Hybrid Rat Diversity Program (HRDP) update

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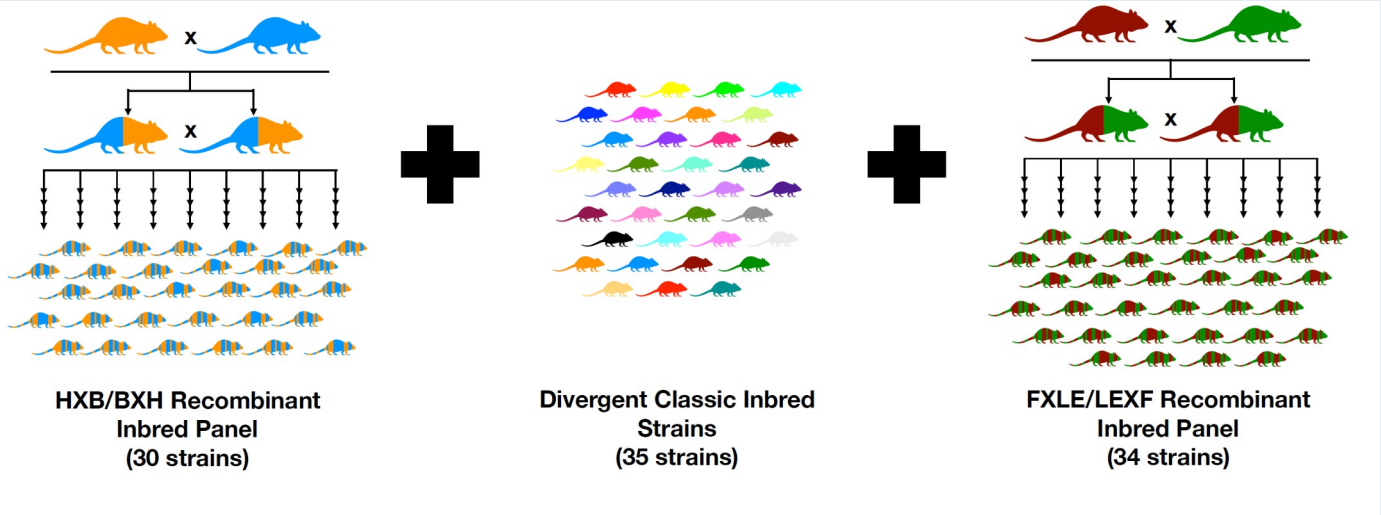
Establishing the HRDP

- Boris Tabakoff and Laura Saba approached MCW (Shimoyama & Dwinell)

- Goal: Develop a panel of inbred rat strains with:
  - Genetic and phenotypic variability
  - High resolution association mapping capability
  - Effects of genetic background
  - Useful for gene/environment interactions
  - Systems genetic approaches for complex traits
  - Model after Hybrid Mouse Diversity Panel

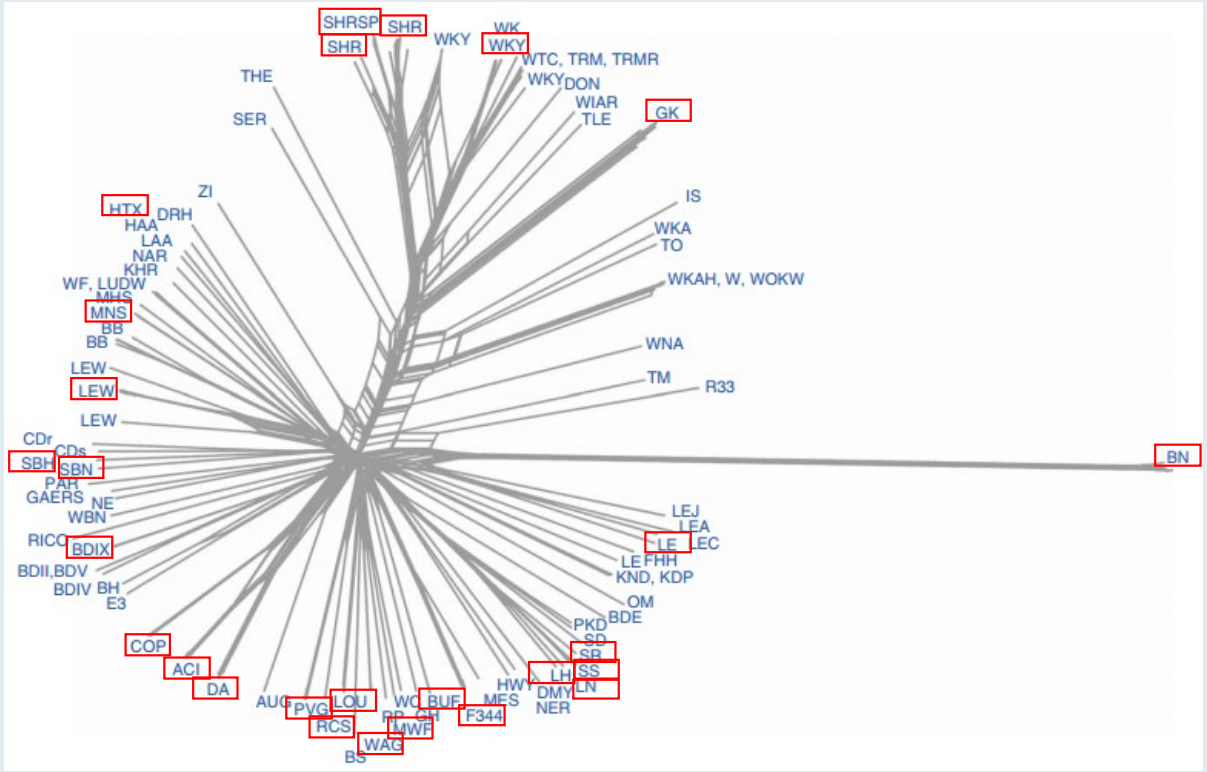


HRDP image created by Laura Saba

The Invited Guests

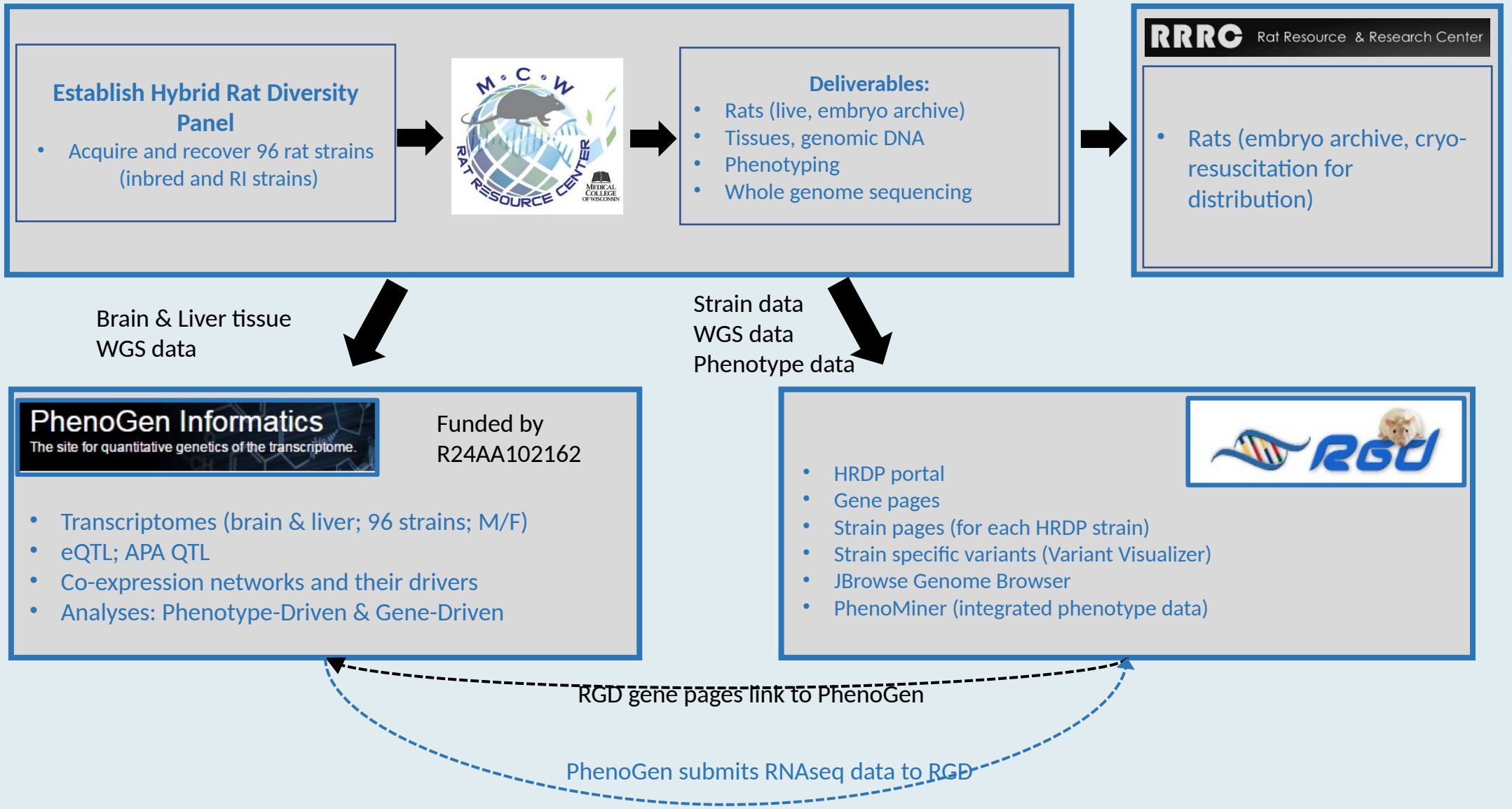
96-98 inbred rat strains

- 32-34 classic inbred strains
- 30 HXB/BXH recombinant inbred strains
- 34 FXLE/LEXF recombinant inbred strains

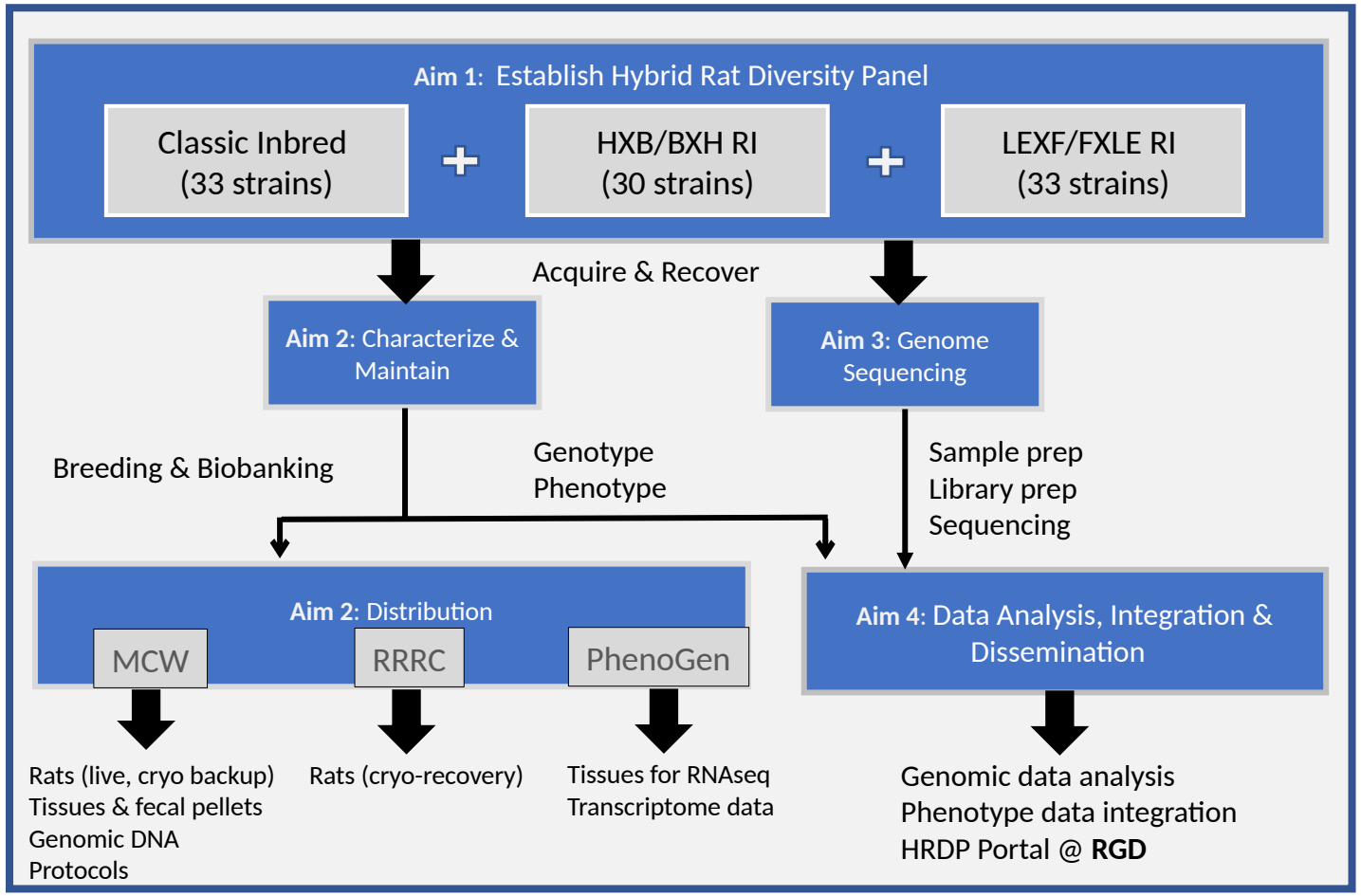


Strain	Disease model	HS founders
ACI/EurMciw	Renal	HS founder similarity (ACI/N)
BDIX/NemOdaMcwi	Leukemia	
BN/NHsdMcwi	Asthma, Neoplasms, Reproduction	HS founder similarity (BN/SsN)
BN-Lx/CubMcwi	Polydactyly-luxate, Hypercholesterolemia	
BUF/MnaMcwi	Neoplasms, Autoimmune disorders	HS founder similarity (BUF/N)
COP/HsdUwmRrrc	Hyperplasia, Exercise	
DA/OlaHsd	Cardiovascular, Arthritis, Neoplasms	
F344/DuCrl	Aging	HS founder similarity (F344/N)
F344/StmMcwi	Aging	
FHH/EurMcwi	Hypertension, Renal	
GK/FarMcwi	Diabetes	
HTX/KyoMcwi	Hydrocephalus, Neurobiology	
LE/StmMcwi	Leukemia	
LEW/Crl	Neoplasms, Autoimmune disorders	
LH/MavRrrcAek	Hypertension	
LL/MavRrrcAek	Hypotension	
LN/MavRrrcAek	Normotension	
M520/NRrrcMcwi	Neoplasms, Renal, Insulin resistance	HS founder similarity (M520/N)
MNS/Nmcwi	Normotension	
MR/NRrrc	Alcohol preference, Aging, Axiety	HS founder similarity (MR/N)
MWF/SimwMcwi	Renal, Hypertension	
PD/Cub	Polydactylous, Metabolic syndrome	
PVG/SeacMcwi	Immune disorders	
RCS/LavRrrcMcwi	Eye disorders	
SBH/Ygl	Hypertension, Renal	
SBN/Ygl	Hypertension resistant	
SHR/OlaIpcvMcwi	Hypertension, Insulin resistant	
SHRSP/A3NCrl	Hypertension, Stroke	
SR/JrHsd	Hypertension resistant	
SS/JrHsdMcwi	Hypertension, Renal	
WAG/RijCrl	Neoplasms, Eye disorders	HS founder similarity (WN/N)
WKY/NCrl	Normotension, Insulin resistant	HS founder similarity (WKY/N)
HXB/Ipcv RI panel	Hypertension, Cardiac, Metabolic, Alcohol	
BXH/Ipcv RI panel	Hypertension, Cardiac, Metabolic, Alcohol	
FXLE/Stm RI panel	Diabetes, Cancer, Seizures, Reproduction	
LEXF/Stm RI panel	Leukemia, Lymphoma, Seizures, Reproduction	

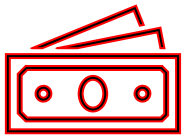
Strategy to Establish the HRDP



Navigating challenges



- Acquiring strains
- Rederivation
- Pandemic



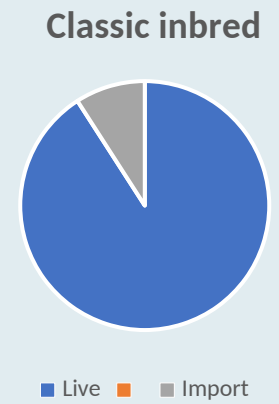
- Maintaining all lines
- WGS requiring more runs

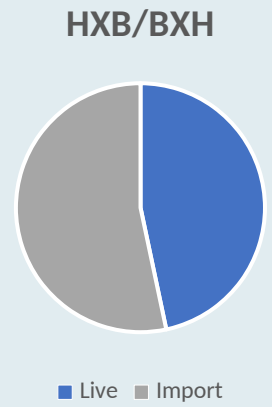
Strain rederivation update

Strain	Rats available
ACI/EurMciw	Yes
BDIX/NemOdaMcwi	Yes
BN/NHsdMcwi	Yes
BN-Lx/CubMcwi	Yes
BUF/MnaMcwi	Yes
COP/HsdUwmRrrc	Yes
DA/OlaHsd	Yes (inotiv)
F344/DuCrl	Yes (MCW & CRL)
F344/NCrl	Yes (CRL)
F344/StmMcwi	Yes
FHH/EurMcwi	Yes
GK/FarMcwi	Yes
HTX/KyoMcwi	Yes
LE/StmMcwi	Yes
LEW/Crl	Yes (CRL)
LH/MavRrrcAek	Yes
LL/MavRrrcAek	Yes
LN/MavRrrcAek	Yes
~~LOU/MNCr~~	~~Extinct~~
M520/NRrrcMcwi	Yes
MNS/NMcwi	Yes
MR/NRrrc	Yes
MWF/HsdMcwi	Yes
PD/Cub	Soon
PVG/SeacMcwi	Yes
RCS/LavRrrcMcwi	Yes
SBH/Ygl	Soon
SBN/Ygl	Soon
SHR/OlalpcvMcwi	Yes
SHRSP/A3NCrl	:(
SR/JrHsd	Yes
SS/JrHsdMcwi	Yes
WAG/RijCrl	Yes
WKY/NCrl	Yes

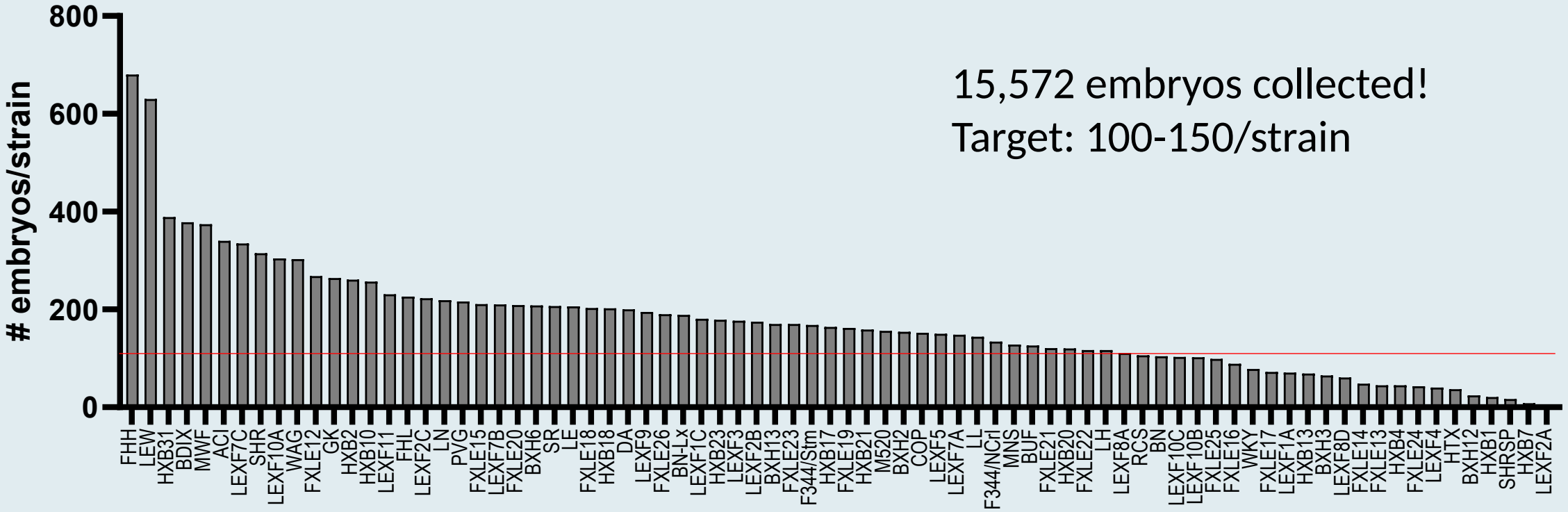
Strain	Rats available
LEXF1A/StmMcwi	Yes
LEXF1C/StmMcwi	Yes
LEXF2A/StmMcwi	Yes
LEXF2B/StmMcwi	Yes
LEXF2C/StmMcwi	Yes
LEXF3/StmMcwi	Yes
LEXF4/StmMcwi	Yes
LEXF5/StmMcwi	Yes
LEXF6B/StmMcwi	Yes
LEXF7A/StmMcwi	Yes
LEXF7B/StmMcwi	Yes
LEXF7C/StmMcwi	Yes
LEXF8A/StmMcwi	Yes
LEXF8D/StmMcwi	Yes
LEXF9/StmMcwi	Yes
LEXF10A/StmMcwi	Yes
LEXF10B/StmMcwi	Yes
LEXF10C/StmMcwi	Yes
LEXF11/StmMcwi	Yes
FXLE12/StmMcwi	Yes
FXLE13/StmMcwi	Yes
FXLE14/StmMcwi	Yes
FXLE15/StmMcwi	Yes
FXLE16/StmMcwi	Yes
FXLE17/StmMcwi	Yes
FXLE18/StmMcwi	Yes
FXLE19/StmMcwi	Yes
FXLE20/StmMcwi	Yes
FXLE21/StmMcwi	Yes
FXLE22/StmMcwi	Yes
FXLE23/StmMcwi	Yes
FXLE24/StmMcwi	Yes
FXLE25/StmMcwi	Yes
FXLE26/StmMcwi	Yes

Strain	Rats available
HXB1/IpcvMcwi	Yes
HXB2/IpcvMcwi	Yes
HXB4/IpcvMcwi	Yes
HXB7/IpcvMcwi	Yes
HXB10/IpcvMcwi	Yes
HXB13/IpcvMcwi	Yes
HXB17/IpcvMcwi	Yes
HXB18/IpcvMcwi	Yes
HXB20/IpcvMcwi	:(
HXB23/IpcvMcwi	Yes
HXB31/IpcvMcwi	Yes
BXH2/CubMcwi	Yes
BXH3/CubMcwi	:(
BXH6/CubMcwi	Yes
BXH10/CubMcwi	:(
BXH12/CubMcwi	Yes
BXH13/CubMcwi	Yes





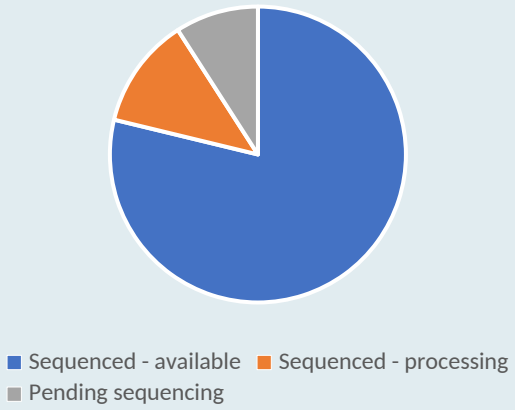
Strain re-cryopreservation update



15,572 embryos collected!
Target: 100-150/strain

Strain sequencing update

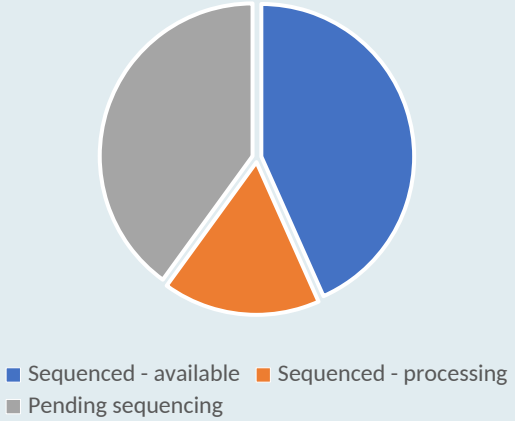
Classic Inbred



58 samples sequenced
46 unique strains:

- HRDP primary strains
- HRDP similar substrains
- HS founders

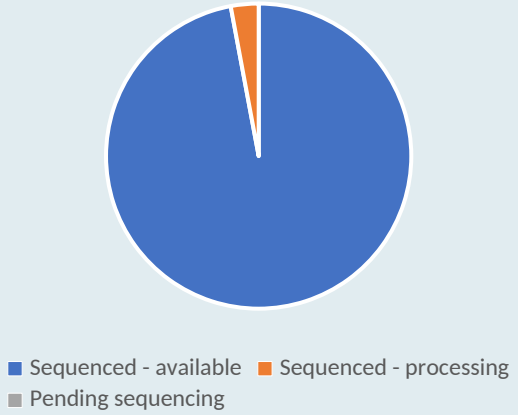
HXB/BXH



25 samples sequenced
18 unique strains:

- 2 strains repeated (MCW & Prague)
- 3 strains no longer available at MCW

FXLE/LEXF



59 samples sequenced
34 unique strains:

- 21 from frozen tissue (Japan) and MCW

SHR/NHsd
SHR/NCrl
SS/JrHsd
WKY/NHsd
ACI/N
BN/SsN
BUF/N
F344/N
M520/N
MR/N
WKY/N
WN/N
BN/Crl
SS/JrHsdMcwiCrl
BN/RijHsd
F344/NHsd

HRDP Portal

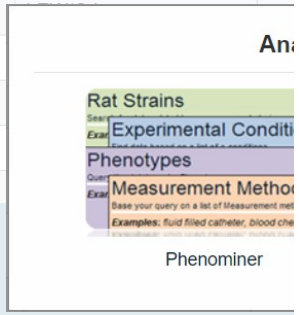
Submit Data | Help | Video Tutorials | News | Publications | Download | REST API | Citing RGD | Contact | Sign in with Google

Home | Data | Analysis & Visualization | Diseases | Phenotypes & Models | Pathways | Community

Enter Search Term... | Advanced Search (OLGA) | GitHub

Classic Inbred Strains

	Strain	Strain Available	Ph
☑	ACI	ACI/EurMcwi	
☐	BDIX	BDIX/NemOdaMcwi	
☑	BN	BN/NHsdMcwi	
☑	BN-*Lx*	BN-*Lx*/CubMcwi	
☑	BUF	BUF/MnaMcwi	
☐	COP	COP/HsdUwmRrrc	
☐	DA	DA/OlaHsd	
☑	F344	F344/DuCrl, F344/NCrl, F344/StmMcwi	
☑	FHH	FHH/EurMcwi	
☑	GK	GK/FarMcwi	
☐	HTX	HTX/KyoMcwi	
☐	LE	LE/StmMcwi	
☐	LEW		
☐	LH		
☐	LL		
☐	LN		
☑	M520		



Phenominer

The Hybrid Rat Diversity Panel

Contact HRDP

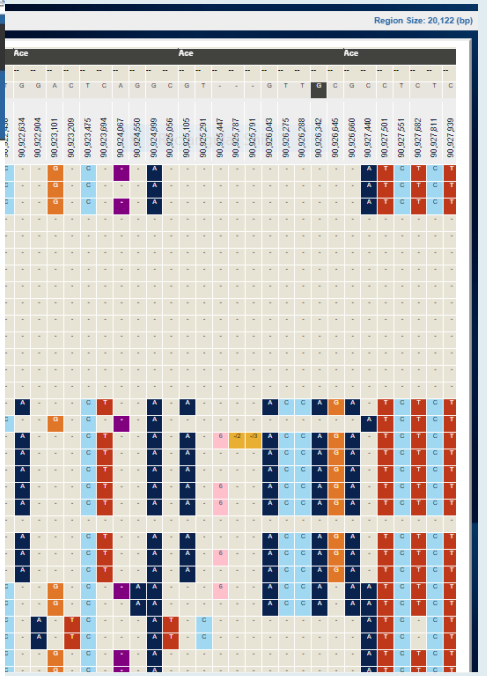
HXB/BXH Recombinant Inbred Panel

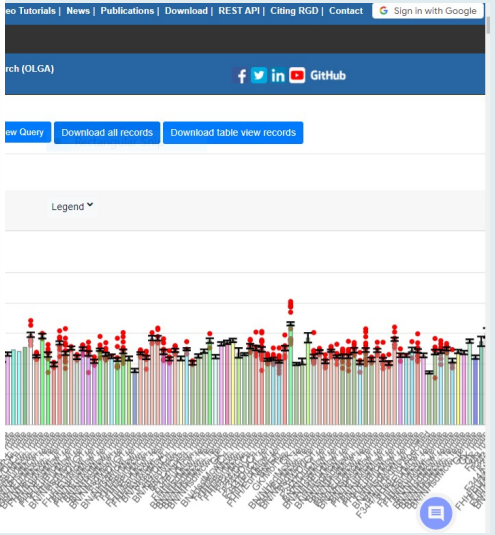
Divergent Classic Inbred Strains

FXLE/LEXF Recombinant Inbred Panel

What is the Hybrid Rat Diversity Panel (HRDP)?

- Panel of 96 inbred rat strains with genetic and phenotypic diversity
  - 33 genetically diverse "classic" inbred strains
  - Two recombinant inbred (RI) panels: FXLE/LEXF (33 strains, Japan) and HXB/BXH (30 strains, Czech Republic)
    - FXLE/Stm
    - LEXF/Stm
    - BXH/Ipcv
    - HXB/Ipcv
  - To learn more about recombinant inbred strains, click here





General

Strain: F344/StmMcwi

Symbol:	F344/StmMcwi
Strain:	
Substrain:	
RGD ID:	
Citation ID:	
Ontology ID:	
Type:	
Available Source:	
Origination:	
Description:	
Last Known Status:	

Phenotype Values via Phenominer *Click to see Annotation Detail View*

Related Phenotype Data for Term "F344/StmMcwi" (RS:0004830)

Rat Strains: **Clinical Measurements:** **Experimental Conditions:** **Measurement Methods:**

- e test strip read by
- ical glucometer
- measuring method
- g method
- ume calorimetry
- unoassay
- ge feces mass
- nt method
- ge food consumption
- nt method
- ge urine mass
- nt method
- ge water drinking
- nt method
- weight measurement
- assay
- nuclear magnetic

Strain Samples in RGD with

Assembly	Sam
mRatBN7.2	F344/

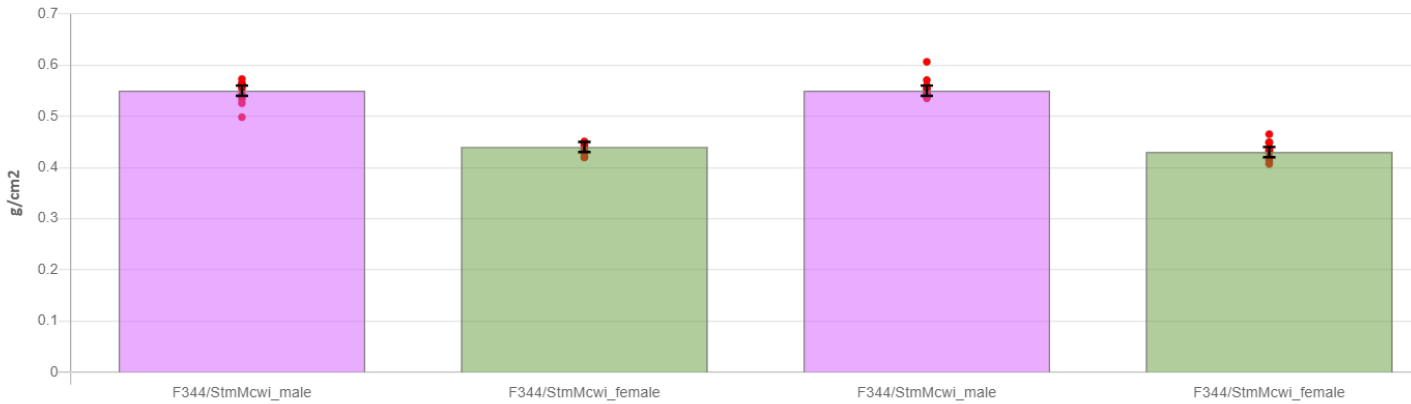
- Measurements
  - BODY MASS (g/cm2)
    - body mass index (BMI) (4)
- Strains
  - F344
    - F344/StmMcwi (4)
- Methods
  - body weighing method (4)
- Conditions
  - controlled bisphenol F content drinking water (1.125 mg/l) (for 70 days) (2)
  - controlled ethanol content drinking water used as vehicle (0.1 %) (for 70 days) (2)
- Sex
  - female (2)
  - male (2)

Phenominer Database Results (4 results)

Edit Query | New Query | Download all records | Download table view records

Colored By: Sex | Legend

Table "column sort" updates the order of the bars in the chart.



d Variants

e	GeneSymbol
	Vom2r5
	Vom2r6
	Vom2r6
	Vom2r6

1	5568402	5568403	G	A	snv	Shprh
1	6990316	6990317	T	C	snv	Utrn
1	7083626	7083627	G	C	snv	Utrn
1	8829753	8829754	C	T	snv	Adgrg6
1	19837583	19837584	G	T	snv	Smlr1
1	20574235	20574236	C	A	snv	Enpp3
1	20747484	20747485	G	A	snv	Enpp1

Accessing HRDP resources

- Rats: 74 strains @ MCW, 3 @ vendors, 4 @ academic institutions
- WGS: 81 HRDP strains plus “bonus” strains
- Tissues: Classic inbred strain naïve tissues (M/F); additional available upon request

- RNAseq: BN-Lx, F344/DuCrl, LE/Stm, SHR/Olalpcv
  - 3 tissues, M/F
  - Available on RGD’s JBrowse

- Mini-HRDP
  - Subset of 8 strains that represent the genetic & phenotypic diversity

Visit the posters to see the HRDP in action!

- Alex Purdy: Genetic mapping of cardiomyocyte ploidy phenotypes that influence basal cardiac physiology
- Wendy Demos: Rat gene expression data expansion at the Rat Genome Database, an update
- Lynn Malloy & Akiko Takizawa: Search for sufficient superovulation and optimal embryo cryopreservation in inbred rat strains in HRDP
- Shur-Jen Wang: Updated Hybrid Rat Diversity Panel Portal at RGD

Acknowledgements

HRDP
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CTC meeting, Memphis 2017