

Session 2: Cross-Species Phenotype Analysis and Ontology

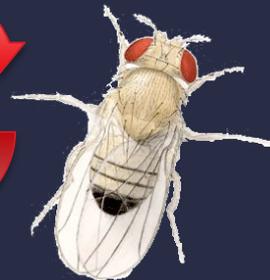
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Oregon Health & Science University

NIH Symposium: Linking Disease Model
Phenotypes to Human Conditions

2015-09-10

We want to:

- Create better models of human disease
- Use model data to inform patient care and disease discovery



Associating models to disease

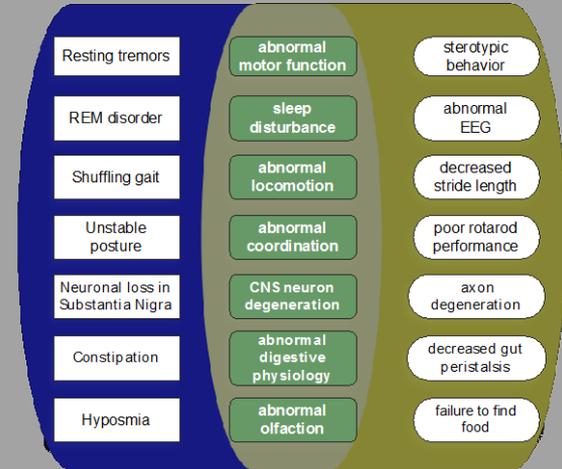
Gja^{5tm1Paul}/Gja^{5tm1Paul}
involves: 129/Sv * C57BL/6

MGI:model_of

Tetralogy of Fallot

Direct assertion

Semantic Similarity



Holoprosencephaly 3

model_of

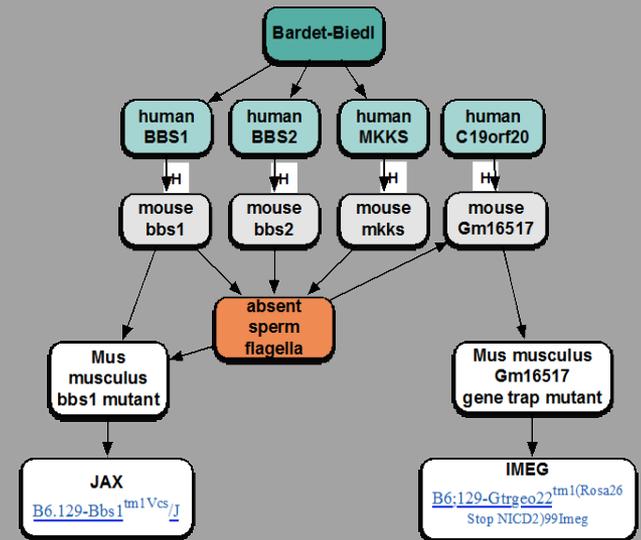
Shh^{Tm1Chg}/
Shh^{Tm1Chg}

SHH

homology

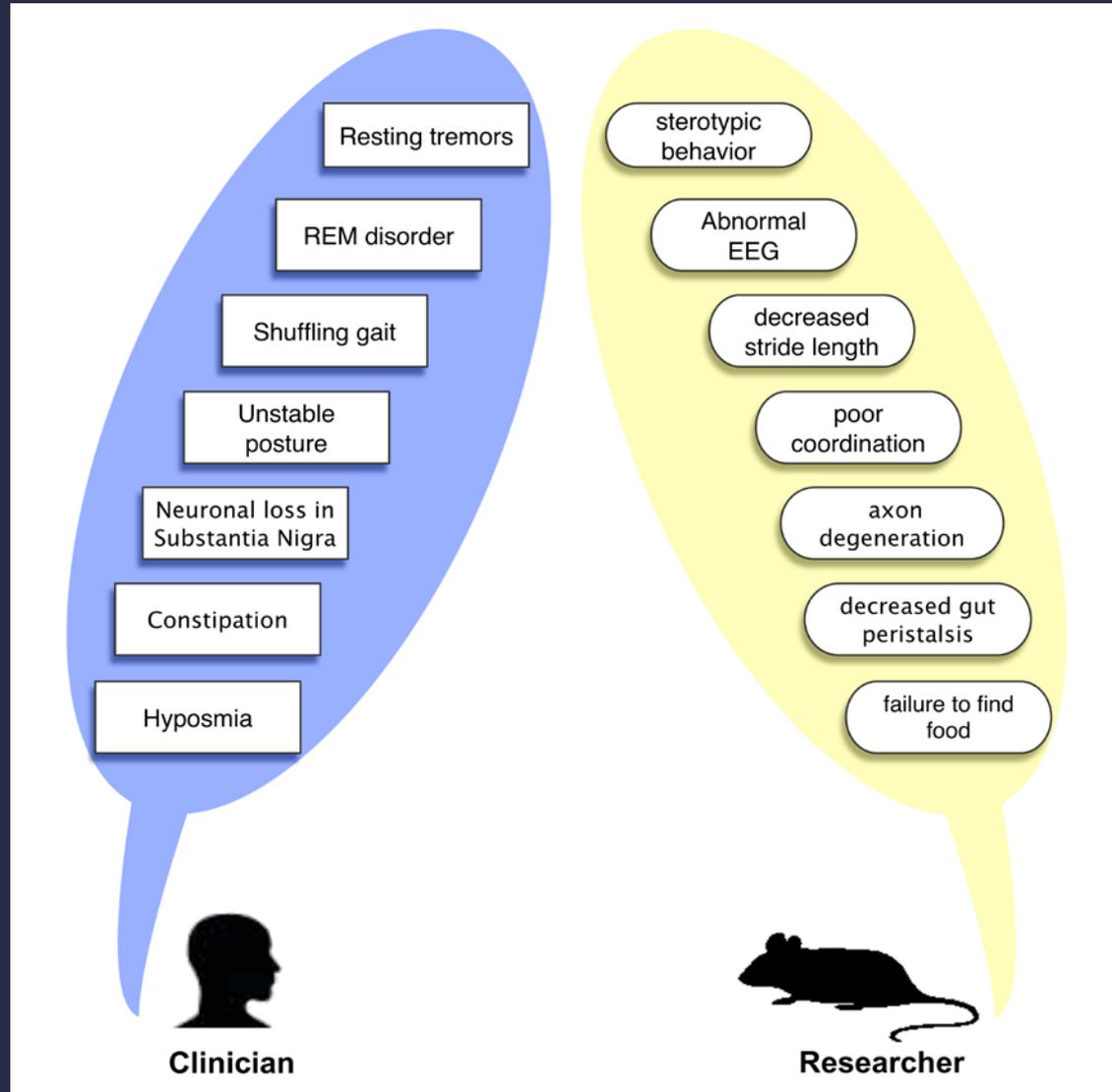
Shh

Homology



Enrichment/statistical association

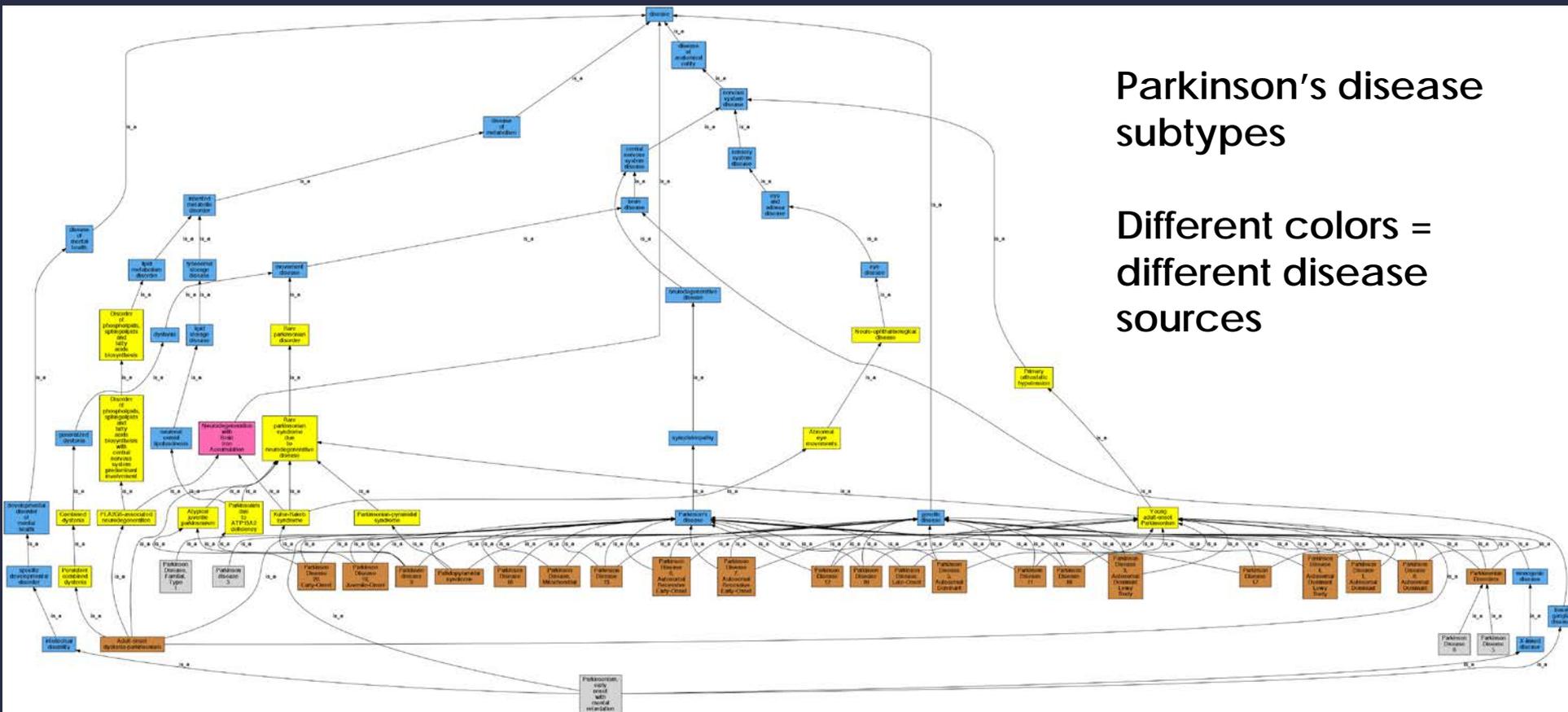
Clinicians and researchers speak different languages



Having a standardized vocabulary is not enough

Hum Mod	Source	MeSH	MedGen	OMIM	DO	ORDO	ICD	SNOMED	HP	EFO	MP	ZP	FBcv	WP	VT	
Species		Diseases					Phenotypes									
Human	ClinVar	█														
	Coriell	█														
	CTD	█		█												
	Elem of Morph								█							
	GeneReviews			█												
	GWAS			█						█						
	HPO			█			█		█							
	OMIM			█												
	Orphanet						█									
	EMRs							█								
Human	KEGG	█		█												
Non-Human	AnimalQTLdb														█	
	FlyBase				█								█			
	IMPC												█			
	MGI			█							█					
	MPD			█							█					
	OMIA			█												
	RGD	█								█						
	WormBase				█									█		
	ZFIN					█						█				

Integrating disease sources



<https://github.com/monarch-initiative/monarch-ontology>

=> Integrating information isn't a simple string-matching or cross-referencing problem

Our goal: facilitate collaboration and discovery across diverse groups

GLOBAL DATA SHARING



Global Alliance
for Genomics & Health

REGISTRIES AND RECRUITMENT



ADVOCACY GROUPS



Phenotype
ontologies

PATIENTS AND FAMILIES



CASE STUDIES IN JOURNALS



COLD SPRING HARBOR
Molecular Case Studies



Undiagnosed
Diseases Program

CLINICAL DIAGNOSTIC CENTERS

Who's talking

Dr. Chris Mungall: Crossing the Species Divide

- Phenotypic similarity within and across species
- Creating a landscape of curated phenotypic data across species, scale, data types

Dr. Damian Smedley: Disease Variant Prioritization and Model Discovery through Cross-Species Phenotype Analysis

- Combining Exome analysis with phenotypic similarity analyses
- Application to undiagnosed diseases and model discovery

Dr. Caleb Webber: Exploiting Mouse Genotype-Phenotypic Associations for Disease Genomics

- Statistical bias determination
- Leveraging mouse for human gene disease-association prediction methods