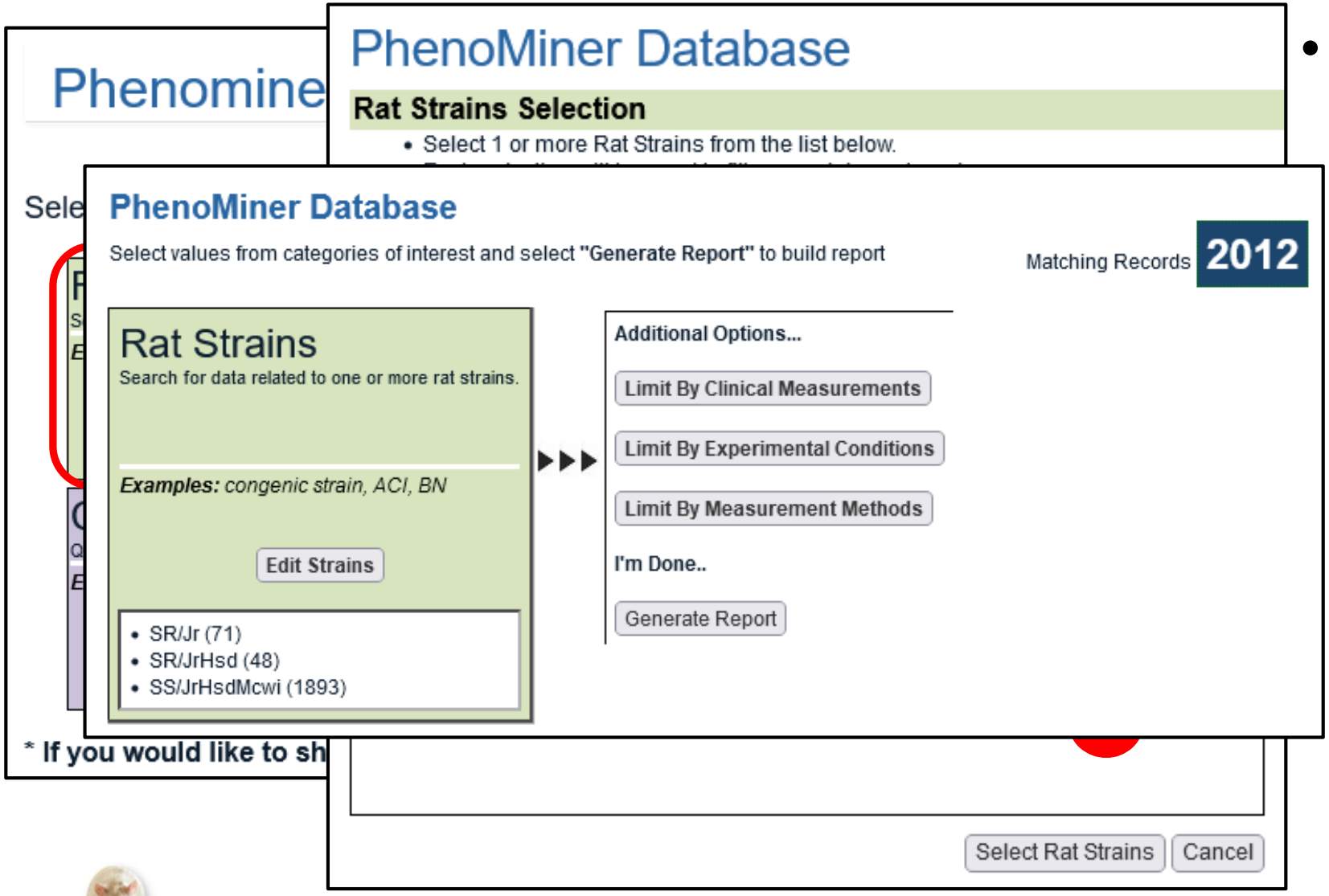
A brief introduction to RGD's PhenoMiner

- PhenoMiner is a tool for ontology-based storage and mining of quantitative phenotype data for the laboratory rat
- PhenoMiner includes both data from high-throughput phenotyping projects (standardized) and scientific literature (unstandardized).
- To allow comparisons across studies as well as flexible and intelligent querying, PhenoMiner uses ontologies to express
  - *What was measured* (Clinical Measurement Ontology)
  - *How it was measured* (Measurement Method Ontology)
  - *Under what conditions it was measured* (Experimental Condition Ontology)
  - *In what animals it was measured* (Rat Strain Ontology)
- The Vertebrate Trait Ontology is also used to group related measurements within a study.
- PhenoMiner can be accessed through the Phenotypes and Models tab in the menu at the top of any RGD page or button on RGD's home page.

Limitations of the PhenoMiner 1.0 User Interface

- “The process for selecting records to view is not intuitive.”
- “Once I’ve selected terms it’s hard to change my selections.”
- “I can only view results for one measurement at a time even if I choose terms that use the same units.”
- “I can see the information at the top of the result page but I can’t do anything with it—there’s no way to filter my results on that page.”
- “What? I can sort the results in the table?”
- “Oh, but when I sort the table it doesn’t change anything in the graph. That still appears to be ordered randomly!”
- Coloring the bars in the graph by the experimental conditions is nice but I’d like to choose what they are colored by.”

PhenoMiner 2.0: More intuitive selection and modification



- The landing page of the original PhenoMiner was designed to be flexible

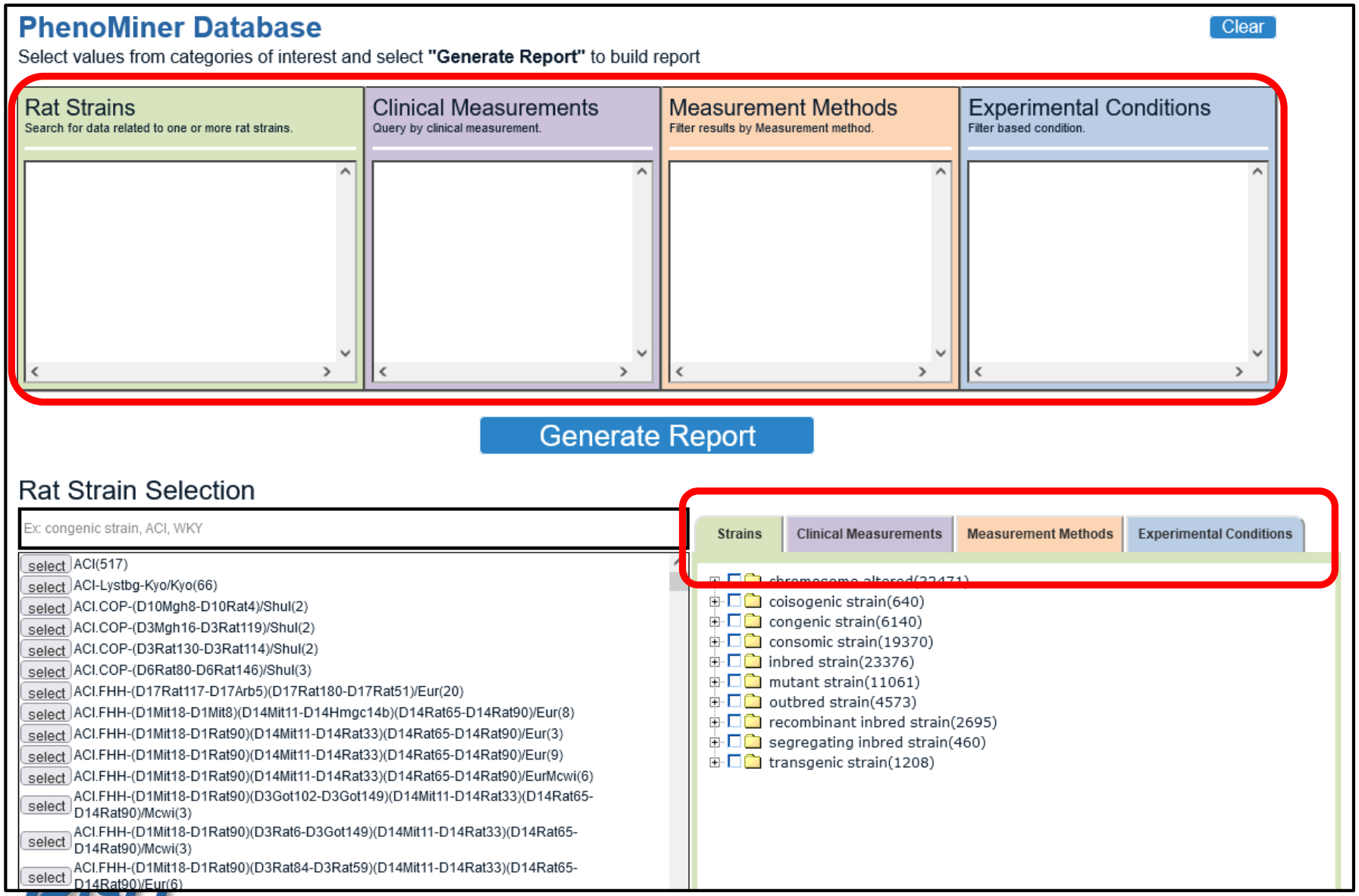
Select any ontology

Navigate through the tree?

Go to another page with further options

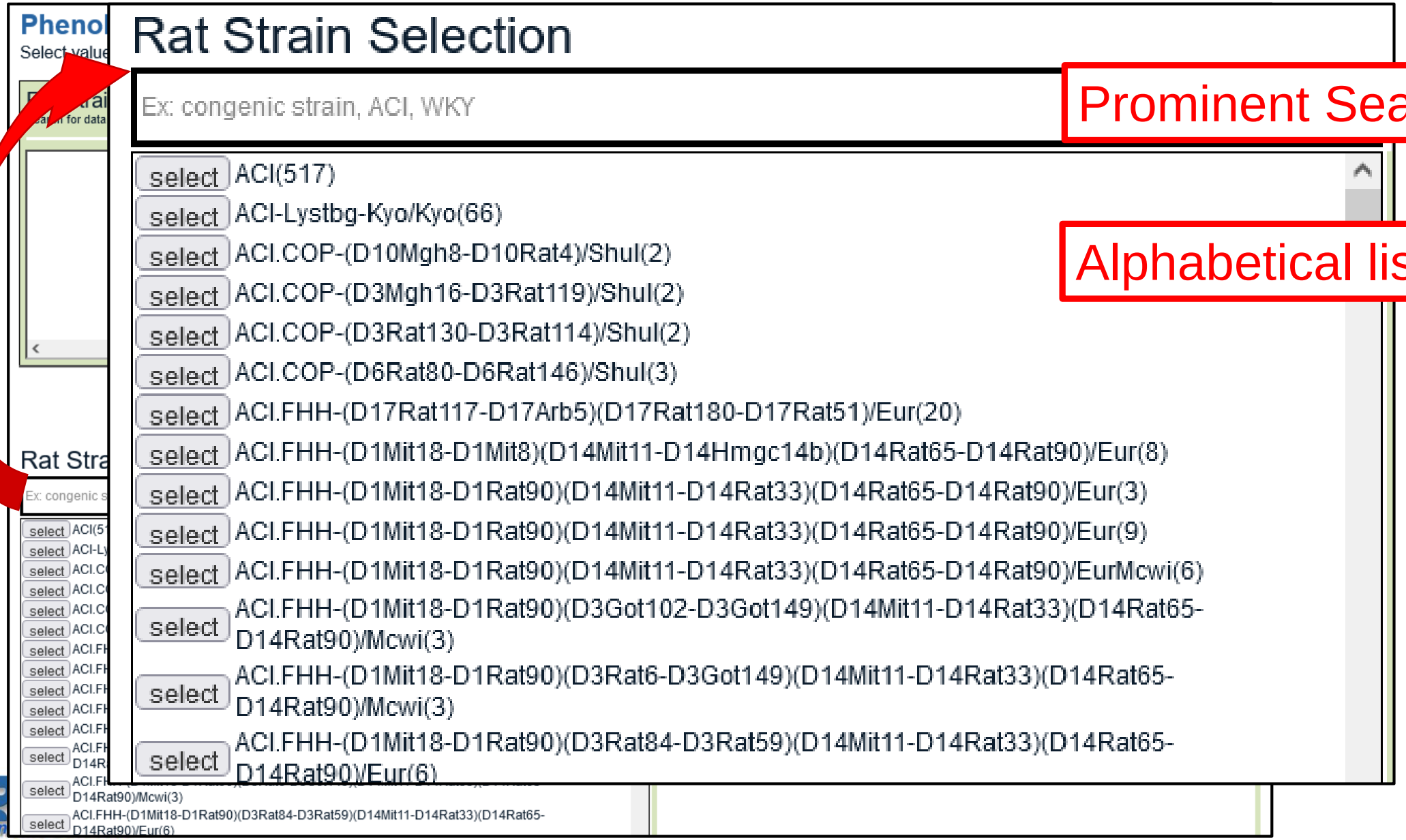
Back and forth between ontology tree selection pages and “where do you want to go next?” pages

PhenoMiner 2.0: More intuitive selection and modification

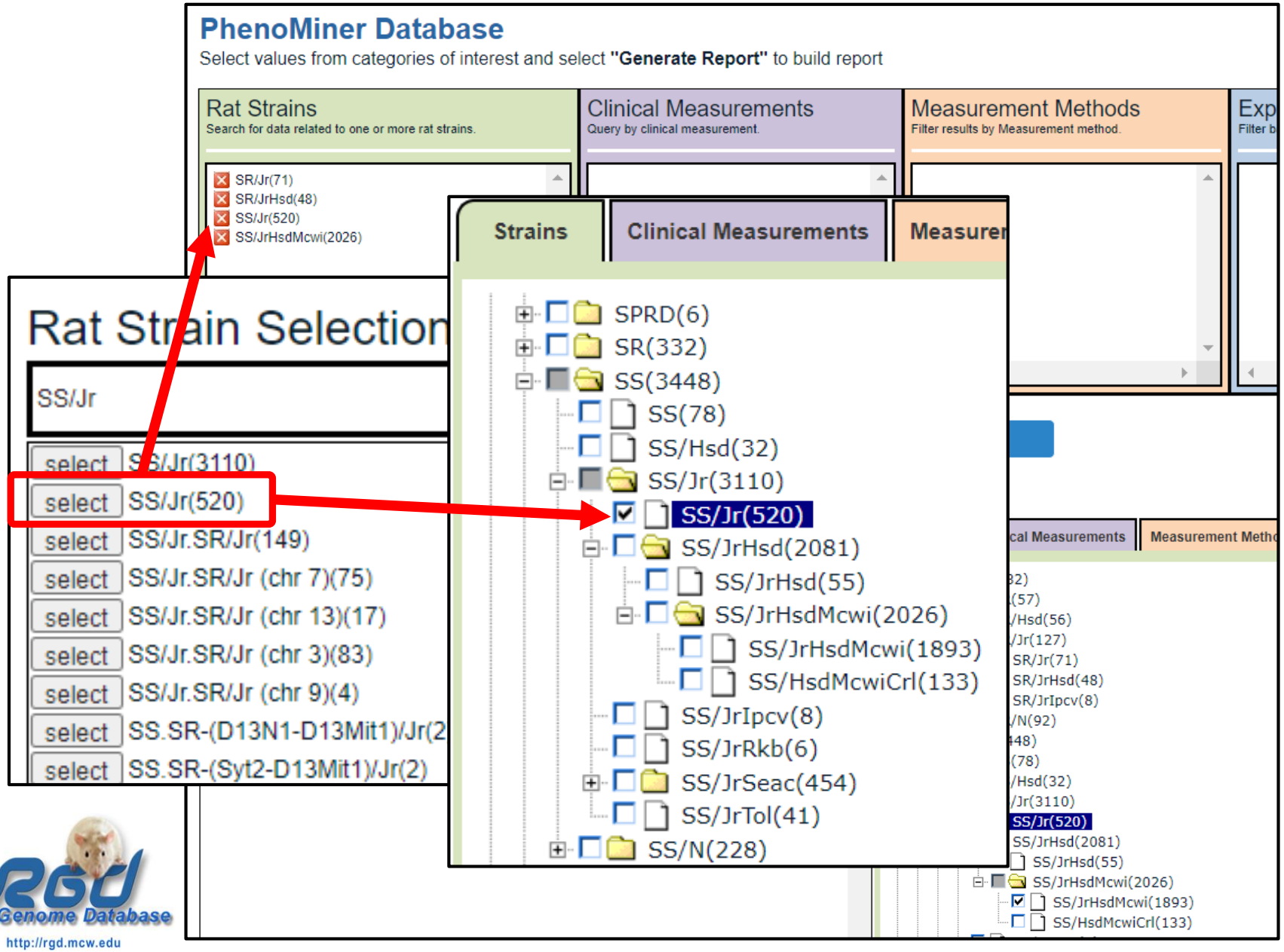


- In PhenoMiner 2.0 all of the components are on a single page.
- The Strain Ontology loads automatically but you can still start with any of the ontologies by using the tabs in the lower right panel.
- As selections are made in the bottom panels, they appear in the boxes at the top.

PhenoMiner 2.0: More intuitive selection and modification



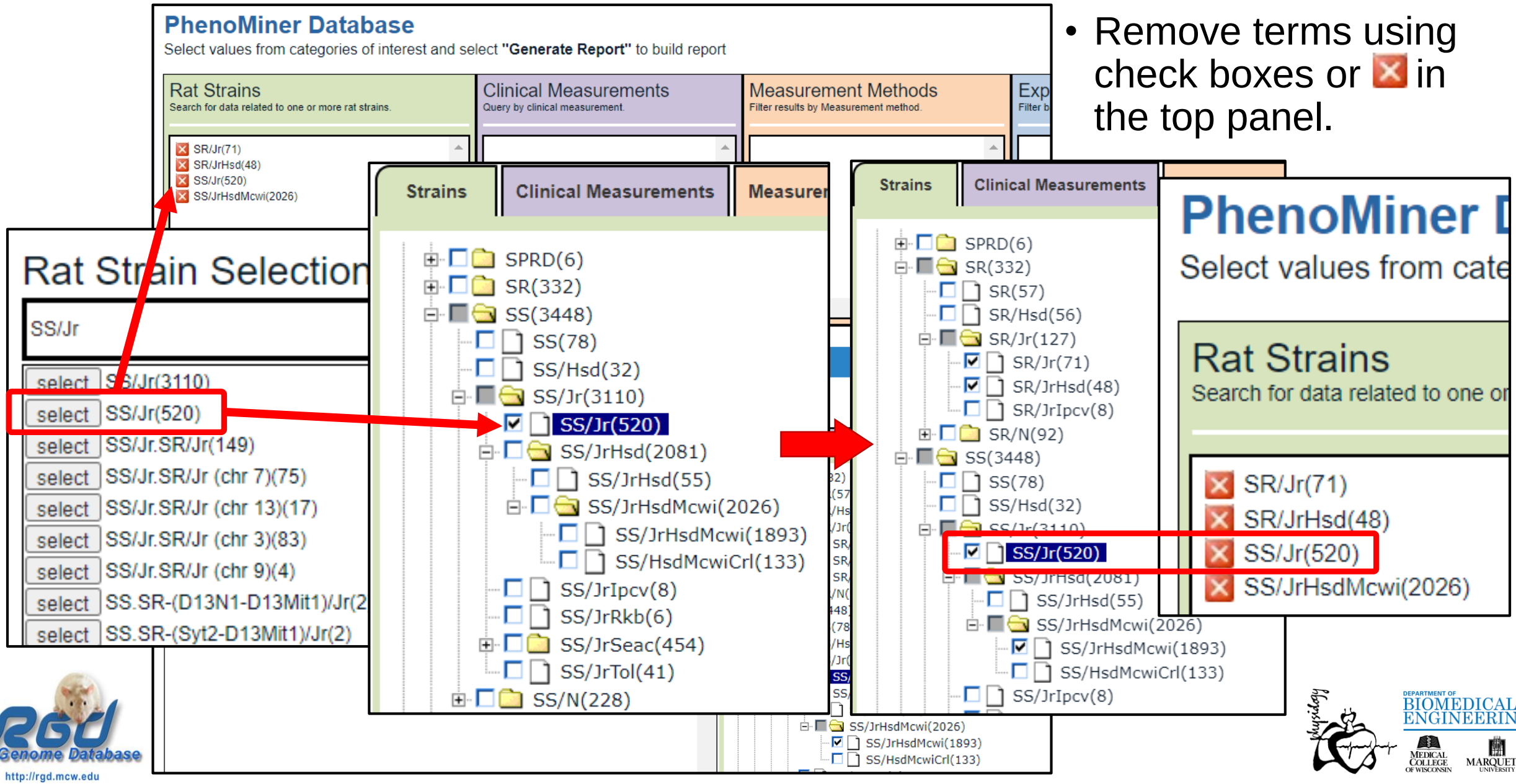
PhenoMiner 2.0: More intuitive selection and modification



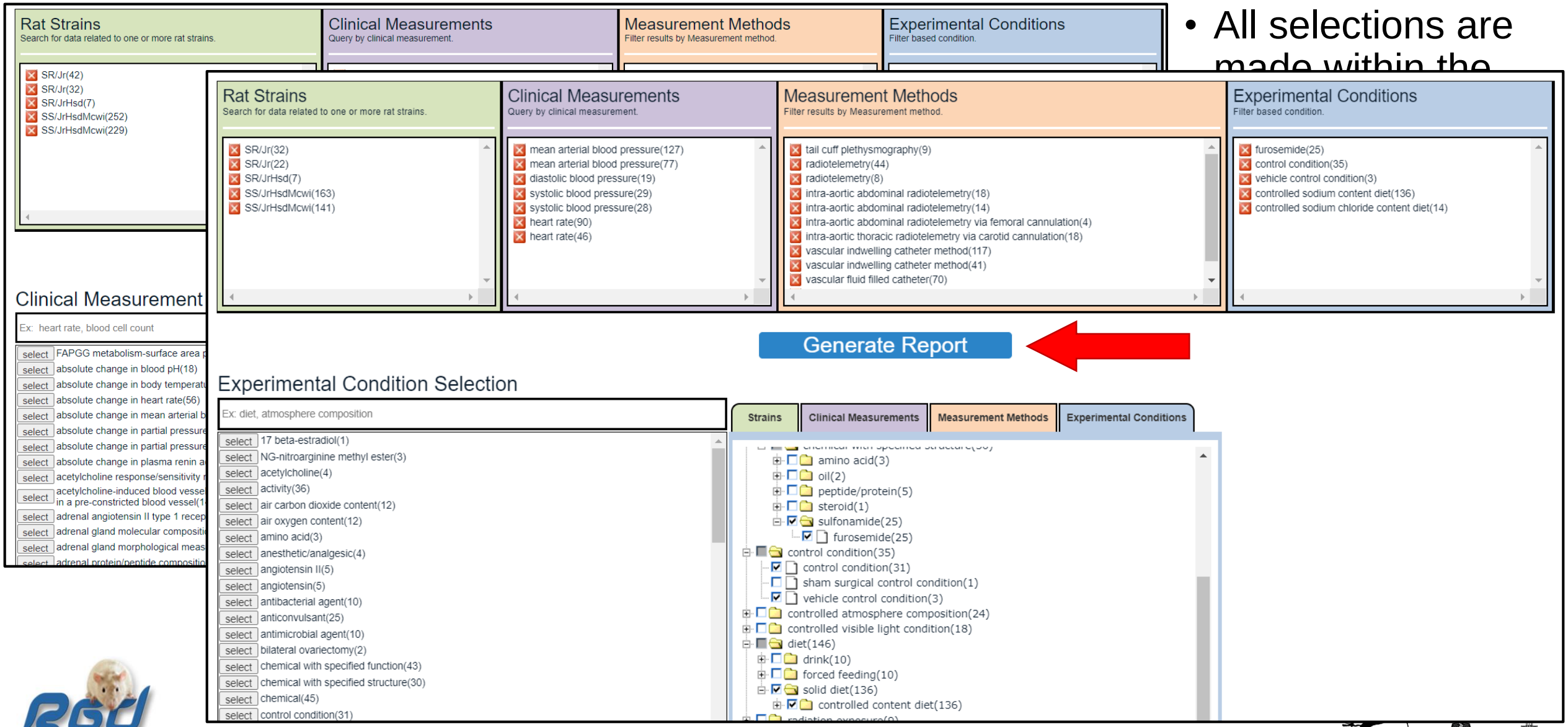
- Entering a term in the search box narrows the list below it.
- "Select" puts the term into the box at the top and opens that region in the ontology tree in the bottom right panel making it easy to refine the selection, add terms, etc.

PhenoMiner 2.0: More intuitive selection and modification

- Remove terms using check boxes or ✕ in the top panel.



PhenoMiner 2.0: More intuitive selection and modification

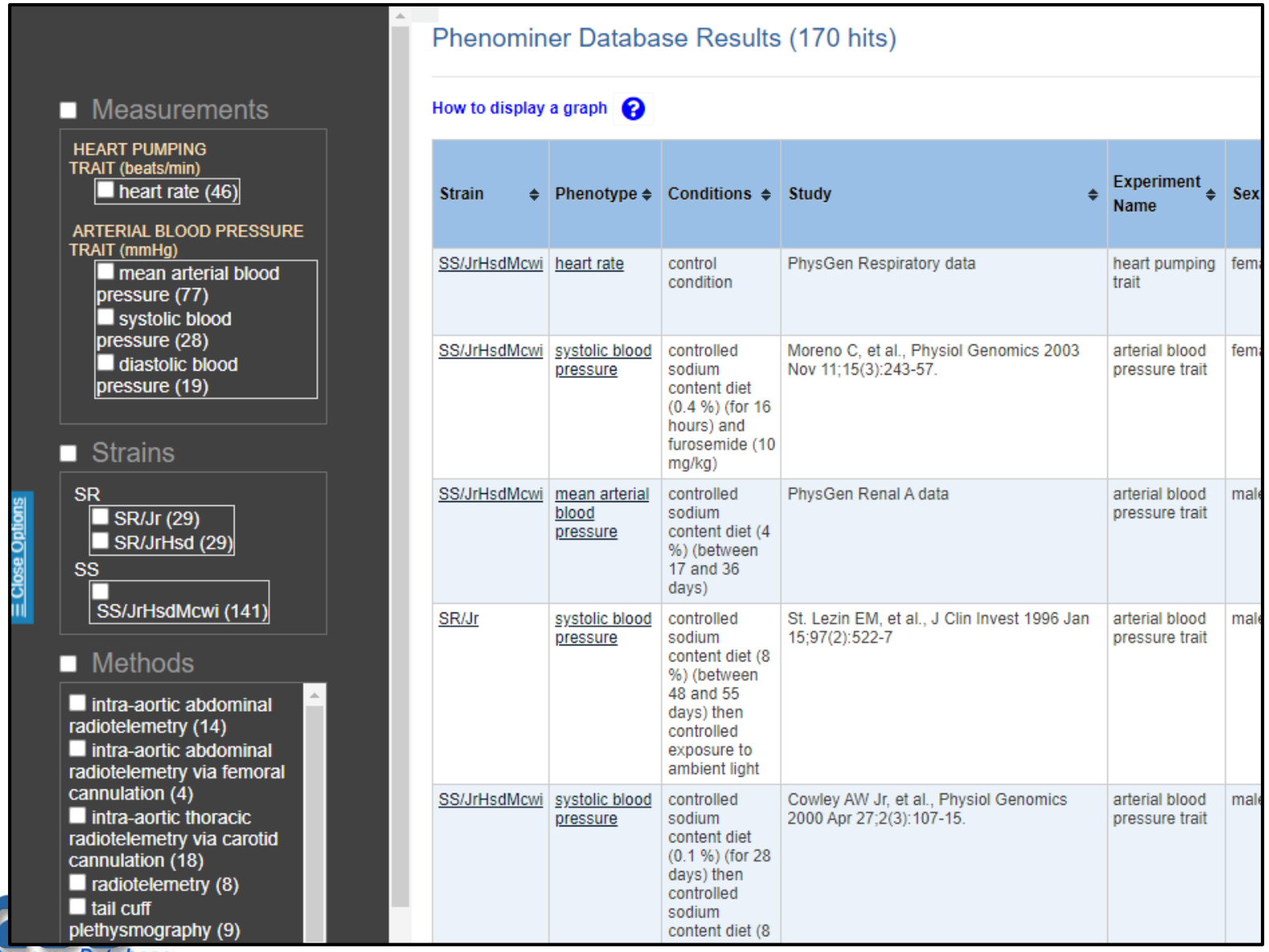


- All selections are made within the

Rat Genome Database
http://rgd.mcw.edu

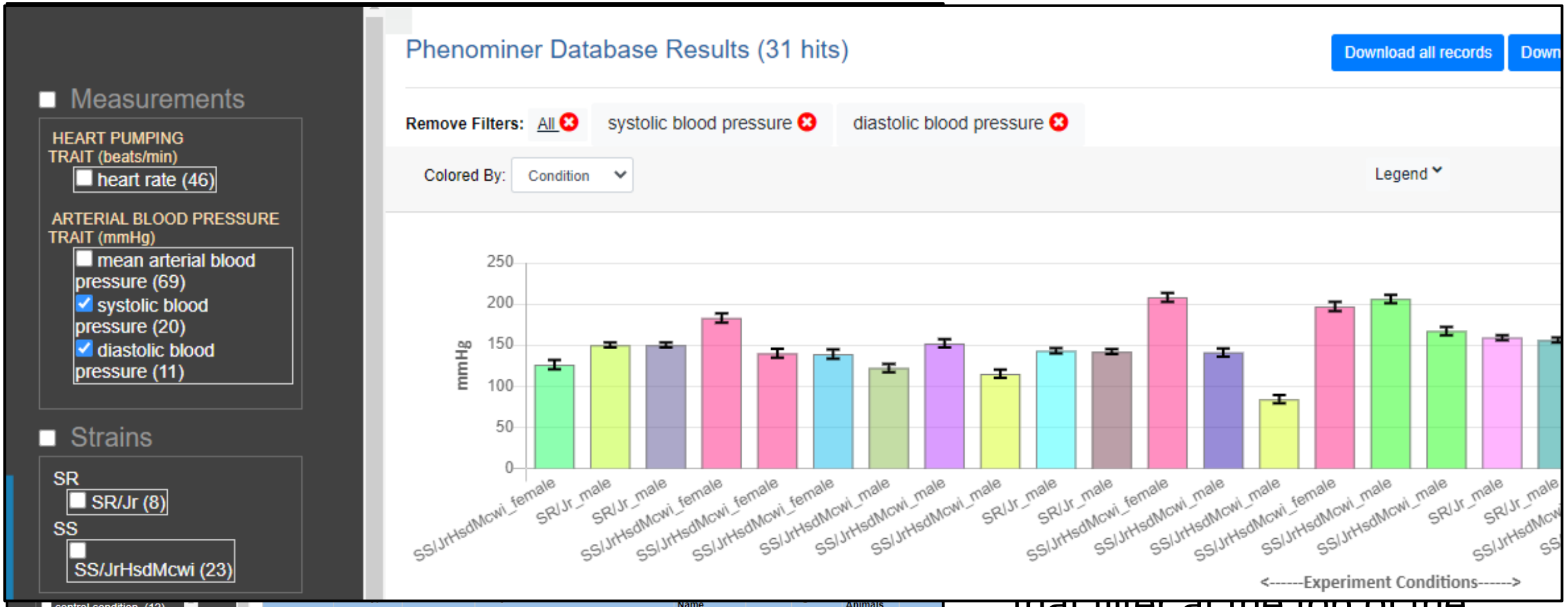
Medical College of Wisconsin
Marquette University

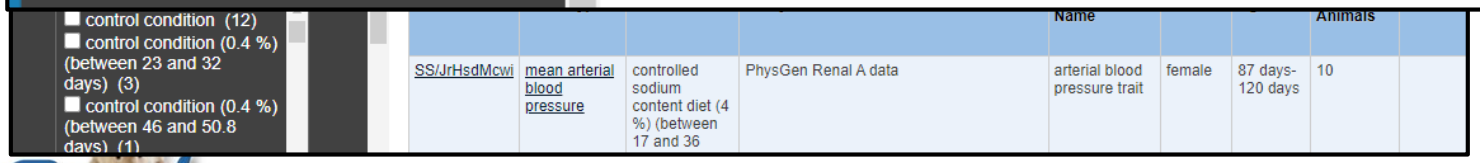
The PhenoMiner 2.0 results display consists of three parts



- The PhenoMiner 2.0 results display consists of three parts:
  - A graph
  - A list of filters
  - A table of results
- If measurements that use more than one unit have been selected, the graph is hidden until the user filters the measurement selection

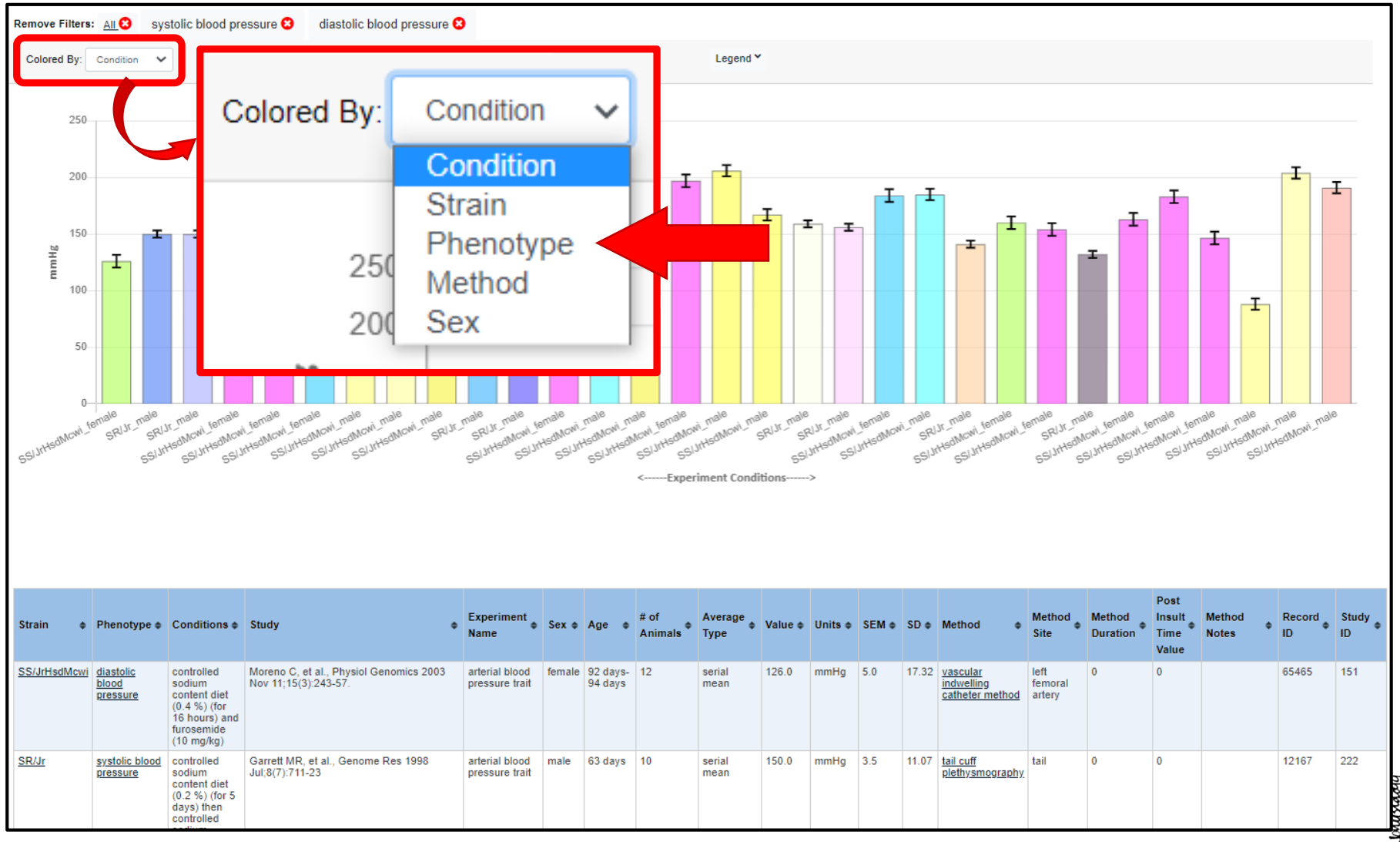
The PhenoMiner 2.0 results display consists of three parts





that filter at the top of the page

The PhenoMiner 2.0 graph is more interactive: “Colored by” function

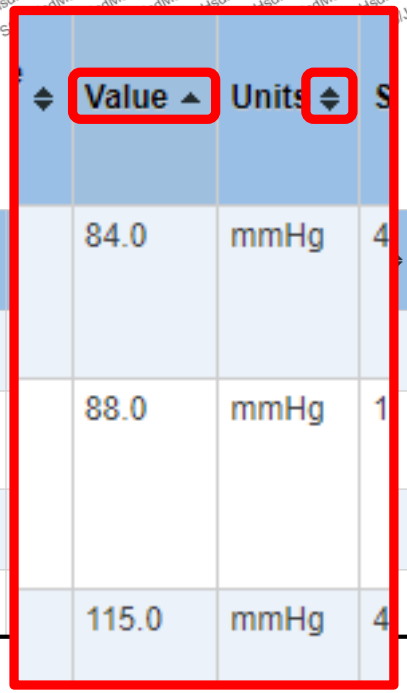


Strain	Phenotype	Conditions	Study	Experiment Name	Sex	Age	# of Animals	Average Type	Value	Units	SEM	SD	Method	Method Site	Method Duration	Post Insult Time Value	Method Notes	Record ID	Study ID
SS/JrHsdMcwi	diastolic blood pressure	controlled sodium content diet (0.4 %) (for 16 hours) and furosemide (10 mg/kg)	Moreno C, et al., Physiol Genomics 2003 Nov 11;15(3):243-57.	arterial blood pressure trait	female	92 days-94 days	12	serial mean	126.0	mmHg	5.0	17.32	vascular indwelling catheter method	left femoral artery	0	0		65465	151
SR/Jr	systolic blood pressure	controlled sodium content diet (0.2 %) (for 5 days) then controlled	Garrett MR, et al., Genome Res 1998 Jul;8(7):711-23	arterial blood pressure trait	male	63 days	10	serial mean	150.0	mmHg	3.5	11.07	tail cuff plethysmography	tail	0	0		12167	222

The PhenoMiner 2.0 graph is more interactive: “Colored by” function

The PhenoMiner 2.0 graph is more interactive: Sorting the table reorders the bars in the graph

Strain	Phenotype	Conditions	Study	Experiment Name	Sex	Age	# of Animals	Average Type	Value	Units	Post Insult Time Value	Method Notes	Record ID	Study ID
SS/JrHsdMcwi	diastolic blood pressure	vehicle control condition	Xu D, et al., Hypertension. 2011 Aug;58(2):303-9. doi: 10.1161/HYPERTENSIONAHA.110.166819. Epub 2011 Jul 5.	arterial blood pressure trait	male	56 days	6		84.0	mmHg	0		106806	3032
SS/JrHsdMcwi	diastolic blood pressure	control condition (0.4 %) (between 23 and 32 days)	Cowley AW Jr, et al., Physiol Genomics. 2016 Jan;48(1):62-72. doi: 10.1152/physiolgenomics.00097.2015. Epub 2015 Nov 3.	arterial blood pressure trait	male	44 days-53 days	14	serial mean	88.0	mmHg	0	carotid a. to thoracic aorta implant	98486	2079
SS/JrHsdMcwi	systolic blood pressure	vehicle control condition	Xu D, et al., Hypertension. 2011 Aug;58(2):303-9. doi: 10.1161/HYPERTENSIONAHA.110.166819. Epub 2011 Jul 5.	arterial blood pressure trait	male	56 days	6		115.0	mmHg	0		106802	3032
SS/JrHsdMcwi	systolic blood pressure	control condition (0.4 %) (between	Cowley AW Jr, et al., Physiol Genomics. 2016 Jan;48(1):62-72. doi: 10.1152/physiolgenomics.00097.2015.	arterial blood pressure trait	male	44 days-53 days	14	serial mean	122.0	mmHg	0	carotid a. to thoracic aorta implant	98479	2079

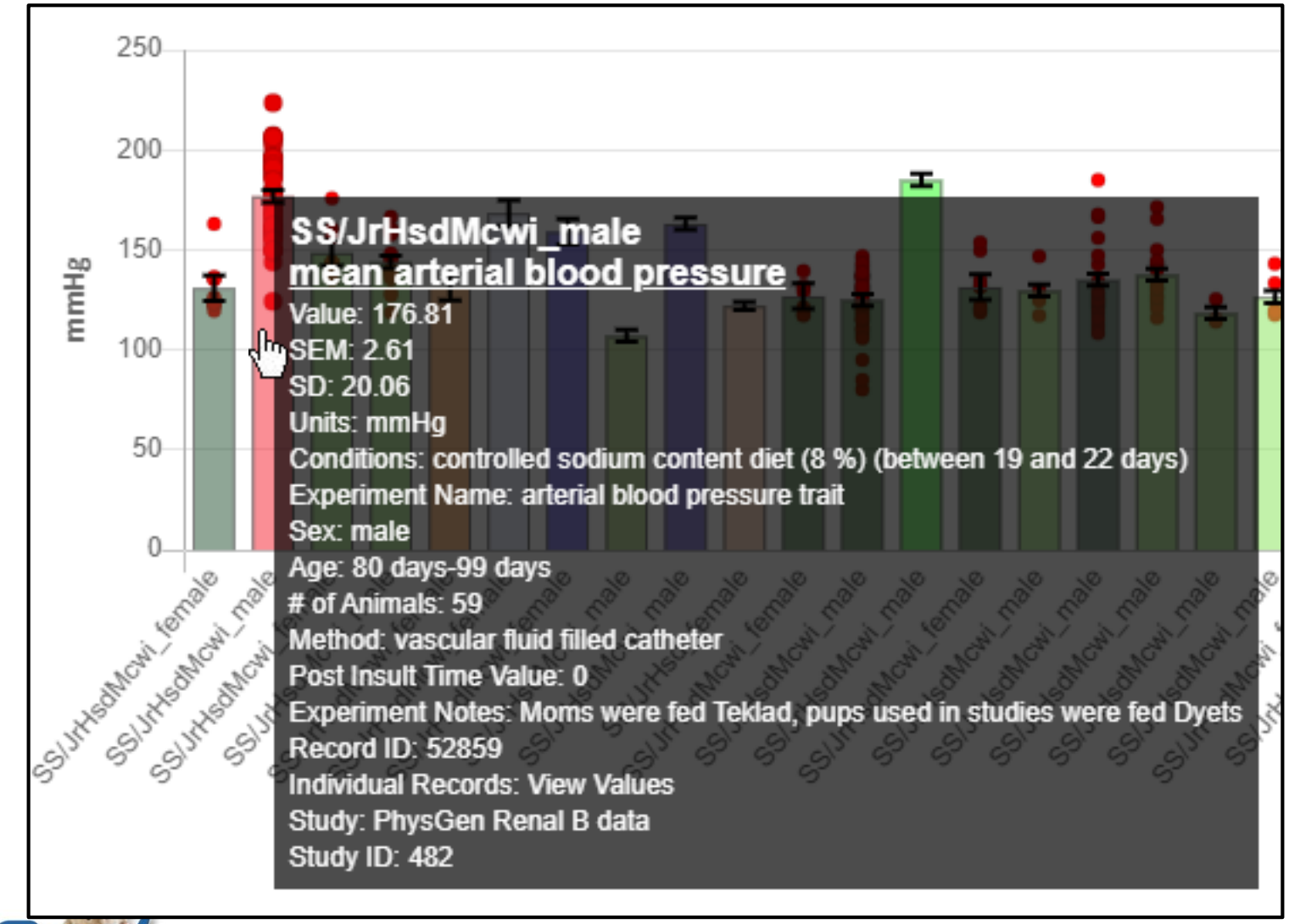


- Using colored by phenotype and sort by value it is easy to see at a glance the mix of diastolic and systolic blood pressure values.

Where data for individual rats has been submitted, the graph shows the average plus the individual values

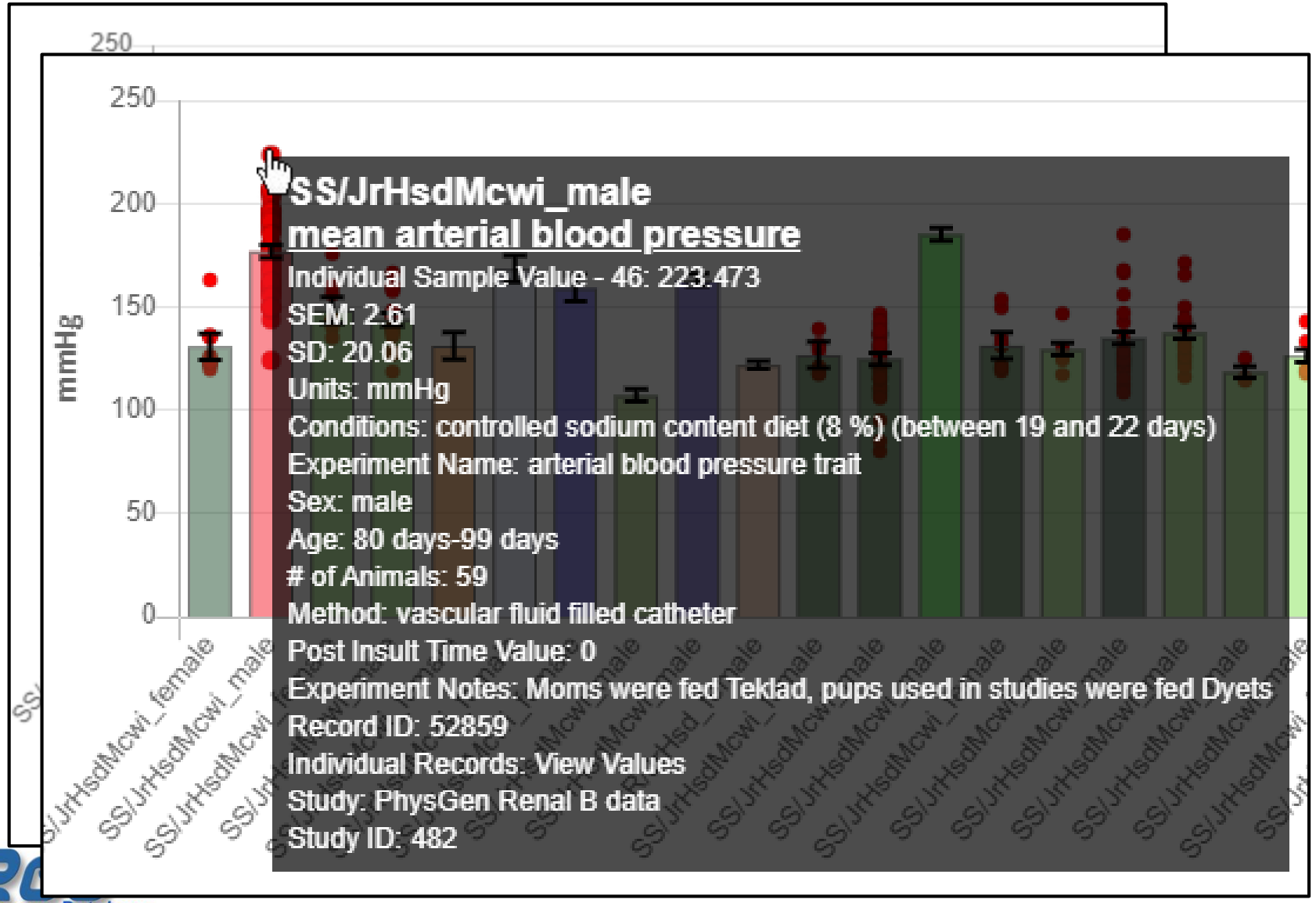
Looking at the graph for mean arterial blood pressure, you can see that some of the bars include red dots indicating the values for individual animals.

Where data for individual rats has been submitted, the graph shows the average plus the individual values



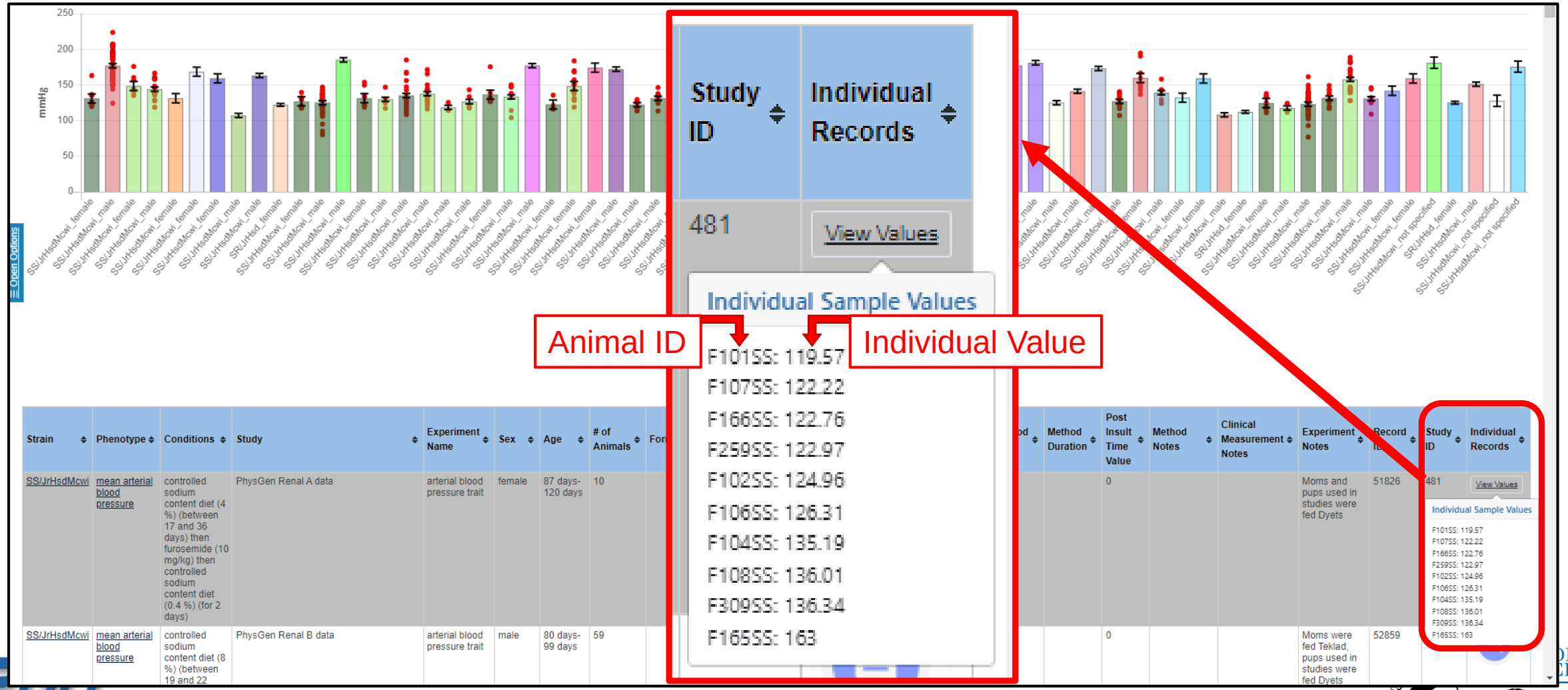
- Mouse over the bar to see a popup with details about the average value for that sample of rats under those conditions.

Where data for individual rats has been submitted, the graph shows the average plus the individual values



- Mouse over the bar to see a popup with details about the average value for that sample of rats under those conditions.
- Mouse over a dot to see the details for that individual rat measurement.

Where data for individual rats has been submitted, the table shows the average with the option to view individual values



Strain	Phenotype	Conditions	Study	Experiment Name	Sex	Age	# of Animals	Method Duration	Post Insult Time Value	Method Notes	Clinical Measurement Notes	Experiment Notes	Record ID	Study ID	Individual Records
SS/JrHsdMcwi	mean arterial blood pressure	controlled sodium content diet (4 %) (between 17 and 36 days) then furosemide (10 mg/kg) then controlled sodium content diet (0.4 %) (for 2 days)	PhysGen Renal A data	arterial blood pressure trait	female	87 days-120 days	10		0			Moms and pups used in studies were fed Dyets	51826	481	View Values
SS/JrHsdMcwi	mean arterial blood pressure	controlled sodium content diet (8 %) (between 19 and 22	PhysGen Renal B data	arterial blood pressure trait	male	80 days-99 days	59		0			Moms were fed Teklad, pups used in studies were fed Dyets	52859		

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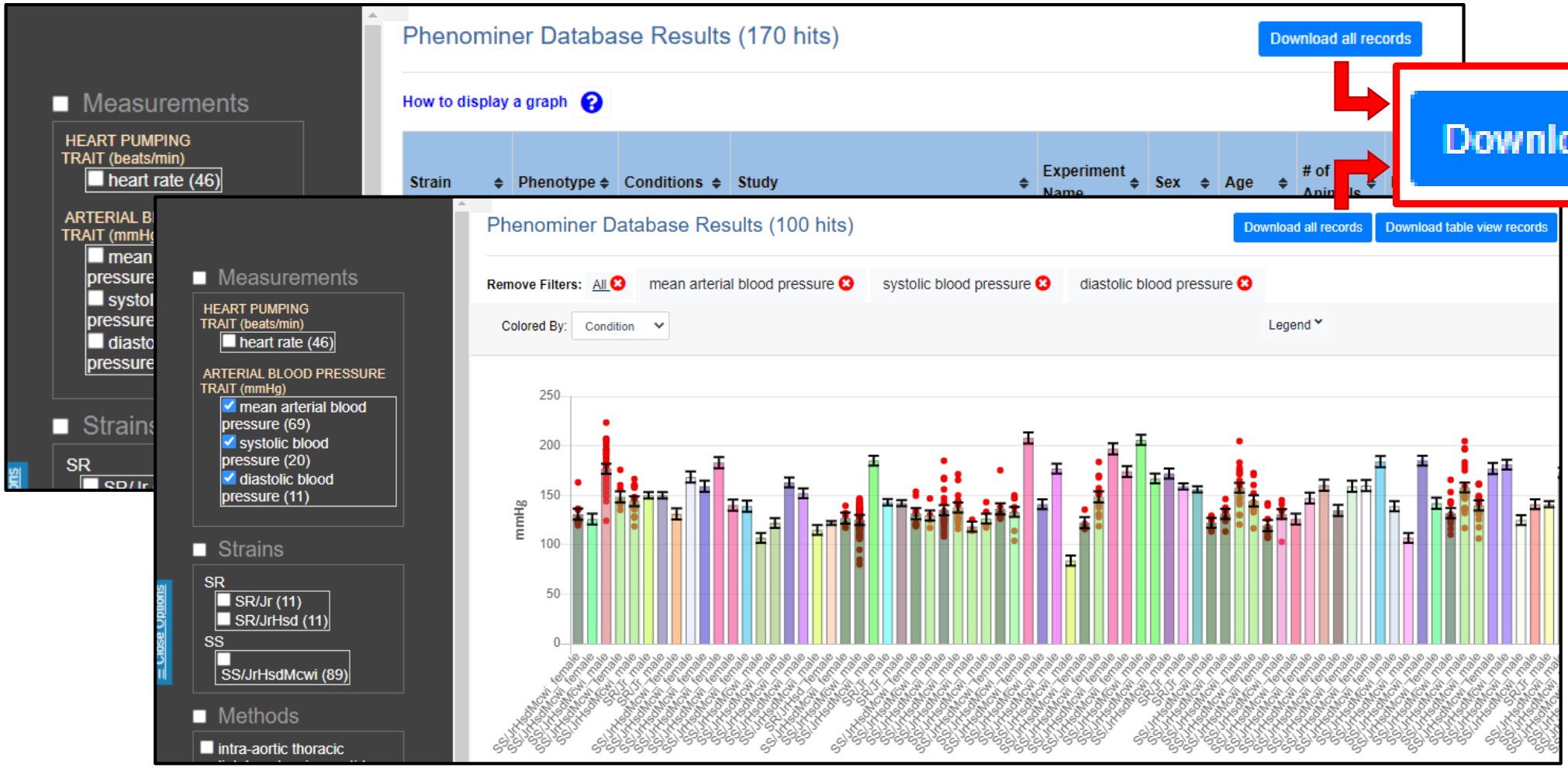
Data from the query can be downloaded



A button for “Download all records” is displayed on the pages for both unfiltered and filtered queries.

Filtered queries also have an option to download just the table view records.

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