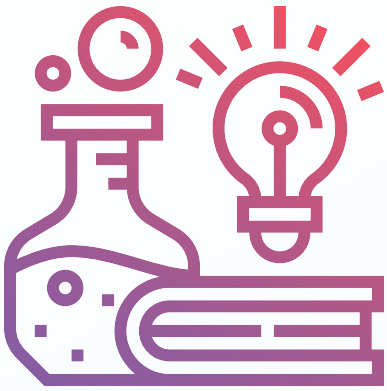
KEY ELEMENTS OF A SUCCESSFUL METABOLOMICS STUDY

Metabolon

Study Design



While there are many things to consider when initiating a study, ultimately there are two basic principles behind every successful metabolomics study — **good study design and adequate power.**

Study Design

Spectrum of groups or treatments:
To ensure that the salient "cause and effect" metabolic changes are detected, experiments should ideally have a spectrum of either time-points, doses, or phenotypic/disease severity. A good rule of thumb is to collect samples at time-points/ doses/exposures that induce mild, moderate, and severe experimental effects (e.g., observed effect, phenotype, or endpoint assay).

Controls:
Though it may sound obvious, make sure that you are prepared to have every variable in your study accompanied by a control. Only incorporate variables that can be tested with proper controls.

Cell Based Study	**Time Point 1**	**Time Point 2**
Vehicle Control	5	5
Drug Dose 1	5	5
Drug Dose 2	5	5
Small Animal Study	**Chow**	**High Fat Diet**
Wild Type	10	10
Knock Out	10	10
Over Express	10	10
Human Studies	**Male**	**Female**
Control	30	30
Case	30	30

Power

Adequate study power is central to uncovering statistically significant results. Even an otherwise well-designed study can produce ambiguous results if it is not sufficiently powered.

An appropriately powered study has enough samples to overcome biological variation, process variation and other factors (such as collection site differences).

Sample Type	Samples Per Group
Cell Lines[1]	4–7
Small Animal[1]	6–10
Large Animal[1]	8–15
Human	25–40+

[1]Isogenic and inbred genetic models typically require fewer samples than human studies.

Fewer samples may be needed if:

- Using multiple time points for cells in culture
- Using multiple drug concentrations
- Taking repeated samples from the same individual
- Treatment effects are expected to be dramatic (toxicological studies)

More samples may be needed if:

- Using a mixed population (mixed gender, fasting status, or a wide-ranging BMI)
- Samples are derived from multiple sites
- Samples are derived using multiple protocols
- Treatment effects are expected to be subtle (diet and exercise studies)

Sample Quantity

The chart to the right suggests some recommended amounts for common samples. Metabolon has worked with nearly 400 different sample types including some with various challenges and quantity limitations. Please engage us in a discussion if you suspect that your samples might present a specific challenge.

Recommended Study Material[2]	
Isolated cells (packed cell volume)	100 µL
Biological Fluids (plasma, urine)	150–200 µL
Tissues	50–100 mg

[2]Sample requirements for lipid profiling may differ. See a staff member for specific sample preparation guidelines.

STUDY DESIGN

Use this form to help outline your proposed study. If you need assistance with your design, please contact us at **hello@metabolon.com**.

Name: _____

Institution: _____

Email: _____

Phone: _____

Research Interests:

1. Study Design & Objectives

Purpose:
What do you want to achieve?

Experimental Design
or Proposed Experiment(s):

2. Sample Information

Sample Type:

Organism or Cell Type:

Special Considerations:
Infectious samples, low sample volume

3. Study Design Mock-Up

Group	Group Name	# of Samples	Description	Statistical Comparisons (If Needed)
1	"Control"			
2				
3				
4				

Notes & Special Considerations

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