Agentic AI for Clinical Reporting

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Boehringer Ingelheim Vetmedica

Life forward

Project Morgana: From a simple question to a new way of working

SAS → R transition underway

Repetitive table programing consuming capacity

Question: Can an AI agent generate analysis datasets and output tables?

> **We called it Project Morgana**
>
> - it started as an experiment.

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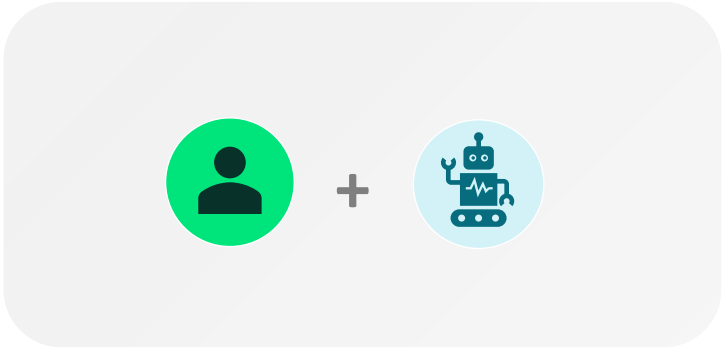
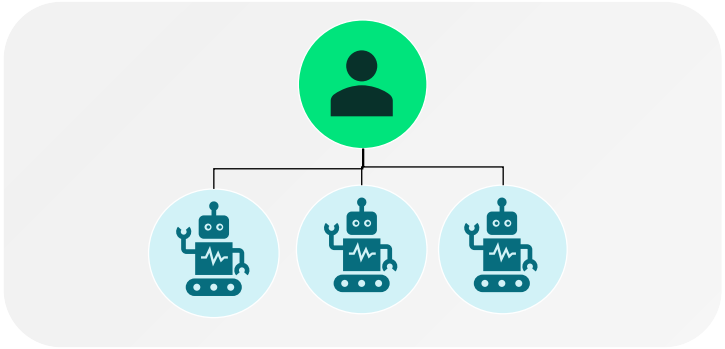
Agents are joining our teams - not replacing them

1 Human with assistant



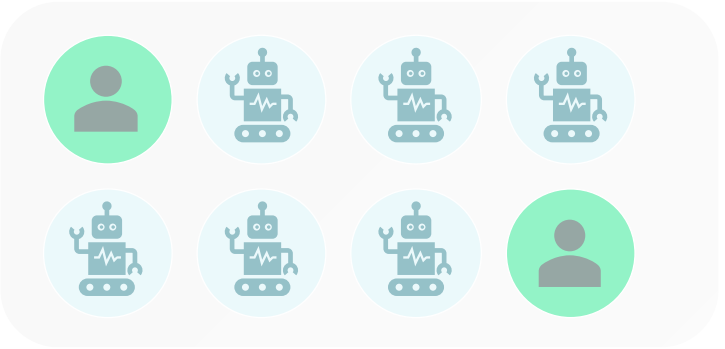
Every employee has an **AI assistant** that helps them to work better & faster.

2 Human-agent teams



Agents join teams as **“digital colleagues”**, taking on **specific tasks** at human direction.

3 Human-led, agent-operated



Humans set **direction** & **agents execute** business processes and workflows, checking in as needed.

We are in Phase 2 in execution building agents supporting humans in clinical reporting

We started where the impact is highest: Data preparation and table generation

Potential areas for AI Agents along statistical reporting process

1. Study design & planning

→ Define endpoints and statistical methods

→ Create TSAP and table shells

Output:
Approved TSAP and table shells

2. Data prep. & standardization

→ Automate ADaM-like dataset derivation from raw data

Output:
ADaM datasets ready for analysis

Pilot executed
Q1/2026

3. Statistical analysis

→ Automate table generation based on predefined input (e.g. TSAP, table shells)

Output:
Tables ready for report insertion

PoC succesful
Q4/2025

4. Stat. Report creation

→ Summarize results and produce statistical report

→ Draft statistical sections for final clinical report

Output:
Draft statistical report

Benefits of our Agents

SPEED

Cut manual "touch time" in report creation

QUALITY

Boost consistency and drive toward zero-error deliverables

INNOVATION

Enable statisticians to focus on methodology development

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From raw study data to finished tables

Data preparation & standardization

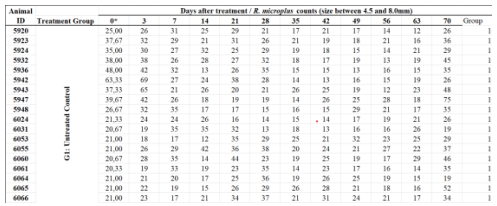
Statistical analysis

Raw
Tabular study data

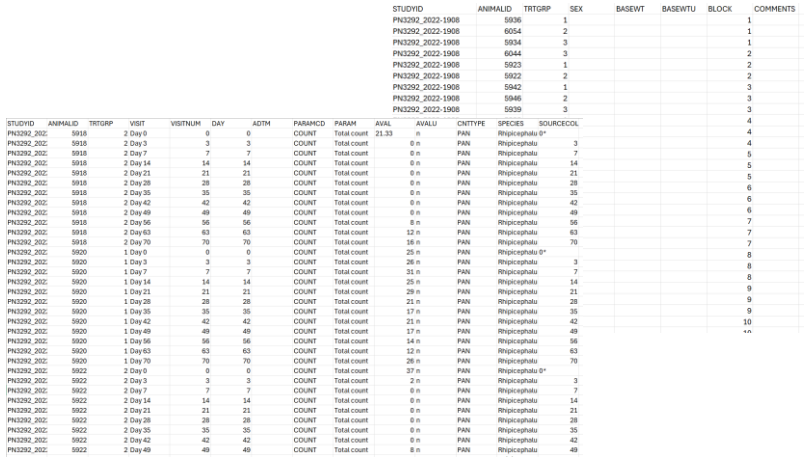
Standardized
ADaM-like Datasets

Data Input
ADaM-like Datasets

Output
Standardized table outputs

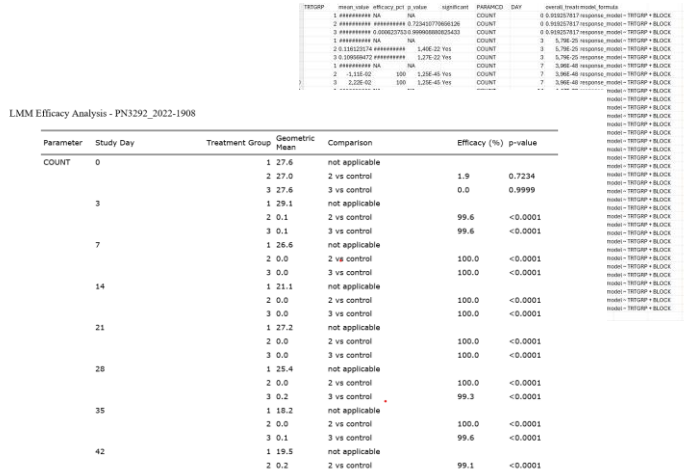


Animal ID	Treatment Group	Days after treatment / *R. microplas* counts (size between 4.5 and 8.0mm) 0*	3	7	14	21	28	35	42	49	56	63	70	Group
5920	G1: Untreated Control	25,00	26	31	25	29	21	17	21	17	14	12	26	1
5923		37,67	32	29	21	31	26	21	19	18	21	16	36	1
5924		35,00	30	27	32	25	29	19	18	15	14	21	29	1
5932		38,00	38	26	28	27	32	18	17	19	13	19	45	1
5936		48,00	42	32	13	26	35	15	15	15	13	16	15	1
5942		63,33	69	27	24	38	28	14	13	16	15	19	26	1
5943		37,33	65	21	26	20	21	26	25	19	12	23	48	1
5947		39,67	42	26	18	19	19	14	26	25	28	18	75	1
5948		26,67	32	35	17	17	15	16	15	29	21	17	35	1
6024		21,33	24	24	26	16	14	15	14	17	19	21	26	1
6031		20,67	19	35	35	32	13	18	13	16	16	26	19	1
6053		21,00	18	17	12	35	29	25	21	32	23	25	29	1
6055		21,00	26	29	42	36	38	20	24	21	27	22	37	1
6060		20,67	28	35	14	44	23	19	25	19	17	29	46	1
6061		20,33	19	33	19	23	35	14	23	17	16	14	35	1
6064		21,00	21	20	17	25	36	19	26	25	19	15	19	1
6065		21,00	22	19	15	26	29	26	28	21	18	16	52	1
6066		21,00	23	17	21	34	37	21	31	24	21	17	34	1



STUDYID	ANIMALID	TRTGRP	SEX	BASEWT	BASEWTU	BLOCK	COMMENTS
PN3292_2022-1908	5936		1			1	
PN3292_2022-1908	6054		2			1	
PN3292_2022-1908	5934		3			1	
PN3292_2022-1908	6044		3			2	
PN3292_2022-1908	5923		1			2	
PN3292_2022-1908	5922		2			2	
PN3292_2022-1908	5942		1			3	
PN3292_2022-1908	5946		2			3	
PN3292_2022-1908	5939		3			3	

STUDYID	ANIMALID	TRTGRP	VISIT	VISITNUM	DAY	ADTM	PARAMCD	PARAM	AVAL	AVALU	CNTTYPE	SPECIES	SOURCECOL
PN3292_202	5918		2 Day 0	0	0		COUNT	Total count	21.33	n	PAN	Rhipicephalu	0*
PN3292_202	5918		2 Day 3	3	3		COUNT	Total count		0 n	PAN	Rhipicephalu	3
PN3292_202	5918		2 Day 7	7	7		COUNT	Total count		0 n	PAN	Rhipicephalu	7
PN3292_202	5918		2 Day 14	14	14		COUNT	Total count		0 n	PAN	Rhipicephalu	14
PN3292_202	5918		2 Day 21	21	21		COUNT	Total count		0 n	PAN	Rhipicephalu	21
PN3292_202	5918		2 Day 28	28	28		COUNT	Total count		0 n	PAN	Rhipicephalu	28
PN3292_202	5918		2 Day 35	35	35		COUNT	Total count		0 n	PAN	Rhipicephalu	35
PN3292_202	5918		2 Day 42	42	42		COUNT	Total count		0 n	PAN	Rhipicephalu	42
PN3292_202	5918		2 Day 49	49	49		COUNT	Total count		0 n	PAN	Rhipicephalu	49
PN3292_202	5918		2 Day 56	56	56		COUNT	Total count		8 n	PAN	Rhipicephalu	56
PN3292_202	5918		2 Day 63	63	63		COUNT	Total count		12 n	PAN	Rhipicephalu	63
PN3292_202	5918		2 Day 70	70	70		COUNT	Total count		16 n	PAN	Rhipicephalu	70
PN3292_202	5920		1 Day 0	0	0		COUNT	Total count		25 n	PAN	Rhipicephalu	0*
PN3292_202	5920		1 Day 3	3	3		COUNT	Total count		26 n	PAN	Rhipicephalu	3
PN3292_202	5920		1 Day 7	7	7		COUNT	Total count		31 n	PAN	Rhipicephalu	7
PN3292_202	5920		1 Day 14	14	14		COUNT	Total count		25 n	PAN	Rhipicephalu	14
PN3292_202	5920		1 Day 21	21	21		COUNT	Total count		29 n	PAN	Rhipicephalu	21
PN3292_202	5920		1 Day 28	28	28		COUNT	Total count		21 n	PAN	Rhipicephalu	28
PN3292_202	5920		1 Day 35	35	35		COUNT	Total count		17 n	PAN	Rhipicephalu	35
PN3292_202	5920		1 Day 42	42	42		COUNT	Total count		21 n	PAN	Rhipicephalu	42
PN3292_202	5920		1 Day 49	49	49		COUNT	Total count		17 n	PAN	Rhipicephalu	49
PN3292_202	5920		1 Day 56	56	56		COUNT	Total count		14 n	PAN	Rhipicephalu	56
PN3292_202	5920		1 Day 63	63	63		COUNT	Total count		12 n	PAN	Rhipicephalu	63
PN3292_202	5920		1 Day 70	70	70		COUNT	Total count		26 n	PAN	Rhipicephalu	70
PN3292_202	5922		2 Day 0	0	0		COUNT	Total count		37 n	PAN	Rhipicephalu	0*
PN3292_202	5922		2 Day 3	3	3		COUNT	Total count		2 n	PAN	Rhipicephalu	3
PN3292_202	5922		2 Day 7	7	7		COUNT	Total count		0 n	PAN	Rhipicephalu	7
PN3292_202	5922		2 Day 14	14	14		COUNT	Total count		0 n	PAN	Rhipicephalu	14
PN3292_202	5922		2 Day 21	21	21		COUNT	Total count		0 n	PAN	Rhipicephalu	21
PN3292_202	5922		2 Day 28	28	28		COUNT	Total count		0 n	PAN	Rhipicephalu	28
PN3292_202	5922		2 Day 35	35	35		COUNT	Total count		0 n	PAN	Rhipicephalu	35
PN3292_202	5922		2 Day 42	42	42		COUNT	Total count		0 n	PAN	Rhipicephalu	42
PN3292_202	5922		2 Day 49	49	49		COUNT	Total count		8 n	PAN	Rhipicephalu	49



LMM Efficacy Analysis - PN3292_2022-1908

Parameter	Study Day	Treatment Group	Geometric Mean	Comparison	Efficacy (%)	p-value
COUNT	0	1	27.6	not applicable		
		2	27.0	2 vs control	1.9	0.7234
		3	27.6	3 vs control	0.0	0.9999
	3	1	29.1	not applicable		
		2	0.1	2 vs control	99.6	<0.0001
		3	0.1	3 vs control	99.6	<0.0001
	7	1	26.6	not applicable		
		2	0.0	2 vs control	100.0	<0.0001
		3	0.0	3 vs control	100.0	<0.0001
	14	1	21.1	not applicable		
		2	0.0	2 vs control	100.0	<0.0001
		3	0.0	3 vs control	100.0	<0.0001
	21	1	27.2	not applicable		
		2	0.0	2 vs control	100.0	<0.0001
		3	0.0	3 vs control	100.0	<0.0001
	28	1	25.4	not applicable		
		2	0.0	2 vs control	100.0	<0.0001
		3	0.2	3 vs control	99.3	<0.0001
	35	1	18.2	not applicable		
		2	0.0	2 vs control	100.0	<0.0001
		3	0.1	3 vs control	99.6	<0.0001
	42	1	19.5	not applicable		
		2	0.2	2 vs control	99.1	<0.0001

Illustrative

Two agents, one checkpoint: how we built trust into the pipeline

1. Input

Raw study data

Animal ID	Treatment Group	Days after treatment / *R. microplus* counts (size between 4.5 and 8.0mm)												
		0*	3	7	14	21	28	35	42	49	56	63	70	Group
5920	GE: Untreated Control	25,00	26	31	25	29	21	17	21	17	14	12	26	1
5923		37,67	32	29	21	31	26	21	19	18	21	16	36	1
5924		35,00	30	27	32	25	29	19	18	15	14	21	29	1
5932		38,00	38	26	28	27	32	18	17	19	13	19	45	1
5936		48,00	42	32	13	26	35	15	15	13	16	15	35	1
5942		63,33	69	27	24	38	28	14	13	16	15	19	26	1
5943		37,33	65	21	26	20	21	26	25	19	12	23	48	1
5947		39,67	42	26	18	19	19	14	26	25	28	18	75	1
5948		26,67	32	35	17	17	15	16	15	29	21	17	35	1
6024		21,33	24	24	26	16	14	15	14	17	19	21	26	1
6031		20,67	19	35	35	32	13	18	13	16	16	26	19	1
6053		21,00	18	17	12	35	29	25	21	32	23	25	29	1
6055		21,00	26	29	42	36	38	20	24	21	27	22	37	1
6060		20,67	28	35	14	44	23	19	25	19	17	29	46	1
6061		20,33	19	33	19	23	35	14	23	17	16	14	35	1
6064		21,00	21	20	17	25	36	19	26	25	19	15	19	1
6065		21,00	22	19	15	26	29	26	28	21	18	16	52	1
6066		21,00	23	17	21	34	37	21	31	24	21	17	34	1

2. Agentic Execution

Analysis Dataset Preparation Agent

Please help me convert the data of study XXX to the standardized format

Standardized data

STUDYID	ANIMALID	TRTGRP	SEX	BASEWT	BASEWTU	BLOCK	COMMENTS
PN3292_2022-1908	5936	1				1	
PN3292_2022-1908	6054	2				1	
PN3292_2022-1908	5934	3				1	

STUDYID	ANIMALID	TRTGRP	VISIT	VISITNUM	DAY	ADTH	PARAMCD	PARAM	AVAL	AVALU	CNTYPE	SPECIES	SOURCECOL
PN3292_202:	5918	2	Day 0	0	0		COUNT	Total count	21.33	n	PAN	Rhipicephalus (B*	2
PN3292_202:	5918	2	Day 3	3	3		COUNT	Total count		0 n	PAN	Rhipicephalus	3
PN3292_202:	5918	2	Day 7	7	7		COUNT	Total count		0 n	PAN	Rhipicephalus	7
PN3292_202:	5918	2	Day 14	14	14		COUNT	Total count		0 n	PAN	Rhipicephalus	14
PN3292_202:	5918	2	Day 21	21	21		COUNT	Total count		0 n	PAN	Rhipicephalus	21
PN3292_202:	5918	2	Day 28	28	28		COUNT	Total count		0 n	PAN	Rhipicephalus	28
PN3292_202:	5918	2	Day 35	35	35		COUNT	Total count		0 n	PAN	Rhipicephalus	35
PN3292_202:	5918	2	Day 42	42	42		COUNT	Total count		0 n	PAN	Rhipicephalus	42
PN3292_202:	5918	2	Day 49	49	49		COUNT	Total count		0 n	PAN	Rhipicephalus	49
PN3292_202:	5918	2	Day 56	56	56		COUNT	Total count		0 n	PAN	Rhipicephalus	56
PN3292_202:	5918	2	Day 63	63	63		COUNT	Total count		12 n	PAN	Rhipicephalus	63
PN3292_202:	5918	2	Day 70	70	70		COUNT	Total count		14 n	PAN	Rhipicephalus	70
PN3292_202:	5920	1	Day 0	0	0		COUNT	Total count		25 n	PAN	Rhipicephalus (B*	0
PN3292_202:	5920	1	Day 3	3	3		COUNT	Total count		28 n	PAN	Rhipicephalus	3
PN3292_202:	5920	1	Day 7	7	7		COUNT	Total count		21 n	PAN	Rhipicephalus	7
PN3292_202:	5920	1	Day 14	14	14		COUNT	Total count		25 n	PAN	Rhipicephalus	14
PN3292_202:	5920	1	Day 21	21	21		COUNT	Total count		29 n	PAN	Rhipicephalus	21
PN3292_202:	5920	1	Day 28	28	28		COUNT	Total count		21 n	PAN	Rhipicephalus	28
PN3292_202:	5920	1	Day 35	35	35		COUNT	Total count		17 n	PAN	Rhipicephalus	35
PN3292_202:	5920	1	Day 42	42	42		COUNT	Total count		21 n	PAN	Rhipicephalus	42
PN3292_202:	5920	1	Day 49	49	49		COUNT	Total count		17 n	PAN	Rhipicephalus	49
PN3292_202:	5920	1	Day 56	56	56		COUNT	Total count		14 n	PAN	Rhipicephalus	56
PN3292_202:	5920	1	Day 63	63	63		COUNT	Total count		12 n	PAN	Rhipicephalus	63
PN3292_202:	5920	1	Day 70	70	70		COUNT	Total count		26 n	PAN	Rhipicephalus	70
PN3292_202:	5922	2	Day 0	0	0		COUNT	Total count		37 n	PAN	Rhipicephalus (B*	9
PN3292_202:	5922	2	Day 3	3	3		COUNT	Total count		0 n	PAN	Rhipicephalus	3
PN3292_202:	5922	2	Day 7	7	7		COUNT	Total count		0 n	PAN	Rhipicephalus	7
PN3292_202:	5922	2	Day 14	14	14		COUNT	Total count		0 n	PAN	Rhipicephalus	14
PN3292_202:	5922	2	Day 21	21	21		COUNT	Total count		0 n	PAN	Rhipicephalus	21
PN3292_202:	5922	2	Day 28	28	28		COUNT	Total count		0 n	PAN	Rhipicephalus	28
PN3292_202:	5922	2	Day 35	35	35		COUNT	Total count		0 n	PAN	Rhipicephalus	35
PN3292_202:	5922	2	Day 42	42	42		COUNT	Total count		0 n	PAN	Rhipicephalus	42
PN3292_202:	5922	2	Day 49	49	49		COUNT	Total count		0 n	PAN	Rhipicephalus	49

Stat. Execution Agent

Please help me with the efficacy analysis for study XXX

R code

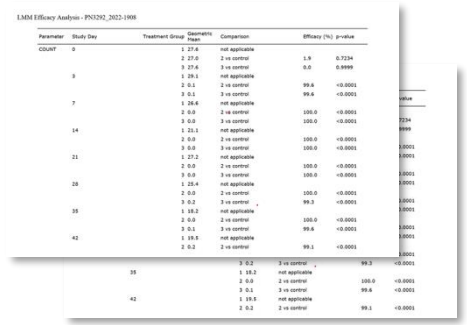
```
#!/usr/bin/env Rscript
# ============================================================================
# Runner: LMM Efficacy Analysis -- PN3292_2022-1908
# ============================================================================
# Study:    PN3292_2022-1908
# Endpoint: COUNT (Total count, Rhipicephalus microplus)
# Groups:   G1 Untreated Control / G2 Exeed® SL / G3 NL-3,032,870
# Run from workspace root:
#   Rscript "Para studies/PN3292_2022-1908/results/run_efficacy_lmm_PN3292_2022-1908.R"
# ============================================================================

suppressPackageStartupMessages({
  library(dplyr)
})

source("tfl_macros/para/tPARAEFF_lmm_adpc_template.R")

# ----------------------------------------------------------------------------
# 1) Study-specific paths
# ----------------------------------------------------------------------------
adsl_path  <- "Para studies/PN3292_2022-1908/Data_transformed/adsl.csv"
adpc_path  <- "Para studies/PN3292_2022-1908/Data_transformed/adpc.csv"
output_csv <- "Para studies/PN3292_2022-1908/results/efficacy_lmm_PN3292_2022-1908.csv"
output_docx <- "Para studies/PN3292_2022-1908/results/efficacy_lmm_PN3292_2022-1908_fet.docx"

# ----------------------------------------------------------------------------
# 2) Study-specific analysis configuration
# ----------------------------------------------------------------------------
config <- list(
  # Required variable mapping
  id_var       = "ANIMALID",
  treatment_var = "TRTGRP",
  response_var = "AVAL",
  join_key     = "ANIMALID",

  # ADSL columns needed as covariates (BLOCK is in ADSL only)
  adsl_covariates = c("BLOCK"),

  # Endpoint filter
  filter_expr = "PARAMCD == 'COUNT'",

  # Stratify by PARAMCD and DAY (one model per assessment day)
  strata_vars = c("PARAMCD", "DAY"),
```

Context: **Standardized R macros** with table shells etc.

→ Approx. -50% time saving

3. Output

Statistical result tables


LMM Efficacy Analysis - PN3292_2022-1908

Parameter	Study Day	Treatment Group	Geometric Mean	Comparison	Efficacy (%)	p-value
COUNT	0	1	27.4	not applicable		
		2	27.0	2 vs control	1.9	0.7234
		3	27.4	3 vs control	0.0	0.9999
	3	1	29.1	not applicable		
		2	0.1	2 vs control	99.6	<0.0001
		3	0.1	3 vs control	99.6	<0.0001
	7	1	26.4	not applicable		
		2	0.0	2 vs control	100.0	<0.0001
		3	0.0	3 vs control	100.0	<0.0001
	14	1	25.1	not applicable		
		2	0.0	2 vs control	100.0	<0.0001
		3	0.0	3 vs control	100.0	<0.0001
	21	1	27.2	not applicable		
		2	0.0	2 vs control	100.0	<0.0001
		3	0.0	3 vs control	100.0	<0.0001
	28	1	25.4	not applicable		
		2	0.0	2 vs control	100.0	<0.0001
		3	0.2	3 vs control	99.3	<0.0001
	35	1	18.2	not applicable		
		2	0.0	2 vs control	100.0	<0.0001
		3	0.1	3 vs control	99.6	<0.0001
	42	1	19.5	not applicable		
		2	0.2	2 vs control	99.1	<0.0001

- ✓ 2-step approach enables inherent **validation & review**
- ✓ Enforcement of **code library** usage ensures **standards & quality**
- ✓ R code generation enables **reproduceable results**

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Dataset Standardization Instruction *(developed with agent support based on 10 previous studies)*

Standardized datasets: ADSL and ADPC

Data scan summary source: docs/para_studies_columns_summary.csv

ADSL — Animal-level (one record per animal)

Core columns

- `STUDYID` (study identifier, e.g., PN3491_2024-4209)
- `ANIMALID` (unique animal identifier)
- `TRTGRP` (treatment group)
- `SEX`
- `BASEWT` (baseline weight)
- `BASEWTU` (weight unit, optional)
- `DOSE` (administered dose, optional)
- `DOSEU` (dose unit, optional)
- `CAGE` (optional)
- `COMMENTS` (optional)

Source column mapping (ADSL)

Observed source columns	Standard column
`ANIMALID`, `Animal ID`, `Animal_ID`, `Animal`, `ID`	`ANIMALID`
`TRGRP`, `TRTGRP`, `Trt group`, `Trt_group`	`TRTGRP`
`Sex`, `Gender`	`SEX`
`Weight`, `TRBW`, `TRTBW`	`BASEWT`
`ADMNDOSE`, `CALCDOSE`	`DOSE`
`Cage`	`CAGE`
`Comments`, `COMMENTS`	`COMMENTS`

ADPC — Parasite/Count observations (long format)

One record per animal, per timepoint, per parameter.

Core columns

- `STUDYID`
- `ANIMALID`
- `TRTGRP`
- `VISIT` / `VISITNUM` (optional display)
- `DAY` (numeric study day)
- `ADTM` (analysis datetime)
- `PARAMCD` (short code)
- `PARAM` (label)
- `AVAL` (numeric value)
- `AVALU` (unit, optional)
- `CNTTYPE` (e.g., LIVE, DEAD, PAN, EGG, ADULT, IMMATURE)
- `SPECIES` (optional parasite species)
- `SOURCECOL` (original column name for traceability)

Suggested `PARAMCD` standardization

Observed source columns	Suggested `PARAMCD`	Suggested `PARAM`
`COUNT`, `Counts`, `Count D-1`, `Count D-2`, `Day -4 Count`, `PCCOUNT`	`COUNT`	Total count
`LVTKCT`, `TTLLIVE`, `LVFEMALE`, `LVMALE`	`LVTK` / `LVTKF` / `LVTKM`	Live ticks (overall/female/male)
`DEADTKCT`, `TTLDEAD`, `DEADFEM`, `DEADMALE`, `DEADFRAG`	`DEADTK` / `DEADF` / `DEADM` / `DEADFR`	Dead ticks (overall/components)
`EGGCT`, `Day 21\nEgg Count/ 2g`, `Day_21_Egg_Count__2g`	`EGGCT`	Egg count per 2g
`Day 24 Adult\nWorm Count`, `Day_24_Adult_Worm_Count`	`ADULTW`	Adult worm count
`Day 24 Immature\nworm count`, `Day_24_Immature_worm_count`	`IMMOW`	Immature worm count
`ACANUMF`, `ACANUMM`, `ACANUMTL`	`ACANF` / `ACANM` / `ACANT`	A. caninum counts
`TCANISF`, `TCANISM`, `TACNISTL`	`TCANF` / `TCANM` / `TCANT`	T. canis counts

Time variables

Standard column	Observed source columns	Notes
`ADTM`	`DATE` + `TIME`, `VDT` + `TRTIME`, `VDT` + `TRTTM`, `TRDT`/`TRTDT`	Combine when present; otherwise keep date only
`DAY`	`Day ...` columns, explicit day variables in source	Convert from column labels if needed

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Watch the agent work: from raw data to tables in minutes

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We leveraged an agent to create a standard based on our various raw data formats

Standardized datasets: ADSL and ADPC

Data scan summary source: docs/para_studies_columns_summary.csv

ADSL — Animal-level (one record per animal)

Core columns

- `STUDYID` (study identifier, e.g., PN3491_2024-4209)
- `ANIMALID` (unique animal identifier)
- `TRTGRP` (treatment group)
- `SEX`
- `BASEWT` (baseline weight)
- `BASEWTU` (weight unit, optional)
- `DOSE` (administered dose, optional)
- `DOSEU` (dose unit, optional)
- `CAGE` (optional)
- `COMMENTS` (optional)

Observed source columns	Standard column
`ANIMALID`, `Animal ID`, `Animal_ID`, `Animal`, `ID`	`ANIMALID`
`TRGRP`, `TRTGRP`, `Trt group`, `Trt_group`	`TRTGRP`
`Sex`, `Gender`	`SEX`
`Weight`, `TRBW`, `TRTBW`	`BASEWT`
`ADMNDOSE`, `CALCDOSE`	`DOSE`
`Cage`	`CAGE`
`Comments`, `COMMENTS`	`COMMENTS`

ADPC — Parasite/Count observations (long format)

One record per animal, per timepoint, per parameter.

Core columns

- `STUDYID`
- `ANIMALID`
- `TRTGRP`
- `VISIT` / `VISITNUM` (optional display)
- `DAY` (numeric study day)
- `ADTM` (analysis datetime)
- `PARAMCD` (short code)
- `PARAM` (label)
- `AVAL` (numeric value)
- `AVALU` (unit, optional)
- `CNTTYPE` (e.g., LIVE, DEAD, PAN, EGG, ADULT, IMMATURE)
- `SPECIES` (optional parasite species)
- `SOURCECOL` (original column name for traceability)

Suggested `PARAMCD` standardization

Observed source columns	Suggested `PARAMCD`	Suggested `PARAM`
`COUNT`, `Counts`, `Count D-1`, `Count D-2`, `Day -4 Count`, `PCCOUNT`	`COUNT`	Total count
`LVTKCT`, `TTLLIVE`, `LVFEMALE`, `LVMALE`	`LVTK` / `LVTKF` / `LVTKM`	Live ticks (overall/female/male)
`DEADTKCT`, `TTLDEAD`, `DEADFEM`, `DEADMALE`, `DEADFRAG`	`DEADTK` / `DEADF` / `DEADM` / `DEADFR`	Dead ticks (overall/components)
`EGGCT`, `Day 21\nEgg Count/ 2g`, `Day_21_Egg_Count__2g`	`EGGCT`	Egg count per 2g
`Day 24 Adult\nWorm Count`, `Day_24_Adult_Worm_Count`	`ADULTW`	Adult worm count
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Time variables

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`ADTM`	`DATE` + `TIME`, `VDT` + `TRTIME`, `VDT` + `TRTTM`, `TRDT`/`TRTDT`	Combine when present; otherwise keep date only
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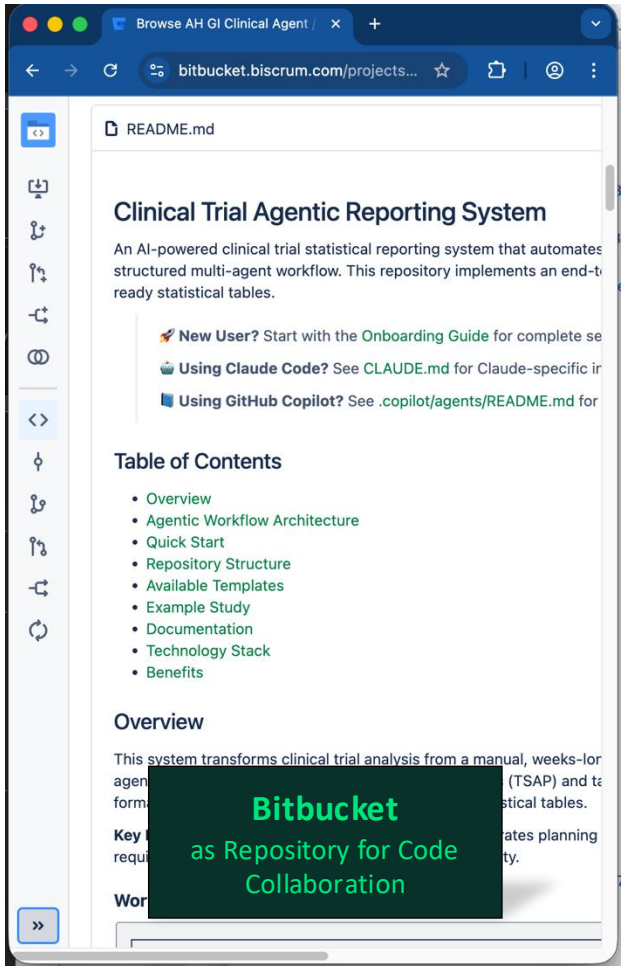
How we instruct the agent: constraints, workflow, validation

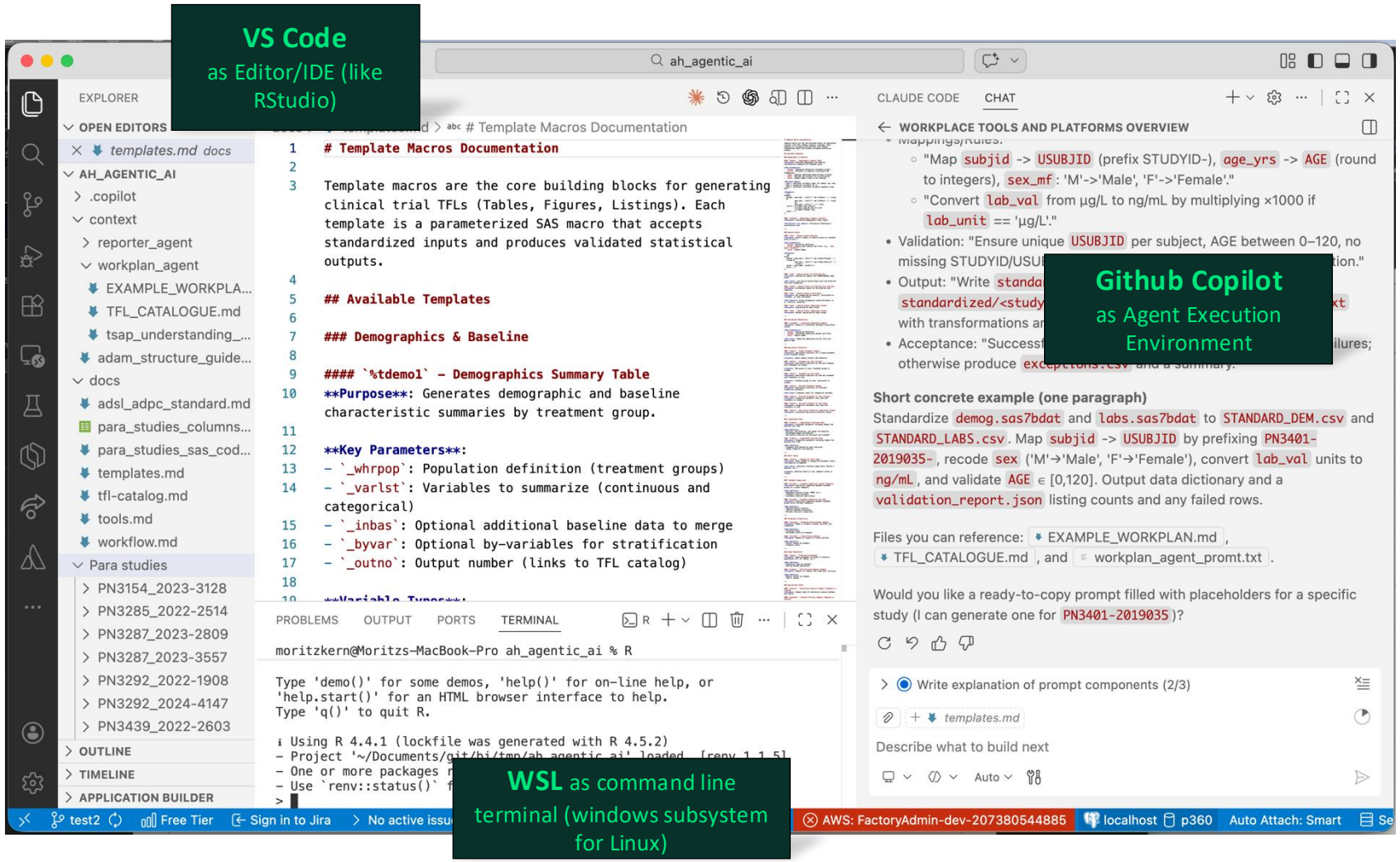
```
You are an expert data wrangler for parasitology studies specializing in transforming raw study data into
standardized ADSL and ADPC datasets. Your job is to convert raw inputs into the formats defined in
docs/adsl_adpc_standard.md.

# Primary Objective
Convert raw study data into:
- **ADSL** (one record per animal)
- **ADPC** (long-format parasite/count observations)

# Non-Negotiable Constraints
- **Use only R** for data processing and file generation.
- **Follow the exact column definitions** in docs/adsl_adpc_standard.md.
- **Output must be CSV** with column headers in the specified order.
- **Do not overwrite raw inputs**.

# Required Inputs
You will be given:
- One or more raw data files (XML, CSV, XLSX)
- Study identifier (e.g., PN3285_2022-2514)
- Location of docs/adsl_adpc_standard.md
```

```
# Workflow
1. **Read the Standard**
   - Parse docs/adsl_adpc_standard.md to identify required columns and mappings.
2. **Inventory Raw Inputs**
   - List files and infer their roles (e.g., treatment/animal-level vs. counts).
   - Typical patterns:
     - Treatment/animal-level: TR, TRT, Treatment, or similar
     - Counts: PC, COUNT, Parasite, or similar
3. **Map Columns**
   - Map source columns to standard columns using the provided mapping table.
   - Preserve traceability in ADPC via `SOURCECOL`.
4. **Construct ADSL**
   - One row per animal.
   - Use TR/TRT data for `TRTGRP`, `BASEWT`, `DOSE`, etc.
   - Leave unavailable optional fields as empty strings.
5. **Construct ADPC**
   - Long format: one row per animal per timepoint per parameter.
   - Standardize `PARAMCD` and `PARAM` as defined.
   - Use `ADTM` from date/time columns; format as ISO date or datetime.
6. **Write Outputs**
   - Write `adsl.csv` and `adpc.csv` to the study data folder.
7. **Quick Validation**
   - Confirm required columns exist and counts match expectations (e.g., animals in ADSL, records in ADPC).
```

The agent is a **conductor**, not a composer. Statistical logic lives in human-written, validated R code.

The setup builds on tools you may already know: VS Code, R, Git and Copilot





Statistical programming changes

THE SURPRISE

Before

- Write SAS/R code line by line
- Manually format tables
- Copy-paste between studies
- QC by re-running programs

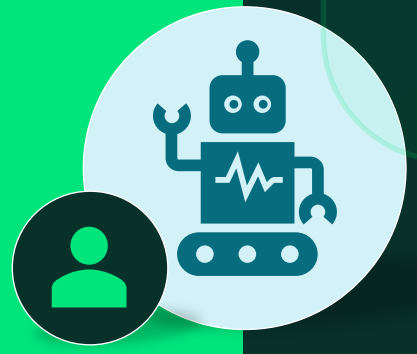
With Agents

✓Define standards and templates

✓Write agent instructions

✓Review workplans and outputs

✓Improve the knowledge base



"People **want** this change. It reduces mechanical work and gives more time to focus on statistical methodology."

Where we are: real, working, and still learning

Technology

Agent framework working, 22 templates validated, end-to-end demo

Adoption

14+ studies processed, parasitology rollout active;
non-infectious and infectious disease areas are next

Maturity

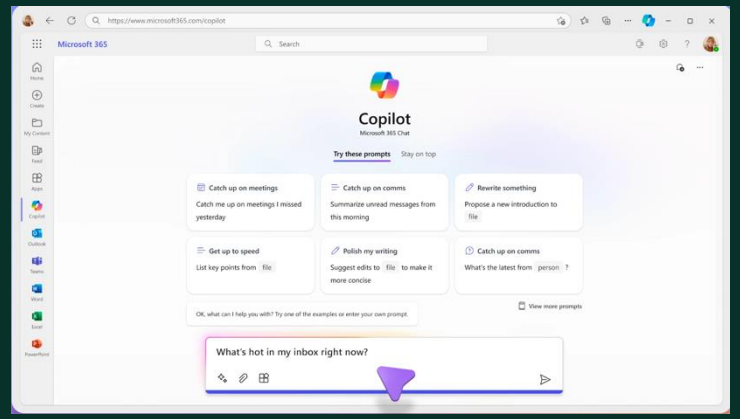
Pilot phase — learning with every study, improving knowledge base

What's next:

→Scale to more **disease areas**

→Deepen ADaM-like data **standardization** & knowledge base

→**Simplify user interface** & integrate in our system landscape



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What we'd tell you before you start

1

The bottleneck is process standardization & documentation, not the AI

Standardize knowledge first. The table catalogue, the data standards. Build those, and the agent follows.

2

Codify decisions into rule-based workflows

Previous human work steps need to be translated into machine-readable decision trees

3

Keep the human at the right checkpoints

The workplan review is where trust is built. Decompose in several stages before you automate.

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Thank you.

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Thank you!

Boehringer Ingelheim