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# Translational Toxicology: Data Visualisation Across Phases

Webinar: 12 May 2020

Presented by Aishling Cooke and Matt Segall

# Today's Webinar Presenters

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Optibrium



**Matt Segall**  
CEO  
Optibrium

# Introduction

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- What is eTRANSAFE?
- What should a visualisation application for the system do?
  - End-user requirements
  - Data sources
- Current version
- Challenges & future directions

# What is eTRANSAFE?

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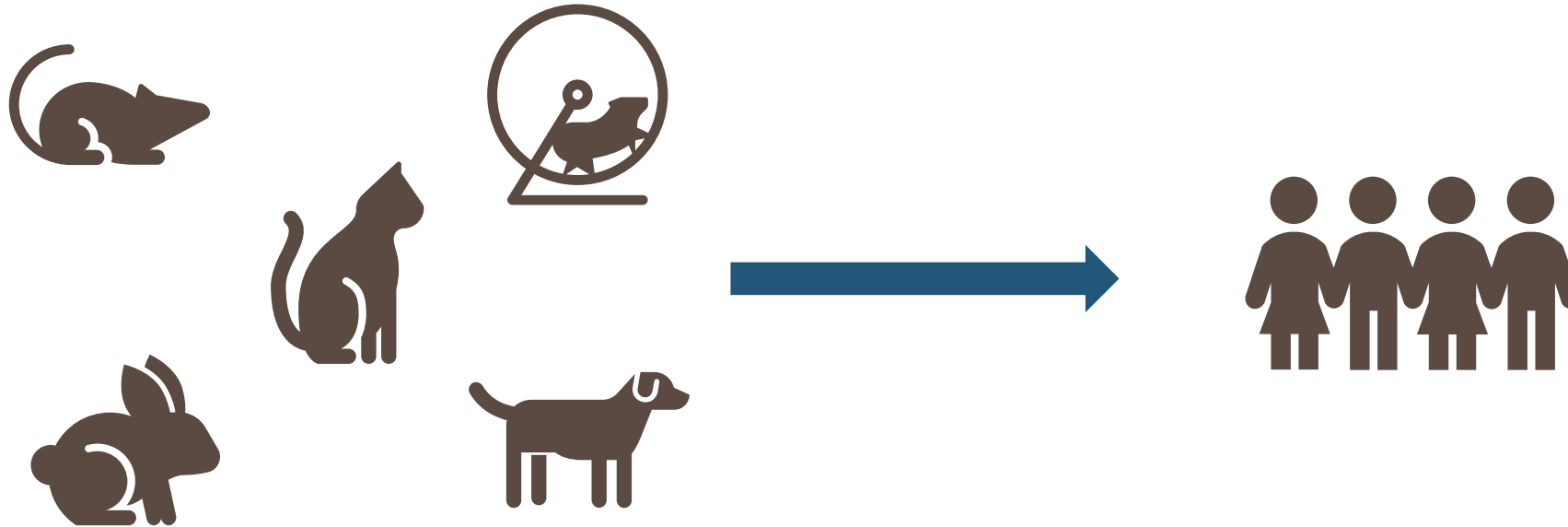
*“The eTRANSAFE (Enhancing TRANslational SAFETY Assessment through Integrative Knowledge Management) project works to improve the efficiency of translational safety assessment approaches during the medicines discovery pipeline”*

- Funded by the Innovative Medicines Initiative (IMI)
- Public-private partnership
- 27 partners
  - Academic institutions
  - SMEs
  - EFPIA partners



# Aim

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Allow translational comparison between pre-clinical and clinical toxicology data, facilitating research and revealing interesting patterns

# eTRANSAFE System & the Visualisation Application

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# Where Should We Start?

Data



Toxicologist? Chemist? Modeller?

*What types of data will be in the system?*

*What functionality would be useful for our end-users?*

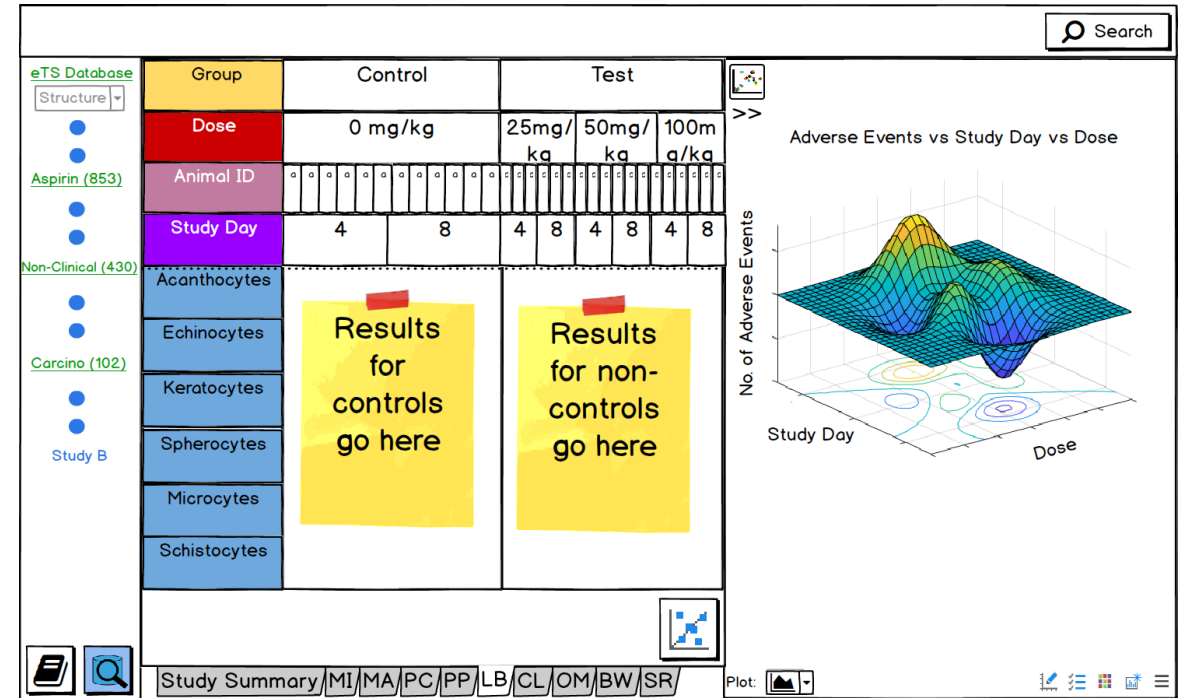
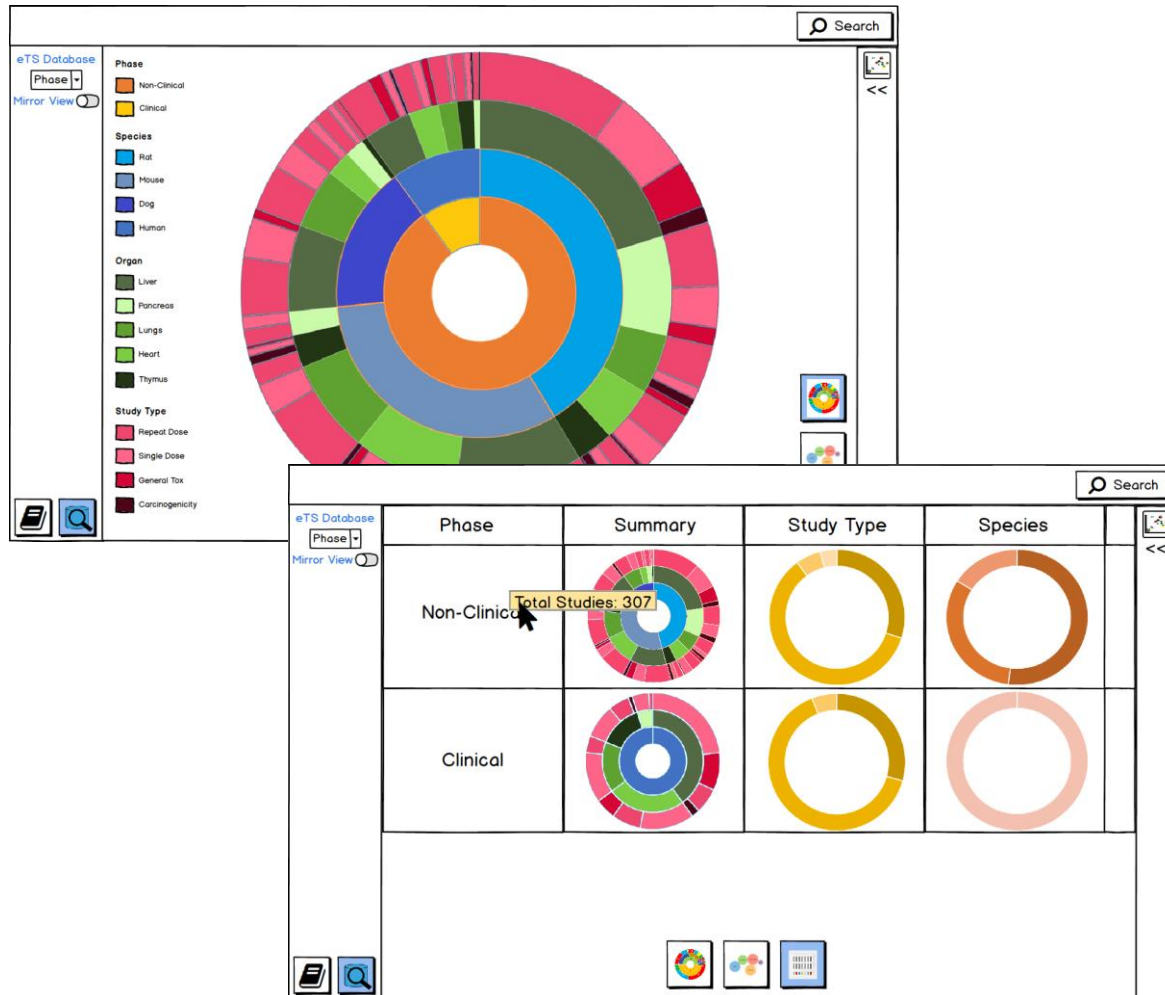
# Data

Pre-Clinical	Clinical	Other
SEND studies	<i>Studies</i>	<i>Target</i>
	<i>Post-marketing</i>	<i>Off-target</i>
		<i>Molecule properties</i>

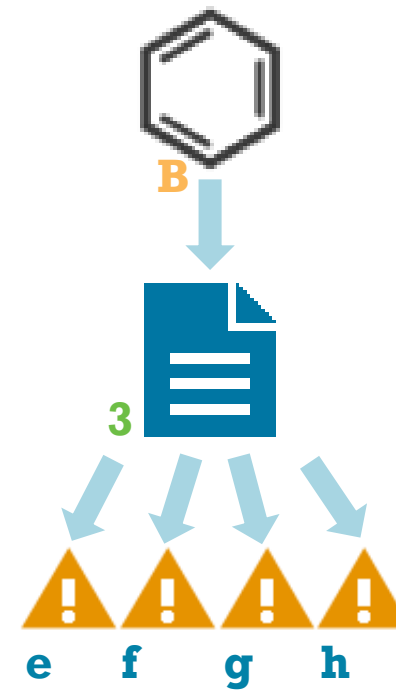
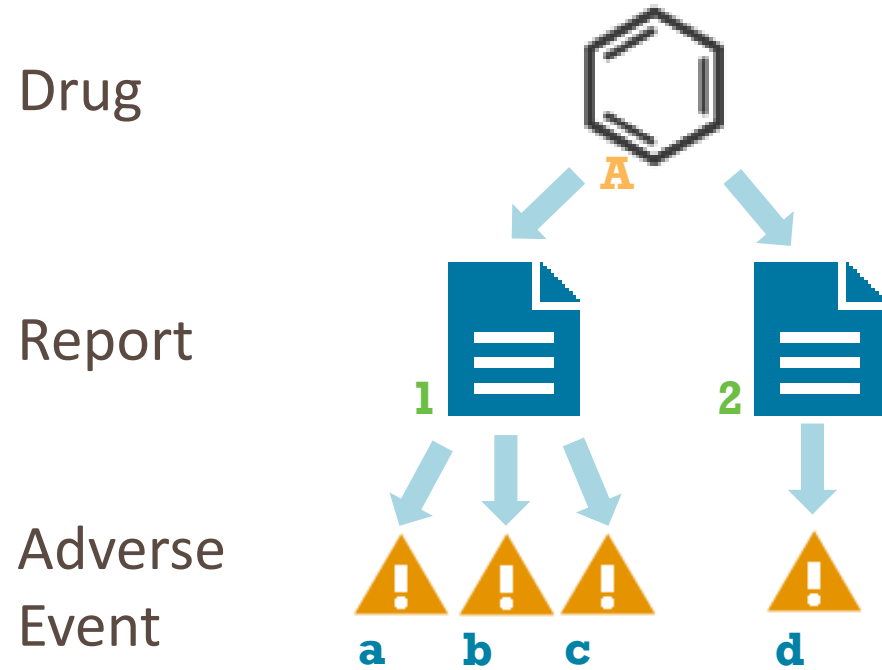




# Initial Designs



# Data structure



## Example Variables

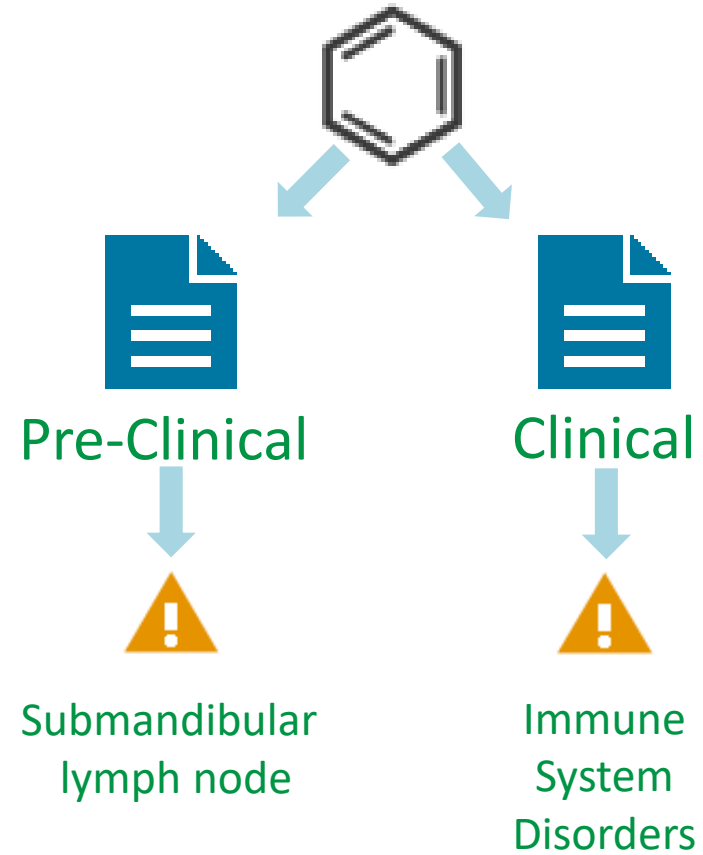
SMILES, InChI

species, phase

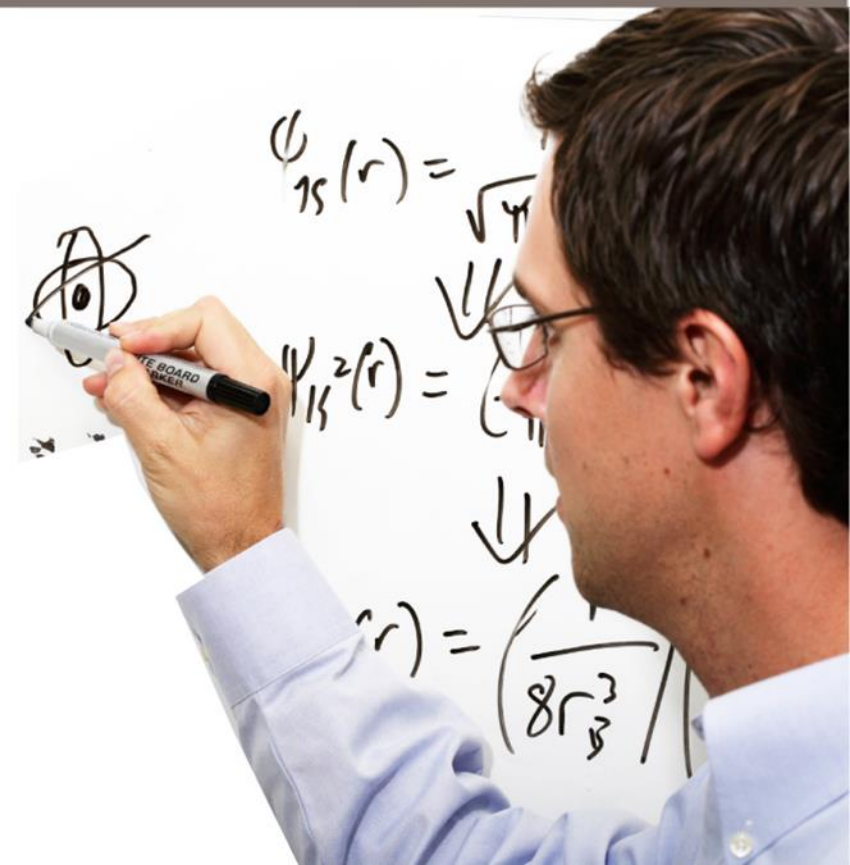
severity, tissue

# Ontology Mapping

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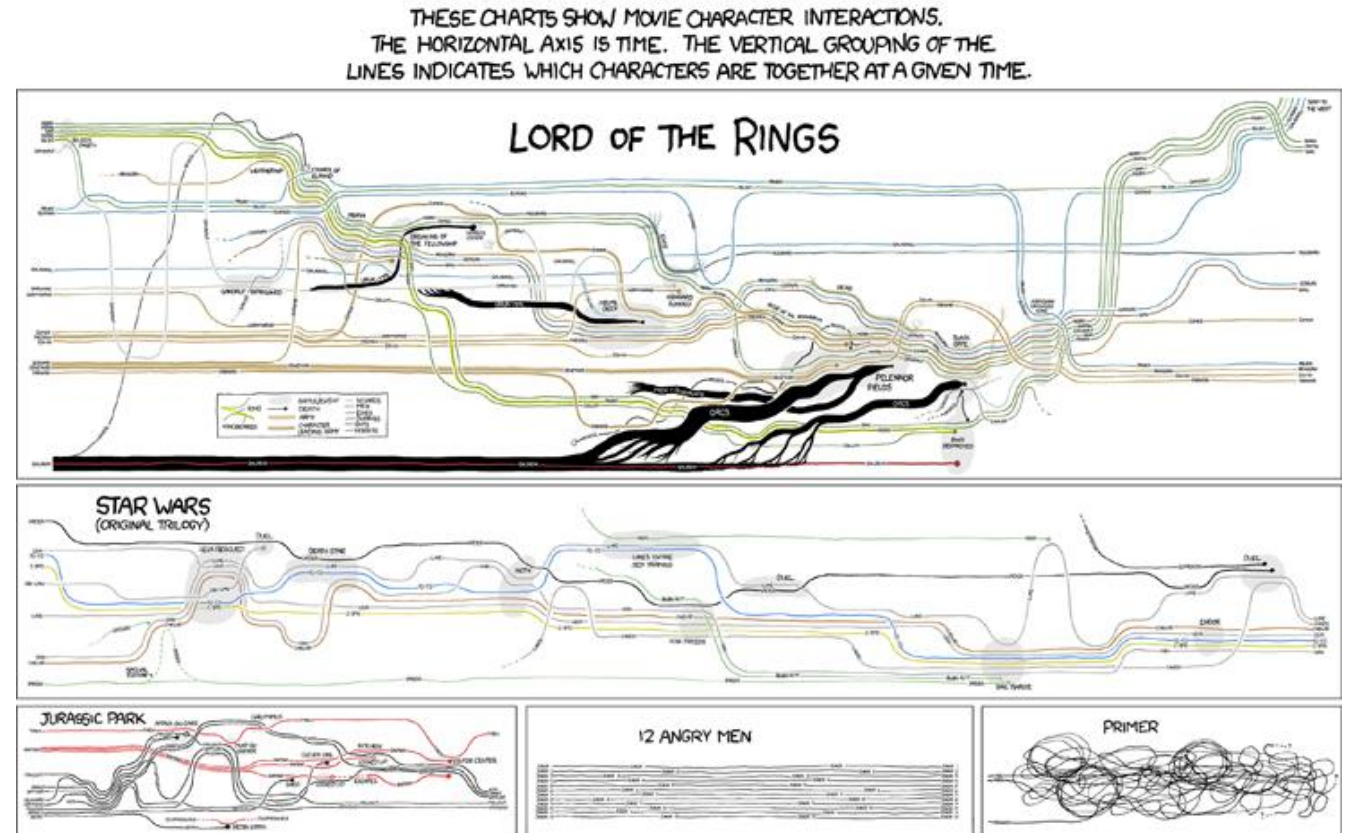


# Demo of Current Version



# Challenges

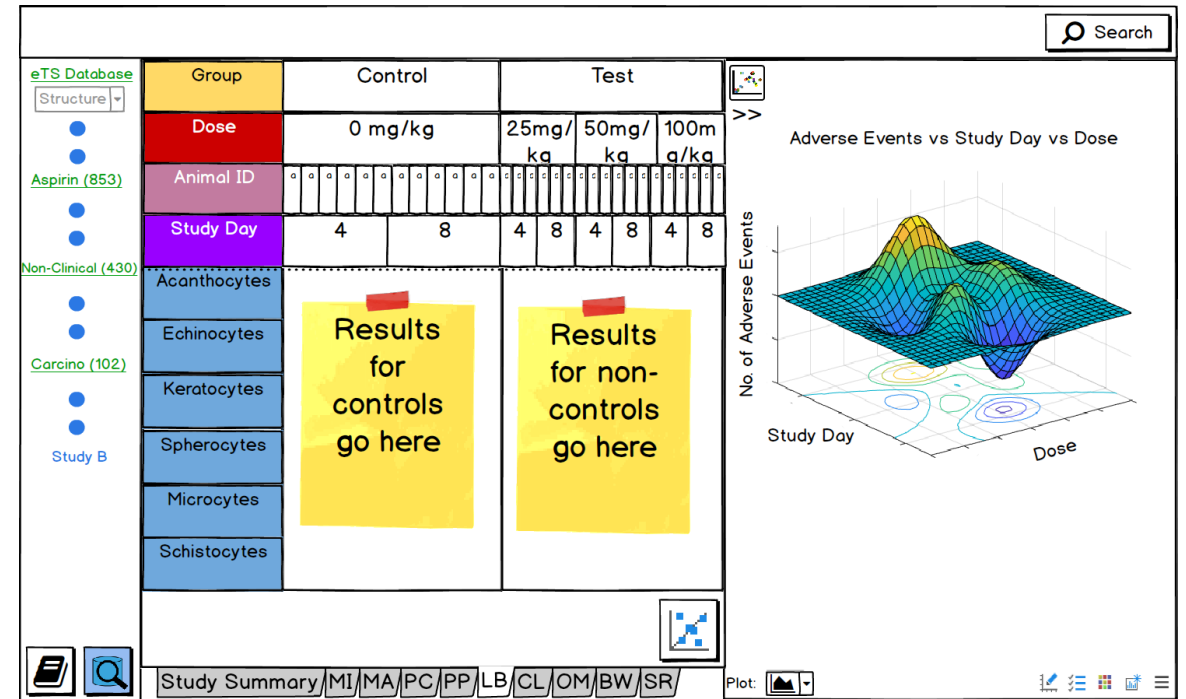
- Complex dependencies
  - Software dependencies & timelines
- Data complexity and diversity
- Extensible vs specialised



<https://xkcd.com/657/>

# Future Directions

- Single study
  - Table
  - Charts
- Summary level
  - More chart types (e.g. chemical space)
  - Better use of variables (e.g. frequency)
  - Further customisation
- Useful incorporation of new data sources of different types





# SEND Pivot Table

STUDYID	DOMAIN	USUBJID	BGSEQ	BGTESTCD	BGTEST	BGORRES	BGORRESL	BGSTRESC	BGSTRESN	BGSTRESU	BGSTAT	BGREASNC	BGEXCLFL	BGREASEX	BGDTC	BGENDTC	BGDY	BGENDY	
PDS2014	BG	PDS2014-C	1	BWGAIN	Body Weig	31.6 g		31.6	31.6 g						2010-12-0	2010-12-1	-4	1	
PDS2014	BG	PDS2014-C	2	BWGAIN	Body Weig	1.8 g		1.8	1.8 g						2010-12-1	2010-12-1	1	2	
PDS2014	BG	PDS2014-C	3	BWGAIN	Body Weig	4.1 g		4.1	4.1 g						2010-12-1	2010-12-1	2	3	
PDS2014	BG	PDS2014-C	4	BWGAIN	Body Weig	5.0 g		5.0	5.0 g						2010-12-1	2010-12-1	3	4	
STUDYID	DOMAIN	USUBJID	SUBJID	RFSTDTCT	RFENDTCT	SITEID	BIRTHDTC	AGE	AGETXT	AGEU	SEX	SPECIES	STRAIN	SBSTRAIN	ARMCD	ARM	SETCD		
PDS2014	DM	PDS2014-C	1	#####	#####				0	DAYS	M	RAT	SPRAGUE-DAWLEY		1 M - Vehicle	1			
PDS2014	DM	PDS2014-C	2	#####	#####				0	DAYS	M	RAT	SPRAGUE-DAWLEY		1 M - Vehicle	1			
PDS2014	DM	PDS2014-C	3	#####	#####				0	DAYS	M	RAT	SPRAGUE-DAWLEY		1 M - Vehicle	1			
PDS2014	DM	PDS2014-C	4	#####	#####				0	DAYS	M	RAT	SPRAGUE-DAWLEY		1 M - Vehicle	1			
PDS2014	DM	PDS2014-C	5	#####	#####				0	DAYS	M	RAT	SPRAGUE-DAWLEY		1 M - Vehicle	1			
PDS2014	DM	PDS2014-C	6	#####	#####				0	DAYS	M	RAT	SPRAGUE-DAWLEY		1 M - Vehicle	1			
STUDYID	DOMAIN	USUBJID	OMSEQ	OMTESTC	OMTEST	OMORRES	OMSTRES	OMSTRES	OMSTRES	OMSTAT	OMREASN	OMSPEC	OMANTRI	OMSPCCN	OMSPCUF	OMLAT			
PDS2014	OM	PDS2014-I	1	WEIGHT	Weight	2.0789 g	2.0789	2.0789 g				BRAIN							
PDS2014	OM	PDS2014-I	2	WEIGHT	Weight	1.3104 g	1.3104	1.3104 g				HEART							
PDS2014	OM	PDS2014-I	3	WEIGHT	Weight	8.7775 g	8.7775	8.7775 g				LIVER							
PDS2014	OM	PDS2014-I	4	WEIGHT	Weight	3.2055 g	3.2055	3.2055 g				KIDNEY							
PDS2014	OM	PDS2014-I	5	WEIGHT	Weight	4.069 g	4.069	4.069 g				TESTIS							
PDS2014	OM	PDS2014-I	6	WEIGHT	Weight	0.0148 g	0.0148	0.0148 g				GLAND PI	FIXED						
STUDYID	DOMAIN	USUBJID	POOLID	PPSEQ	PPGRPID	PPTSTCD	PPTST	PPCAT	PPSCAT	PPORRES	PPORRESU	PPSTRESC	PPSTRESN	PPSTRESU	PPSTAT	PPREASND	PPSPEC	VISITDY	PPTPTREF
PDS2014	PP	PDS2014-0031		1		CMAX	Max Conc	PDS-12345678		1670 ng/mL		1670	1670 ng/mL				PLASMA	1	
PDS2014	PP	PDS2014-0031		2		TMAX	Time of C	PDS-12345678		2 h		2	2 h				PLASMA	1	
PDS2014	PP	PDS2014-0031		3		TLST	Time of La	PDS-12345678		7 h		7	7 h				PLASMA	1	
PDS2014	PP	PDS2014-0031		4		AUCTAU	AUC Over	PDS-12345678		11126 h*ng/mL		11126	11126 h*ng/mL				PLASMA	1	
PDS2014	PP	PDS2014-0031		5		AUCLST	AUC to La	PDS-12345678		8348 h*ng/mL		8348	8348 h*ng/mL				PLASMA	1	
PDS2014	PP	PDS2014-0031		6		AUCIFO	AUC Infi	PDS-12345678		-11177 h*ng/mL		-11177	-11177 h*ng/mL				PLASMA	1	
PDS2014	PP	PDS2014-0031		7		CMAX	Max Conc	PDS-12345678		1410 ng/mL		1410	1410 ng/mL				PLASMA	29	
PDS2014	PP	PDS2014-0031		8		TMAX	Time of C	PDS-12345678		2 h		2	2 h				PLASMA	29	
PDS2014	PP	PDS2014-0031		9		TLST	Time of La	PDS-12345678		7 h		7	7 h				PLASMA	29	
PDS2014	PP	PDS2014-0031		10		AUCTAU	AUC Over	PDS-12345678		6888 h*ng/mL		6888	6888 h*ng/mL				PLASMA	29	
PDS2014	PP	PDS2014-0031		11		AUCLST	AUC to La	PDS-12345678		5222 h*ng/mL		5222	5222 h*ng/mL				PLASMA	29	
PDS2014	PP	PDS2014-0032		12		CMAX	Max Conc	PDS-12345678		2140 ng/mL		2140	2140 ng/mL				PLASMA	1	
PDS2014	PP	PDS2014-0032		13		TMAX	Time of C	PDS-12345678		2 h		2	2 h				PLASMA	1	
PDS2014	PP	PDS2014-0032		14		TLST	Time of La	PDS-12345678		7 h		7	7 h				PLASMA	1	
PDS2014	PP	PDS2014-0032		15		AUCTAU	AUC Over	PDS-12345678		-23450 h*ng/mL		-23450	-23450 h*ng/mL				PLASMA	1	
PDS2014	PP	PDS2014-0032		16		AUCLST	AUC to La	PDS-12345678		12724 h*ng/mL		12724	12724 h*ng/mL				PLASMA	1	
PDS2014	PP	PDS2014-0032		17		AUCIFO	AUC Infi	PDS-12345678		-25088 h*ng/mL		-25088	-25088 h*ng/mL				PLASMA	1	
PDS2014	PP	PDS2014-0032		18		CMAX	Max Conc	PDS-12345678		2380 ng/mL		2380	2380 ng/mL				PLASMA	29	
PDS2014	PP	PDS2014-0032		19		TMAX	Time of C	PDS-12345678		2 h		2	2 h				PLASMA	29	
PDS2014	PP	PDS2014-0032		20		TLST	Time of La	PDS-12345678		24 h		24	24 h				PLASMA	29	
PDS2014	PP	PDS2014-0032		21		AUCTAU	AUC Over	PDS-12345678		14883 h*ng/mL		14883	14883 h*ng/mL				PLASMA	29	
PDS2014	PP	PDS2014-0032		22		AUCLST	AUC to La	PDS-12345678		14883 h*ng/mL		14883	14883 h*ng/mL				PLASMA	29	
PDS2014	PP	PDS2014-0033		23		CMAX	Max Conc	PDS-12345678		2640 ng/mL		2640	2640 ng/mL				PLASMA	1	
PDS2014	PP	PDS2014-0033		24		TMAX	Time of C	PDS-12345678		4 h		4	4 h				PLASMA	1	
PDS2014	PP	PDS2014-0033		25		TLST	Time of La	PDS-12345678		24 h		24	24 h				PLASMA	1	
PDS2014	PP	PDS2014-0033		26		AUCTAU	AUC Over	PDS-12345678		20786 h*ng/mL		20786	20786 h*ng/mL				PLASMA	1	
PDS2014	PP	PDS2014-0033		27		AUCLST	AUC to La	PDS-12345678		20786 h*ng/mL		20786	20786 h*ng/mL				PLASMA	1	
PDS2014	PP	PDS2014-0033		28		AUCIFO	AUC Infi	PDS-12345678		21126 h*ng/mL		21126	21126 h*ng/mL				PLASMA	1	

<https://github.com/phuse-org/phuse-scripts/tree/master/data/send/PDS>

# Categorical Domain (e.g. MI)

		Treatment										
		Study Day 30										
		Animal ID	PDS2014-...	PDS2014-...	PDS2014-...	PDS2014-...	PDS2014-...	PDS2014-...	PDS2014-...	PDS2014-...	PDS2014-...	P
Test	Tissue											
	ARTERY AORTA	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	N
	BONE MARROW FEMUR	Fat vacuol...	Fat vacuol...	Fat vacuol...	Fat vacuol...	Fat vacuol...	Fat vacuol...	Fat vacuol...	Fat vacuol...	Fat vacuol...	Fat vacuol...	F
	BONE MARROW STERNUM	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	N
	BONE STERNUM	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	N
	BRAIN	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	N
	CERVIX	NULL	NULL	NULL	NULL	NULL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	N
	EPIDIDYMIS	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NULL	NULL	NULL	NULL	NULL	N
	ESOPHAGUS	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	N
	EYE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	N
	GLAND ADRENAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	N
	GLAND COAGULATING	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NULL	NULL	NULL	NULL	NULL	N
	GLAND HARDERIAN	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	N
	GLAND MAMMARY	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	N
	GLAND PARATHYROID	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	N
	GLAND PITUITARY	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	N
	GLAND PROSTATE	Inflammati...	Inflammati...	Inflammati...	Inflammati...	Inflammati...	NULL	NULL	NULL	NULL	NULL	N



# Categorical Domain (e.g. MI)

	Treatment	Control			Test		
		Study Day	30	31	58	30	31
Test	Tissue						
	ARTERY AORTA	0/10	0/10	NULL	0/10	0/10	NULL
	BONE MARROW FEMUR	7/10	6/10	NULL	7/10	7/10	NULL
	BONE MARROW STERNUM	0/10	0/10	0/10	1/29	0/30	0/10
	BONE STERNUM	0/10	0/10	0/10	0/29	0/30	0/10
	BRAIN	0/10	0/10	NULL	0/10	0/10	NULL
	CERVIX	0/5	0/5	NORMAL	0/5	0/10	0/2
	EPIDIDYMIS	0/5	0/5	NULL	0/5	0/5	NORMAL
	ESOPHAGUS	0/10	0/10	NULL	0/10	0/10	NULL
	EYE	1/10	0/10	NULL	1/10	0/10	NULL
	GLAND ADRENAL	0/10	1/10	3/10	15/30	17/30	3/10
	GLAND COAGULATING	0/5	0/5	NULL	0/5	0/5	NULL
	GLAND HARDERIAN	0/10	0/10	NULL	1/10	0/10	NULL
	GLAND MAMMARY	0/10	0/9	0/5	7/20	3/20	0/5
	GLAND PARATHYROID	0/10	0/10	NULL	0/9	0/10	NULL
	GLAND PITUITARY	1/10	0/10	NULL	0/10	0/10	NULL
	GLAND PROSTATE	2/5	3/5	NULL	4/5	2/5	NULL

# Numerical Domain (e.g. BW)

		Treatment									
		Sex									
		Animal ID									
		PDS2014-...	PDS2014-...	PDS2014-...	PDS2014-...	PDS2014-...	PDS2014-...	PDS2014-...	PDS2014-...	PDS2014-...	PDS2014-...
Test	Study Day										
	-4	299.9	299.9	299.9	299.9	299.9	299.9	299.9	299.9	299.9	299.9
	1	331.5	331.5	331.5	331.5	331.5	331.5	331.5	331.5	331.5	331.5
	10	375.6	375.6	375.6	375.6	375.6	375.6	375.6	375.6	375.6	375.6
	11	384.9	384.9	384.9	384.9	384.9	384.9	384.9	384.9	384.9	384.9
	12	387.3	387.3	387.3	387.3	387.3	387.3	387.3	387.3	387.3	387.3
	13	397.6	397.6	397.6	397.6	397.6	397.6	397.6	397.6	397.6	397.6
	14	397.8	397.8	397.8	397.8	397.8	397.8	397.8	397.8	397.8	397.8
	15	402.6	402.6	402.6	402.6	402.6	402.6	402.6	402.6	402.6	402.6
	16	404.5	404.5	404.5	404.5	404.5	404.5	404.5	404.5	404.5	404.5
	17	413.5	413.5	413.5	413.5	413.5	413.5	413.5	413.5	413.5	413.5
	18	415.9	415.9	415.9	415.9	415.9	415.9	415.9	415.9	415.9	415.9
	19	420.5	420.5	420.5	420.5	420.5	420.5	420.5	420.5	420.5	420.5
	2	333.3	333.3	333.3	333.3	333.3	333.3	333.3	333.3	333.3	333.3
	20	424.5	424.5	424.5	424.5	424.5	424.5	424.5	424.5	424.5	424.5
	21	427.8	427.8	427.8	427.8	427.8	427.8	427.8	427.8	427.8	427.8
	22	434.9	434.9	434.9	434.9	434.9	434.9	434.9	434.9	434.9	434.9

# Numerical Domain (e.g. BW)

	Treatment	Control	Test
Test			
Study Day			
-4		231.953	231.827
1		251.881	255.234
10		291.311	270.376
11		299.486	276.05
12		298.817	273.392
13		306.157	278.344
14		308.577	280.064
15		310.883	280.98
16		315.383	286.693
17		320.397	289.689
18		320.9	290.209
19		326.477	293.184
2		254.98	249.182
20		330.317	294.826
21		329.129	298.685
22		335.151	301.903

# Translational Toxicology: Data Visualisation Across Phases

Thank you for joining us for today's webinar

For further information please contact:  
[info@optibrium.com](mailto:info@optibrium.com)

A recording of the presentation will be made  
available on the Optibrium Community website:

[optibrium.com/community](https://optibrium.com/community)

