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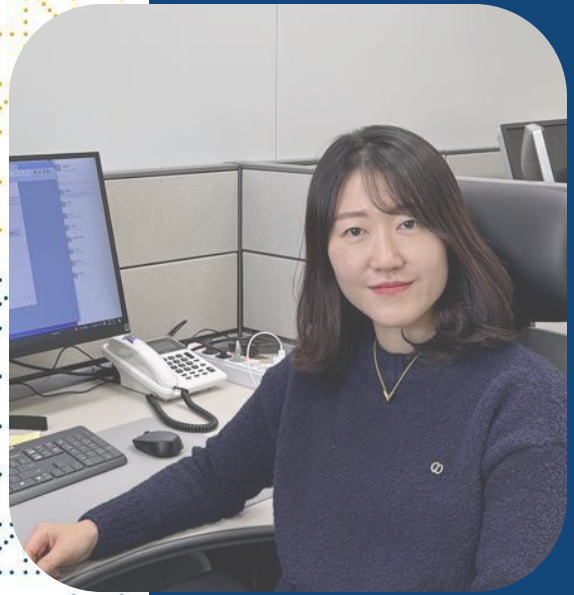
2023
KOREA
INTERCHANGE
SEOUL | 11-14 DECEMBER

Insights from Nonclinical Data Integration Analytics

Presented by Yoongi Kim, Senior Researcher,
Advanced Toxicology Research Department,
Korea Institute f Toxicology



Meet the Speaker

Yoongi Kim

Title: Study Data Standardization Manager, Senior Researcher

Organization: Korea Institute of Toxicology

Yoon-gi Kim is a Senior Researcher at the Korea Institute of Toxicology and has actively worked as a GLP QA expert in both the United States and South Korea. Currently, as a Study Data Standardization Manager, Kim is engaged in conducting various research projects utilizing CDISC SEND. Kim is also a dedicated volunteer in the Phuse nonclinical working group, striving to establish a foundation for international collaboration through the use of standardized nonclinical data.

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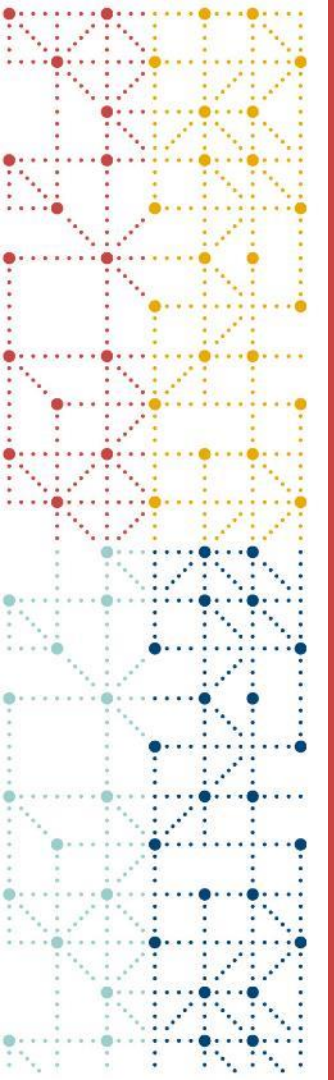
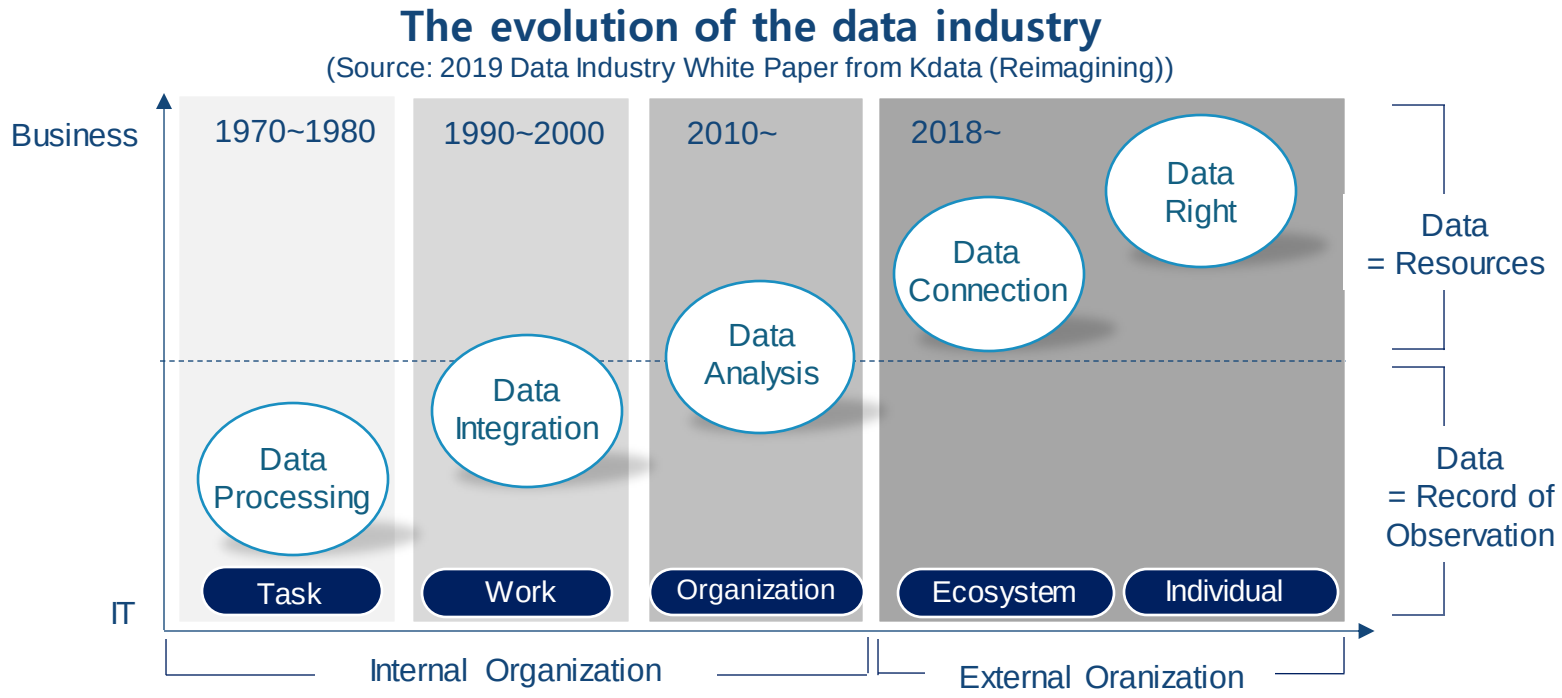


Agenda

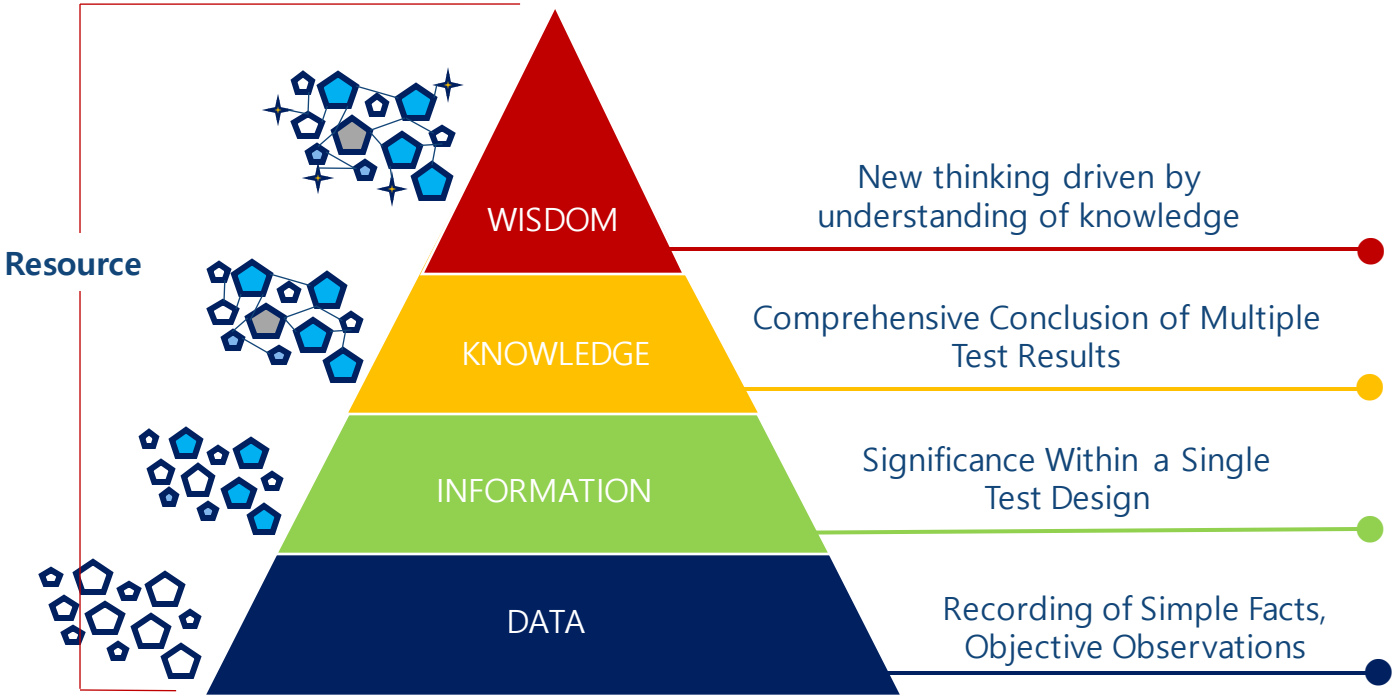
1. Nonclinical Data as a Resource
2. Data Silo
3. Tackling silos in nonclinical data
4. Discover insights from nonclinical data

Nonclinical Data as a Resource

Nonclinical data as a resource



Nonclinical data as a resource



Nonclinical data as a resource

DATA → Recording of Simple Facts

Body weight measurement

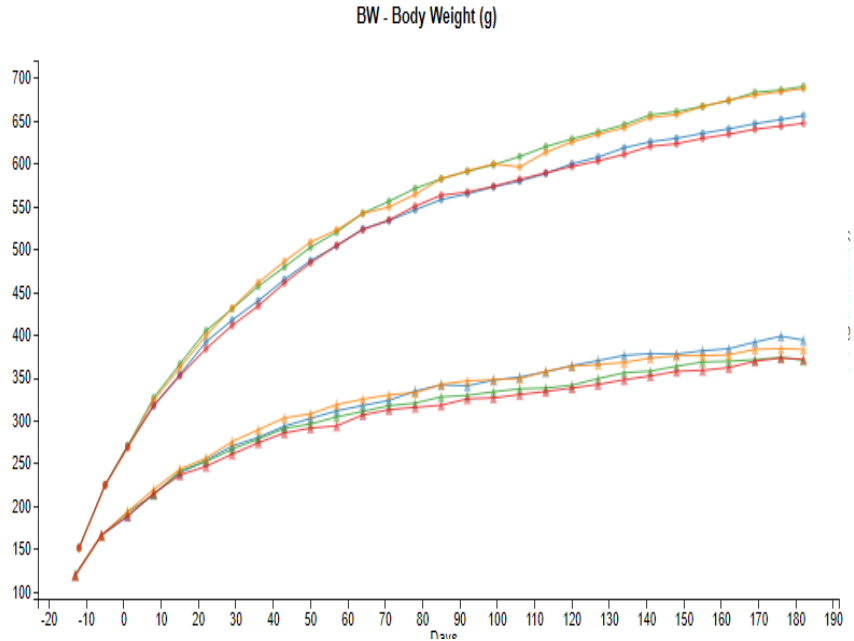
BWSEQ	BWTESTCD	BWTEST	BWORRES	BWORRESU	BWSTRESC	BWSTRESN	BWSTRESU
1	BW	Body Weight	20.7	g	20.7	20.7	g
2	BW	Body Weight	26.8	g	26.8	26.8	g
3	BW	Body Weight	27.2	g	27.2	27.2	g
4	BW	Body Weight	28.8	g	28.8	28.8	g
5	BW	Body Weight	29.1	g	29.1	29.1	g
6	BW	Body Weight	29.7	g	29.7	29.7	g

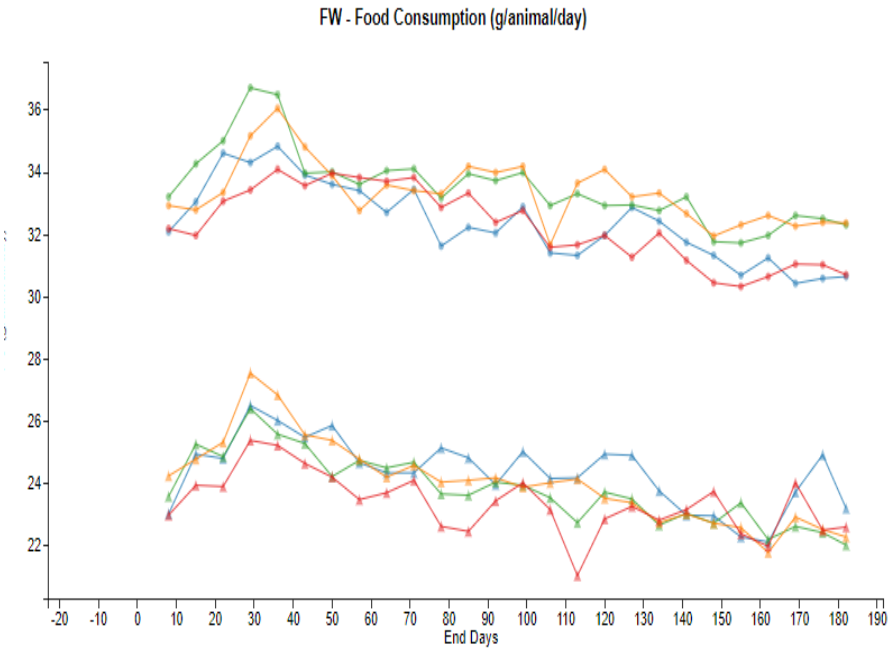
Clinical Observation

CLINICAL SIGN	CLINICAL SIGNS	General Appearance:Unconsumed feed	General Appearance:Unconsumed feed		18	2021-08-01T09:1...
CLINICAL SIGN	CLINICAL SIGNS	General Appearance:Unconsumed feed	General Appearance:Unconsumed feed		18	2021-08-01T09:1...
CLINICAL SIGN	CLINICAL SIGNS	No Abnormalities Detected	NORMAL		29	2021-08-10T14:3...

Nonclinical data as a resource

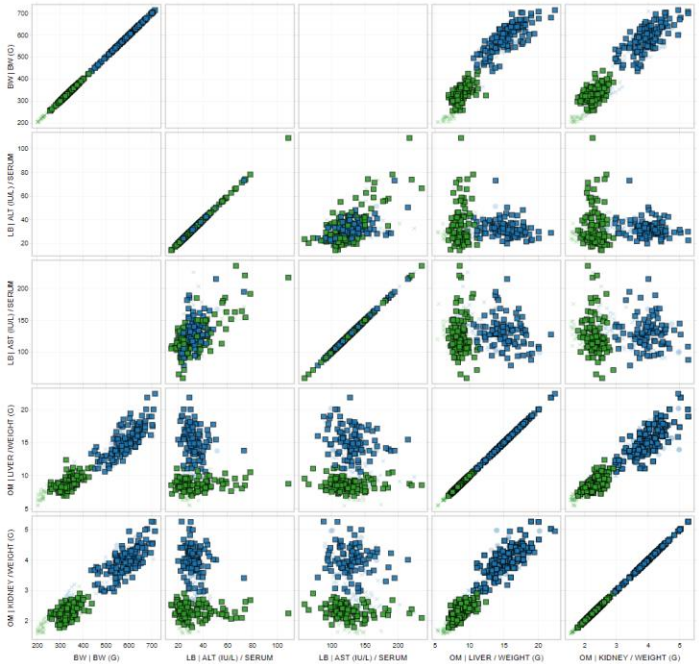
Information → 'Analyzed Data' to include purpose and meaning

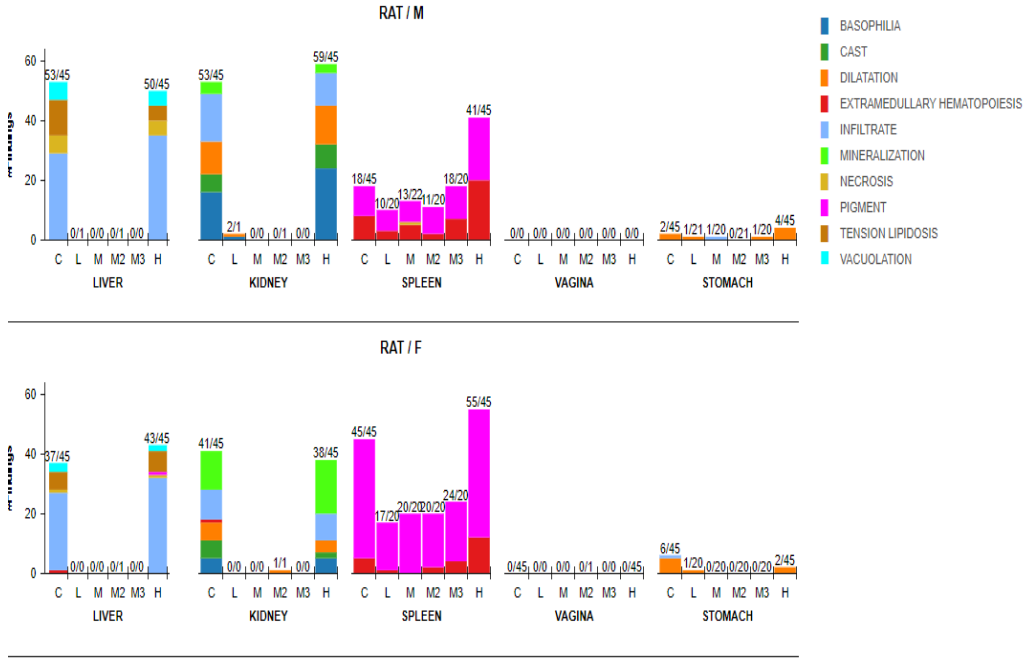




Nonclinical data as a resource

Knowledge → Results derived from 'analyzing patterns of information'

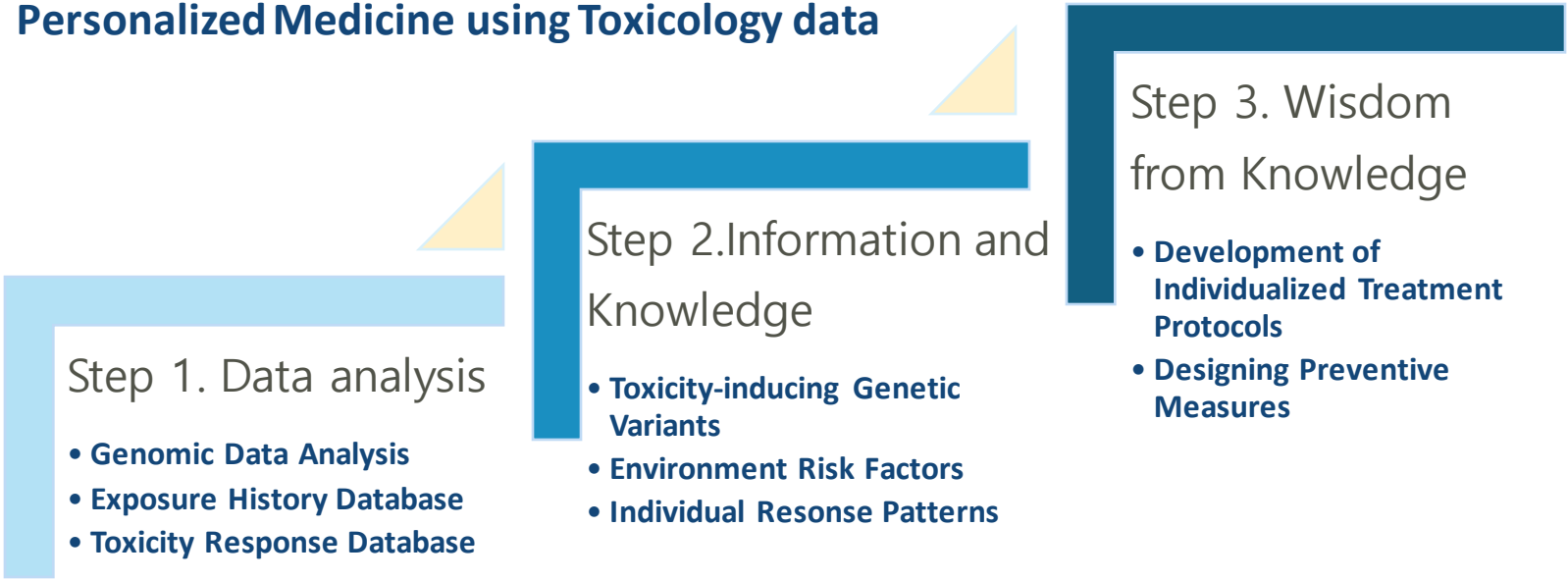


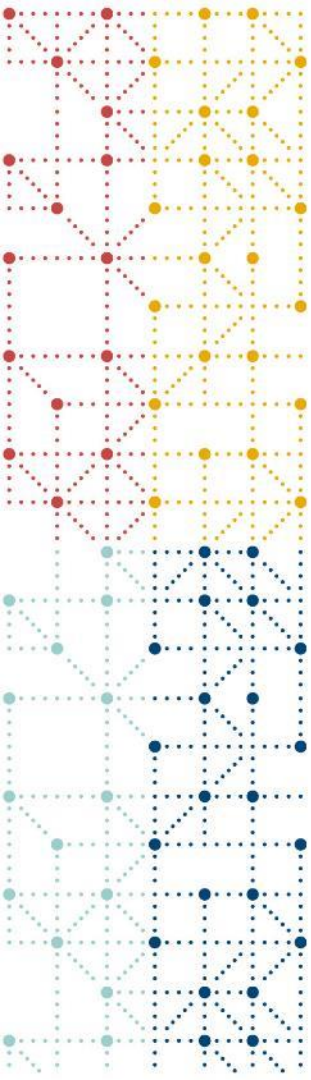


Nonclinical data as a resource

Wisdom → 'Practical application' of that knowledge to make decisions

Personalized Medicine using Toxicology data





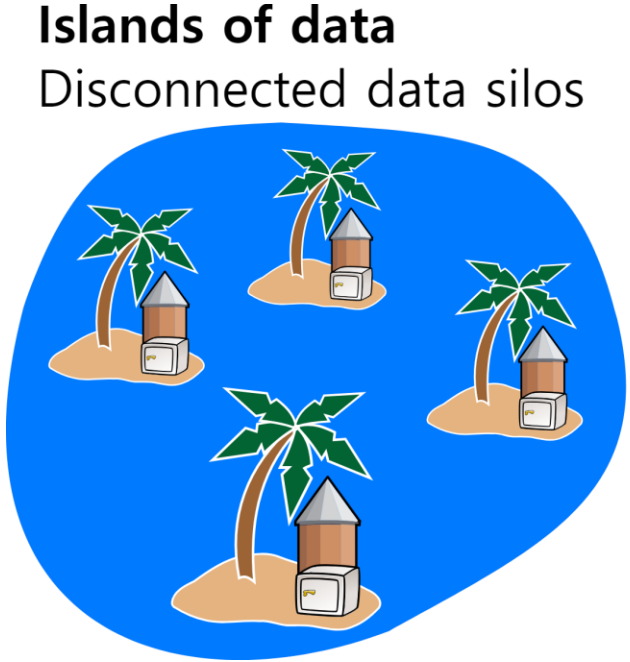
Data Silo

What is Data silo?

Silo

1. A tall tower or pit on a farm to store grain.
2. an underground chamber in which a guided missile is kept ready for firing.
3. a system, process, department, etc. that operates in isolation from others

What is Data silo?

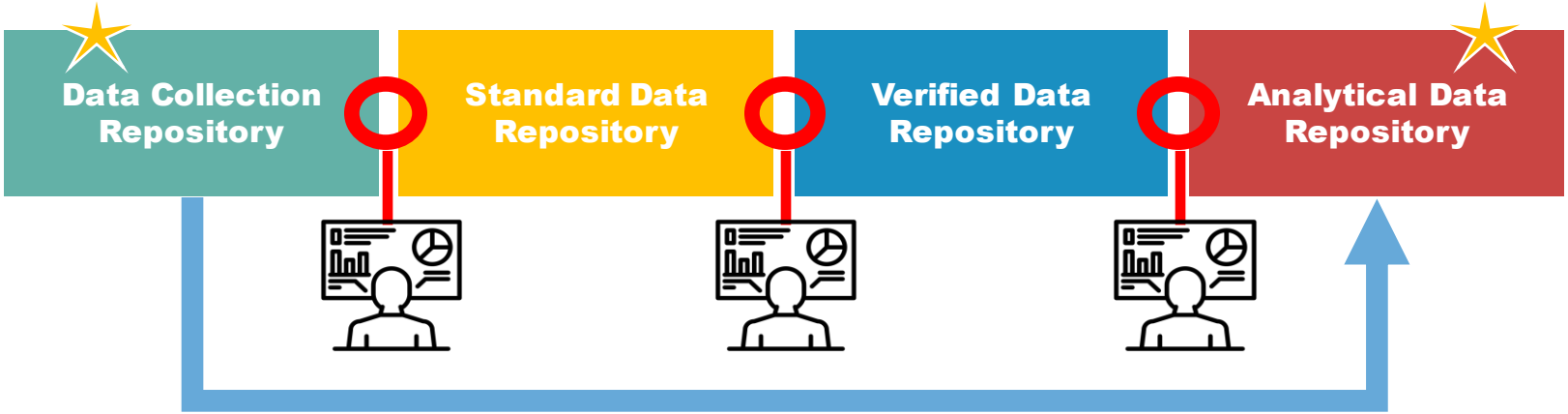


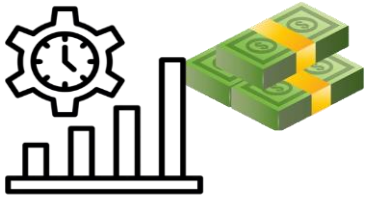
"Data storage and management system that is segregated and inaccessible to different departments within a company"

The disadvantages of data silos

- Limited Information AccessibilityRedundant Work
- Lack of Collaboration
- Degradation of Data Quality and Consistency
- Analytical Challenges
- Decreased Competitiveness

The Limits of a Disconnected System

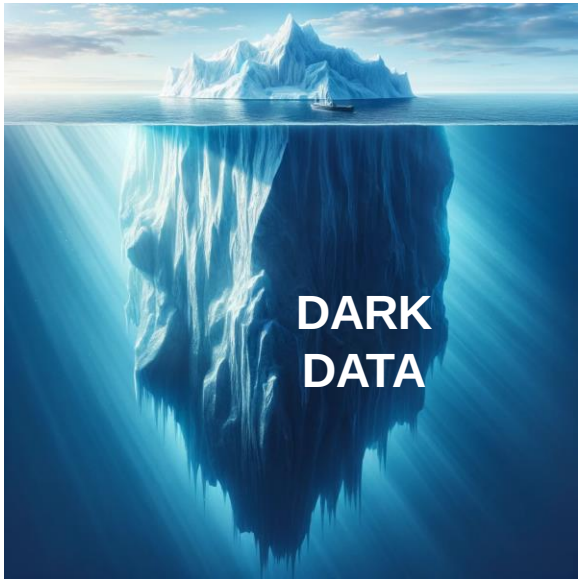




- (Cost) Pay individual fees for each system
- (Efficiency) Perform repetitive tasks at every step
- (Reliability) Occurrence of data inconsistency
- (Management) Increase in internalization costs

The Limits of a Disconnected System

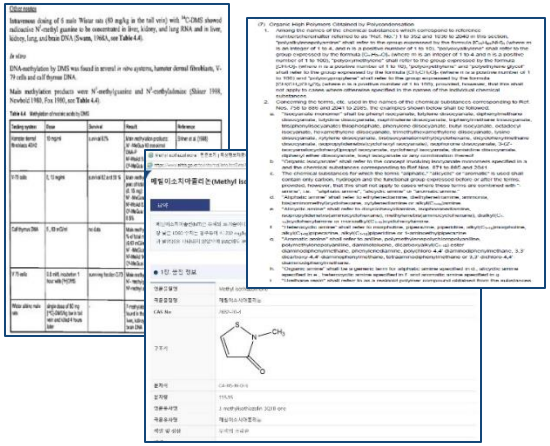
Dark Data



20% **Currently used Data, Structured Data**

80% **Dark data that is hidden and not being utilized, Unstructured Data**

Lack of Toxicity Database for Machine Learning, AI



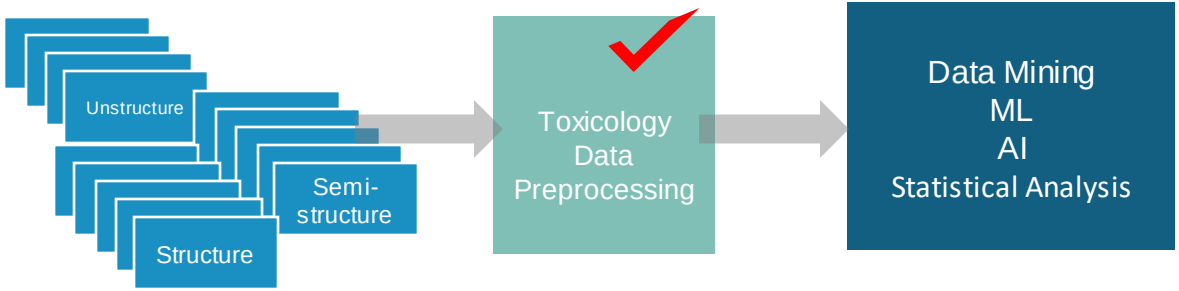
Toxicity Database

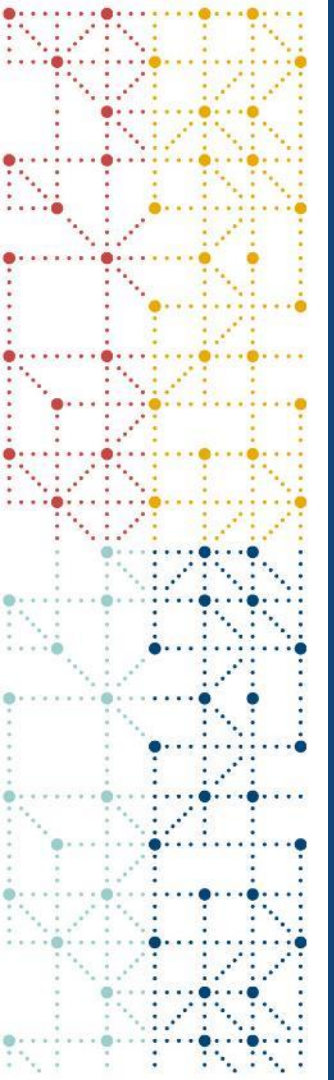
Data Gap Arising from Outdated and Unstructured Data

Data Insufficient for Training Machine Learning or AI

Very Limited Experimental Data and Unreliable Sources

Inadequate Modeling for Measuring the Toxicity of Complex Formulations





Tackling silos in nonclinical data

Resolving Silos

Data Integration

Consolidate all nonclinical data into a single centralized repository

Data Governance Establishment

Set clear rules and procedures for data quality, security, accessibility, and usage

Metadata Management

Create and manage metadata for data to understand its context and make it searchable

Adoption of Analytical Tools and Techniques

Utilize advanced data analysis tools and technologies, such as Artificial Intelligence (AI) and Machine Learning (ML)

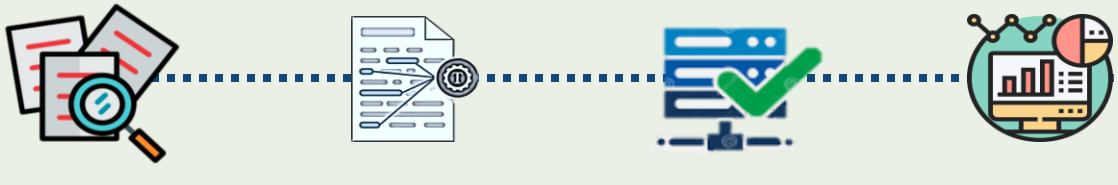
Strengthening Cross-departmental Collaboration

Promote collaboration between various departments and teams to enhance data-driven decision-making

Resolving Silos

Security System

Integration System



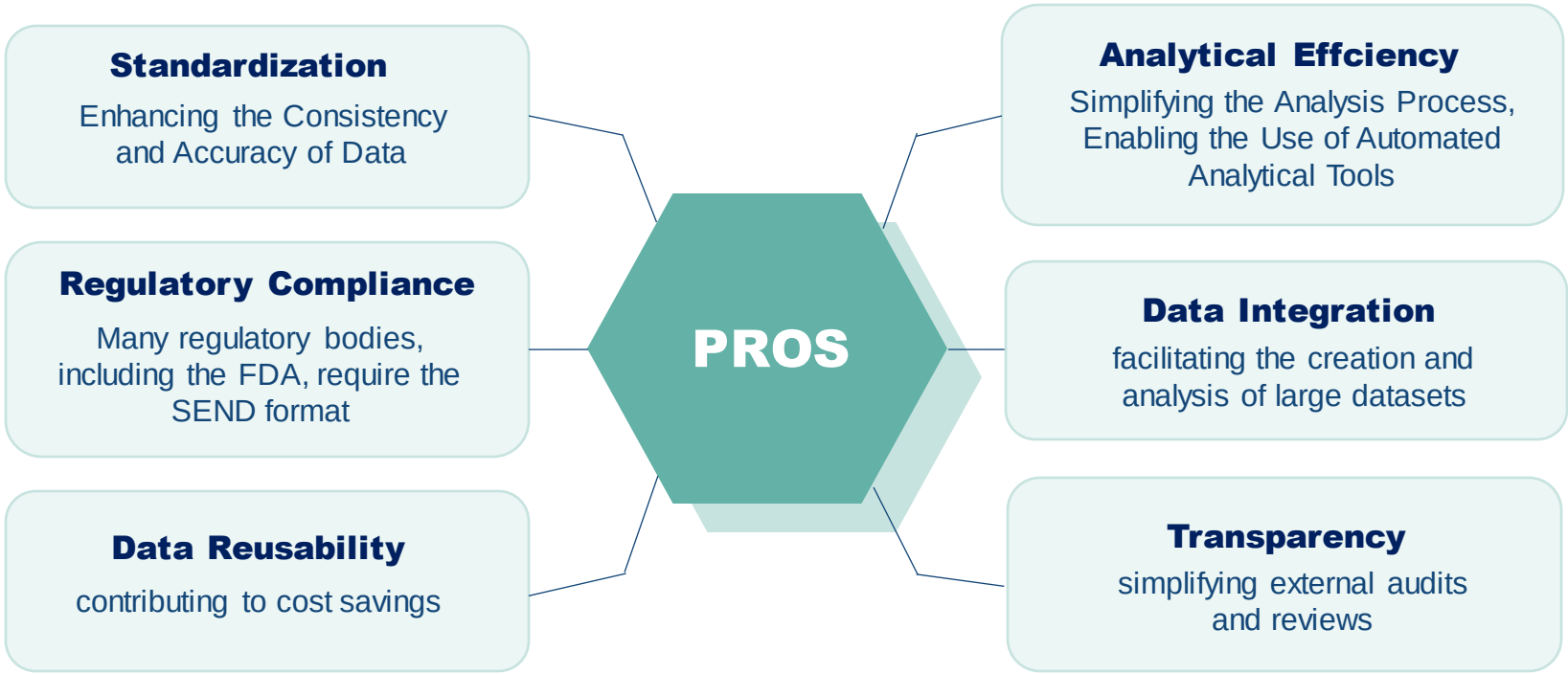
Data Collection

Data Extraction

Data Validation

Data Analysis

Pros of SEND
in building an integrated system



Pros of SEND
in building an integrated system

Standardized Metadata

Meta data
= a data of the data
= data that provides information about other data

Study Identification
- Unique identifier of the study (e.g., STUDYID).
- Title of the study.
- Start and end dates of the study.

Study Design
- Type of study (e.g., toxicology, pharmacology).
- Phase of the study (e.g., initial, interim, final).
- Experimental methodologies used in the study.

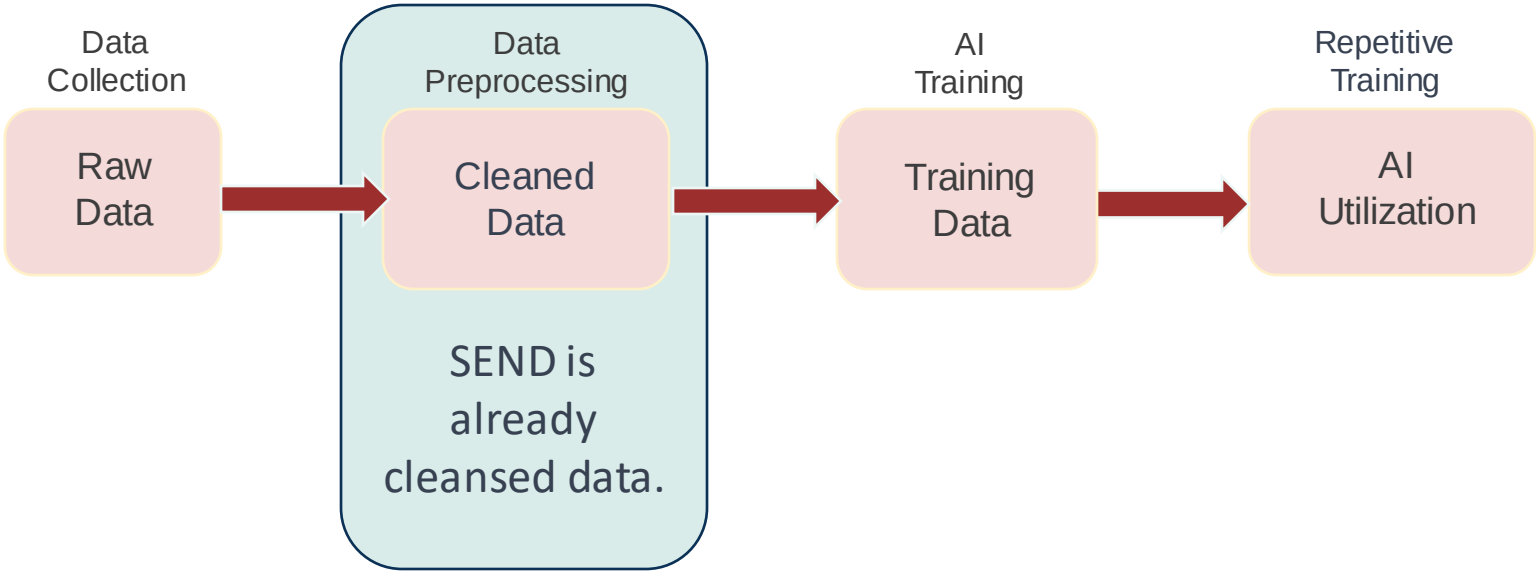
Subject
- Unique identifier of the subjects (animals) (e.g., USUBJID).
- Species, breed, sex, age, etc., of the subjects.

Structure of Test Data
- Domains used in the data (e.g., DM for Demographics, LB for Laboratory Data).
- Variables within each domain and their descriptions (e.g., variable name, variable definition).

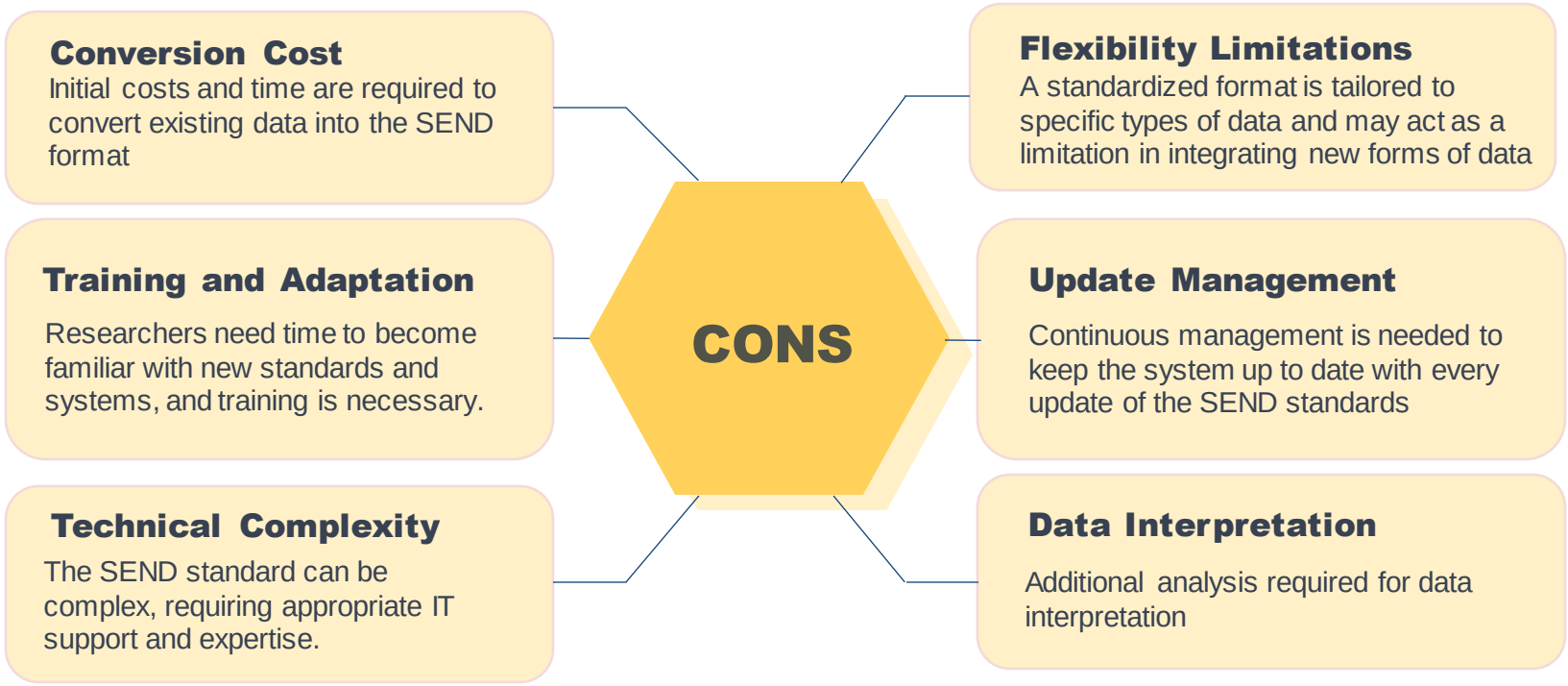
Data Collection and Processing Information
- Tools and software used for data collection.
- Methodologies used for data processing and analysis.

Pros of SEND
in building an integrated system

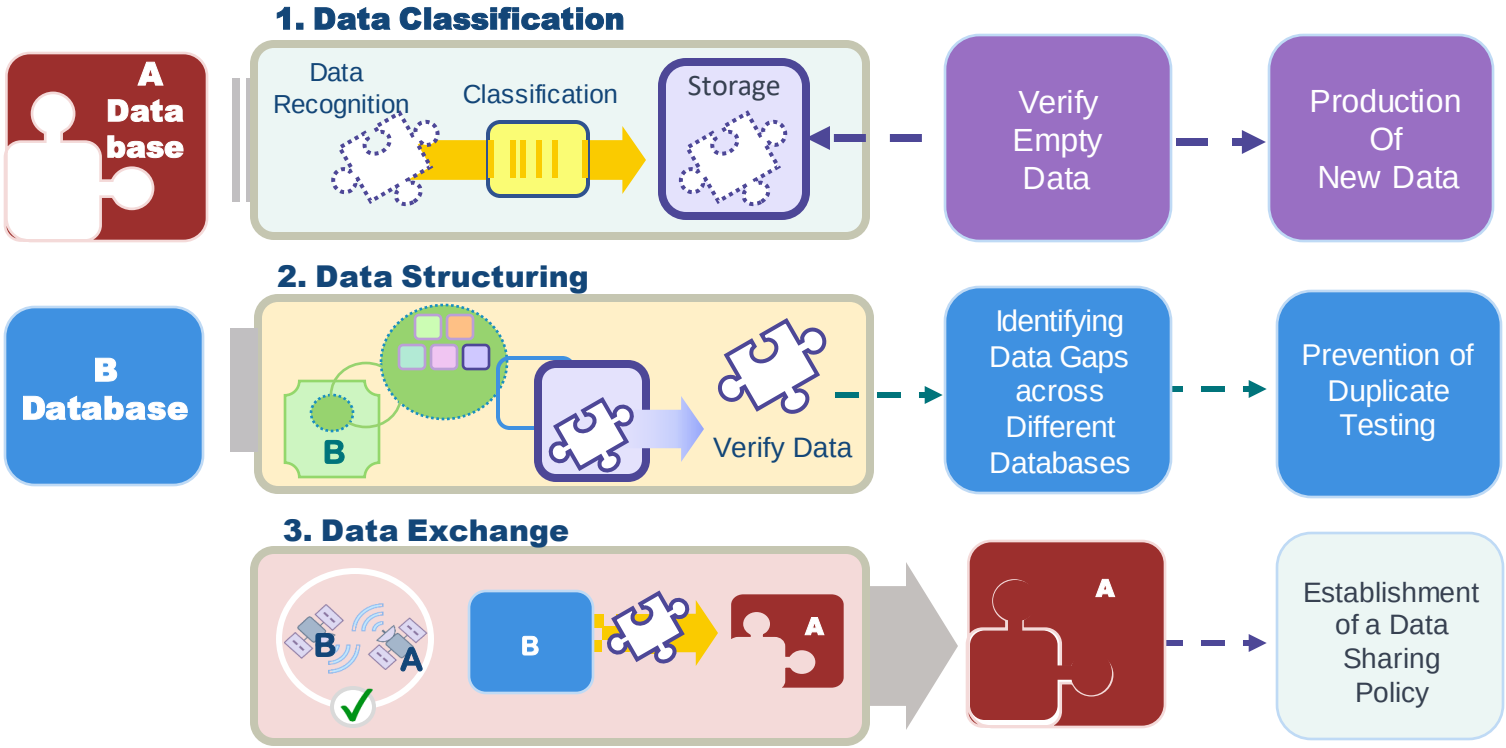
"Eighty percent of data analysis is data preprocessing."

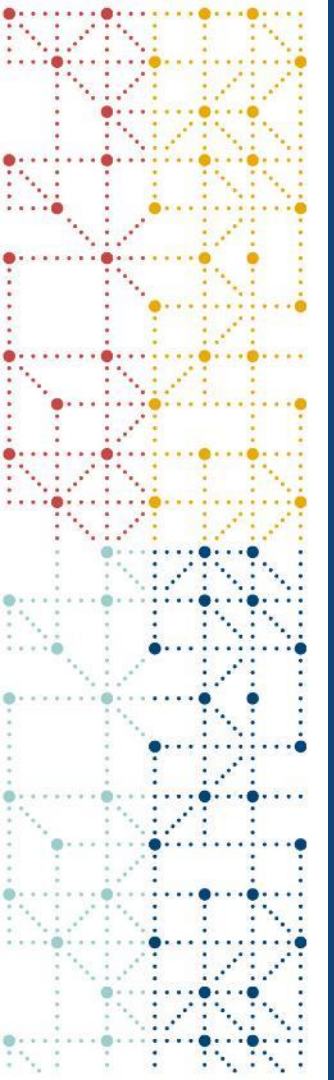


Cons of SEND
in building an integrated system



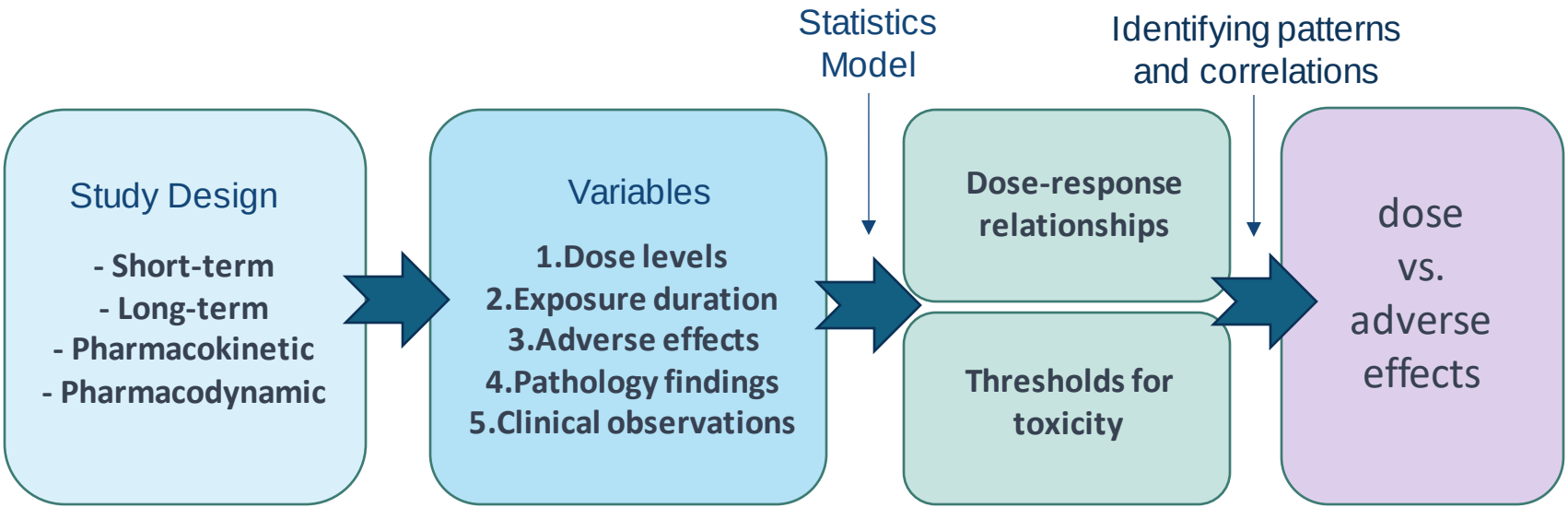
Strength in Interoperability





Discover insights from nonclinical data

Toxicity profiles for a Compound



Historical Control Data

Analysis of historical control data is possible according to various criteria

Gender Analysis Separate data for male and female animals to analyze differences in responses based on gender.	**Study Design Analysis** Analyze data according to the design of the study (e.g., single-dose studies, repeated dose studies, metabolism studies).
Age and Weight Analysis Analyze data according to the age and weight of the animals to investigate the impact of physiological differences.	**Type of Response Analysis**: Analyze data based on different physiological and pathological response types (e.g., organ changes, hematological changes).
Genetic Variability Analysis Analyze data from animals with different genetic backgrounds to understand the influence of genetic factors on toxicity responses.	**Animal Health Status Analysis**: Analyze data based on the health status of the animals before the start of the study (e.g., pre-existing conditions, immune status).
Environmental Condition Analysis Consider various environmental conditions (e.g., temperature, humidity, light cycle) under which the studies were conducted and analyze the data accordingly.	**Dosage and Frequency Analysis**: Investigate the impact of drug dosage levels and administration frequency on study outcomes by analyzing the data.

Enhance translational research

"Translational"
the process of transferring or linking results observed in preclinical data to clinical data

SEND (Standard for Exchange of Nonclinical Data) for preclinical data
SDTM (Study Data Tabulation Model) for clinical data

Unified Data Structure •Similar structures and terminologies •Both clinical and preclinical data record drug administration information, dosing routes, dosages, and observed results in a consistent manner	**Comparative and Correlation Analysis** •Directly compare drug response patterns •If specific responses observed in animal models are also present in humans.	**Safety and Efficacy Evaluation** •By linking observations of toxicity and efficacy indicators from preclinical studies to clinical data, a comprehensive evaluation of a drug's safety and efficacy profile is conducted.	**Regulatory Decision-Making** •If specific side effect observed in preclinical studies is also seen in clinical trials, it could influence the drug's labeling decisions.	**Biomarkers and Pathway Analysis** •Analyzing whether specific biomarkers or biological pathways identified in preclinical studies are similarly observed in clinical research.

Additional utilization of SEND

Consistent data structure and standardization are critical for **data sharing and comparative analysis.**

Understanding **off-target toxicity** / multiple compounds binding to the same target as well as understanding **trends for a class** of compounds or **Mechanism of Action (MOA)**	**Predicting / modelling the toxicology profile** or biological activities of chemicals in animals using Quantitative structure activity relationship (QSAR)	Understanding the **effects of vehicles** that might be used on different studies

Nonclinical Data Research Using SEND

The application of SEND is continuously expanding.

SENDIG V 3.1.1	SENDIG-DART V1.2	SENDIG-GENETOX v1.0
1.General Toxicology Studies 2.Safety Pharmacology Studies 3.Carcinogenicity Studies 4.Pharmacokinetic/Pharmacodynamic Studies	1.General Reproductive Toxicology Studies 2.Developmental Toxicity Studie 3.Embryo-Fetal Development Studies 4. Pre- and Postnatal Development Studies	1.Ames Tes. 2.Mouse Lymphoma Assay 3.Chromosomal Aberration Test 4.Micronucleus Test

Current status by the Numbers

Controlled Terminology
2023-09-29

Data Mapping
Mapping Data
2112

Average Conversion Days
4 Weeks Study 4 Days
13 Weeks Study 10 Days

When converting to a 13-week repeat study,
Average mouse clicks per day
32,000 clicks

Most conversions in one study
127

Fewest conversions in one study
2

KIT 안전성평가연구소
Korea Institute of Toxicology

Thank You!

Global Toxicity Institute Striving for the Public Health and Safety Across the Society

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