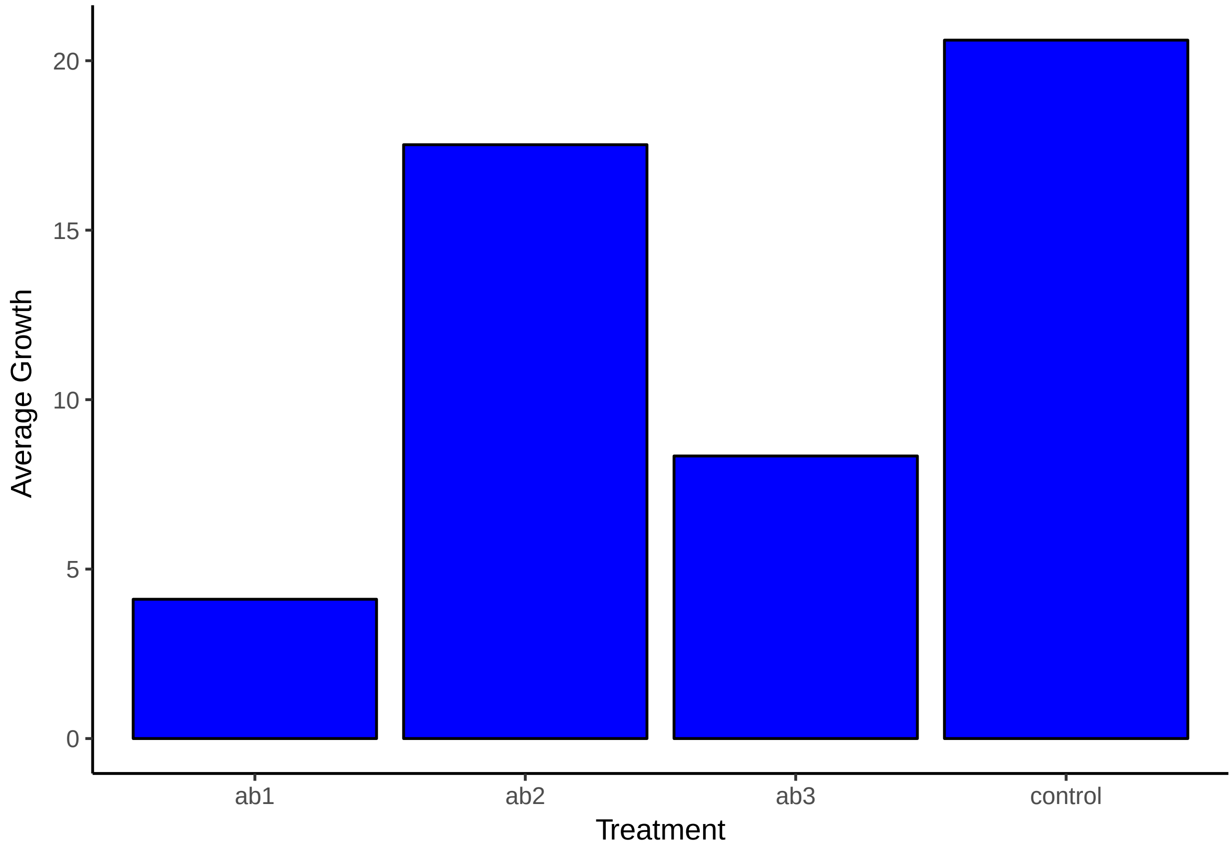
AntibioticsANOVA

A student has conducted an experiment evaluating the effect of three different antibiotics — **ab1**, **ab2**, and **ab3** — on the growth of *E. coli* in lab cultures. The results are presented in graphical format below:



We also include charts summarizing the data: one for the overall dataset, one for each type of treatment, and one for the control.

```
## Factors are dropped from the summary
```

	N	Mean	SD	Min	Q1	Median	Q3	Max
growth	16	12.64	7.25	2.88	5.8	14.03	19.98	21.67

```
## Factors are dropped from the summary
```

	N	Mean	SD	Min	Q1	Median	Q3	Max
growth	4	4.11	1.89	2.88	3.06	3.31	5.16	6.93

```
## Factors are dropped from the summary
```

	N	Mean	SD	Min	Q1	Median	Q3	Max
growth	4	17.52	2.63	14.78	15.71	17.13	19.34	21.04

```
## Factors are dropped from the summary
```

	N	Mean	SD	Min	Q1	Median	Q3	Max
growth	4	8.34	3.64	4.67	5.82	7.69	10.85	13.28

```
## Factors are dropped from the summary
```

	N	Mean	SD	Min	Q1	Median	Q3	Max
growth	4	20.61	0.91	19.46	19.98	20.65	21.23	21.67

By examining the data, we might expect **ab1** and **ab3** to be significantly different from the control group; **ab2** does not appear significantly different. Let μ_0 represent the mean of the control, μ_1 represent the mean of **ab1**, μ_2 represent the mean of **ab2**, and μ_3 represent the mean of **ab3**. Then we have our hypotheses:

Null Hypothesis (H_0)**:** There is not a significant difference in the means of the data: $\mu_0 = \mu_1 = \mu_2 = \mu_3$.

Alternate Hypothesis (H_1)**:** At least one of the antibiotics **ab1**, **ab2**, **ab3** has a mean significantly different from the control group. That is, for some $i \in \{1, 2, 3\}$ we have $\mu_i \neq \mu_0$.

To test these hypotheses we ran an ANOVA-design linear model, and compared the results using a likelihood ratio test.