Wrangling Data from microplate OD600 growth curve in 96WP

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19 May, 2025

Load and wrangle data

```
#load data, change date
data<-read.csv("../data/20250311OD600.csv")
design<-read.csv("../reference/20250311OD600Design.csv", header=FALSE)

source("C:/Users/parke/OneDrive - Indiana University/GitHub/ASG-fitness-effects/microplate_fitness_assay
```

Prep Data

```
#FEP, Fitness Effects of Phage (subtract Ctrl Infection avgs from corr Strain/Media rows)
# ctrl avgs from od.long
ctrl_avg <- od.long %>%
  filter(Infection == "Ctrl") %>%  # Keep only control rows
  group_by(Media, Strain) %>%
  summarize(ctrl_avg = mean(total.OD, na.rm = TRUE), .groups = "drop")
# subtract control average
FEP <- od.long %>%
  left_join(ctrl_avg, by = c("Media", "Strain")) %>%
  mutate(total.OD = total.OD - ctrl_avg) %>%
  select(-ctrl_avg)  # Remove temporary column
FEP<-FEP%>%  #Fitness effects of Phage
  filter(!grepl("Ctrl", Infection))


#FEM, Fitness effects of Media (subtract LB from DSM of corr Strain/Infection)
# LB avgs from od.long
LBavg <- od.long %>%
  filter(Media == "LB") %>%  # Keep only control rows
  group_by(Strain, Infection) %>%
  summarize(LBavg = mean(total.OD, na.rm = TRUE), .groups = "drop")
# subtract control average
FEM <- od.long %>%
  left_join(LBavg, by = c("Strain", "Infection")) %>%
  mutate(total.OD = total.OD - LBavg) %>%
  select(-LBavg)  # Remove temporary column
FEM<-FEM%>%  #Fitness effects of Phage
  filter(!grepl("LB", Media))


#FES, Fitness effects of Strain (subtract avg WT values from each corr Media/Infection rows)
```

```r
# wt avgs from od.long
WTavg <- od.long %>%
  filter(Strain == "WT") %>%  # Keep only control rows
  group_by(Media, Infection) %>%
  summarize(WTavg = mean(total.OD, na.rm = TRUE), .groups = "drop")
# subtract control average
FES <- od.long %>%
  left_join(WTavg, by = c("Media", "Infection")) %>%
  mutate(total.OD = total.OD - WTavg) %>%
  select(-WTavg)  # Remove temporary column
FES<-FES%>%  #Fitness effects of Phage
  filter(!grepl("WT", Strain))


#FEP6, Fitness Effects of Phage in 1st 6 hours
#Isolate 6h post-infection
OD.long6<-OD.long[(1:7008),]
OD.long6 <- OD.long6 %>%
  group_by(Well, Media, Strain, Infection) %>%
  summarize(total.OD = sum(OD600, na.rm = TRUE), .groups = "drop")
# ctrl avgs from OD.long6
ctrl_avg6 <- OD.long6 %>%
  filter(Infection == "Ctrl") %>%  # Keep only control rows
  group_by(Media, Strain) %>%
  summarize(ctrl_avg6 = mean(total.OD, na.rm = TRUE), .groups = "drop")
# subtract control average
FEP6 <- OD.long6 %>%
  left_join(ctrl_avg6, by = c("Media", "Strain")) %>%
  mutate(total.OD = total.OD - ctrl_avg6) %>%
  select(-ctrl_avg6)  # Remove temporary column
FEP6<-FEP6%>%  #Fitness effects of Phage
  filter(!grepl("Ctrl", Infection))


#FEP24, Fitness Effects of Phage in 1st 24 hours
#Isolate 24h post-infection
OD.long24<-OD.long[(1:27744),]
OD.long24 <- OD.long24 %>%
  group_by(Well, Media, Strain, Infection) %>%
  summarize(total.OD = sum(OD600, na.rm = TRUE), .groups = "drop")
# ctrl avgs from OD.long24
ctrl_avg24 <- OD.long24 %>%
  filter(Infection == "Ctrl") %>%  # Keep only control rows
  group_by(Media, Strain) %>%
  summarize(ctrl_avg24 = mean(total.OD, na.rm = TRUE), .groups = "drop")
# subtract control average
FEP24 <- OD.long24 %>%
  left_join(ctrl_avg24, by = c("Media", "Strain")) %>%
  mutate(total.OD = total.OD - ctrl_avg24) %>%
  select(-ctrl_avg24)  # Remove temporary column
FEP24<-FEP24%>%  #Fitness effects of Phage
  filter(!grepl("Ctrl", Infection))
```

Analysis

```
#Infection vs no infection
FEPa <- aov(total.OD ~ Media * Strain * Infection , data = FEP)
summary(FEPa)
```

```
##                          Df Sum Sq Mean Sq F value   Pr(>F)
## Media                     1  10144   10144  15.404 0.000276 ***
## Strain                    3  62762   20921  31.770 1.84e-11 ***
## Infection                 2 169599   84800 128.778  < 2e-16 ***
## Media:Strain              3  57242   19081  28.976 7.69e-11 ***
## Media:Infection           2   3352    1676   2.546 0.088976 .
## Strain:Infection          6 468301   78050 118.528  < 2e-16 ***
## Media:Strain:Infection    6   4902     817   1.241 0.302643
## Residuals                48  31608     658
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
#Media per strain
FEMa<-aov(total.OD ~ Strain * Infection , data = FEM)
summary(FEMa)
```

```
##                   Df Sum Sq Mean Sq F value  Pr(>F)
## Strain             3  43828   14609   4.583 0.00885 **
## Infection          3  11777    3926   1.232 0.31436
## Strain:Infection   9  38424    4269   1.339 0.25634
## Residuals         32 102003    3188
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
#Mutant vs WT
FESa <- aov(total.OD ~ Media * Strain * Infection , data = FES)
summary(FESa)
```

```
##                          Df  Sum Sq Mean Sq F value   Pr(>F)
## Media                     1   66181   66181  76.723 1.61e-11 ***
## Strain                    2   29243   14622  16.951 2.70e-06 ***
## Infection                 3 1792935  597645 692.842  < 2e-16 ***
## Media:Strain              2    5369    2684   3.112   0.0536 .
## Media:Infection           3   39897   13299  15.417 3.72e-07 ***
## Strain:Infection          6   35758    5960   6.909 2.49e-05 ***
## Media:Strain:Infection    6    9238    1540   1.785   0.1222
## Residuals                48   41405     863
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
#Infection vs no infection just 6 hr
FEP6a <- aov(total.OD ~ Media * Strain * Infection , data = FEP6)
summary(FEP6a)
```

```
##                          Df Sum Sq Mean Sq F value   Pr(>F)
```

```
## Media                   1   15.0    15.0  11.442 0.001437 **
## Strain                  3  553.1   184.4 140.347  < 2e-16 ***
## Infection               2 1952.6   976.3 743.180  < 2e-16 ***
## Media:Strain            3   92.5    30.8  23.465 1.71e-09 ***
## Media:Infection         2  157.4    78.7  59.921 8.96e-14 ***
## Strain:Infection        6  557.5    92.9  70.726  < 2e-16 ***
## Media:Strain:Infection  6   42.1     7.0   5.345 0.000273 ***
## Residuals              48   63.1     1.3
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```r
#Infection vs no infection 24h--is there a diff vs 48h?
FEP24a <- aov(total.OD ~ Media * Strain * Infection , data = FEP24)
summary(FEP24a)
```

```
##                         Df Sum Sq Mean Sq F value   Pr(>F)
## Media                    1   4640    4640  86.622 2.52e-12 ***
## Strain                   3  11232    3744  69.895  < 2e-16 ***
## Infection                2  36224   18112 338.137  < 2e-16 ***
## Media:Strain             3    942     314   5.865  0.00170 **
## Media:Infection          2    849     424   7.921  0.00106 **
## Strain:Infection         6  48850    8142 151.998  < 2e-16 ***
## Media:Strain:Infection   6   3541     590  11.017 1.09e-07 ***
## Residuals               48   2571      54
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```