



**CERTAINTY
DISCOVERY**

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Turning rAAV Data into Insight: An Informatics Solution for Molecule Design, Developability, and Cross-Project Learning

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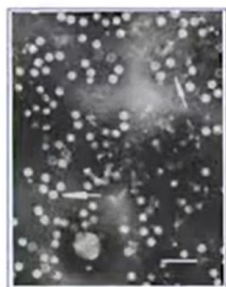
Certara Certainty Discovery Conference,
Frankfurt, Germany, 4-5th November, 2025

Shijun Yu, Senior Scientist

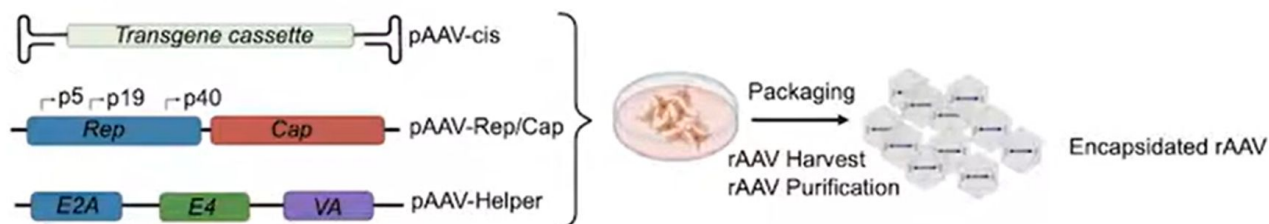
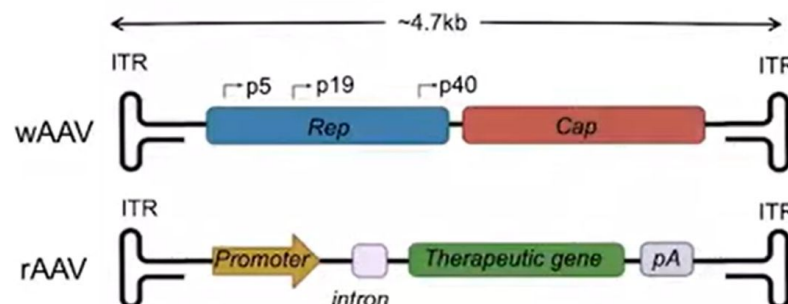
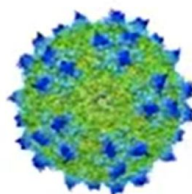
Computational Science Center of Excellence (CS-CoE), Basel,
F.Hoffmann-La Roche

What is rAAV?

Recombinant Adeno-associated viral vectors (rAAV) are composed of a proteinaceous capsid shell and an engineered DNA cargo designed to deliver its therapeutic cargo into target cells.

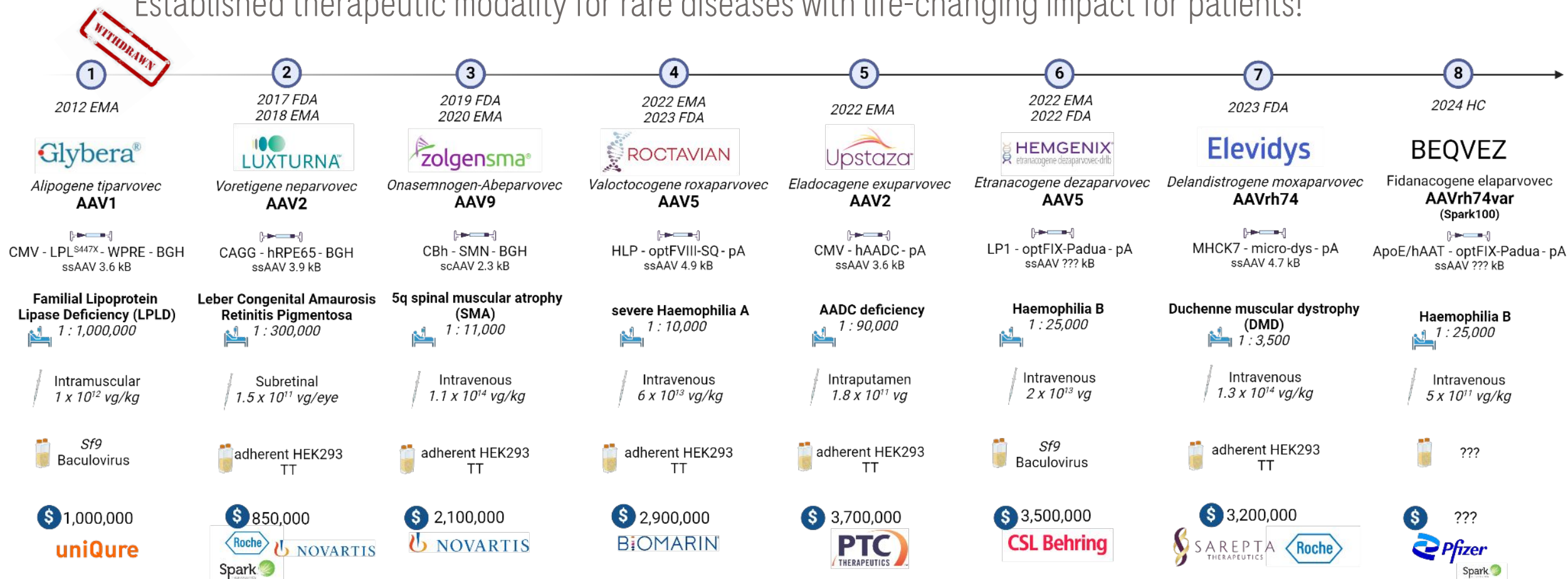


Atchison RW et al. 1965. Science



Regulatory-approved rAAV Gene Therapies (1st gen rAAVs, 2024)

Established therapeutic modality for rare diseases with life-changing impact for patients!



Key Advantages & Challenges in the rAAV Research

Advantages

**Broad Tropism and
Ability to Transduce
Diverse Tissues**

Stable expression

**Maturing
engineering toolkit**

Challenges

**Data
capture/retrieval
across labs,
projects, platforms**

**Safety,
biodistribution &
genome interaction
risks**

**Manufacturing,
quality, and
analytics at scale**

Our Mission

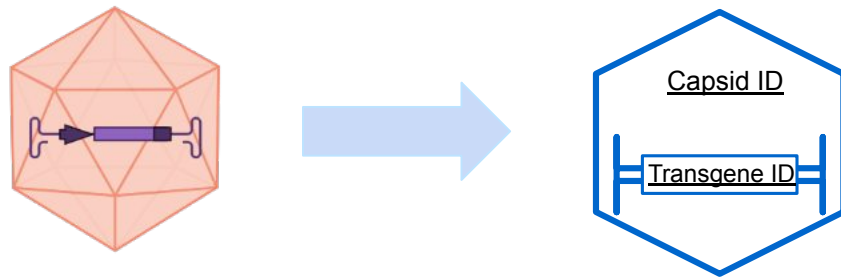
Data Foundation

**Immunogenicity
intelligence,
Biodistribution &
safety analytics**

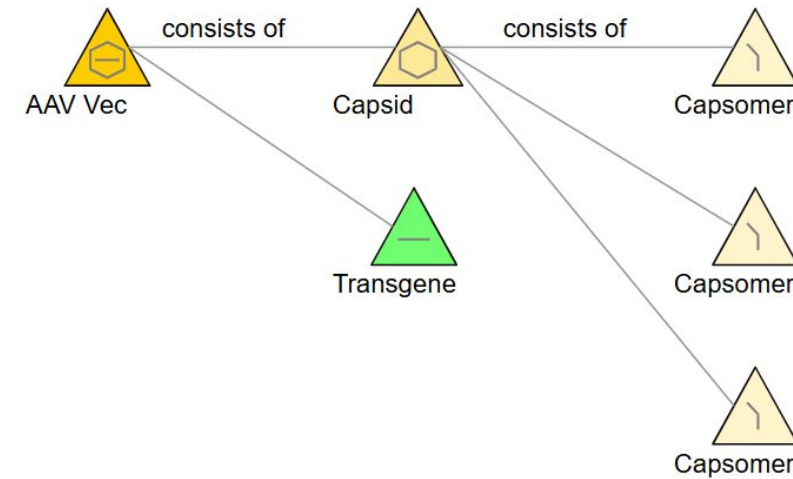
**Capsid & payload
design with ML/AI**

rAAV Data Modelling and Compound Registration

Molecular View



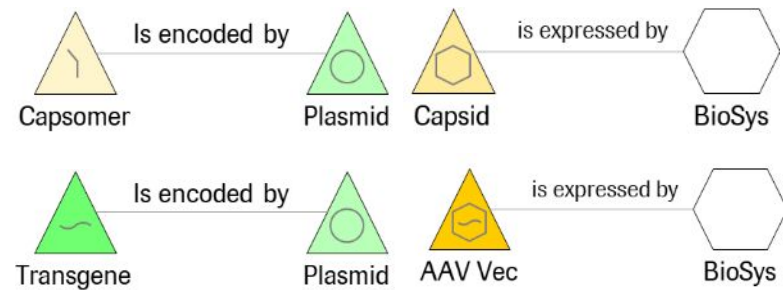
Molecular View



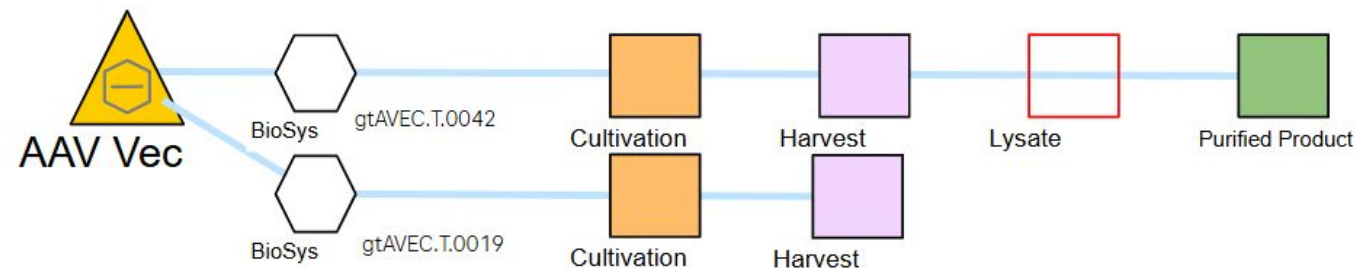
rAAV Data Modelling and Definition in D360

Production View

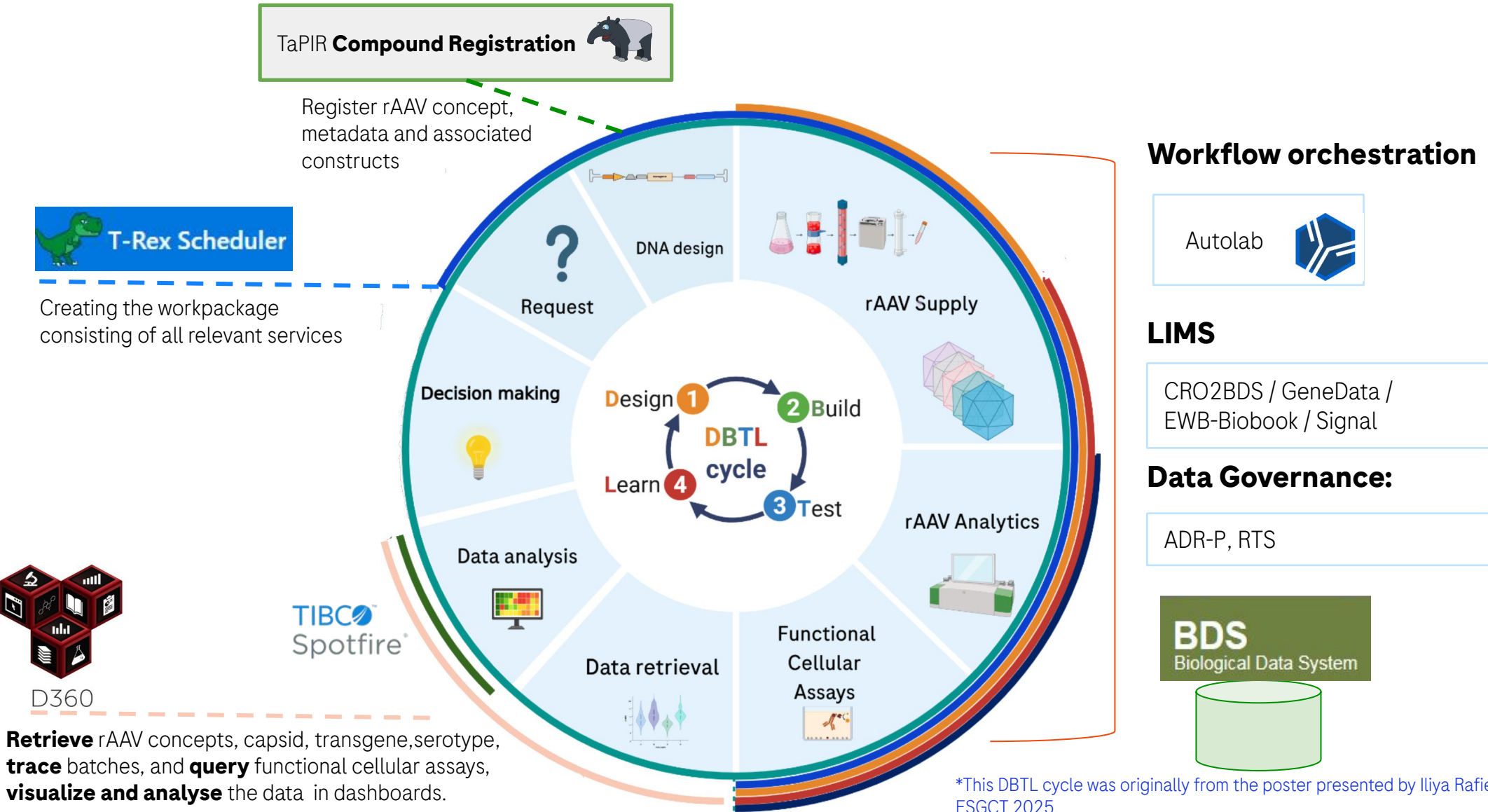
rAAV Constructs:



Different types of Batches (Genealogy)

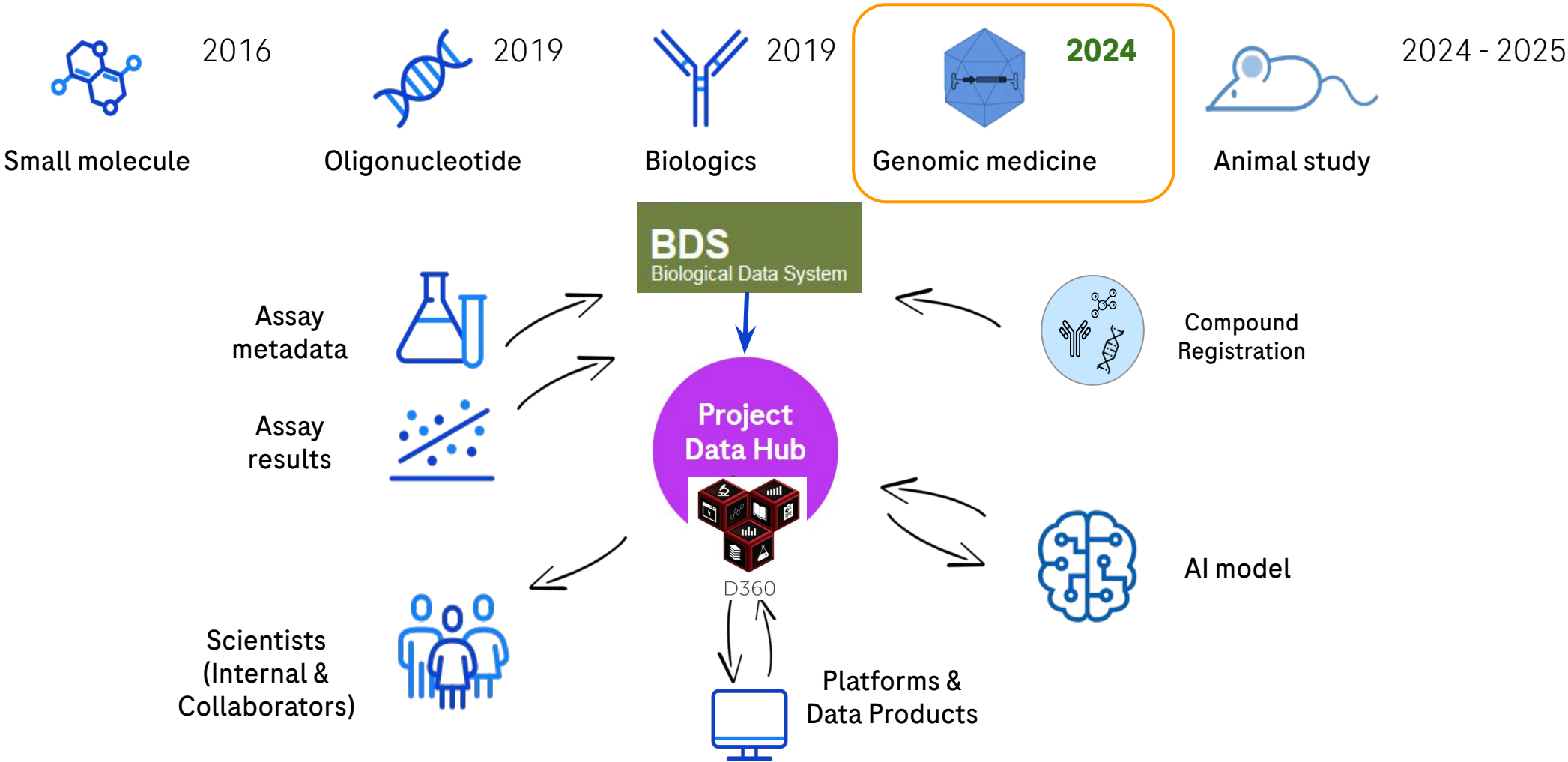


DBTL Cycle in Roche's rAAV Drug Discovery



BDS (Biological Data System) - pRED Discovery Data Warehouse

Integrate scientific & assay data from all modalities in pRED (Pharma Research and Early Development)



rAAV Concept, Capsid and Transgene in D360

Data Presentation & Data Query

Category	Item
AAV Concept	AAV Vector Concepts
	AAV Vector ID
	AAV Vector Name
	AAV Vector Concept Project
Capsid's metadata	Capsid
	Capsid Name
	Capsid MW (Da)
	Capsid Mass Extinction Coefficient
AAV Concept Key Information	Capsid Molar Extinction Coefficient
	Capsomere
	Entered by
	Entry Date
	HELM String
	HELM Sketch
	Modified by
	Modify Date
	MW (Da)
	Plasmid
Transgene's metadata (to further define in TaPIR)	Plasmid Name
	Serotype
	Transgene
in-vitro assay data	Visual Format Key
	Visual Format Key SVG
	AAV Biological Systems
	AAV Vector Batches
in-vivo study tracking	AAV Vector Assays
	FISH Studies

	AAV Vector ID	AAV Vector Name	Concat Distinct AAV Vector Concept Project	Concat Capsid	Concat Capsid Name	Mean Capsid MW (Da)	Concat Transgene
1:	<input type="checkbox"/> AV1AA0021	AAV1AA0021	ACTA1 AAV GT	P1AG1584	AAV8 serotype	208253.74	NA1AA0322
2:	<input type="checkbox"/> AV1AA0026	AAV1AA0026	ACTA1 AAV GT	P1AF6688	AAV2 serotype	208610.92	NA1AA0447
3:	<input type="checkbox"/> AV1AA0027	AAV1AA0027	ACTA1 AAV GT	P1AF6688	AAV2 serotype	208610.92	NA1AA0448
4:	<input type="checkbox"/> AV1AA0045	AAV1AA0045	ACTA1 AAV GT	P1AG1584	AAV8 serotype	208253.74	NA1AA0444
5:	<input type="checkbox"/> AV1AA0046	AAV1AA0046	ACTA1 AAV GT	P1AG1584	AAV8 serotype	208253.74	NA1AA0445
6:	<input type="checkbox"/> AV1AA0047	AAV1AA0047	ACTA1 AAV GT	P1AG1584	AAV8 serotype	208253.74	NA1AA0446
7:	<input type="checkbox"/> AV1AA0048	AAV1AA0048	ACTA1 AAV GT	P1AG1584	AAV8 serotype	208253.74	NA1AA0447
8:	<input type="checkbox"/> AV1AA0049	AAV1AA0049	ACTA1 AAV GT	P1AG1584	AAV8 serotype	208253.74	NA1AA0448

Key questions to answer:

- Retrieve all AAV concepts with a given serotype
- Retrieve all AAV concepts and associated key information in my project
- Understand the parents (Capsid and transgene) of a list of AAVs concepts
- Find all AAV concepts which is expressed by the same Biosys
- Provide all in-vivo studies for a list of AAVs concepts

rAAV Batches and Genealogy in D360

rAAV Batches Traceability and Production Review

>	AAV Vector Concepts
>	AAV Biological Systems
✓	AAV Vector Batches
●	Batch ID
●	ERN
●	Batch Comment
●	Batch Type
●	Entered by
●	Entry Date
●	Modified by
●	Modify Date
●	Available Container Amount
●	Available Container Volume
●	Container Concentration
●	Container Concentration(Molar)
●	Container Concentration Unit
●	Container Volume
●	Initial Amount
●	Initial Amount Unit
●	Initial Concentration
●	Initial Concentration (Molar)
●	Initial Concentration Unit
●	Initial Volume
●	Initial Volume Unit
●	Number of Containers
●	Parent Batch ID
●	Preparation Date
●	Supplier
✓	Specific Batch types
>	Harvest Batches
✓	Purification Batches
●	Purification Batch ID
●	Batch Quality
●	Formulation Buffer
●	Purification Step
●	Purification Yield
●	Endotoxin Concentration
●	Endotoxin Unit
>	Cultivation Batches
>	Lysate Batches
>	AAV Vector Assays

AAV Batch 's metadata (General)

AAV Inventory Data

AAV's batch-specific metadata

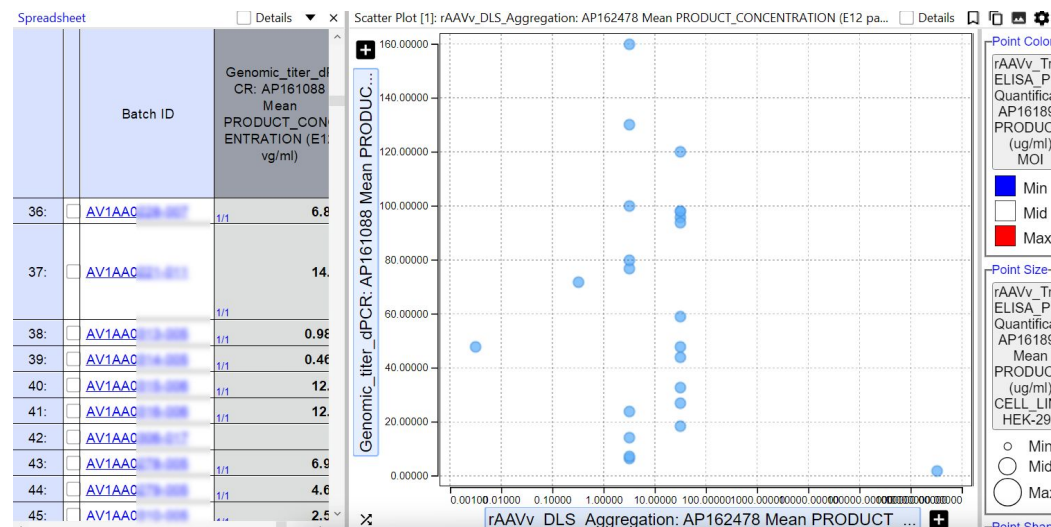
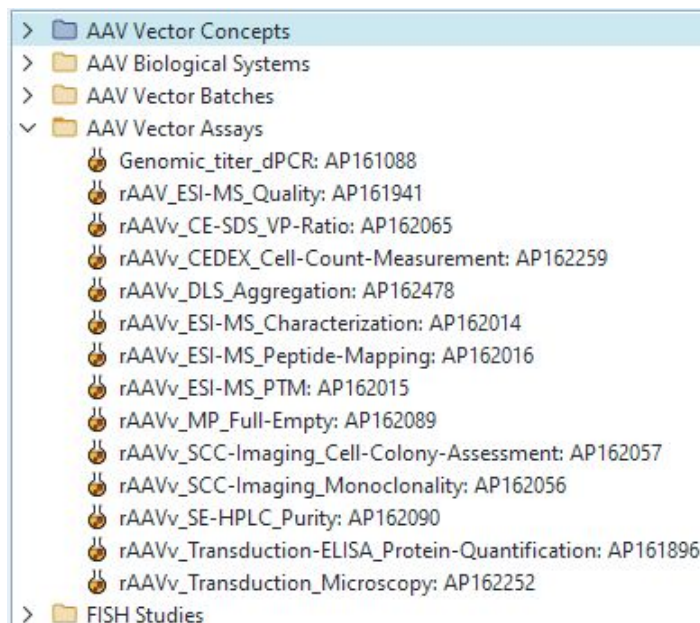
Batch ID	Concat Distinct AAV Vector Concept Project	AAV Vector ID	Batch Type	Batch Quality	Parent Batch ID
<input type="checkbox"/> AV1AA0042-001	VEGF/Ang2 scDutaFab GT	AV1AA0042	Cultivation		
<input type="checkbox"/> AV1AA0042-002	VEGF/Ang2 scDutaFab GT	AV1AA0042	Harvest		AV1AA0042-001
<input type="checkbox"/> AV1AA0043-001	VEGF/Ang2 scDutaFab GT	AV1AA0043	Cultivation		
<input type="checkbox"/> AV1AA0043-002	VEGF/Ang2 scDutaFab GT	AV1AA0043	Harvest		AV1AA0043-001
<input type="checkbox"/> AV1AA0044-003	VEGF/Ang2 scDutaFab GT	AV1AA0044	Purification	Final Product	AV1AA0044-002
<input type="checkbox"/> AV1AA0044-001	VEGF/Ang2 scDutaFab GT	AV1AA0044	Cultivation		
<input type="checkbox"/> AV1AA0044-002	VEGF/Ang2 scDutaFab GT	AV1AA0044	Harvest		AV1AA0044-001
<input type="checkbox"/> AV1AA0050-009	VEGF/Ang2 scDutaFab GT	AV1AA0050	Cultivation		
<input type="checkbox"/> AV1AA0050-010	VEGF/Ang2 scDutaFab GT	AV1AA0050	Cultivation		
<input type="checkbox"/> AV1AA0050-011	VEGF/Ang2 scDutaFab GT	AV1AA0050	Cultivation		
<input type="checkbox"/> AV1AA0050-001	VEGF/Ang2 scDutaFab GT	AV1AA0050	Cultivation		

Key questions to answer:

- Retrieve all AAV batches of a project,
- Display batch type, parent batch the quality of final product
- Track all batches, supply logistics for project lifecycle planning
- Cluster batches from the same biosys

rAAV Cross-project Data Correlation & Visualization in D360

Analytics Assays, Functional Cellular Readouts & rAAV Variants



Key questions to answer:

- Show the results of analytics assay, cellular assays or safety assays tested for a list of AAVs
- Find the correlation between cellular readouts of AAV variants in a project or cross-projects
- Get all assay tested for a list of AAVs batches

Summary

Key benefits of using D360 for rAAV community

- Streamline the rAAV molecules review by quickly retrieving and visualizing assay results;
- Facilitate cross-project learning;
- Enhance rAAVs manufacturability & developability knowledge;
- Easily get an overview of batch quality and produced rAAV batches across departments.
- Develop an insights of critical quality attributes (CQAs), and correlations between specific cellular readouts of the tested AAV variants.

Ongoing work:

- Define the Transgene in TaPIR and introduce its metadata to D360
- Define and implement the AAVs “all entity details” viewer in D360 to easily access to the AAVs molecule profile in Roche
- Build complex dashboards to support different groups and project teams
- Build and enable the ML/AI models in D360 to improve the capsid and payload design in D360

Lessons Learned

Challenges & Opportunities



Collect diverse user stories & user needs



Support by Power Users



Continuous rollout & refinement



Pre-align & collaborate with peers and other platforms



Be flexible, still deliver on time:

- Prioritize Ops and New “Projects”.
- Manage the timelines and resources.



Communities growth and support demand

Acknowledgement

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Ahana Guha Roy¹
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Béla Borsos
Olivier Roche

^{1,2} Roche External Workforces; ¹ Technical implementation in D360

Q&A



Doing now what patients need next