

# REPLICATES AT THE BENCH

[rep-li-kets]

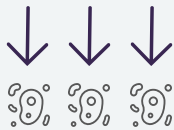
Performing repeated measurements to assess biological and technical variability within a study.

## Advantages of using replicates

### Technical replicates

Taking multiple measurements on the same experimental unit reveals how accurate your measurement is within the single experimental unit.

1x biological replicates



3x technical replicates

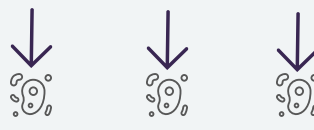
### Biological replicates

Taking measurements from multiple experimental units takes into account biological variability.

3x biological replicates

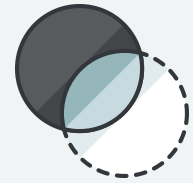


1x technical replicates from each



### Reporting replicates

Reporting on replicates within the methods, results and figure legends of a manuscript and specifying if they were technical or biological replicates, increases transparency and reproducibility.



## Best Practices

### Consider the following example

You are interested in analyzing the therapeutic effect of an oncolytic virus on the number of tumour infiltrating lymphocytes present in a tumour.

To do so, you randomize mice to receive either the intervention or control. After a period of time, you you harvest the tumour from the mouse and cut it into 12 sections. 3 images are taken per section.

### Example

**Technical replicates** →  
3 images x 12 sections  
= 36 technical replicates.

**Biological replicates** →  
n=10 mice in the intervention group.  
n=10 mice in the control group.

### Reporting

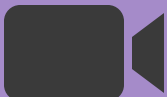
"n=10 mice with tumours per group. Data for each mouse is the average number of cells per image from each microscopy section (3 images per tumour section x12 sections)."

"Our biological replicates were the individual mice in all experiments. Data from independent mice were used in all analyses."

## Tools and more information

### Resources

- Video explanation of biological and technical replicates



### Publications

- Replication, Nature 2014.
- What does research reproducibility mean? Science Translational Medicine, 2016.