GUIDELINES FOR DESIGNING PIG TRIALS

on performance, digestibility, meat and carcass quality

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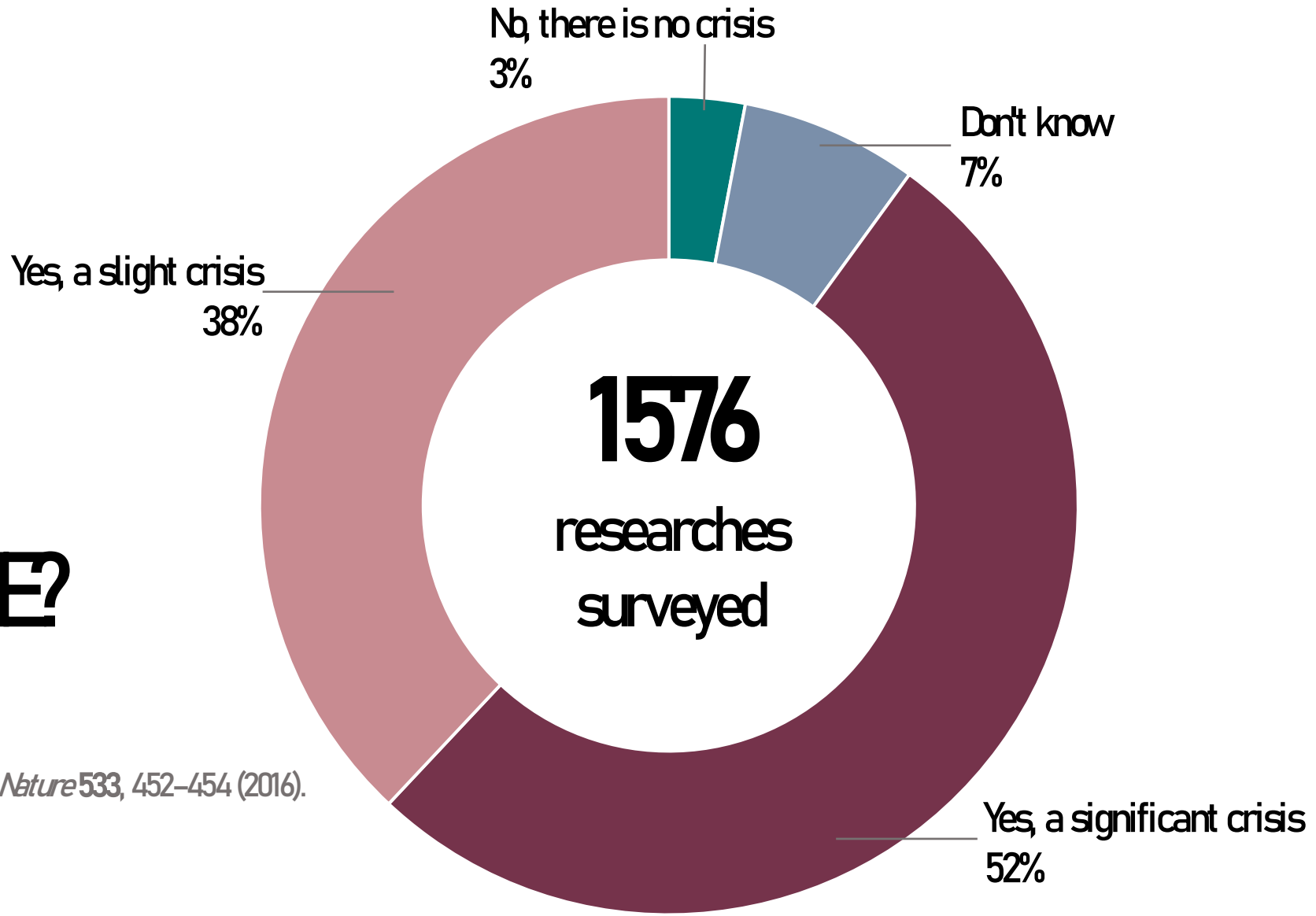
EAAP 2024, SESSION 92
4 SEPTEMBER 2024

Disclaimer: the PIGWEB project has received funding from European Union's Horizon 2020 research and innovation program under Grant Agreement No 101004770.

IS THERE A REPRODUCIBILITY 'CRISIS' IN SCIENCE?



Baker, M 1,500 scientists lift the lid on reproducibility. *Nature* 533, 452–454 (2016).

Why Most Published Research Findings Are False

John P.A. Ioannidis - 2005

Is science really facing a reproducibility crisis, and do we need it to?

Daniele Fanelli - 2017

Most scientists 'can't replicate studies by their peers'

Tom Feilden - 2017

Improving reproducibility in animal research

Florian Frommlet - 2020

Reproducibility trial: 246 biologists get different results from same data sets

Anil Oza - 2023

The replication crisis has spread through science – can it be fixed?

Clare Wilson - 2022

Science has been in a "replication crisis" for a decade. Have we learned anything?

Kelsey Piper - 2020

The replication crisis has led to positive structural, procedural, and community changes

Korbmacher et al. - 2023

EXPERIMENTAL DESIGN

Replicates?
Allocation?

DATA QUALITY EXPERIMENTAL PIG RESEARCH

EXPERIMENTAL PROCEDURES

Materials?
Steps to follow?

EXPERIMENTAL DESIGN

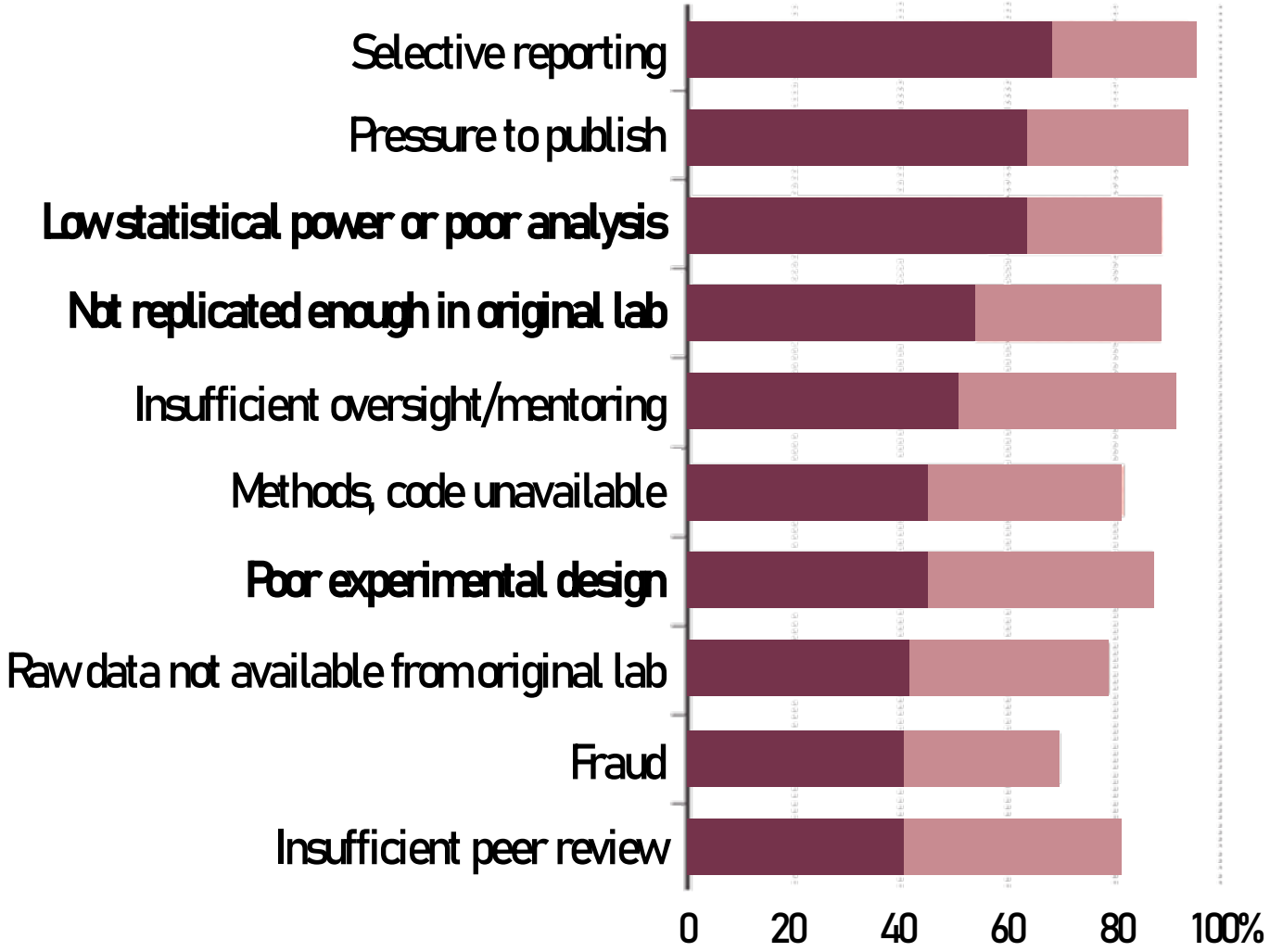
Replicates?
Allocation?

DATA QUALITY EXPERIMENTAL PIG RESEARCH

EXPERIMENTAL PROCEDURES

Materials?
Steps to follow?

WHAT FACTORS CONTRIBUTE TO IRREPRODUCIBLE RESEARCH?



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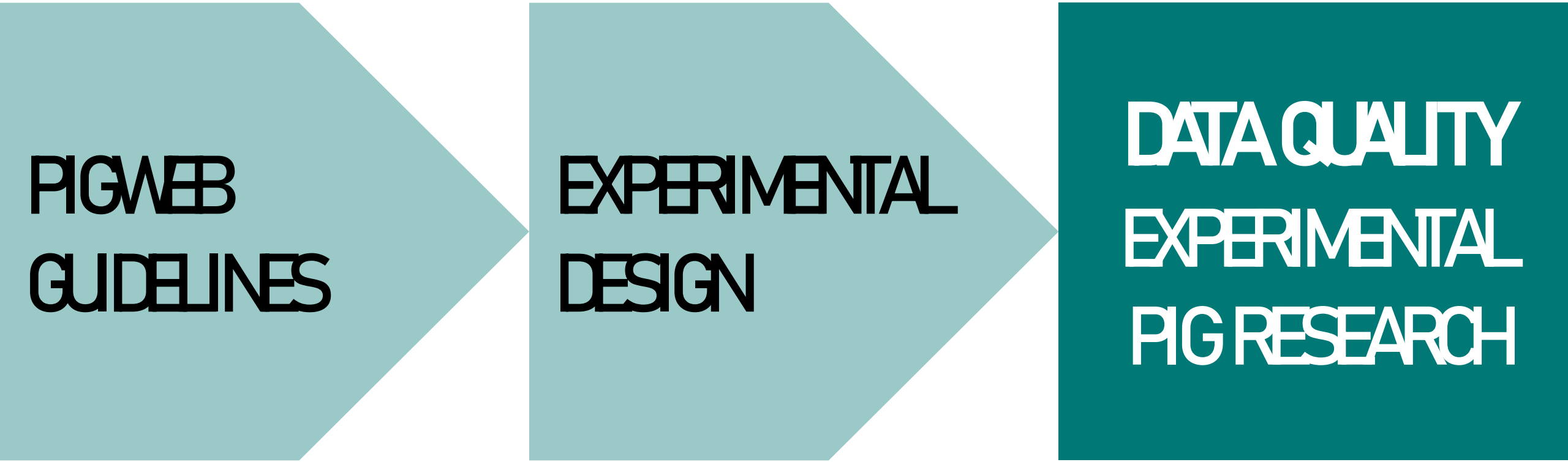

PIGWEB
GUIDELINES
EXPERIMENTAL
DESIGN
DATA QUALITY
EXPERIMENTAL
PIG RESEARCH

PERFORMANCE

BW, ADFI, ADG, FCR

DIGESTIBILITY

ATTD CP

CARCASS/MEAT QUALITY

MEAT%, DRIP LOSS, IMF

EXISTING GUIDELINES

PARTNER PROTOCOLS

PITFALLS

POWER ANALYSIS

PIGWEB GUIDELINES ON EXPERIMENTAL DESIGN

EXISTING GUIDELINES

PARTNER PROTOCOLS

PITFALLS

POWER ANALYSIS

PIGWEB GUIDELINES ON EXPERIMENTAL DESIGN

EXPERTISE PIGWEB

EXISTING GUIDELINES

ONLINE SEARCH

7 BOOKS

7 PAPERS

3 JOURNALS

3 CHECKLISTS

2 PROTOCOOLS

2 WEB APPS

PREPARE

ARRIVE

Animal Welfare Body Utrecht

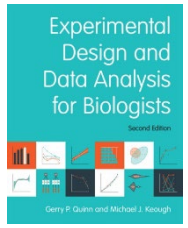
EDA Experimental Design Assistant

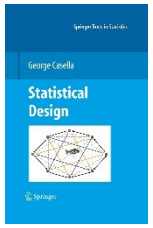
protocols.io

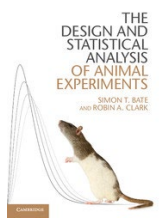
animal

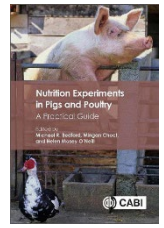
AJAS Asian-Australasian Journal of Animal Sciences

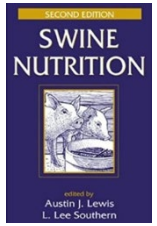
Animal feed SCIENCE AND TECHNOLOGY











What additional guidelines you know for designing pig trials focusing on performance, digestibility, and meat/carcass quality?

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GUIDELINES!?

- **Many** guidelines for experimental design are available. Most are broadly applicable, some are specific to animal trials, and few are specific for pig trials.
- Guidelines can be very useful, but when in doubt, consult a **statistician** (before the experiment starts).
- Most guidelines discuss **essential elements** to consider when designing an experiment.

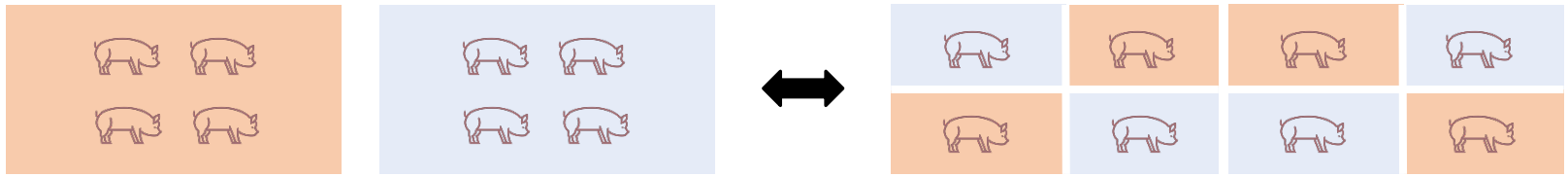

inclusion criteria
experimental plan
hypothesis
replication
blinding
experimental unit
glossary
blocking
power analysis
environmental factors
training
sample size
pilot study
control group
reporting
3Rs
pitfalls
representativeness
protocols
statistical analysis
statistician
designs
randomization
significance level
exclusion criteria

HYPOTHESIS AND ANALYSIS

- Define a clear **hypothesis** a priori, to avoid HARKing (Hypothesising After the Results are Known). The study design must match the hypothesis defined.
- Define the **statistical analysis** a priori: no P-Hacking (adjust analysis to obtain significant results).

EXPERIMENTAL / OBSERVATIONAL UNIT

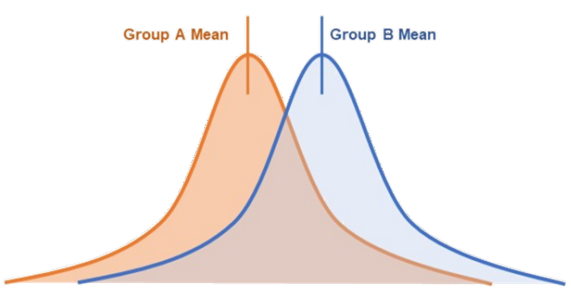
- Define the **experimental unit**: entity to which a treatment is applied independently.
- Define the **observational unit**: entity on which measurements or observations are made.
- When treatments are applied to groups of animals, the measurements at the animal level are not necessarily independent of each other, and the experimental unit is the group.



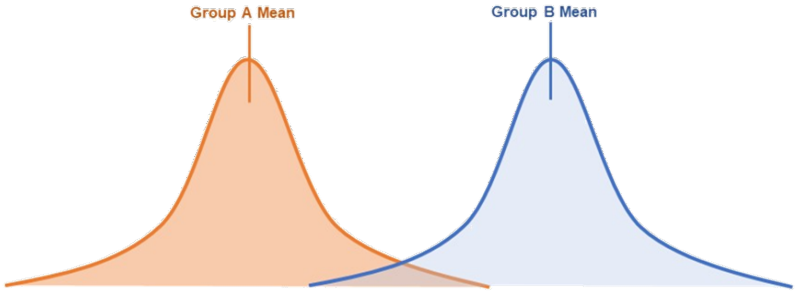
group-treatment individual-treatment

REPLICATION

- Estimate the number of replicates, i.e. **sample size** or number of experimental units per treatment.
- Perform a **power analysis a priori** to ensure that a statistically significant effect can be found, if one exists, and no time and resources are wasted.
- Power depends on the **effect size** you wish to determine, the estimated variance and the replication.



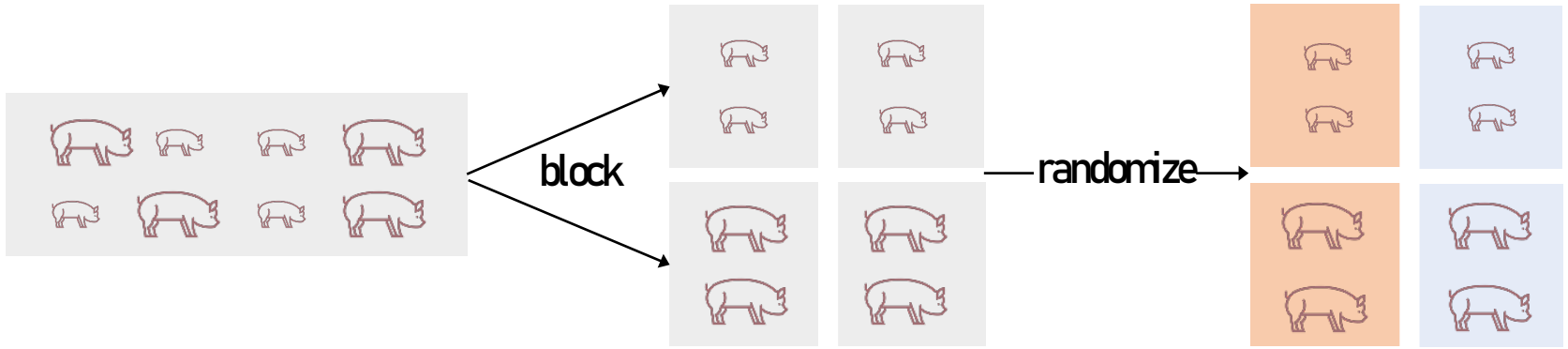
small effect size



large effect size

NO BIAS

- Block what you can, randomize what you cannot.
- Use **blocking** to eliminate known variation (e.g., weight).
- Use **randomization** to assign treatments to experimental units (e.g., pen).
- Use **blinding** to avoid observational bias: i.e. measurements without knowledge of treatment applied.



REPORTING

- Report all **details on the experimental design**, including the statistical analysis and exclusion of data.
- Report all results, avoid **Cherry-Picking** (selection of only statistically significant results to support a hypothesis whilst ignoring other non-significant results) and **Spinning** (over-interpretation to make results more beautiful than they are).
- Consider using **repositories** for data/statistics/software to enhance transparency and reproducibility.

FOLLOW US TO STAY TUNED ON THE PROJECT RESULTS

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