MouseDB Documentation

Release 0.1

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ONE

MOUSEDB CONCEPTS

Data storage for MouseDB is separated into packages which contain information about animals, and information collected about animals. There is also a separate module for timed matings of animals. This document will describe the basics of how data is stored in each of these modules.

1.1 Animal Module

Animals are tracked as individual entities, and given associations to breeding cages to follow ancestry, and strains.

1.1.1 Animal

Most parameters about an animal are set within the animal object. Here is where the animals strain, breeding, parentage and many other parameters are included. Animals have foreignkey relationships with both Strain and Breeding, so an animal may only belong to one of each of those. As an example, a mouse cannot come from more than one Breeding set, and cannot belong to more than one strain.

1.1.2 Breeding Cages

A breeding cage is defined as a set of one or more male and one or more female mice. Because of this, it is not always clear who the precise parentage of an animal is. If the parentage is known, then the Mother and Father fields can be set for a particular animal.

1.1.3 Strains

A strain is a set of mice with a similar genetics. Importantly strains are separated from Backgrounds. For example, one might have mice with the genotype ob/ob but these mice may be in either a C57-Black6 or a mixed background. This difference is set at the individual animal level. The result of this is that a query for a particular strain may then need to be filtered to a specific background.

1.2 Data Module

Data (or measurements) can be stored for any type of measurement. Conceptually, several pieces of data belong to an experiment (for example several mice are measured at some time) and several experiments belong to a study. Measurements can be stored independent of experiments and experiments can be performed outside of the context of

a study. It is however, perfered that measurements are stored within an experiment and experiments are stored within studies as this will greatly facilitate the organization of the data.

1.2.1 Studies

In general studies are a collection of experiments. These can be grouped together on the basis of animals and/or treatment groups. A study must have at least one treatment group, which defines the animals and their conditions.

1.2.2 Experiments

An experiment is a collection of measurements for a given set of animals. In general, an experiment is defined as a number of measurements take in a given day.

1.2.3 Measurements

A measurement is an animal, an assay and a measurement value. It can be associated with an experiment, or can stand alone as an individual value. Measurements can be viewed in the context of a study, an experiment, a treatment group or an animal by going to the appropriate page.

CHAPTER

TWO

MOUSEDB INSTALLATION

2.1 Configuration

MouseDB requires both a database and a webserver to be set up. Ideally, the database should be hosted separately from the webserver and MouseDB installation, but this is not necessary, as both can be used from the same server. If you are using a remote server for the database, it is best to set up a user for this database that can only be accessed from the webserver. If you want to set up several installations (ie for different users or different laboratories), you need separate databases and MouseDB installations for each. You will also need to set up the webserver with different addresses for each installation.

2.2 Software Dependencies

1. **MouseDB source code**. Download from one of the following:

1. http://github.com/davebridges/mousedb/downloads for the current release

2. http://github.com/davebridges/mousedb for the source code via Git

Downloading and/or unzipping will create a directory named mousedb. You can update to the newest revision at any time either using git or downloading and re-installing the newer version. Changing or updating software versions will not alter any saved data, but you will have to update the localsettings.py file (described below).

1. **Python**. Requires Version 2.6, is not yet compatible with Python 3.0. Download from http://www.python.org/download/.

2. **Django**. Download from http://www.djangoproject.com/download/

3. **Database software**. Typically MySQL is used, but PostgreSQL, Oracle or SQLite can also be used. You also need to install the python driver for this database (unless you are using SQLite, which is internal to Python 2.5+). See http://docs.djangoproject.com/en/dev/topics/install/database-installation - Django Database Installation Documentation for more information.

2.3 Database Setup

1. Create a new database. You need to record the user, password, host and database name. If you are using SQLite this step is not required.

2. Go to localsettings_empty.py and edit the settings:

- DATABASE_ENGINE: ‘mysql’, ‘postgresql_psycopg2’ or ‘sqlite3 depending on the database software used.

- DATABASE_NAME: database name
- DATABASE_USER: database user
- DATABASE_PASSWORD: database password
- DATABASE_HOST: database host

1. Save this file as localsettings.py in the main MouseDB directory.

2.4 Web Server Setup

You need to set up a server to serve both the django installation and saved files. For the saved files. I recommend using apache for both. The preferred setup is to use Apache2 with mod_python. The following is a httpd.conf example where the code is placed in /usr/src/mousedb:

If you want to restrict access to these files, change the Allow from all directive to specific domains or ip addresses (for example Allow from 192.168.0.0/99 would allow from 192.168.0.0 to 192.168.0.99)

2.5 Final Configuration and User Setup

1. Go to mousedb/admin/auth/users/ and create users, selecting usernames, full names, password (or have the user set the password) and then choose group permissions.

CHAPTER

THREE

ANIMAL DATA ENTRY

3.1 Newborn Mice or Newly Weaned Mice

1. Go to Breeding Cages Tab
2. Click on Add/Wean Pups Button
3. Each row is a new animal. If you accidentaly enter an extra animal, check off the delete box then submit.
4. Leave extra lines blank if you have less than 10 mice to enter
5. If you need to enter more than 10 mice, enter the first ten and submit them. Go back and enter up to 10 more animals (10 more blank spaces will appear)

3.2 Newborn Mice

1. Enter Breeding Cage under Cage
2. Enter Strain
3. Enter Background (normally Mixed or C57BL/6-BA unless from the LY breeding cages in which case it is C57BL/6-LY5.2)
4. Enter Birthdate in format YYYY-MM-DD
5. Enter Generation and Backcross

3.3 Weaning Mice

1. If not previously entered, enter data as if newborn mice
2. Enter gender
3. Enter Wean Date in format YYYY-MM-DD
4. Enter new Cage number for Cage

3.4 Cage Changes (Not Weaning)

1. Find mouse either from animal list or strain list

2. Click the edit mouse button
3. Change the Cage, Rack and Rack Position as Necessary

3.5 Genotyping or Ear Tagging

1. Find mouse either from animal list or strain list, or through breeding cage
2. Click the edit mouse button or the Eartag/Genotype/Cage Change/Death Button
3. Enter the Ear Tag and/or select the Genotype from the Pull Down List

3.6 Marking Mice as Dead

3.6.1 Dead Mice (Single Mouse)

1. Find mouse from animal list or strain list
2. Click the edit mouse button
3. Enter the death date in format YYYY-MM-DD
4. Choose Cause of Death from Pull Down List

3.6.2 Dead Mice (Several Mice)

1. Find mice from breeding cages
2. Click the Eartag/Genotype/Cage Change/Death Button
3. Enter the death date in format YYYY-MM-DD
4. Choose the Cause of Death from Pull Down List

CHAPTER

FOUR

STUDIES AND EXPERIMENTAL SETUP

Set up a new study at /mousedb/admin/data/study/ selecting animals

You must put a description and select animals in one or more treatment groups

If you have more than 2 treatment groups save the first two, then two more empty slots will appear. For animals, click on the magnifying glass then find the animal in that treatment group and click on the MouseID. The number displayed now in that field will not be the MouseID, but don't worry its just a different number to describe the mouse. To add more animals, click on the magnifying glass again and select the next animal. There should be now two numbers, separated by commas in this field. Repeat to fill all your treatment groups. You must enter a diet and environment for each treatment. The other fields are optional, and should only be used if appropriate. Ensure for pharmaceutical, you include a saline treatment group.

CHAPTER

FIVE

MEASURMENT ENTRY

5.1 Studies

If this measurement is part of a study (ie a group of experiments) then click on the plus sign beside the study field and enter in the details about the study and treatment groups. Unfortunately until i can figure out how to filter the treatment group animals in the admin interface, at each of the subsequent steps you will see all the animals in the database (soon hopefully it will only be the ones as part of the study group).

5.2 Experiment Details

- Pick experiment date, feeding state and resarchers
- Pick animals used in this experiment (the search box will filter results)
- Fasting state, time, injections, concentration, experimentID and notes are all optional

5.3 Measurements

- There is room to enter 14 measurements. If you need more rows, enter the first 14 and select "Save and Continue Editing" and 14 more blank spots will appear.
- Each row is a measurement, so if you have glucose and weight for some animal that is two rows entered.
- For animals, click on the magnifying glass then find the animal in that treatment group and click on the MouseID. The number displayed now in that field will not be the MouseID, but don't worry its just a different number to describe the mouse.
- For values, the standard units (defined by each assay) are mg for weights, mg/dL for glucose and pg/mL for insulin). You must enter integers here (no decimal places). If you have several measurements (ie several glucose readings during a GTT, enter them all in one measurement row, separated by commas and *NO spaces*).

CHAPTER

SIX

AUTOMATED DOCUMENTATION

6.1 Data Package

6.1.1 Models

class **Assay** (**args, **kwargs*)

Bases: `django.db.models.base.Model`

Assay(id, assay, assay_slug, notes, measurement_units)

exception **DoesNotExist**

Bases: `django.core.exceptions.ObjectDoesNotExist`

exception **MultipleObjectsReturned**

Bases: `django.core.exceptions.MultipleObjectsReturned`

measurement_set

class **Diet** (**args, **kwargs*)

Bases: `django.db.models.base.Model`

Diet(id, vendor_id, description, product_id, fat_content, protein_content, carb_content, irradiated, notes)

exception **DoesNotExist**

Bases: `django.core.exceptions.ObjectDoesNotExist`

exception **MultipleObjectsReturned**

Bases: `django.core.exceptions.MultipleObjectsReturned`

treatment_set

vendor

class **Environment** (**args, **kwargs*)

Bases: `django.db.models.base.Model`

Environment(id, building, room, temperature, humidity, notes)

exception **DoesNotExist**

Bases: `django.core.exceptions.ObjectDoesNotExist`

exception **MultipleObjectsReturned**

Bases: `django.core.exceptions.MultipleObjectsReturned`

contact

treatment_set

class Experiment(**args, **kwargs*)
Bases: django.db.models.base.Model

Experiment(id, date, notes, experimentID, feeding_state, fasting_time, injection, concentration, study_id)

exception DoesNotExist
Bases: django.core.exceptions.ObjectDoesNotExist

exception MultipleObjectsReturned
Bases: django.core.exceptions.MultipleObjectsReturned

animals

get_feeding_state_display(**moreargs, **morekwargs*)

get_injection_display(**moreargs, **morekwargs*)

get_next_by_date(**moreargs, **morekwargs*)

get_previous_by_date(**moreargs, **morekwargs*)

measurement_set

researchers

study

class Implantation(**args, **kwargs*)
Bases: django.db.models.base.Model

Implantation(id, implant, vendor_id, product_id, notes)

exception DoesNotExist
Bases: django.core.exceptions.ObjectDoesNotExist

exception MultipleObjectsReturned
Bases: django.core.exceptions.MultipleObjectsReturned

surgeon

treatment_set

vendor

class Measurement(**args, **kwargs*)
Bases: django.db.models.base.Model

Measurement(id, animal_id, experiment_id, assay_id, values)

exception DoesNotExist
Bases: django.core.exceptions.ObjectDoesNotExist

exception MultipleObjectsReturned
Bases: django.core.exceptions.MultipleObjectsReturned

animal

assay

experiment

class Pharmaceutical(**args, **kwargs*)
Bases: django.db.models.base.Model

Pharmaceutical(id, drug, dose, recurrance, mode, vendor_id, notes)

exception DoesNotExist
Bases: django.core.exceptions.ObjectDoesNotExist

exception MultipleObjectsReturned
Bases: django.core.exceptions.MultipleObjectsReturned

get_mode_display(**moreargs, **morekwargs*)

treatment_set

vendor

class Researcher(**args, **kwargs*)
Bases: django.db.models.base.Model

Researcher(id, first_name, last_name, name_slug, email, active)

exception DoesNotExist
Bases: django.core.exceptions.ObjectDoesNotExist

exception MultipleObjectsReturned
Bases: django.core.exceptions.MultipleObjectsReturned

environment_set

experiment_set

get_absolute_url(**moreargs, **morekwargs*)

implantation_set

transplantation_set

treatment_set

class Study(**args, **kwargs*)
Bases: django.db.models.base.Model

Study(id, description, start_date, stop_date, notes)

exception DoesNotExist
Bases: django.core.exceptions.ObjectDoesNotExist

exception MultipleObjectsReturned
Bases: django.core.exceptions.MultipleObjectsReturned

experiment_set

strain

treatment_set

class Transplantation(**args, **kwargs*)
Bases: django.db.models.base.Model

Transplantation(id, tissue, transplant_date, notes)

exception DoesNotExist
Bases: django.core.exceptions.ObjectDoesNotExist

exception MultipleObjectsReturned
Bases: django.core.exceptions.MultipleObjectsReturned

donor

get_next_by_transplant_date(**moreargs, **morekwargs*)

get_previous_by_transplant_date(**moreargs, **morekwargs*)

surgeon

treatment_set

class Treatment(**args, **kwargs*)
Bases: django.db.models.base.Model

Treatment(id, treatment, study_id, diet_id, environment_id, transplantation_id, notes)

exception DoesNotExist
Bases: django.core.exceptions.ObjectDoesNotExist

exception MultipleObjectsReturned
Bases: django.core.exceptions.MultipleObjectsReturned

animals

diet

environment

implantation

pharmaceutical

researchers

study

transplantation

class Vendor(**args, **kwargs*)
Bases: django.db.models.base.Model

Vendor(id, vendor, website, email, ordering, notes)

exception DoesNotExist
Bases: django.core.exceptions.ObjectDoesNotExist

exception MultipleObjectsReturned
Bases: django.core.exceptions.MultipleObjectsReturned

diet_set

get_ordering_display(**moreargs, **morekwargs*)

implantation_set

pharmaceutical_set

6.1.2 Forms

class ExperimentForm(*data=None, files=None, auto_id='id_%s', prefix=None, initial=None, error_class=<class 'django.forms.util.ErrorList'>, label_suffix=':', empty_permitted=False, instance=None*)
Bases: django.forms.models.ModelForm

class Meta()

model
alias of Experiment

media

class **MeasurementForm**(*data=None, files=None, auto_id='id_%s', prefix=None, initial=None, error_class=<class 'django.forms.util.ErrorList'>, label_suffix=':', empty_permitted=False, instance=None*)

Bases: `django.forms.models.ModelForm`

class **Meta**()

model

alias of `Measurement`

media

class **StudyExperimentForm**(*data=None, files=None, auto_id='id_%s', prefix=None, initial=None, error_class=<class 'django.forms.util.ErrorList'>, label_suffix=':', empty_permitted=False, instance=None*)

Bases: `django.forms.models.ModelForm`

class **Meta**()

model

alias of `Experiment`

media

class **StudyForm**(*data=None, files=None, auto_id='id_%s', prefix=None, initial=None, error_class=<class 'django.forms.util.ErrorList'>, label_suffix=':', empty_permitted=False, instance=None*)

Bases: `django.forms.models.ModelForm`

class **Meta**()

model

alias of `Study`

media

6.1.3 Views and URLs

add_measurement

experiment_detail

experiment_detail_all

experiment_list

study_experiment

6.1.4 Administrative Site Configuration

6.2 Animals Package

The animal app contains and controls the display of data about animals.

Animals are tracked as individual entities, and given associations to breeding cages to follow ancestry, and strains.

6.2.1 Animal

Most parameters about an animal are set within the animal object. Here is where the animals strain, breeding, parentage and many other parameters are included. Animals have foreignkey relationships with both Strain and Breeding, so an animal may only belong to one of each of those. As an example, a mouse cannot come from more than one Breeding set, and cannot belong to more than one strain.

6.2.2 Breeding Cages

A breeding cage is defined as a set of one or more male and one or more female mice. Because of this, it is not always clear who the precise parentage of an animal is. If the parentage is known, then the Mother and Father fields can be set for a particular animal.

6.2.3 Strains

A strain is a set of mice with a similar genetics. Importantly strains are separated from Backgrounds. For example, one might have mice with the genotype ob/ob but these mice may be in either a C57-Black6 or a mixed background. This difference is set at the individual animal level. The result of this is that a query for a particular strain may then need to be filtered to a specific background.

6.2.4 Models

This module describes the Strain, Animal, Breeding and Cage data models.

This module stores all data regarding a particular laboratory animal. Information about experimental data and timed matings are stored in the data and timed_matings packages. This module describes the database structure for each data model.

class **Strain**(**args, **kwargs*)
Bases: `django.db.models.base.Model`

A data model describing a mouse strain.

This is separate from the background of a mouse. For example a ob/ob mouse on a mixed or a black-6 background still have the same strain. The background is defined in the animal and breeding cages.

class **Animal**(**args, **kwargs*)
Bases: `django.db.models.base.Model`

A data model describing an animal.

This data model describes a wide variety of parameters of an experimental animal. This model is linked to the Strain and Cage models via 1:1 relationships. If the parentage of a mouse is known, this can be identified (the breeding set may not be clear on this matter). Mice are automatically marked as not alive when a Death date is provided and the object is saved.

class **Breeding**(**args, **kwargs*)
Bases: `django.db.models.base.Model`

This data model stores information about a particular breeding set

A breeding set may contain one ore more males and females and must be defined via the progeny strain. For example, in the case of generating a new strain, the strain indicates the new strain not the parental strains. If the breeding set is part of a timed mating experiment, then Timed_Mating must be selected. Breeding cages are automatically inactivated upon saving when a End date is provided.

class Cage(**args, **kwargs*)
Bases: `django.db.models.base.Model`

This data model stores information about a particular cage.

This model, which is not yet implemented will be used by both breeding and non-breeding cages and will facilitate easier tracking and storage of cages. To implement this, it will be necessary to automatically generate a new cage (if a novel barcode is entered), or to use a current cage if the barcode is already present in the database

6.2.5 Forms

Forms for use in manipulating objects in the animal app.

class AnimalChangeForm(*data=None, files=None, auto_id='id_%s', prefix=None, initial=None, error_class=<class 'django.forms.util.ErrorList'>, label_suffix=':', empty_permitted=False, instance=None*)
Bases: `django.forms.models.ModelForm`

This form provides fields for altering animal fields.

This form us used with the mouse/(MouseID)/change url. This modelform excludes the fields CageID (not yet implemented), Gender, Born, Weaned, Backcross, Generation, Mother, Father, Notes and Alive (automatically set upon death).

class Meta()

model
alias of `Animal`

media

class AnimalForm(*data=None, files=None, auto_id='id_%s', prefix=None, initial=None, error_class=<class 'django.forms.util.ErrorList'>, label_suffix=':', empty_permitted=False, instance=None*)
Bases: `django.forms.models.ModelForm`

This form provides all fields for altering animal data.

This is expected to be used as part of the migration to CageID rather than Cage. Therefore, in this form, Cage is excluded and CageID is set as an integer field. The CageID will be set based on that integer, and a pre-save step will generate that foreignkey field if necesssary.

class Meta()

model
alias of `Animal`

media

6.2.6 Views and URLs

These views define template redirects for the animal app.

This module contains only non-generic views. Several generic views are also used and are defined in animal/urls/.

animal_change
This view is used to render a form to modify one animal.

The request takes the form /mouse/(id)/change/ or insetad of mouse mice, animal or animals. This returns a form specific to the animal defined in id. id represents the background identification number of a mouse and not the eartag or other identification number for an animal. This view is restricted to users with the permission animal.change_animal.

animal_detail
This view displays specific details about an animal.

It takes a request in the form animal/(id)/, mice/(id) or mouse/(id)/ and renders the detail page for that mouse. The request is defined for id not MouseID (or barcode) because this allows for details to be displayed for mice without barcode identification. Therefore care must be taken that animal/4932 is id=4932 and not barcode=4932. The animal name is defined at the top of the page. This page is restricted to logged-in users.

animal_new
This view is used to generate a form to add one animal.

It takes a request of /mouse/new/ or insetad of mouse mice, animal or animals and returns a blank form. If you are adding an animal as part of a breeding set it is best to use /breeding/(breeding_id)/pups.

breeding
This view displays a list of breeding sets.

It takes a request in the form /breeding/ and lists all currently active breeding sets. This page is restricted to logged-in users.

breeding_all
This view displays a list of breeding sets.

It takes a request in the form /breeding/all and lists all breeding sets (both active and inactive). This page is restricted to logged-in users.

breeding_change
This view is used to generate a form by which to change pups which belong to a particular breeding set.

It takes a request in the form /breeding/(breeding_id)/change/ and returns a form specific to the breeding set defined in breeding_id. breeding_id is the background identification number of the breeding set and does not refer to the barcode of any breeding cage. This view returns a formset in which one row represents one animal. To add extra animals to a breeding set use /breeding/(breeding_id)/pups/. This view is restricted to those with the permission animal.change_animal.

breeding_detail
This view displays specific details about a breeding set.

It takes a request in the form /breeding/(breeding_id)/all and renders the detail page for that breeding set. The breeding_id refers to the background id of the breeding set, and not the breeding cage barcode. This view also passes along a dictionary of all pups belonging to that breeding set. This page is restricted to logged-in users.

breeding_pups
This view is used to generate a form by which to add pups which belong to a particular breeding set.

It takes a request in the form /breeding/(breeding_id)/pups/ and returns a form specific to the breeding set defined in breeding_id. breeding_id is the background identification number of the breeding set and does not refer to the barcode of any breeding cage. This view is restricted to those with the permission animal.add_animal.

strain_detail
This view displays specific details about a strain.

It takes a request in the form strain/(strain_slug)/ and renders the detail page for that strain. This view also passes along a dictionary of alive animals belonging to that strain. This page is restricted to logged-in users.

strain_detail_all
This view displays specific details about a strain.

It takes a request in the form /strain/(strain_slug)/all and renders the detail page for that strain. This view also passes along a dictionary of all animals belonging to that strain. This page is restricted to logged-in users.

strain_list
This view presents a list of strains currently present in the database and annotates this list with a count of alive and total animals.

This view redirects from a /strain/ request. This view is restricted to logged-in users.

6.2.7 Administrative Site Configuration

Admin site settings for the animal app.

class AnimalAdmin (*model, admin_site*)
Bases: `django.contrib.admin.options.ModelAdmin`

Provides parameters for animal objects within the admin interface.

mark_sacrificed (*request, queryset*)
An admin action for marking several animals as sacrificed.

This action sets the selected animals as Alive=False, Death=today and Cause_of_Death as sacrificed. To use other paramters, mice muse be individually marked as sacrificed. This admin action also shows as the output the number of mice sacrificed.

media

class AnimalInline (*parent_model, admin_site*)
Bases: `django.contrib.admin.options.TabularInline`

Provides an inline tabular formset for animal objects.

Not currently used.

model
alias of `Animal`

class BreedingAdmin (*model, admin_site*)
Bases: `django.contrib.admin.options.ModelAdmin`

Settings in the admin interface for dealing with Breeding objects.

media

class CageAdmin (*model, admin_site*)
Bases: `django.contrib.admin.options.ModelAdmin`

Settings in the admin interface for dealing with Cage objects.

Not currently implemented as the Cage model is not yet implemented.

media

class StrainAdmin (*model, admin_site*)
Bases: `django.contrib.admin.options.ModelAdmin`

Settings in the admin interface for dealing with Strain objects.

media

6.3 Timed Mating Package

6.4 Groups Package

CHAPTER

SEVEN

INDICES AND TABLES

- *Index*
- *Module Index*
- *Search Page*

MODULE INDEX

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