

5. Imputation of missing values

Fay

2022-10-05

Load libraries

```
library(mice)

##
## Attaching package: 'mice'
## The following object is masked from 'package:stats':
##
##   filter
## The following objects are masked from 'package:base':
##
##   cbind, rbind

library(tidyr)
library(tidyverse)

## -- Attaching packages ----- tidyverse 1.3.2 --
## v ggplot2 3.4.0      v dplyr   1.0.10
## v tibble  3.1.8      v stringr 1.4.1
## v readr   2.1.3      v forcats 0.5.2
## v purrr   0.3.5
## -- Conflicts ----- tidyverse_conflicts() --
## x dplyr::filter() masks mice::filter(), stats::filter()
## x dplyr::lag()    masks stats::lag()

library(VIM)

## Loading required package: colorspace
## Loading required package: grid
## VIM is ready to use.
##
## Suggestions and bug-reports can be submitted at: https://github.com/statistikat/VIM/issues
##
## Attaching package: 'VIM'
##
## The following object is masked from 'package:datasets':
##
##   sleep

library(fitdistrplus)

## Loading required package: MASS
```

```
##
## Attaching package: 'MASS'
##
## The following object is masked from 'package:dplyr':
##
##     select
##
## Loading required package: survival
library(fitur)

##
## Attaching package: 'fitur'
##
## The following object is masked from 'package:purrr':
##
##     rdunif
library(visdat)
```

Import data

```
hm <- read.csv("output_data/MICE.csv")

# Vectors for selecting genes

#Lab genes
# The measurements of IL.12 and IRG6 are done with an other assay and will
#ignore for now
Gene_lab <- c("IFNy", "CXCR3", "IL.6", "IL.13", "IL.10",
              "IL1RN", "CASP1", "CXCL9", "IDO1", "IRGM1", "MPO",
              "MUC2", "MUC5AC", "MYD88", "NCR1", "PRF1", "RETNLB", "SOCS1",
              "TICAM1", "TNF") # "IL.12", "IRG6")

Genes_wild <- c("IFNy", "CXCR3", "IL.6", "IL.13", "IL.10",
               "IL1RN", "CASP1", "CXCL9", "IDO1", "IRGM1", "MPO",
               "MUC2", "MUC5AC", "MYD88", "NCR1", "PRF1", "RETNLB", "SOCS1",
               "TICAM1", "TNF") #, "IL.12", "IRG6")

Facs_lab <- c("CD4", "Treg", "Div_Treg", "Treg17", "Th1",
             "Div_Th1", "Th17", "Div_Th17", "CD8", "Act_CD8",
             "Div_Act_CD8", "IFNy_CD4", "IFNy_CD8")

#"IL17A_CD4")
#, "Treg_prop", from another assay

Facs_wild <- c("Treg", "CD4", "Treg17", "Th1", "Th17", "CD8",
              "Act_CD8", "IFNy_CD4", "IL17A_CD4", "IFNy_CD8")
```

How do the variables look like?

1. cleaning

```
#how many nas in each column
#sapply(hm, function(x) sum(is.na(x)))

# Required step for the further imputations
hm <- hm %>% mutate_if(is.character, as.factor)
hm <- hm %>% mutate_if(is.integer, as.numeric)
```

Test different distributions

After talking with Dan and some reading, I found out that many machine learning models / packages require data following a normal distribution. I am hear trying to standardize my data to a normal distribution. After testing the MICE package on my standardized and on the raw data, I realized there was no difference in my end results.

I would like to further question if normalization / scaling of the data is necessary.

I am here using the laboratory infections, as we have more measures and I am randomly selecting a variable to represent the facs measures and another gene for the gene expression data. In some papers it is mentioned that facs / genes may each follow different distribution (adding to my confusion).

```
# I am here selecting CD4 to represent the facs datta
facs_variable <- hm %>%
  filter(origin == "Lab", dpi == max_dpi, infection == "challenge") %>%
  dplyr::select(CD4)

# we don't want any nas as these will disrupt the distribution tests by different
# packages
facs_variable <- facs_variable %>% drop_na()

#here is our facs variabls
a <- facs_variable$CD4

# gene_variable, another random gene (MYD88), chosen due to abundancy in measures
gene_variable <- hm %>%
  filter(origin == "Lab", dpi == max_dpi, infection == "challenge") %>%
  dplyr::select(MYD88)

# Let's drop the nas again
gene_variable <- gene_variable %>%
  drop_na()

#s and hurray here is our gene variable
b <- gene_variable$MYD88
```

Fucntions to test distributions

I think I got these from Alice's package ParasiteLoad (Have to check again)

```
# Define function to be used to test, get the log lik and aic
tryDistrib <- function(x, distrib){
  # deals with fitdistr error:
  fit <- tryCatch(MASS::fitdistr(x, distrib), error=function(err) "fit failed")
  return(list(fit = fit,
    loglik = tryCatch(fit$loglik, error=function(err) "no loglik computed"),
    AIC = tryCatch(fit$aic, error=function(err) "no aic computed")))
```

```

}

findGoodDist <- function(x, distribs, distribs2){
  l =lapply(distribs, function(i) tryDistrib(x, i))
  names(l) <- distribs
  print(l)
  listDistr <- lapply(distribs2, function(i){
    if (i %in% "t"){
      fitdistrplus::fitdist(x, i, start = list(df =2))
    } else {
      fitdistrplus::fitdist(x,i)
    }
  })
  )
  par(mfrow=c(2,2))
  denscomp(listDistr, legendtext=distribs2)
  cdfcomp(listDistr, legendtext=distribs2)
  qqcomp(listDistr, legendtext=distribs2)
  ppcomp(listDistr, legendtext=distribs2)
  par(mfrow=c(1,1))
}

```

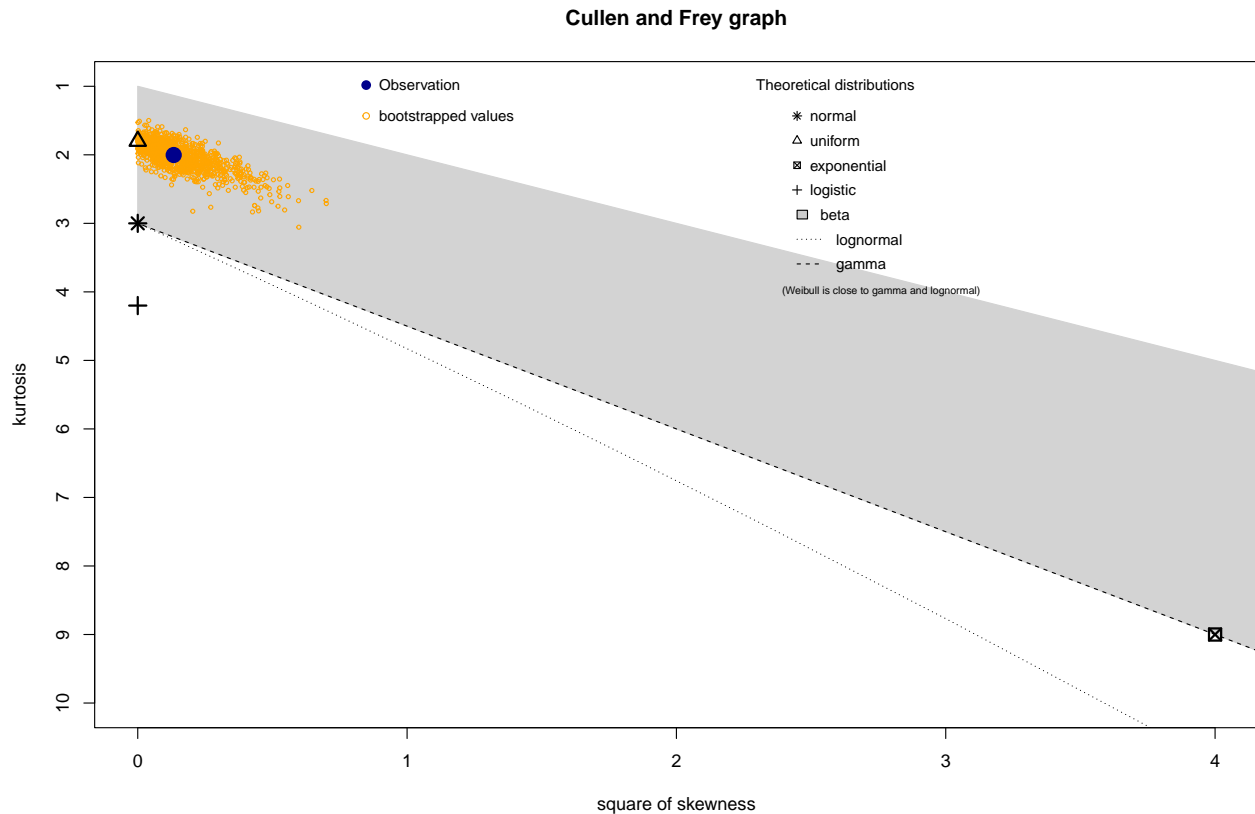
For the facs data

Testing our CD4s distributions

```

set.seed(333)
descdist(data = a, discrete = FALSE, boot = 1000)

```



```
## summary statistics
## -----
## min: 12.3   max: 68.01
## median: 44.3
## mean: 39.87056
## estimated sd: 15.10846
## estimated skewness: -0.3653128
## estimated kurtosis: 2.003008
```

So seeing this graph, I understand we could be having a beta distribution.. But what happens next, shows something different.

Interface for looking at distributions

```
#fitur::fit_dist_addin()
```

According to interface, I can visually identify a cauchy distribution.

```
tryDistrib(a, "normal") #yes
```

```
## $fit
##      mean      sd
## 39.8705556 15.0437591
## ( 1.3907960) ( 0.9834413)
##
## $loglik
## [1] -483.1985
##
## $AIC
## NULL
```

```
tryDistrib(a, "binomial") #nope
```

```
## $fit  
## [1] "fit failed"  
##  
## $loglik  
## [1] "no loglik computed"  
##  
## $AIC  
## [1] "no aic computed"
```

```
tryDistrib(a, "student") #nope
```

```
## $fit  
## [1] "fit failed"  
##  
## $loglik  
## [1] "no loglik computed"  
##  
## $AIC  
## [1] "no aic computed"
```

```
tryDistrib(a, "weibull") #yes
```

```
## $fit  
##      shape      scale  
## 3.026572 44.731966  
## ( 0.235684) ( 1.430370)  
##  
## $loglik  
## [1] -481.6586  
##  
## $AIC  
## NULL
```

```
tryDistrib(a, "weibullshifted") #nope
```

```
## $fit  
## [1] "fit failed"  
##  
## $loglik  
## [1] "no loglik computed"  
##  
## $AIC  
## [1] "no aic computed"
```

```
tryDistrib(a, "gamma") #nope
```

```
## Warning in densfun(x, parm[1], parm[2], ...): NaNs produced
```

```
## Warning in densfun(x, parm[1], parm[2], ...): NaNs produced
```

```
## $fit  
##      shape      rate  
## 5.48687051 0.13761675  
## (0.69652903) (0.01829378)  
##
```

```
## $loglik
## [1] -490.2143
##
## $AIC
## NULL
```

```
tryDistrib(a, "cauchy") #yes
```

```
## $fit
##      location      scale
## 45.483672    9.183808
## ( 1.402233) ( 1.206321)
##
## $loglik
## [1] -510.3078
##
## $AIC
## NULL
```

```
tryDistrib(a, "exp") #nope
```

```
## $fit
## [1] "fit failed"
##
## $loglik
## [1] "no loglik computed"
##
## $AIC
## [1] "no aic computed"
```

```
tryDistrib(a, "log") #nope
```

```
## $fit
## [1] "fit failed"
##
## $loglik
## [1] "no loglik computed"
##
## $AIC
## [1] "no aic computed"
```

```
tryDistrib(a, "t")
```

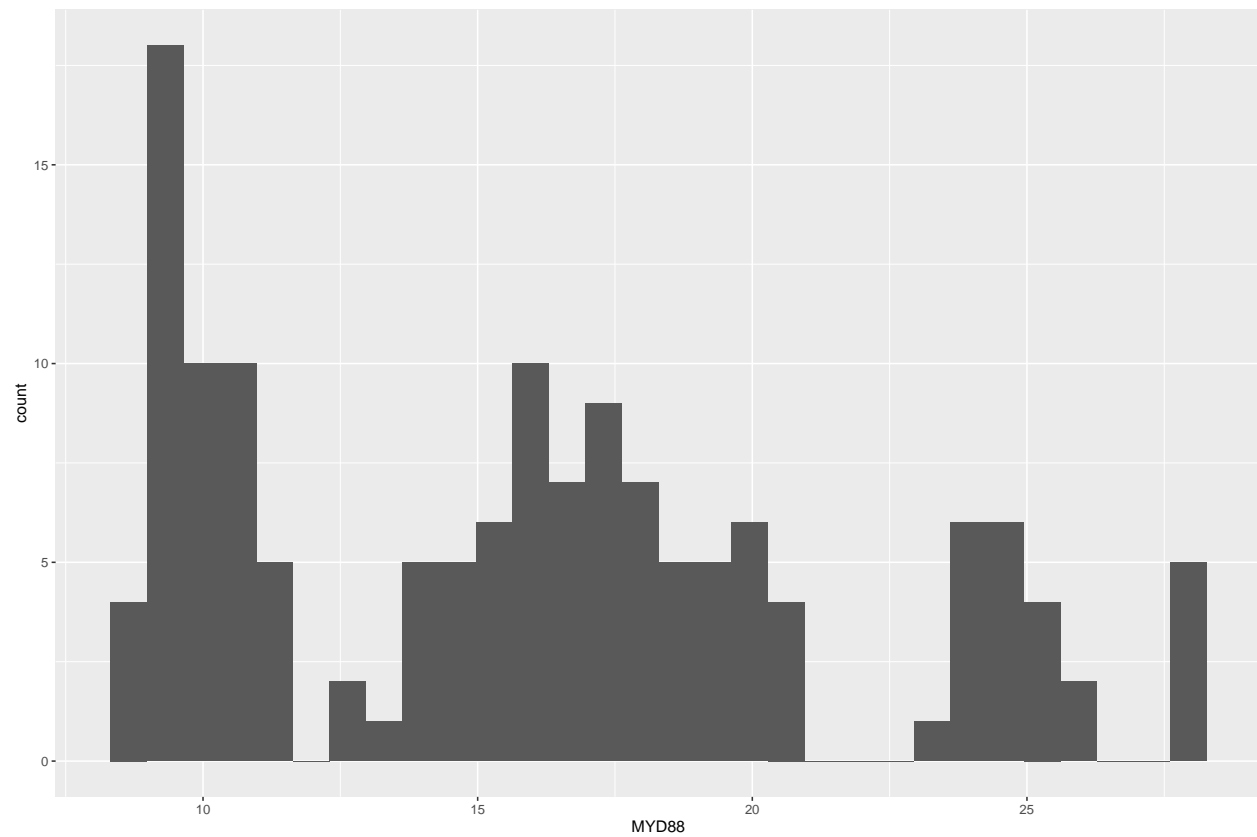
```
## $fit
## [1] "fit failed"
##
## $loglik
## [1] "no loglik computed"
##
## $AIC
## [1] "no aic computed"
```

FACS data -> cauchy?

Gene data

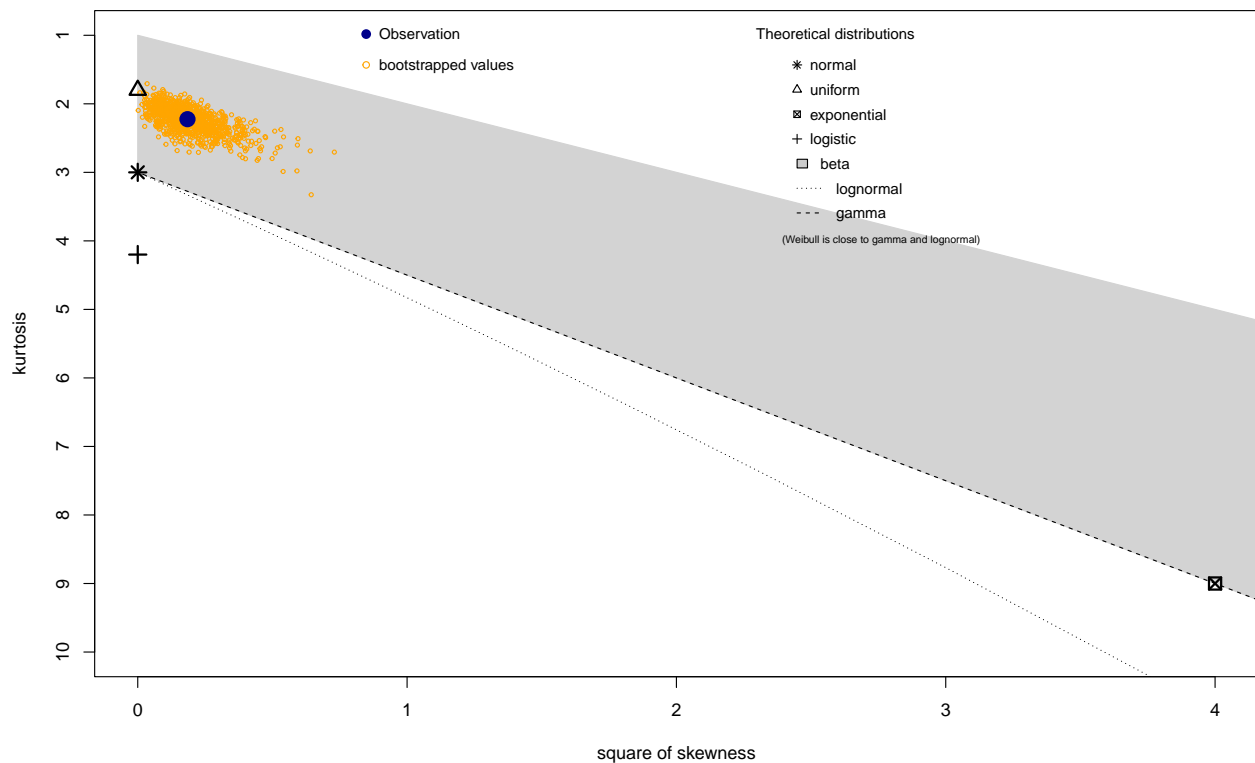
```
ggplot(gene_variable, aes(MYD88)) +
  geom_histogram()
```

```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```



```
set.seed(66)  
descdist(data = b, discrete = FALSE, boot = 1000)
```


Cullen and Frey graph



```
## summary statistics
## -----
## min: 8.790171 max: 28.07896
## median: 15.88865
## mean: 16.06125
## estimated sd: 5.471353
## estimated skewness: 0.4296881
## estimated kurtosis: 2.224176
```

Interface for looking at the distributions. #really cool

```
#fitur::fit_dist_addin()
```

For the gene data

```
tryDistrib(b, "normal") #yes
```

```
## $fit
##      mean      sd
## 16.0612546 5.4521888
## ( 0.4559349) ( 0.3223947)
##
## $loglik
## [1] -445.4387
##
## $AIC
## NULL
```

```
tryDistrib(b, "binomial") #nope
```

```
## $fit  
## [1] "fit failed"  
##  
## $loglik  
## [1] "no loglik computed"  
##  
## $AIC  
## [1] "no aic computed"
```

```
tryDistrib(b, "student") #nope
```

```
## $fit  
## [1] "fit failed"  
##  
## $loglik  
## [1] "no loglik computed"  
##  
## $AIC  
## [1] "no aic computed"
```

```
tryDistrib(b, "weibull") #yes
```

```
## Warning in densfun(x, parm[1], parm[2], ...): NaNs produced
```

```
## $fit  
##      shape      scale  
## 3.2070620 17.9702182  
## ( 0.2062014) ( 0.4960698)  
##  
## $loglik  
## [1] -443.3646  
##  
## $AIC  
## NULL
```

```
tryDistrib(b, "weibullshifted") #nope
```

```
## $fit  
## [1] "fit failed"  
##  
## $loglik  
## [1] "no loglik computed"  
##  
## $AIC  
## [1] "no aic computed"
```

```
tryDistrib(b, "gamma") #yes
```

```
## $fit  
##      shape      rate  
## 8.70300403 0.54186345  
## (1.01010105) (0.06473885)  
##  
## $loglik  
## [1] -439.5963
```

```
##
## $AIC
## NULL
```

```
tryDistrib(b, "cauchy") #yes
```

```
## $fit
##      location      scale
## 15.7530893    3.6204942
## ( 0.4959989) ( 0.3886226)
##
## $loglik
## [1] -479.3897
##
## $AIC
## NULL
```

```
tryDistrib(b, "exp") #nope
```

```
## $fit
## [1] "fit failed"
##
## $loglik
## [1] "no loglik computed"
##
## $AIC
## [1] "no aic computed"
```

```
tryDistrib(b, "log") #nope
```

```
## $fit
## [1] "fit failed"
##
## $loglik
## [1] "no loglik computed"
##
## $AIC
## [1] "no aic computed"
```

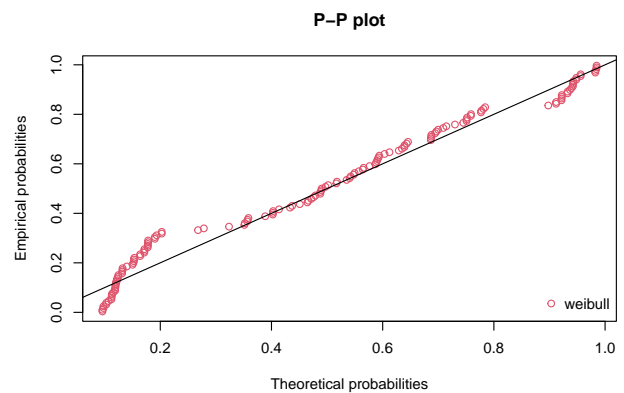
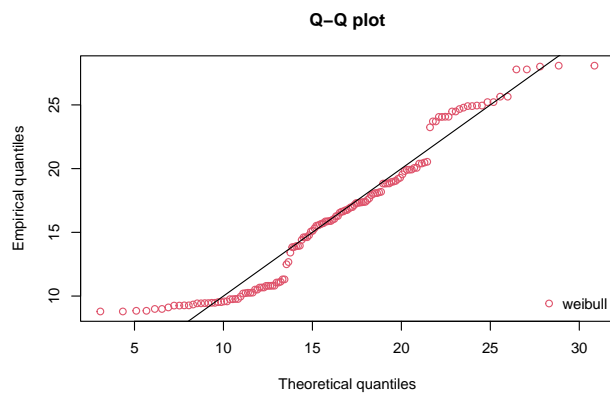
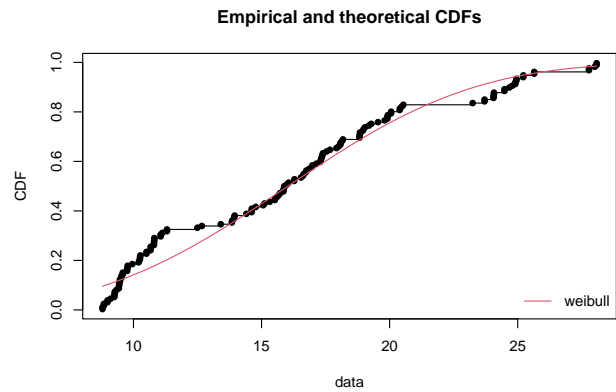
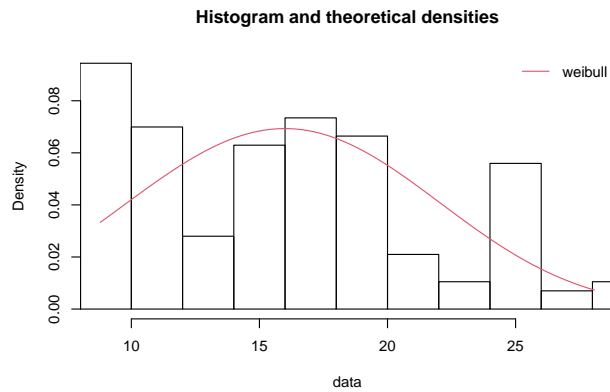
```
tryDistrib(b, "t") #nope
```

```
## $fit
## [1] "fit failed"
##
## $loglik
## [1] "no loglik computed"
##
## $AIC
## [1] "no aic computed"
```

```
findGoodDist(b, "normal", "weibull")
```

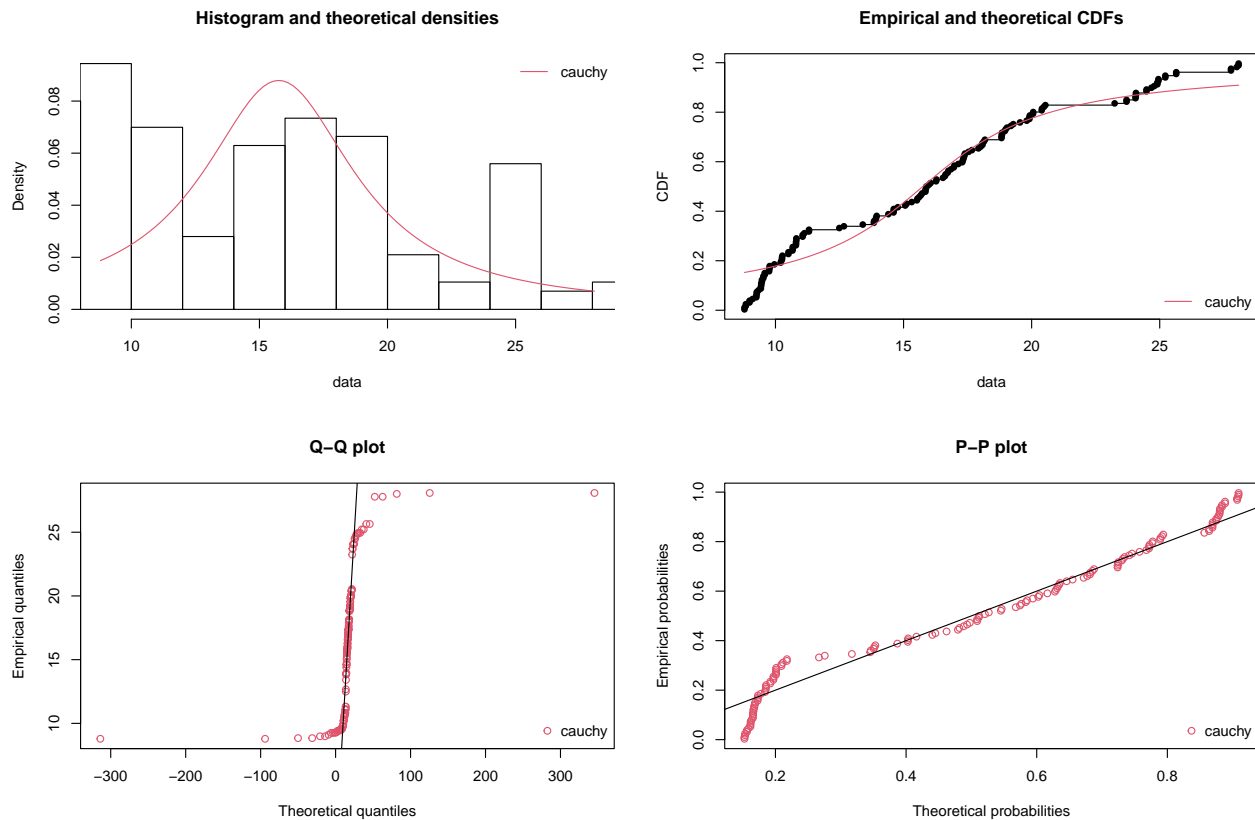
```
## $normal
## $normal$fit
##      mean      sd
## 16.0612546  5.4521888
## ( 0.4559349) ( 0.3223947)
##
```

```
## $normal$loglik
## [1] -445.4387
##
## $normal$AIC
## NULL
```



```
findGoodDist(b, "normal", "cauchy")
```

```
## $normal
## $normal$fit
##      mean      sd
## 16.0612546 5.4521888
## ( 0.4559349) ( 0.3223947)
##
## $normal$loglik
## [1] -445.4387
##
## $normal$AIC
## NULL
```



Cauchy?

For some reason I am seeing Cauchy distributions everywhere. Please help me.

Standardization

I am now ignoring this part as the standardization didn't have much of an impact in my imputations.

Transforming the features to have the properties of a standard normal distribution with mean = 0 and standard deviation = 1

I have tried the imputations with the standardized and non-standardized data and I am getting the same results. Therefore I am ditching this "standardization".

```
# function to standardize data
#standardize <- function(x) {
#  return ((x - mean(x, na.rm = TRUE)) /
#          sd(x, na.rm = TRUE))
#}

#summary(x) # facs
#summary(y) # gene

#testing the function
#x_stand <- standardize(x)

#fitur::fit_dist_addin()

#summary(x_stand)
```

```

# create a data frame with only the variables to standardize
#genes_facs_df <- hm %>%
# dplyr::select(all_of(c(Facs_lab, Gene_lab, Facs_wild, Genes_wild)))

# apply the standardize function on all the numeric variables
#std_data <- as.data.frame(lapply(genes_facs_df, standardize))

#colnames(std_data) <- paste(colnames(std_data), "std", sep = "_")

# join the standardized data to our data set
#hm <- cbind(hm, std_data)

#remove the non-standardized data

#hm <- hm %>%
# dplyr::select(-all_of(c(Facs_lab, Gene_lab, Facs_wild, Genes_wild)))

```

Imputing missing data

Here is a beautiful graphic guide for my imputations. <https://stefvanbuuren.name/fimd/sec-toomany.html>

I will be using the package MICE (multivariate Imputation by chained Equations) which only requires a data frame of missing observations.

Description: *Multiple imputation using Fully Conditional Specification (FCS)*

implemented by the MICE algorithm as described in Van Buuren and Groothuis-Oudshoorn (2011) doi: 10.18637/jss.v045.i03. Each variable has its own imputation model. Built-in imputation models are provided for continuous data (predictive mean matching, normal), binary data (logistic regression), unordered categorical data (polytomous logistic regression) and ordered categorical data (proportional odds). MICE can also impute continuous two-level data (normal model, pan, second-level variables). Passive imputation can be used to maintain consistency between variables. Various diagnostic plots are available to inspect the quality of the imputations.

<https://www.jstatsoft.org/article/view/v045i03>

tutorial: <https://www.youtube.com/watch?v=WPiYOS3qK70>

<https://datascienceplus.com/imputing-missing-data-with-r-mice-package/>

<https://datascienceplus.com/handling-missing-data-with-mice-package-a-simple-approach/>

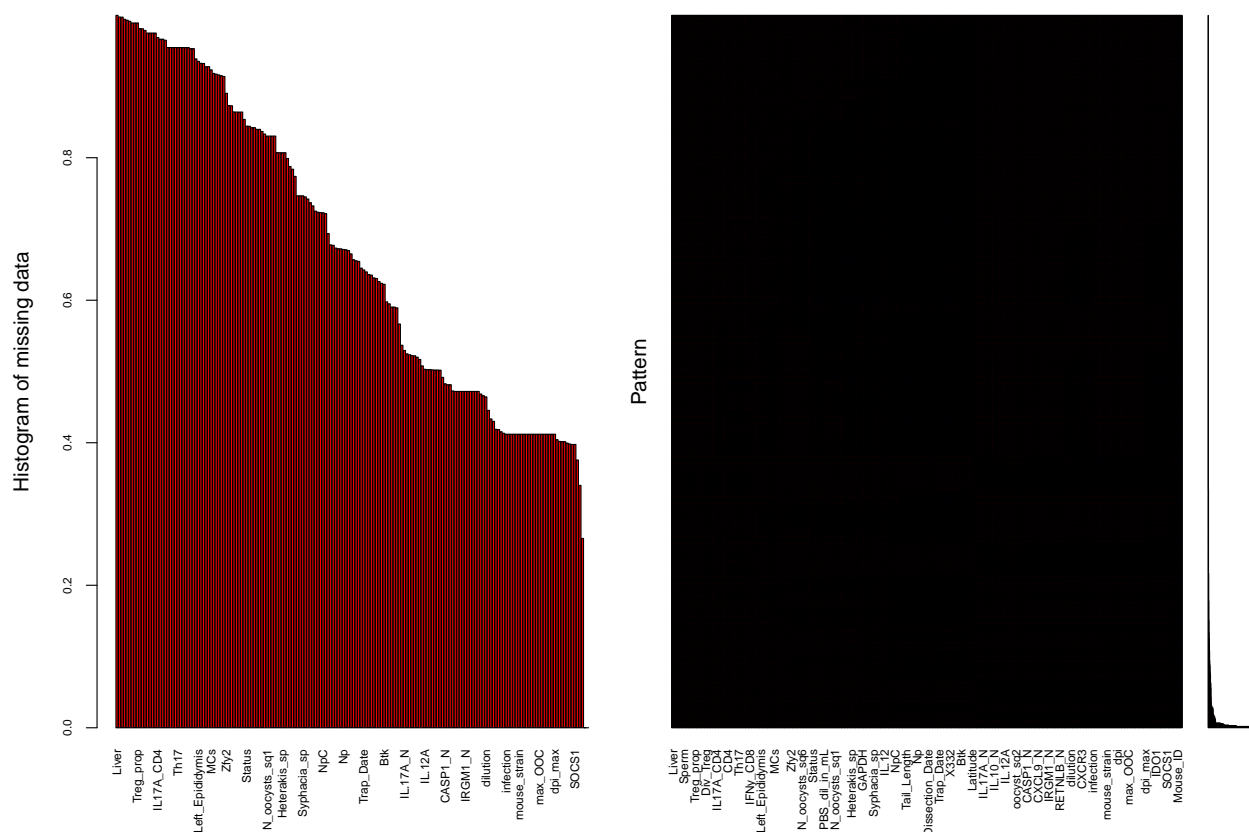
Missing data can be classified into three categories:

- 1. Missing completely at random (MCAR)** We can't probably predict that value from any other value in the data. MCAR implies the reason for the missingness of a field is completely random, and that we probably can't predict that value from any other value in the data.
- 2. Missing at Random (MAR)** Missingness can be explained by other values in other columns, but not from that column.
- 3. Missing NOT at random (MNAR)** The basic MICE assumption is that the data is missing at random, and that we can make a guess about its true value by looking at other data samples.

Step1 : cleaning and checking the missing data points in our field data.

```
hm %>%
  agr(col = c('navyblue', 'red'), numbers = TRUE, sortVars = TRUE,
      labels=names(hm), cex.axis=.7, gap=3,
      ylab=c("Histogram of missing data", "Pattern"))
```

```
## Warning in plot.aggr(res, ...): not enough vertical space to display frequencies
## (too many combinations)
```



```
##
## Variables sorted by number of missings:
##      Variable      Count
##      Liver 0.9997855458
##      Host 0.9974265494
##      Ticks 0.9972120952
##      IFNy_FEC 0.9942097362
##      Sperm 0.9929230109
##      batch 0.9914218314
##      OPG_0 0.9890628351
##      Caecum 0.9890628351
##      Treg_prop 0.9890628351
##      Right_Ovary_weight 0.9811280292
##      Left_Ovary_weight 0.9809135750
##      Y 0.9785545786
##      Div_Treg 0.9749088570
##      Div_Th1 0.9749088570
##      Div_Th17 0.9749088570
```

```

##          Div_Act_CD8 0.9749088570
##          IL17A_CD4 0.9686896848
##          Ct.Eimeria 0.9663306884
##          Ct.Mus 0.9663306884
##          eimeriaSpecies 0.9648295089
##          CD4 0.9545357066
##          Treg 0.9545357066
##          Treg17 0.9545357066
##          Th1 0.9545357066
##          Th17 0.9545357066
##          CD8 0.9545357066
##          Act_CD8 0.9545357066
##          IFNy_CD4 0.9545357066
##          IFNy_CD8 0.9545357066
##          Left_Embryo 0.9530345271
##          Right_Embryo 0.9530345271
##          IFNy_MES 0.9386660948
##          Left_Epididymis 0.9352348274
##          Left_Testis 0.9324469226
##          Right_Testis 0.9322324684
##          FEC_Eim_Ct 0.9277289299
##          MC.Eimeria.FEC 0.9277289299
##          MCs 0.9232253914
##  ILWE_DNA_Content_ng.microliter 0.9182929445
##          Ectoparasites_Logical 0.9172206734
##          Worms_presence 0.9161484023
##          Seminal_Vesicles_Weight 0.9150761312
##          Heligmosomoides_polygurus 0.9140038602
##          Zfy2 0.8904138966
##          Date_count 0.8732575595
##          counter 0.8728286511
##          N_oocysts_sq5 0.8642504825
##          N_oocysts_sq6 0.8640360283
##          N_oocysts_sq7 0.8640360283
##          N_oocysts_sq8 0.8640360283
##          IL.13_N 0.8537422260
##          Status 0.8443062406
##          mean_neubauer 0.8440917864
##          Oocyst_Predict_Crypto 0.8421616985
##          ILWE_Crypto_Ct 0.8421616985
##          PBS_dil_in_mL 0.8398027021
##          Ncells 0.8398027021
##          YNPAR 0.8368003431
##          OPG 0.8331546215
##          N_oocysts_sq1 0.8303667167
##          N_oocysts_sq2 0.8303667167
##          N_oocysts_sq3 0.8303667167
##          N_oocysts_sq4 0.8303667167
##          Catenotaenia_pusilla 0.8072056616
##          Mastophorus_muris 0.8069912074
##          Heterakis_sp 0.8069912074
##          Hymenolepis_sp 0.8069912074
##          Fleas 0.7988419472
##          IL.13 0.7876903281

```



```

##          GAPDH 0.7838301523
##          Es1C 0.7737508042
## Trichuris_muris 0.7465151190
## Aspiculuris_sp 0.7465151190
## Syphacia_sp 0.7465151190
##          Es1 0.7450139395
##          Region 0.7420115805
##          IRG6 0.7368646794
##          IL.12 0.7323611409
##          Sod1C 0.7250696976
##          Gpd1C 0.7235685181
##          Idh1C 0.7229251555
##          NpC 0.7227107013
##          MpiC 0.7216384302
##          Spleen 0.6935449282
##          Address 0.6776753163
## Tail_Length 0.6770319537
##          Sod1 0.6731717778
##          Idh1 0.6723139610
##          Gpd1 0.6720995068
##          Np 0.6712416899
## Body_Length 0.6708127815
##          Mpi 0.6697405104
## Body_Weight 0.6650225177
## Dissection_Date 0.6568732576
##          HI_NLoc1 0.6553720781
##          IFNy_CEW 0.6545142612
##          X65 0.6450782758
##          Trap_Date 0.6425048252
##          Taenia_sp 0.6397169204
##          Tsx 0.6360711988
##          HI 0.6352133819
##          X332 0.6313532061
##          Syap1 0.6304953892
##          X347 0.6262063050
##          mtBamH 0.6236328544
##          Btk 0.6223461291
##          Sex 0.5976838945
##          Year 0.5948959897
##          Longitude 0.5903924512
##          Latitude 0.5903924512
##          IFNy_N 0.5893201801
##          PRF1_N 0.5665880335
##          MPO_N 0.5367788977
##          IL.17A_N 0.5294874544
##          IL.17A 0.5247694617
##          PRF1 0.5234827364
##          NCR1_N 0.5224104654
##          IL.10_N 0.5219815569
##          IFNy 0.5200514690
##          IL.6_N 0.5168346558
##          IL.12A_N 0.5078275788
##          IL.12A 0.5031095861
##          004sq 0.5026806777

```

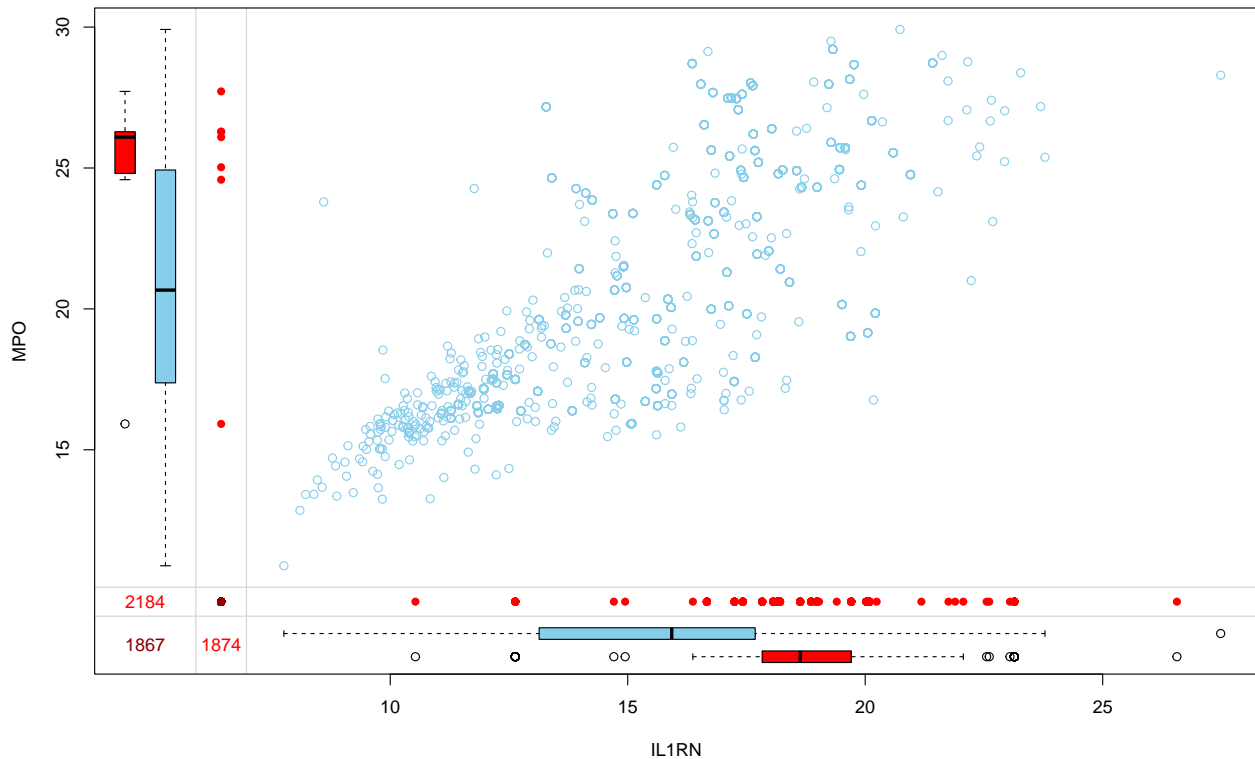
```

##          OOC 0.5026806777
##      oocyst_sq4 0.5022517692
##      oocyst_sq2 0.5020373150
##      oocyst_sq3 0.5020373150
##      oocyst_sq1 0.5018228608
##      IL.10 0.4917435128
##      CASP1_N 0.4827364358
##      TICAM1_N 0.4814497105
##      TNF_N 0.4814497105
##      NCR1 0.4726570877
##      CXCL9_N 0.4720137251
##      CXCR3_N 0.4720137251
##      IDO1_N 0.4720137251
##      IL1RN_N 0.4720137251
##      IRGM1_N 0.4720137251
##      MUC2_N 0.4720137251
##      MUC5AC_N 0.4720137251
##      MYD88_N 0.4720137251
##      RETNLB_N 0.4720137251
##      SOCS1_N 0.4720137251
##      MPO 0.4683680034
##      IL.6 0.4660090071
##      dilution 0.4642933734
##      PPIB 0.4454214025
##      CASP1 0.4334119665
##      TICAM1 0.4299806991
##      CXCR3 0.4188290800
##      RETNLB 0.4184001716
##      labels 0.4153978126
##      TNF 0.4132532704
##      infection 0.4119665451
##      end_rel_weight 0.4119665451
##      experiment 0.4119665451
##      primary_infection 0.4119665451
##      challenge_infection 0.4119665451
##      mouse_strain 0.4119665451
##      weight 0.4119665451
##      weight_dpi0 0.4119665451
##      relative_weight 0.4119665451
##      dpi 0.4119665451
##      infection_history 0.4119665451
##      Position 0.4119665451
##      max_dpi 0.4119665451
##      max_OOC 0.4119665451
##      max_WL 0.4119665451
##      death 0.4119665451
##      hybrid_status 0.4119665451
##      Parasite_primary 0.4119665451
##      Parasite_challenge 0.4119665451
##      dpi_max 0.4119665451
##      CXCL9 0.4042461934
##      IL1RN 0.4018871971
##      MUC5AC 0.4016727429
##      IDO1 0.4014582887

```

```
## MYD88 0.3995282007
## MUC2 0.3982414754
## IRGM1 0.3975981128
## SOCS1 0.3975981128
## delta_ct_cewe_MminusE 0.3757237830
## MC.Eimeria 0.3401243834
## Feces_Weight 0.2657087712
## Mouse_ID 0.0002144542
## origin 0.0000000000
```

```
marginplot(hm[c(35,38)])
```



Now let's continue by using the package MICE to impute the data

Lab

I first used standardized data. Now, I added # to remove these steps.

Now using raw data!

Stef Van Buuren advises of using up to 15 - 20 predictor variables. I have tried using the whole data set, which created chaos.

I am now using everything possible to use, even the variables that I will use in my further analysis.

- Further reading required here.

I divided the data into lab and field again, as it is only adding to the con

Lab Genes

```

# genes
# lab samples
lab <- hm %>%
  filter(origin == "Lab", infection == "challenge", dpi == dpi_max)

lab <- unique(lab)

gf_lab <- lab %>%
  dplyr::select(all_of(Gene_lab))

gf_lab <- unique(gf_lab)

#remove rows with only nas
gf_lab <- gf_lab[,colSums(is.na(gf_lab))<nrow(gf_lab)]

#remove columns with only nas
gf_lab <- gf_lab[rowSums(is.na(gf_lab)) != ncol(gf_lab), ]

#remove wrongly normalized genes
lab <- lab %>%
  dplyr::select(-ends_with("_N"))

#select same rows in the first table
lab_gene <- lab[row.names(gf_lab), ]

lab_gene[rowSums(is.na(lab_gene)) != ncol(lab_gene), ]

```

##	infection	Mouse_ID	end_rel_weight	experiment	primary_infection
## 1	challenge	LM0227	99.79044	E57	E88
## 2	challenge	LM0228	110.69242	E57	E88
## 3	challenge	LM0229	99.73767	E57	E88
## 4	challenge	LM0231	98.74335	E57	E88
## 5	challenge	LM0232	102.31323	E57	E88
## 6	challenge	LM0233	100.63823	E57	E88
## 7	challenge	LM0234	99.63370	E57	E88
## 8	challenge	LM0235	99.64249	E57	E88
## 9	challenge	LM0236	103.04762	E57	E88
## 10	challenge	LM0238	95.41842	E57	E88
## 11	challenge	LM0239	95.15714	E57	E88
## 12	challenge	LM0240	100.00000	E57	E88
## 13	challenge	LM0247	95.57685	E57	E88
## 15	challenge	LM0249	93.48659	E57	E88
## 16	challenge	LM0251	94.30052	E57	E88
## 17	challenge	LM0254	94.26523	E57	E88
## 18	challenge	LM0255	93.04491	E57	E88
## 19	challenge	LM0256	102.29846	E57	E88
## 20	challenge	LM0257	89.84615	E57	E88
## 21	challenge	LM0258	92.60385	E57	E64
## 23	challenge	LM0260	93.24604	E57	E64
## 24	challenge	LM0261	93.03136	E57	E64
## 25	challenge	LM0262	108.61335	E57	E64

## 26	challenge	LM0263	100.04706	E57	E64
## 27	challenge	LM0264	99.60850	E57	E64
## 28	challenge	LM0265	99.77299	E57	E64
## 29	challenge	LM0266	81.82957	E57	E64
## 30	challenge	LM0268	91.69866	E57	E64
## 31	challenge	LM0269	98.10185	E57	E64
## 32	challenge	LM0270	96.31645	E57	E64
## 33	challenge	LM0271	96.24742	E57	E64
## 34	challenge	LM0272	100.04392	E57	E64
## 35	challenge	LM0273	100.50691	E57	E64
## 36	challenge	LM0275	107.87326	E57	E64
## 37	challenge	LM0276	104.90030	E57	E64
## 38	challenge	LM0277	98.91122	E57	E64
## 39	challenge	LM0278	106.51341	E57	E64
## 40	challenge	LM0279	99.62529	E57	E64
## 41	challenge	LM0280	105.29311	E57	E64
## 42	challenge	LM0282	116.45065	E57	E64
## 43	challenge	LM0283	101.30890	E57	E64
## 44	challenge	LM0284	105.18088	E57	E64
## 45	challenge	LM0285	101.18374	E57	E64
## 46	challenge	LM0286	107.02674	E57	E64
## 47	challenge	LM0287	110.72756	E57	E64
## 48	challenge	LM0288	101.16515	E57	E64
## 49	challenge	LM0289	91.64229	E57	E64
## 52	challenge	LM0293	95.75699	E57	E64
## 53	challenge	LM0294	97.94360	E57	E64
## 54	challenge	LM0332	98.63548	P3	Eflab
## 55	challenge	LM0333	91.40000	P3	Eflab
## 56	challenge	LM0334	95.34884	P3	Eflab
## 57	challenge	LM0335	97.02128	P3	E88
## 58	challenge	LM0336	86.80688	P3	E88
## 62	challenge	LM0340	92.72388	P3	E64
## 64	challenge	LM0342	85.25180	P3	E139
## 65	challenge	LM0343	93.62832	P3	E139
## 66	challenge	LM0344	96.09053	P3	UNI
## 67	challenge	LM0345	89.18919	P3	UNI
## 68	challenge	LM0346	92.85714	P3	UNI
## 69	challenge	LM0347	87.40955	P3	E88
## 70	challenge	LM0352	92.42640	P4	E64
## 72	challenge	LM0353	92.33926	P4	E64
## 74	challenge	LM0354	97.21489	P4	E64
## 76	challenge	LM0355	105.49618	P4	E64
## 78	challenge	LM0356	96.51978	P4	E88
## 80	challenge	LM0357	89.03181	P4	E88
## 82	challenge	LM0358	92.77494	P4	E88
## 84	challenge	LM0359	97.79202	P4	E88
## 86	challenge	LM0361	87.00997	P4	Eflab
## 88	challenge	LM0363	96.38135	P4	Eflab
## 90	challenge	LM0364	81.90944	P4	UNI
## 92	challenge	LM0365	77.93483	P4	UNI
## 94	challenge	LM0366	84.21604	P4	UNI
## 95	challenge	LM0367	93.92379	P4	UNI
## 97	challenge	LM0368	95.71776	E10	E64
## 98	challenge	LM0369	91.33938	E10	E64

## 99	challenge	LM0370	99.12136	E10	E64
## 100	challenge	LM0372	86.13021	E10	E64
## 101	challenge	LM0373	79.90448	E10	E64
## 102	challenge	LM0375	80.27901	E10	E64
## 103	challenge	LM0376	104.07623	E10	E64
## 104	challenge	LM0377	96.00216	E10	E64
## 105	challenge	LM0379	103.73719	E10	E64
## 106	challenge	LM0380	91.56379	E10	E88
## 107	challenge	LM0385	94.35532	E10	E88
## 108	challenge	LM0389	103.86039	E10	E88
## 110	challenge	LM0393	99.33943	E10	UNI
## 111	challenge	LM0394	104.82721	E10	UNI
## 112	challenge	LM0395	104.90834	E10	UNI
## 113	challenge	LM0396	101.32721	E10	UNI
## 114	challenge	LM0397	101.43849	E10	UNI
## 115	challenge	LM0398	100.32573	E10	UNI
## 116	challenge	LM0399	81.21109	E10	UNI
## 117	challenge	LM0400	101.71745	E11	E64
## 119	challenge	LM0401	97.85867	E11	UNI
## 121	challenge	LM0402	85.76372	E11	UNI
## 123	challenge	LM0404	98.12672	E11	E64
## 125	challenge	LM0406	77.00535	E11	UNI
## 126	challenge	LM0407	99.36128	E11	UNI
## 128	challenge	LM0408	77.80488	E11	E64
## 130	challenge	LM0410	105.40858	E11	E64
## 132	challenge	LM0411	83.27273	E11	E64
## 134	challenge	LM0412	78.11052	E11	UNI
## 136	challenge	LM0413	95.77811	E11	E64
## 140	challenge	LM0417	75.33199	E11	E64
## 142	challenge	LM0420	90.31579	E11	E88
## 144	challenge	LM0421	80.74667	E11	UNI
## 145	challenge	LM0422	73.44595	E11	E64
## 147	challenge	LM0424	97.19134	E11	E64
## 149	challenge	LM0425	99.71783	E11	UNI
## 151	challenge	LM0426	102.66112	E11	E88
## 153	challenge	LM0428	94.96729	E11	E88
## 155	challenge	LM0429	80.47099	E11	E88
## 156	challenge	LM0430	95.84545	E11	UNI
## 158	challenge	LM0431	95.85492	E11	E64
##	challenge_infection	mouse_strain	labels	weight	weight_dpi0
## 1	E64	BUSNA_STRA	E57bxMNW	23.81	23.86
## 2	E64	STRA_BUSNA	E57bxBGY	23.50	21.23
## 3	UNI	SCHUNT_SCHUNT	E57bxEMW	19.01	19.06
## 4	E64	PWD_SCHUNT	E57bxCEK	20.43	20.69
## 5	UNI	BUSNA_STRA	E57bxCUY	26.98	26.37
## 6	UNI	STRA_STRA	E57bxSTU	29.96	29.77
## 7	E64	STRA_STRA	E57bxBLW	32.64	32.76
## 8	E64	STRA_SCHUNT	E57bxDTU	19.51	19.58
## 9	E64	STRA_STRA	E57bxFRU	27.05	26.25
## 10	E64	PWD_BUSNA	E57bxLYZ	20.41	21.39
## 11	UNI	SCHUNT_SCHUNT	E57bxJMR	18.47	19.41
## 12	E64	SCHUNT_PWD	E57bxCIW	20.45	20.45
## 13	UNI	STRA_SCHUNT	E57bxJMX	25.93	27.13
## 15	E64	SCHUNT_STRA	E57bxPSV	24.40	26.10

## 16	UNI	STRA_BUSNA	E57bxEOT	21.84	23.16
## 17	UNI	SCHUNT_PWD	E57bxBCD	21.04	22.32
## 18	E64	BUSNA_BUSNA	E57bxMOR	16.99	18.26
## 19	UNI	STRA_STRA	E57bxJVZ	29.82	29.15
## 20	E64	SCHUNT_SCHUNT	E57bxJQU	20.44	22.75
## 21	E64	BUSNA_PWD	E57bxHVV	18.28	19.74
## 23	E64	SCHUNT_SCHUNT	E57byGHV	27.06	29.02
## 24	UNI	PWD_SCHUNT	E57bxKOP	18.69	20.09
## 25	E64	BUSNA_BUSNA	E57byABO	22.95	21.13
## 26	E64	PWD_SCHUNT	E57byLMZ	21.26	21.25
## 27	UNI	PWD_PWD	E57bxADL	17.81	17.88
## 28	E64	BUSNA_STRA	E57byIMQ	26.37	26.43
## 29	UNI	SCHUNT_STRA	E57bxIOS	19.59	23.94
## 30	UNI	SCHUNT_SCHUNT	E57bxGSW	19.11	20.84
## 31	E64	STRA_SCHUNT	E57byLOT	21.19	21.60
## 32	E64	SCHUNT_STRA	E57byKMQ	23.01	23.89
## 33	UNI	STRA_BUSNA	E57bxPSU	23.34	24.25
## 34	UNI	BUSNA_STRA	E57byAYZ	22.78	22.77
## 35	UNI	STRA_SCHUNT	E57byKQW	21.81	21.70
## 36	UNI	SCHUNT_PWD	E57byMNW	22.47	20.83
## 37	UNI	STRA_STRA	E57byBGY	31.04	29.59
## 38	UNI	BUSNA_STRA	E57byCEK	23.62	23.88
## 39	UNI	SCHUNT_PWD	E57byDTU	22.24	20.88
## 40	E64	BUSNA_BUSNA	E57byFPV	21.27	21.35
## 41	E64	SCHUNT_SCHUNT	E57byMRZ	18.50	17.57
## 42	UNI	STRA_STRA	E57byFRU	35.04	30.09
## 43	UNI	PWD_PWD	E57byLYZ	19.35	19.10
## 44	E64	STRA_BUSNA	E57byLRS	23.55	22.39
## 45	E64	PWD_PWD	E57byBMX	19.66	19.43
## 46	UNI	PWD_BUSNA	E57byCWZ	20.41	19.07
## 47	E64	BUSNA_PWD	E57byPRZ	20.85	18.83
## 48	UNI	PWD_BUSNA	E57byCIW	19.97	19.74
## 49	UNI	SCHUNT_SCHUNT	E57byPSV	21.93	23.93
## 52	UNI	BUSNA_BUSNA	E57byJQU	19.86	20.74
## 53	E64	PWD_PWD	E57byFLN	16.67	17.02
## 54	E88	NMRI	P3bTBI	50.60	51.30
## 55	E64	NMRI	P3bBTL	45.70	50.00
## 56	UNI	NMRI	P3bRLW	45.10	47.30
## 57	UNI	NMRI	P3bIIT	45.60	47.00
## 58	E64	NMRI	P3bXFQ	45.40	52.30
## 62	UNI	NMRI	P3bFLD	49.70	53.60
## 64	E64	NMRI	P3bEVY	47.40	55.60
## 65	UNI	NMRI	P3bBQA	52.90	56.50
## 66	E88	NMRI	<NA>	46.70	48.60
## 67	E64	NMRI	P3bIHD	52.80	59.20
## 68	UNI	NMRI	P3bVJA	49.40	53.20
## 69	E88	NMRI	P3bFMI	60.40	69.10
## 70	E88	NMRI	P4bRXD	38.93	42.12
## 72	E88	NMRI	P4bIFU	40.50	43.86
## 74	E64	NMRI	P4bMOP	40.49	41.65
## 76	UNI	NMRI	P4bKJY	48.37	45.85
## 78	E88	NMRI	P4bQSH	38.55	39.94
## 80	E88	NMRI	P4bXUM	38.07	42.76
## 82	E64	NMRI	P4bGAB	43.53	46.92

## 84	UNI	NMRI	P4bYNV	41.19	42.12	
## 86	E88	NMRI	P4bRLM	37.51	43.11	
## 88	UNI	NMRI	P4bPQS	41.55	43.11	
## 90	E88	NMRI	P4bSMQ	38.35	46.82	
## 92	E88	NMRI	P4bGXY	52.38	67.21	
## 94	E64	NMRI	P4bPBN	40.23	47.77	
## 95	UNI	NMRI	P4bXOQ	45.60	48.55	
## 97	E64	SCHUNT_SCHUNT	E10bBWZ	19.67	20.55	
## 98	E64	SCHUNT_SCHUNT	E10bQBG	18.14	19.86	
## 99	E64	PWD_PWD	E10bVIV	18.05	18.21	
## 100	E88	SCHUNT_SCHUNT	E10bAHH	21.30	24.73	
## 101	E88	SCHUNT_SCHUNT	E10bEJZ	21.75	27.22	
## 102	E88	PWD_PWD	E10bLFS	12.66	15.77	
## 103	UNI	SCHUNT_SCHUNT	E10bMVN	19.66	18.89	
## 104	UNI	SCHUNT_SCHUNT	E10bLQS	17.77	18.51	
## 105	UNI	PWD_PWD	E10bTSD	17.21	16.59	
## 106	E88	SCHUNT_SCHUNT	E10bVKF	17.80	19.44	
## 107	E64	SCHUNT_SCHUNT	E10bPNK	15.88	16.83	
## 108	UNI	SCHUNT_SCHUNT	E10bVXW	19.64	18.91	
## 110	UNI	SCHUNT_SCHUNT	E10bOET	19.55	19.68	
## 111	UNI	PWD_PWD	E10bXCZ	19.11	18.23	
## 112	UNI	PWD_PWD	E10bPON	17.74	16.91	
## 113	E64	SCHUNT_SCHUNT	E10bLCS	19.85	19.59	
## 114	E64	PWD_PWD	E10bIFF	20.45	20.16	
## 115	E88	SCHUNT_SCHUNT	E10bQSC.1	18.48	18.42	
## 116	E88	PWD_PWD	E10bPSW	14.35	17.67	
## 117	E64	SCHUNT_SCHUNT	E11bIJQ	18.36	18.05	
## 119	UNI	SCHUNT_SCHUNT	E11bAHY	18.28	18.68	
## 121	E64	SCHUNT_SCHUNT	E11bDLP	17.35	20.23	
## 123	E64	PWD_PWD	E11bBSZ	17.81	18.15	
## 125	E88	SCHUNT_SCHUNT	E11bDMR	14.40	18.70	
## 126	E64	SCHUNT_SCHUNT	E11bAOS	24.89	25.05	
## 128	E88	PWD_PWD	E11bINQ	12.76	16.40	
## 130	E64	PWD_PWD	E11bOTY	17.93	17.01	
## 132	E88	PWD_PWD	E11bBNU	13.74	16.50	
## 134	E64	SCHUNT_SCHUNT	E11bEFU	21.91	28.05	
## 136	UNI	SCHUNT_SCHUNT	E11bPWY	19.51	20.37	
## 140	E88	SCHUNT_SCHUNT	E11bAEM	18.72	24.85	
## 142	E88	SCHUNT_SCHUNT	E11bABD	17.16	19.00	
## 144	E64	PWD_PWD	E11bGOP	15.14	18.75	
## 145	E88	PWD_PWD	E11bELU	10.87	14.80	
## 147	UNI	PWD_PWD	E11bGQZ	16.61	17.09	
## 149	UNI	PWD_PWD	E11bBFZ	17.67	17.72	
## 151	UNI	SCHUNT_SCHUNT	E11bAYZ	24.69	24.05	
## 153	E64	SCHUNT_SCHUNT	E11bJOR	18.87	19.87	
## 155	E64	PWD_PWD	E11bHJY	14.01	17.41	
## 156	UNI	SCHUNT_SCHUNT	E11bJLX	23.07	24.07	
## 158	E64	SCHUNT_SCHUNT	E11bOSZ	18.50	19.30	
##	relative_weight	Feces_Weight	dpi	oocyst_sq1	oocyst_sq2	oocyst_sq3
## 1	99.79044	2.73	8	3	5	8
## 2	110.69242	1.13	8	13	6	11
## 3	99.73767	2.36	8	0	0	0
## 4	98.74335	2.81	8	13	15	16
## 5	102.31323	2.15	8	0	0	0

## 6	100.63823	1.75	8	0	0	0
## 7	99.63370	1.63	8	4	10	7
## 8	99.64249	0.95	8	1	0	1
## 9	103.04762	2.33	8	8	4	11
## 10	95.41842	1.38	8	22	23	22
## 11	95.15714	2.87	8	0	0	0
## 12	100.00000	1.39	8	0	0	0
## 13	95.57685	7.14	8	0	1	0
## 15	93.48659	2.71	8	1	0	1
## 16	94.30052	1.32	8	0	0	0
## 17	94.26523	3.97	8	0	0	0
## 18	93.04491	1.41	8	5	11	13
## 19	102.29846	2.16	8	0	0	0
## 20	89.84615	1.46	8	4	1	1
## 21	92.60385	1.22	8	4	4	3
## 23	93.24604	3.14	8	0	0	0
## 24	93.03136	1.36	8	0	0	0
## 25	108.61335	1.42	8	1	0	0
## 26	100.04706	1.56	8	4	8	1
## 27	99.60850	1.01	8	0	0	0
## 28	99.77299	2.45	8	0	0	0
## 29	81.82957	2.79	8	0	0	0
## 30	91.69866	2.11	8	0	0	0
## 31	98.10185	1.22	8	0	0	0
## 32	96.31645	1.58	8	0	0	0
## 33	96.24742	2.08	8	0	0	0
## 34	100.04392	1.48	8	0	0	0
## 35	100.50691	2.00	8	0	0	0
## 36	107.87326	1.19	8	0	0	0
## 37	104.90030	1.00	8	0	0	0
## 38	98.91122	1.52	8	0	0	0
## 39	106.51341	1.17	8	0	0	0
## 40	99.62529	1.10	8	0	2	0
## 41	105.29311	1.42	8	0	0	0
## 42	116.45065	1.96	8	0	0	0
## 43	101.30890	1.49	8	0	0	0
## 44	105.18088	1.50	8	0	0	1
## 45	101.18374	1.40	8	14	13	8
## 46	107.02674	1.44	8	0	0	0
## 47	110.72756	1.27	8	0	0	0
## 48	101.16515	1.37	8	0	0	0
## 49	91.64229	2.23	8	0	0	0
## 52	95.75699	1.24	8	0	0	0
## 53	97.94360	1.00	8	1	4	4
## 54	98.63548	2.40	8	0	0	0
## 55	91.40000	NA	8	NA	NA	NA
## 56	95.34884	2.15	8	0	0	0
## 57	97.02128	1.78	8	0	0	0
## 58	86.80688	NA	8	NA	NA	NA
## 62	92.72388	2.44	8	0	0	0
## 64	85.25180	NA	8	NA	NA	NA
## 65	93.62832	1.62	8	0	0	0
## 66	96.09053	NA	2	NA	NA	NA
## 67	89.18919	NA	8	NA	NA	NA

## 68	92.85714	1.87	8	0	0	0
## 69	87.40955	2.65	8	0	2	0
## 70	92.42640	2.53	8	50	45	39
## 72	92.33926	1.93	8	67	75	64
## 74	97.21489	3.03	8	0	0	0
## 76	105.49618	2.87	8	0	0	0
## 78	96.51978	3.24	8	0	0	0
## 80	89.03181	1.46	8	0	0	0
## 82	92.77494	4.61	8	3	2	1
## 84	97.79202	2.21	8	0	0	0
## 86	87.00997	2.60	8	1	1	1
## 88	96.38135	2.05	8	0	0	0
## 90	81.90944	0.77	8	20	23	20
## 92	77.93483	0.24	8	0	0	0
## 94	84.21604	0.47	5	46	30	39
## 95	93.92379	2.31	8	0	0	0
## 97	95.71776	1.37	8	0	0	0
## 98	91.33938	1.13	8	0	0	0
## 99	99.12136	1.18	8	2	1	1
## 100	86.13021	0.80	8	35	55	50
## 101	79.90448	0.13	8	2	3	5
## 102	80.27901	0.26	8	14	23	15
## 103	104.07623	1.11	8	0	0	0
## 104	96.00216	1.63	8	0	0	0
## 105	103.73719	0.68	8	0	0	0
## 106	91.56379	1.01	8	0	2	1
## 107	94.35532	1.64	8	0	0	0
## 108	103.86039	1.07	8	0	0	0
## 110	99.33943	1.16	8	0	0	0
## 111	104.82721	1.08	8	0	0	0
## 112	104.90834	0.91	8	0	0	0
## 113	101.32721	1.05	8	2	1	0
## 114	101.43849	1.11	8	29	15	20
## 115	100.32573	0.90	8	102	100	91
## 116	81.21109	0.26	8	37	31	36
## 117	101.71745	NA	8	0	0	0
## 119	97.85867	NA	8	0	0	0
## 121	85.76372	NA	8	4	1	0
## 123	98.12672	NA	8	0	0	0
## 125	77.00535	0.61	7	3	1	0
## 126	99.36128	NA	8	0	0	0
## 128	77.80488	NA	8	6	3	6
## 130	105.40858	NA	8	2	0	1
## 132	83.27273	NA	8	17	15	19
## 134	78.11052	NA	8	0	1	1
## 136	95.77811	NA	8	0	0	0
## 140	75.33199	NA	8	1	2	1
## 142	90.31579	NA	8	0	0	0
## 144	80.74667	NA	6	NA	NA	NA
## 145	73.44595	NA	8	3	5	3
## 147	97.19134	NA	8	0	0	0
## 149	99.71783	NA	8	0	0	0
## 151	102.66112	NA	8	0	0	0
## 153	94.96729	NA	8	0	0	0

## 155	80.47099		NA	6	NA	NA	NA
## 156	95.84545		NA	8	0	0	0
## 158	95.85492		NA	8	0	0	0
##	oocyst_sq4	dilution	004sq	00C	infection_history	MC.Eimeria	
## 1	1	1	17	42500	falciformis_ferrisi	TRUE	
## 2	6	1	36	90000	falciformis_ferrisi	TRUE	
## 3	0	1	0	0	falciformis_uninfected	FALSE	
## 4	16	1	60	150000	falciformis_ferrisi	TRUE	
## 5	0	1	0	0	falciformis_uninfected	TRUE	
## 6	0	1	0	0	falciformis_uninfected	TRUE	
## 7	6	1	27	67500	falciformis_ferrisi	TRUE	
## 8	0	1	2	5000	falciformis_ferrisi	TRUE	
## 9	8	1	31	77500	falciformis_ferrisi	TRUE	
## 10	20	1	87	217500	falciformis_ferrisi	TRUE	
## 11	0	1	0	0	falciformis_uninfected	TRUE	
## 12	1	1	1	2500	falciformis_ferrisi	TRUE	
## 13	0	1	1	2500	falciformis_uninfected	TRUE	
## 15	1	1	3	7500	falciformis_ferrisi	TRUE	
## 16	0	1	0	0	falciformis_uninfected	TRUE	
## 17	0	1	0	0	falciformis_uninfected	FALSE	
## 18	8	1	37	92500	falciformis_ferrisi	TRUE	
## 19	0	1	0	0	falciformis_uninfected	FALSE	
## 20	1	1	7	17500	falciformis_ferrisi	TRUE	
## 21	6	1	17	42500	ferrisi_ferrisi	TRUE	
## 23	0	1	0	0	ferrisi_ferrisi	FALSE	
## 24	0	1	0	0	ferrisi_uninfected	FALSE	
## 25	0	1	1	2500	ferrisi_ferrisi	FALSE	
## 26	7	1	20	50000	ferrisi_ferrisi	FALSE	
## 27	0	1	0	0	ferrisi_uninfected	FALSE	
## 28	1	1	1	2500	ferrisi_ferrisi	FALSE	
## 29	0	1	0	0	ferrisi_uninfected	FALSE	
## 30	0	1	0	0	ferrisi_uninfected	FALSE	
## 31	0	1	0	0	ferrisi_ferrisi	TRUE	
## 32	0	1	0	0	ferrisi_ferrisi	FALSE	
## 33	0	1	0	0	ferrisi_uninfected	FALSE	
## 34	0	1	0	0	ferrisi_uninfected	FALSE	
## 35	0	1	0	0	ferrisi_uninfected	FALSE	
## 36	0	1	0	0	ferrisi_uninfected	FALSE	
## 37	0	1	0	0	ferrisi_uninfected	FALSE	
## 38	0	1	0	0	ferrisi_uninfected	FALSE	
## 39	0	1	0	0	ferrisi_uninfected	FALSE	
## 40	0	1	2	5000	ferrisi_ferrisi	TRUE	
## 41	0	1	0	0	ferrisi_ferrisi	TRUE	
## 42	0	1	0	0	ferrisi_uninfected	FALSE	
## 43	0	1	0	0	ferrisi_uninfected	FALSE	
## 44	0	1	1	2500	ferrisi_ferrisi	TRUE	
## 45	13	1	48	120000	ferrisi_ferrisi	TRUE	
## 46	0	1	0	0	ferrisi_uninfected	FALSE	
## 47	1	1	1	2500	ferrisi_ferrisi	TRUE	
## 48	0	1	0	0	ferrisi_uninfected	FALSE	
## 49	0	1	0	0	ferrisi_uninfected	FALSE	
## 52	0	1	0	0	ferrisi_uninfected	FALSE	
## 53	6	1	15	37500	ferrisi_ferrisi	TRUE	
## 54	0	1	0	0	falciformis_falciformis	TRUE	

## 55	NA	NA	NA	NA	falciformis_ferrisi	TRUE
## 56	0	1	0	0	falciformis_uninfected	FALSE
## 57	0	1	0	0	falciformis_uninfected	FALSE
## 58	NA	NA	NA	NA	falciformis_ferrisi	TRUE
## 62	0	1	0	0	ferrisi_uninfected	FALSE
## 64	NA	NA	NA	NA	ferrisi_ferrisi	TRUE
## 65	0	1	0	0	ferrisi_uninfected	FALSE
## 66	NA	NA	NA	NA	uninfected_falciformis	TRUE
## 67	NA	NA	NA	NA	uninfected_ferrisi	TRUE
## 68	0	1	0	0	uninfected	TRUE
## 69	1	1	3	7500	falciformis_falciformis	TRUE
## 70	47	1	181	452500	ferrisi_falciformis	TRUE
## 72	71	1	277	692500	ferrisi_falciformis	TRUE
## 74	0	1	0	0	ferrisi_ferrisi	FALSE
## 76	0	1	0	0	ferrisi_uninfected	FALSE
## 78	0	1	0	0	falciformis_falciformis	TRUE
## 80	0	1	0	0	falciformis_falciformis	TRUE
## 82	0	1	6	15000	falciformis_ferrisi	TRUE
## 84	0	1	0	0	falciformis_uninfected	FALSE
## 86	0	1	3	7500	falciformis_falciformis	TRUE
## 88	0	1	0	0	falciformis_uninfected	FALSE
## 90	19	1	82	205000	uninfected_falciformis	TRUE
## 92	0	1	0	0	uninfected_falciformis	TRUE
## 94	37	1	152	380000	uninfected_ferrisi	TRUE
## 95	0	1	0	0	uninfected	FALSE
## 97	0	1	0	0	ferrisi_ferrisi	TRUE
## 98	0	1	0	0	ferrisi_ferrisi	FALSE
## 99	2	1	6	15000	ferrisi_ferrisi	TRUE
## 100	35	1	175	437500	ferrisi_falciformis	TRUE
## 101	4	1	14	35000	ferrisi_falciformis	TRUE
## 102	15	1	67	167500	ferrisi_falciformis	TRUE
## 103	0	1	0	0	ferrisi_uninfected	FALSE
## 104	0	1	0	0	ferrisi_uninfected	FALSE
## 105	0	1	0	0	ferrisi_uninfected	TRUE
## 106	2	1	5	12500	falciformis_falciformis	TRUE
## 107	0	1	0	0	falciformis_ferrisi	TRUE
## 108	0	1	0	0	falciformis_uninfected	TRUE
## 110	0	1	0	0	uninfected	FALSE
## 111	0	1	0	0	uninfected	FALSE
## 112	0	1	0	0	uninfected	FALSE
## 113	1	1	4	10000	uninfected_ferrisi	FALSE
## 114	18	1	82	205000	uninfected_ferrisi	TRUE
## 115	105	1	398	995000	uninfected_falciformis	TRUE
## 116	36	1	140	350000	uninfected_falciformis	TRUE
## 117	0	1	0	0	ferrisi_ferrisi	TRUE
## 119	0	1	0	0	uninfected	FALSE
## 121	2	1	7	17500	uninfected_ferrisi	TRUE
## 123	0	1	0	0	ferrisi_ferrisi	TRUE
## 125	0	1	4	10000	uninfected_falciformis	TRUE
## 126	0	1	0	0	uninfected_ferrisi	TRUE
## 128	9	1	24	60000	ferrisi_falciformis	TRUE
## 130	3	1	6	15000	ferrisi_ferrisi	TRUE
## 132	11	1	62	155000	ferrisi_falciformis	TRUE
## 134	4	1	6	15000	uninfected_ferrisi	TRUE

## 136	0	1	0	0	ferrisi_uninfected	TRUE
## 140	0	1	4	10000	ferrisi_falciformis	TRUE
## 142	0	1	0	0	falciformis_falciformis	TRUE
## 144	NA	NA	NA	NA	uninfected_ferrisi	TRUE
## 145	2	1	13	32500	ferrisi_falciformis	TRUE
## 147	0	1	0	0	ferrisi_uninfected	FALSE
## 149	0	1	0	0	uninfected	FALSE
## 151	0	1	0	0	falciformis_uninfected	FALSE
## 153	0	1	0	0	falciformis_ferrisi	TRUE
## 155	NA	NA	NA	NA	falciformis_ferrisi	TRUE
## 156	0	1	0	0	uninfected	FALSE
## 158	0	1	0	0	ferrisi_ferrisi	TRUE
##	delta_ct_cewe_MminusE	IFNy_CEWE	IFNy_MES	IRG6	IL.12	CASP1
## 1	-5.7900000	54.4201293	NA	-4.425000	-9.130000	22.02920
## 2	-5.9100000	84.9852125	NA	-4.392500	-6.932500	24.25054
## 3	-7.1200000	11.9382982	NA	-3.122500	-4.647500	22.55511
## 4	-5.1600000	37.5056013	NA	-4.312500	-6.857500	27.50341
## 5	-6.2200000	21.8877741	NA	-3.010000	-5.435000	25.45624
## 6	-5.9700000	81.6629906	NA	NA	-6.122500	23.14097
## 7	-7.8900000	112.0556441	NA	-1.042500	-4.827500	23.11127
## 8	-5.8400000	53.5403908	NA	-3.027500	-5.597500	25.06357
## 9	-6.0200000	121.1053913	NA	-2.042500	-5.092500	22.45011
## 10	-4.4200000	61.4115394	NA	-4.337500	-6.392500	23.55407
## 11	-6.7600000	25.0601964	NA	-6.939167	-5.692500	23.81598
## 12	-6.6500000	43.3808824	NA	-2.455000	-5.660000	22.70095
## 13	-4.6800000	15.7742980	NA	-3.952500	-6.082500	22.49518
## 15	-5.9600000	25.5475920	NA	-4.147500	-6.652500	22.84267
## 16	-4.7300000	1.7194288	NA	-4.365000	-6.470000	22.04784
## 17	-8.4800000	23.1158022	NA	NA	NA	23.38067
## 18	-2.7300000	87.5850374	NA	-3.245000	-6.495000	23.42149
## 19	-8.9000000	14.6139890	NA	-2.137500	-4.062500	22.85872
## 20	-6.9300000	21.2530815	NA	-3.450000	-5.385000	23.05298
## 21	-5.7500000	22.5199588	NA	-2.285000	-5.855000	22.51961
## 23	-11.9000000	11.2982790	NA	-3.910000	-6.305000	22.76425
## 24	-5.9000000	22.7925982	NA	-6.357500	-9.977500	24.16598
## 25	-10.0600000	0.2251453	NA	-5.502500	-7.702500	23.57993
## 26	-8.3800000	15.5470128	NA	-12.735000	-6.165000	NA
## 27	-10.0200000	12.6543617	NA	-1.047500	-4.912500	23.76993
## 28	-11.4200000	24.5913140	NA	-15.332500	-6.567500	22.86814
## 29	-8.2500000	1.0402825	NA	0.862500	-4.067500	22.86023
## 30	-8.1500000	22.2297969	NA	-8.365000	-12.480000	28.45142
## 31	-7.9100000	28.0476365	NA	-13.027500	-3.817500	22.69451
## 32	-9.7500000	19.7264529	NA	-5.455000	-8.010000	24.16373
## 33	-9.2000000	11.5962496	NA	-4.755000	-8.220000	21.79801
## 34	-10.5500000	NA	NA	-6.865000	-9.900000	23.41526
## 35	-10.4200000	16.5237750	NA	-3.427500	-6.162500	23.28426
## 36	4.1400000	6.0570706	NA	-3.140000	-5.230000	25.19149
## 37	-10.6100000	37.2475523	NA	-3.740000	-6.190000	21.63034
## 38	-10.3900000	14.6670412	NA	-3.945000	-6.145000	23.74273
## 39	-10.9900000	27.8926078	NA	-5.355000	-8.825000	20.93711
## 40	-9.1800000	8.4130370	NA	-12.047500	-8.652500	24.43256
## 41	-7.1200000	54.1465789	NA	-3.255000	-5.190000	29.98603
## 42	-12.6900000	23.3076495	NA	-11.830000	-5.850000	24.28977
## 43	-10.5700000	33.8222754	NA	-2.852500	-5.162500	22.78772

## 44	-6.1900000	48.3675947	NA	-2.342500	-4.142500	22.53197
## 45	-3.1100000	52.2081652	NA	NA	-5.265000	24.20202
## 46	-9.2100000	19.5159266	NA	-1.420000	-4.235000	23.79661
## 47	-6.3400000	52.3669479	NA	19.702500	NA	23.59150
## 48	-8.7900000	32.5857552	NA	-5.495000	-8.070000	25.16027
## 49	-9.1800000	11.1755693	NA	-3.315000	-7.370000	20.43007
## 52	-5.0200000	0.2251453	NA	-11.330000	-8.980000	22.82450
## 53	11.6100000	177.3127309	NA	-3.197500	-5.097500	25.93133
## 54	-5.1200000	224.3393844	NA	-2.025000	-5.085000	20.43024
## 55	-4.2700000	223.2448333	NA	-0.550000	-4.325000	20.90917
## 56	-4.9400000	47.4564142	NA	-2.400000	-4.610000	22.92319
## 57	-5.5700000	23.6249410	NA	-2.325000	-3.900000	21.43852
## 58	-4.0200000	123.7794696	NA	-5.355000	-3.731667	21.03117
## 62	-10.4900000	50.9646675	NA	-7.546250	-4.476250	21.70017
## 64	-6.1100000	26.8867342	NA	-2.525000	-4.167500	21.44578
## 65	-8.4400000	19.2799310	NA	-2.478750	-4.398750	25.34167
## 66	-8.0600000	3.6723117	NA	-2.682500	-3.615000	21.28205
## 67	-4.3800000	176.3435950	NA	-2.652500	-5.032500	22.26009
## 68	-8.7400000	14.9964343	NA	-2.476250	-4.528750	25.73564
## 69	-8.7300000	43.5591599	NA	-2.517500	-4.365000	21.92730
## 70	3.9530667	566.8701574	536.1762	NA	NA	22.16068
## 72	3.2080333	459.5826735	550.7469	NA	NA	26.08998
## 74	-7.5708667	256.0896972	1724.6254	NA	NA	27.75083
## 76	-5.2074833	275.9549291	825.9205	NA	NA	21.69953
## 78	-7.3878000	238.7214896	1516.5278	NA	NA	23.58463
## 80	-4.1202000	179.4015615	1405.1078	NA	NA	NA
## 82	-5.4295333	79.8828764	976.9080	NA	NA	23.01611
## 84	-8.6026667	271.9518628	67.4229	NA	NA	20.75492
## 86	-4.8094667	243.6993892	1530.7264	NA	NA	26.91510
## 88	-8.5907333	189.4943738	1993.5744	NA	NA	22.30920
## 90	4.0165333	493.7231850	451.7653	NA	NA	24.02626
## 92	1.4390000	875.6170169	704.5907	NA	NA	24.83386
## 94	2.1886675	NA	NA	NA	NA	21.65407
## 95	-7.0490667	651.1146943	635.8187	NA	NA	25.34344
## 97	-6.1779045	NA	NA	NA	NA	22.36512
## 98	-8.2711003	NA	NA	NA	NA	21.54675
## 99	-6.2704640	NA	NA	NA	NA	20.70334
## 100	2.5584555	NA	NA	NA	NA	27.75544
## 101	3.0796963	NA	NA	NA	NA	20.29093
## 102	3.5440847	NA	NA	NA	NA	21.84692
## 103	-9.5128344	NA	NA	NA	NA	24.56166
## 104	-9.0824159	NA	NA	NA	NA	21.28489
## 105	-12.3017417	NA	NA	NA	NA	21.67512
## 106	-2.2251093	NA	NA	NA	NA	20.92126
## 107	-5.4040322	NA	NA	NA	NA	19.99790
## 108	-3.6478825	NA	NA	NA	NA	21.11699
## 110	NA	NA	NA	NA	NA	23.09224
## 111	NA	NA	NA	NA	NA	22.80543
## 112	NA	NA	NA	NA	NA	20.93479
## 113	-7.8432623	NA	NA	NA	NA	19.96002
## 114	-3.4276041	NA	NA	NA	NA	21.19813
## 115	1.1360048	NA	NA	NA	NA	22.41502
## 116	2.3155669	NA	NA	NA	NA	21.02919
## 117	-4.8183351	NA	NA	NA	NA	20.48537

## 119		NA	NA	NA	NA	NA	21.37431	
## 121	-5.8576836		NA	NA	NA	NA	20.42448	
## 123	-0.8952328		NA	NA	NA	NA	20.75696	
## 125	3.8339912		NA	NA	NA	NA	24.61451	
## 126	-9.6522040		NA	NA	NA	NA	24.82729	
## 128	6.6112832		NA	NA	NA	NA	20.62177	
## 130	-8.5264218		NA	NA	NA	NA	21.04427	
## 132	3.5831072		NA	NA	NA	NA	22.11439	
## 134	5.3659974		NA	NA	NA	NA	22.93029	
## 136	-7.9430190		NA	NA	NA	NA	25.57550	
## 140	4.8236461		NA	NA	NA	NA	20.39827	
## 142	-0.2317072		NA	NA	NA	NA	20.98834	
## 144	2.8147415		NA	NA	NA	NA	22.24713	
## 145	6.8173643		NA	NA	NA	NA	21.46682	
## 147	-9.8561885		NA	NA	NA	NA	20.78469	
## 149	NA		NA	NA	NA	NA	21.23007	
## 151	-0.6405949		NA	NA	NA	NA	20.67898	
## 153	-8.7913922		NA	NA	NA	NA	20.84055	
## 155	3.9615129		NA	NA	NA	NA	25.08039	
## 156	NA		NA	NA	NA	NA	20.16156	
## 158	-5.9558402		NA	NA	NA	NA	21.07134	
##	CXCL9	CXCR3	ID01	IFNy	IL.10	IL.12A	IL1RN	IL.6
## 1	13.60226	20.92666	13.685507	19.69138	21.78837	22.05403	16.42338	21.09045
## 2	14.53048	21.62075	12.347823	20.85947	22.92255	NA	20.13510	25.32600
## 3	18.99093	23.66537	15.902410	NA	24.90025	27.79559	18.14916	24.18021
## 4	14.03929	20.21312	12.783337	21.19368	22.31029	24.91667	16.79377	23.90781
## 5	19.20542	23.02829	18.254268	NA	27.67319	21.28318	18.98532	23.19571
## 6	19.07817	23.18574	18.488880	23.25197	25.82543	24.61300	19.45825	22.59572
## 7	14.67773	20.19632	14.430931	20.64367	21.62915	22.29154	18.55582	23.91450
## 8	14.21946	23.73105	15.666291	22.30059	23.61026	23.87069	17.67666	21.14346
## 9	16.20309	23.18462	14.952342	NA	NA	24.37512	19.31653	22.02135
## 10	12.88829	19.21698	11.663551	20.71101	22.94861	22.46574	17.29027	19.62519
## 11	20.30617	22.52077	16.930006	NA	23.85751	22.43391	20.58918	NA
## 12	13.01806	19.12177	10.705361	19.03305	20.62422	21.85280	17.38254	25.26331
## 13	17.39209	22.45032	15.675249	NA	NA	24.08877	17.74972	22.69335
## 15	15.54217	22.51152	13.079090	20.31647	23.01596	23.13067	16.69397	20.95665
## 16	19.29231	21.26747	18.558979	NA	NA	25.93313	19.67336	21.85538
## 17	17.12064	18.00746	15.731242	24.08206	18.74826	18.57226	15.10803	18.38914
## 18	13.68531	19.10121	12.914861	18.96116	22.42743	21.28113	16.44270	20.98553
## 19	18.63569	22.41295	19.069602	NA	23.03015	23.34710	17.63167	20.25383
## 20	12.95849	21.44775	14.508282	29.97387	27.89777	24.66741	17.32784	18.45020
## 21	14.61636	21.07130	13.138920	20.09308	21.08242	23.28134	17.43922	20.03526
## 23	16.18053	20.92691	13.646650	21.79559	24.07971	23.40507	17.14403	21.09167
## 24	15.03703	19.36417	16.004009	21.76826	20.66591	19.46319	16.54046	15.07182
## 25	14.00879	18.14328	11.186614	20.22957	21.31080	18.07291	12.63218	17.39709
## 26	14.61884	20.03795	12.098614	22.31389	21.07542	22.75165	18.66006	28.89199
## 27	21.33524	23.44335	18.017771	23.99340	24.23830	22.02696	16.75777	23.78059
## 28	16.94201	20.31368	12.246575	19.88967	21.62254	22.43880	17.64324	19.93494
## 29	18.99404	24.81556	18.253549	NA	25.12770	24.12161	18.20610	21.68421
## 30	16.56531	20.53629	16.273956	22.35195	23.68561	21.13981	16.66748	25.89126
## 31	15.85200	20.53802	12.968113	21.25679	20.76649	22.92053	17.42489	20.02823
## 32	13.93241	18.97607	11.229936	19.70805	21.15728	23.03091	13.40232	19.07150
## 33	18.71677	23.27692	17.629490	25.08631	23.52992	22.38969	19.58139	19.71861
## 34	19.96504	21.66393	19.114217	NA	20.44784	20.28119	17.72250	20.33407

## 35	18.19233	23.07634	16.734890	NA	NA	23.48609	19.91583	22.39279
## 36	18.54367	22.53733	17.279974	NA	22.20044	22.04799	17.97018	18.60527
## 37	17.56039	22.10287	18.416046	22.13662	NA	24.93255	19.46909	20.06929
## 38	18.40169	24.60278	19.753084	NA	26.19512	21.85720	19.76563	18.46774
## 39	16.51682	18.58505	16.471883	22.91005	17.86940	16.73749	14.97143	19.05836
## 40	13.82651	16.86408	8.661838	16.57294	17.79117	18.65275	14.25306	13.21835
## 41	13.24525	22.15447	13.915862	22.82618	22.04275	NA	17.18358	25.41724
## 42	17.31654	21.16552	17.871126	NA	22.65766	22.10378	17.71976	18.10097
## 43	18.82635	24.69742	17.110750	22.58397	23.16757	24.81331	18.98606	19.05980
## 44	17.26648	21.32868	15.929076	NA	NA	22.54053	17.83004	21.65526
## 45	12.21244	18.70600	9.754557	17.72261	18.49236	18.19827	14.68719	17.79219
## 46	20.24753	22.12217	19.708596	23.97380	23.32834	23.12603	18.26465	21.87536
## 47	13.56512	19.16785	9.842353	18.37035	19.89393	21.50916	15.60916	17.97426
## 48	16.38290	18.19756	15.927925	20.77524	20.83681	18.63496	17.24873	14.40759
## 49	16.55790	21.64540	15.251946	23.23372	20.98086	20.21188	17.40872	17.73381
## 52	17.97308	20.18662	18.265865	23.20072	19.05747	17.88111	16.32045	16.57967
## 53	11.98283	18.21390	10.025161	17.51103	18.33959	19.37826	13.28305	29.81903
## 54	18.32872	20.61515	16.717158	20.05072	29.98877	21.09687	12.75221	23.03621
## 55	21.96734	21.00294	18.171699	22.18927	24.20689	24.72053	15.08824	23.67766
## 56	16.90758	20.65725	12.292333	19.17606	23.25961	18.34379	11.65156	21.54047
## 57	22.16466	21.31698	18.373123	24.47713	25.52867	25.19540	13.83283	26.71171
## 58	16.66383	20.20715	11.993194	18.02613	22.34004	17.92831	11.97324	24.37765
## 62	15.42738	18.40655	12.523361	20.88908	21.44767	18.67195	11.82725	21.07280
## 64	16.72246	20.89049	13.721075	20.93640	22.36207	22.12284	11.85427	23.48067
## 65	18.64811	21.14188	15.843818	23.41244	23.60720	21.88740	13.10425	NA
## 66	22.49707	21.95768	18.930756	24.76847	26.11948	23.39947	15.37061	22.34438
## 67	15.25164	18.21933	11.803676	19.99699	20.51353	18.63812	12.28923	25.24031
## 68	20.65578	24.65157	12.237259	22.60203	23.43752	17.81487	11.43627	23.53264
## 69	18.51135	23.52242	13.708155	25.84433	NA	19.46938	11.27634	27.13311
## 70	23.45426	22.91576	21.459525	25.35428	28.87344	27.54653	16.75650	25.39795
## 72	19.96006	25.66519	20.724537	25.11981	NA	29.01087	19.70521	NA
## 74	23.07473	24.22064	27.169505	NA	28.05381	NA	19.23186	NA
## 76	24.18800	22.86653	22.517576	NA	25.01750	25.09793	18.03112	23.56129
## 78	23.33492	22.76071	22.130637	29.09622	27.95595	25.52104	15.84708	NA
## 80	22.51919	23.52785	24.362430	NA	28.18004	26.80866	23.13962	29.95433
## 82	24.12845	22.75096	22.364820	NA	25.69999	27.89652	17.58811	NA
## 84	22.14808	21.48844	21.229097	NA	29.13131	27.82527	18.63039	22.60560
## 86	23.73669	25.80037	26.746953	NA	29.09962	NA	20.02498	29.77186
## 88	20.71644	21.03955	20.531902	28.38656	26.44454	NA	16.61041	26.23716
## 90	18.86451	21.52073	21.448918	24.85421	24.91564	28.03990	17.10527	27.46334
## 92	16.34429	22.66652	22.097978	26.40918	25.56209	24.81170	18.86001	18.92939
## 94	13.14677	21.81679	13.300336	21.39121	26.30993	20.90934	12.25711	20.56615
## 95	23.74179	22.67323	25.029717	NA	27.22396	NA	20.08638	26.18491
## 97	19.88270	23.46890	20.563533	NA	23.16663	NA	18.06204	22.68031
## 98	18.09229	19.91255	12.713460	28.41633	NA	18.66064	11.27495	22.64689
## 99	18.47461	20.08603	11.083212	19.56943	22.15091	18.06970	10.39335	21.31040
## 100	18.54329	24.06576	18.841289	23.44436	23.54490	26.62713	21.42000	28.75247
## 101	14.49042	21.27995	12.360175	19.12952	24.38039	21.41433	12.06338	18.29274
## 102	14.45594	20.22281	11.304476	17.61460	19.95704	19.87975	12.45559	24.09667
## 103	22.72566	24.54876	15.063209	21.87366	25.98836	21.86184	14.72332	NA
## 104	23.29208	19.66524	13.730573	22.62076	25.28405	20.77861	12.24016	28.21305
## 105	19.01887	21.37939	18.925460	22.57627	24.59390	22.30268	17.24273	22.23118
## 106	14.94362	20.76001	12.729950	19.74535	22.25595	23.58768	15.60735	22.04766
## 107	18.02023	18.55728	16.255302	22.33094	24.22079	23.54103	15.59951	25.20569

## 108	21.25767	20.76581	21.997595	NA	24.20175	27.25172	16.35892	23.12287
## 110	20.79058	19.80003	13.061516	24.31700	24.68163	19.39702	12.63565	NA
## 111	21.78558	20.95861	12.274416	21.76822	26.12950	18.76423	11.69210	NA
## 112	22.47699	21.59717	11.437480	19.42611	21.70019	18.53399	11.07716	26.58406
## 113	15.04185	18.34869	13.407077	20.37461	21.67449	20.30762	14.73684	21.28534
## 114	18.33013	21.69704	15.595453	20.73940	23.22688	22.51991	15.92684	25.01886
## 115	14.38687	21.45424	12.455074	18.06665	23.59355	23.96571	18.17187	19.31163
## 116	10.82695	19.13856	9.136530	16.08884	17.90145	20.38809	12.16899	16.59937
## 117	18.70781	20.68170	14.946433	22.86852	24.26723	26.45146	17.50911	26.84019
## 119	24.86841	18.54700	19.502043	NA	23.37539	23.72379	17.68361	NA
## 121	15.35375	20.46746	14.252057	21.71419	24.76140	24.47478	17.02771	18.96176
## 123	18.79592	19.20522	16.970430	20.35299	22.75786	25.69510	19.51251	21.60006
## 125	14.09206	21.53098	12.763815	20.42732	22.16032	19.81310	13.69251	18.24249
## 126	18.86993	20.54109	17.037959	23.84323	21.56791	25.24423	20.05260	26.92355
## 128	13.72277	20.32615	12.100585	18.55228	21.83610	24.04269	15.60828	23.60529
## 130	14.14905	20.58743	14.815813	20.64220	21.05282	22.04188	15.78011	22.64934
## 132	14.05901	21.30977	11.611228	17.50713	20.53981	23.48844	15.62994	24.81393
## 134	16.14029	24.78347	14.976568	19.26630	23.52439	27.55042	14.97696	20.20337
## 136	21.90772	22.77867	20.337306	NA	NA	NA	20.21300	25.05195
## 140	12.87900	20.05828	11.674964	18.17334	19.67574	22.59618	14.91150	17.73281
## 142	11.55303	20.06144	11.659147	17.62484	22.33842	21.54046	15.91221	19.48198
## 144	15.30404	21.33039	11.142649	17.52305	21.16372	19.35372	12.50428	19.22344
## 145	13.54572	21.08006	11.447434	15.71529	19.74151	19.67658	12.83904	18.49392
## 147	25.69238	18.95654	20.921377	25.05199	26.77299	25.82938	19.69194	21.82732
## 149	25.34770	20.24860	20.689122	NA	23.93211	22.63377	20.95269	28.76398
## 151	25.74388	19.01495	20.553644	25.39302	23.32124	23.91089	18.21358	26.92797
## 153	15.14489	22.14929	15.490731	21.16589	24.41267	23.00500	17.08754	22.09470
## 155	12.26390	23.41073	8.769283	16.93482	19.79551	20.64987	13.13472	17.46569
## 156	20.93232	18.84797	18.051913	NA	24.87735	27.64148	15.62935	25.09494
## 158	17.73318	21.05519	16.366598	22.02264	23.21401	24.41094	18.40590	27.11805
##	IRGM1	MPD	MUC2	MUC5AC	MYD88	NCR1	PP1B	
## 1	11.625516	23.16109	11.394231	12.368312	16.856985	23.33234	13.837251	
## 2	10.033986	26.67972	9.724516	14.599135	18.010443	22.89312	13.660587	
## 3	7.810604	NA	7.749293	12.871210	20.059938	23.96486	14.494109	
## 4	10.157602	27.67628	7.183272	14.041496	15.618948	23.45405	10.907114	
## 5	9.241544	NA	9.869590	14.371520	17.538455	24.12714	13.634454	
## 6	9.197374	24.94612	8.225922	11.583533	20.053889	25.43377	14.403728	
## 7	8.600942	24.90775	8.730690	11.900492	18.177256	23.25482	14.544612	
## 8	8.297135	25.61896	7.522414	13.148207	19.038180	23.69673	14.109420	
## 9	8.997360	29.21133	8.156661	8.684992	20.392755	23.81112	16.441977	
## 10	9.052160	27.46451	8.642571	10.342714	14.618691	21.39968	9.414350	
## 11	8.162201	25.54124	8.859693	15.460500	19.281729	23.66060	15.535059	
## 12	7.565302	24.91439	6.904949	15.359870	14.612337	20.06957	8.931464	
## 13	9.841508	25.19862	7.871219	8.678551	16.285136	24.37670	10.074262	
## 15	10.548003	23.12428	9.808142	10.449504	16.981842	23.76296	13.354351	
## 16	9.218357	28.14862	8.669347	10.198480	16.960683	23.89841	13.076376	
## 17	9.193427	23.38627	8.394537	10.196126	14.609839	18.00615	9.602059	
## 18	9.322633	21.87048	8.714876	12.295662	15.888646	21.33841	12.051565	
## 19	9.447187	27.92150	8.040773	9.121950	17.378285	29.49340	13.986585	
## 20	9.598510	27.07087	7.807939	10.415893	15.854892	23.12706	11.512442	
## 21	8.335187	24.66545	7.790361	9.038129	16.616529	22.28476	12.031604	
## 23	9.565223	25.42206	8.771323	9.468288	15.065539	24.36829	10.358415	
## 24	8.438642	27.97673	8.473955	10.951688	12.671592	18.33988	6.635629	
## 25	9.439790	NA	8.613752	20.293679	13.916375	18.49862	7.481513	

## 26	8.954314	24.31267	17.990707	24.237810	15.120134	20.80061	9.996475
## 27	11.480787	19.99031	10.255215	10.923709	17.310957	25.28210	13.429490
## 28	8.748695	26.20443	7.940369	12.292991	15.518893	20.79229	10.095299
## 29	10.577026	NA	8.761090	9.023115	19.547397	23.63638	14.052324
## 30	13.691213	NA	12.038068	20.929919	15.678849	22.63025	12.604779
## 31	8.203141	NA	8.233775	17.425917	17.354687	21.23689	11.883716
## 32	9.725386	24.64733	6.814177	11.003653	13.408224	20.03371	8.345564
## 33	10.881357	25.72409	10.267396	11.219287	15.989496	20.77055	12.250654
## 34	11.739965	21.94526	12.198908	12.960735	16.747558	20.53246	12.528826
## 35	8.942380	24.38990	8.418066	9.847442	16.538393	25.24495	13.094121
## 36	9.036738	22.05586	7.435172	13.026381	16.057834	21.49756	9.855434
## 37	8.848435	25.72081	8.204233	9.882749	18.079438	22.91124	13.067838
## 38	9.752966	28.66910	9.577180	10.404196	17.139011	21.85548	11.827515
## 39	11.495214	20.75777	10.413618	11.989536	14.774482	19.67674	10.561795
## 40	7.154126	23.86028	7.951477	15.116064	10.230339	17.36359	6.389641
## 41	8.987010	27.49619	9.597302	21.741745	16.270490	23.07639	11.793558
## 42	10.481867	23.27109	9.326657	9.908069	15.881726	19.59789	10.451906
## 43	10.481346	24.32100	8.573053	9.253118	16.642453	22.90715	11.241596
## 44	8.958850	NA	7.632720	8.440455	19.807910	24.18657	14.538603
## 45	9.836893	23.37686	9.851718	11.585622	14.407068	19.93898	9.089143
## 46	9.977461	24.92838	8.415812	8.076470	17.337172	21.63473	11.911375
## 47	9.029007	24.40325	9.316026	9.889951	13.850419	18.81508	8.848376
## 48	8.049613	NA	7.563250	12.350998	11.128010	17.17266	6.411566
## 49	9.385581	27.61566	8.563067	9.972695	15.725963	21.39350	10.193708
## 52	9.486106	23.34994	7.878306	10.787435	12.493822	17.79122	7.310284
## 53	8.136754	27.16886	10.834516	29.918079	13.929742	18.11990	8.629256
## 54	10.030781	16.37685	8.541946	8.852514	20.404963	25.36659	18.954379
## 55	9.531294	15.92918	7.957801	8.211709	24.785884	26.75319	20.016719
## 56	11.168791	17.07884	8.345124	10.313463	15.319679	24.26265	13.129234
## 57	9.563630	16.38449	8.132526	8.572920	23.240718	27.48604	20.110959
## 58	11.576390	17.15236	10.280913	10.532018	18.139879	26.70705	16.276033
## 62	9.928879	16.55492	8.291121	9.120236	13.839477	20.19892	11.149913
## 64	10.479662	16.32184	8.641474	8.817069	19.929199	25.53460	15.495881
## 65	10.788702	17.07038	9.428260	9.364003	18.078884	26.75811	15.947445
## 66	8.050492	16.71614	7.611355	7.888725	20.995390	23.38357	16.860413
## 67	10.108555	16.57170	9.364101	9.848285	15.544608	22.93460	14.208671
## 68	11.398526	16.60661	9.628627	9.639826	19.190942	23.87387	16.652335
## 69	10.256888	16.39160	9.063478	9.058345	20.478204	26.26590	17.174022
## 70	7.149357	25.63594	6.211322	10.154484	24.906656	27.00035	25.343128
## 72	9.016223	NA	9.246984	14.123916	24.948713	NA	20.327051
## 74	8.986193	27.97227	8.883982	23.694956	27.782637	25.83862	22.369721
## 76	8.747040	26.39468	7.865111	9.540464	19.913584	29.07498	20.531678
## 78	9.505613	20.34651	9.117813	10.210623	25.644537	26.89351	NA
## 80	7.028294	NA	9.249620	25.681823	23.705403	NA	22.103932
## 82	7.679259	28.01318	7.529806	12.495365	24.056632	25.88560	22.478307
## 84	8.823074	NA	7.071763	8.979468	18.841489	26.76586	17.501629
## 86	10.566932	NA	10.301982	15.246147	24.071985	NA	23.274190
## 88	8.015308	26.53156	6.875894	15.616582	18.824360	24.66802	17.465761
## 90	7.324264	27.47612	6.626930	13.267206	25.219254	NA	21.147130
## 92	7.796770	NA	8.052046	18.066238	24.484515	24.82501	20.284544
## 94	10.259382	16.46249	8.504597	8.874519	20.875416	24.39808	15.645345
## 95	9.255368	NA	8.579815	29.113148	28.078962	27.33835	23.238054
## 97	10.008556	NA	8.371019	9.336553	24.674035	25.71248	18.281386
## 98	10.729052	16.12279	9.020236	9.326122	17.670409	22.21427	14.413171

## 99	9.706705	15.60862	8.225850	8.669181	17.396433	22.32535	14.702480	
## 100	7.212158	28.72646	11.580169	26.744894	20.536848	28.81700	18.202079	
## 101	10.292874	16.43850	8.630854	8.630570	17.291781	24.59491	13.107441	
## 102	9.925298	17.66268	9.721816	10.491249	15.854700	22.79706	13.918555	
## 103	14.224817	20.66631	12.365167	12.636119	18.984608	NA	17.449930	
## 104	11.186153	16.54841	9.411632	9.773155	28.008621	26.55833	18.319490	
## 105	10.323671	17.42215	8.655927	9.526401	18.953311	27.12947	14.636746	
## 106	9.898791	17.78050	8.541098	8.728032	16.724469	24.81094	13.893756	
## 107	10.261519	17.17013	8.567059	8.840712	17.923550	22.33892	14.983365	
## 108	7.290380	28.70681	6.445662	9.138264	13.951069	23.72726	19.298295	
## 110	11.602668	17.49598	9.719942	10.305993	10.797975	25.57028	15.192410	
## 111	11.183381	17.01788	9.354890	9.778690	10.666151	24.28717	15.899326	
## 112	10.668408	16.28529	8.850896	9.096841	10.200785	23.38032	17.084020	
## 113	9.601861	16.79333	7.966876	8.117302	9.107979	22.97322	13.150899	
## 114	9.425018	16.97132	7.794905	8.401166	9.336994	NA	14.976505	
## 115	9.436140	24.79474	8.197041	9.244237	9.956077	26.18841	14.769298	
## 116	9.375088	17.69353	8.866534	9.777502	10.271472	19.15281	11.580540	
## 117	8.839694	19.82217	7.487277	8.125193	8.844189	23.92244	16.403453	
## 119	9.457993	18.28340	8.071410	8.206934	9.252441	25.46251	18.080968	
## 121	9.304423	23.43023	7.997043	9.088218	9.269372	22.09169	14.474276	
## 123	8.739251	20.15552	9.256436	10.444694	10.814310	26.34456	16.246197	
## 125	12.235026	19.78562	11.179115	11.697763	12.527439	24.33736	15.324285	
## 126	10.412347	19.15029	9.342203	9.990472	11.061339	NA	17.020771	
## 128	8.635025	19.64736	7.290007	8.052774	8.988102	26.30723	14.632568	
## 130	9.722631	18.87126	8.935368	10.212263	10.256080	NA	12.848529	
## 132	8.832139	17.72639	7.722895	8.278575	9.471053	26.67078	14.317981	
## 134	10.745571	18.11004	9.538819	10.048293	10.673092	NA	17.197486	
## 136	10.781881	19.84596	9.299197	9.821379	10.803154	24.99690	18.261446	
## 140	8.890484	21.49815	8.237312	8.762589	9.752521	NA	12.442283	
## 142	9.496184	20.05410	7.969417	8.572635	9.429172	23.67079	12.798479	
## 144	11.492399	18.39825	10.125236	10.724162	11.321831	19.99873	13.183301	
## 145	10.481360	18.73255	9.916628	10.691091	11.307609	29.54948	13.589753	
## 147	9.314263	19.02520	8.686559	9.464939	10.506455	23.17187	17.830669	
## 149	8.418992	24.76759	7.942093	9.095062	9.772552	21.21622	19.134550	
## 151	8.419839	21.41300	6.748056	7.525599	8.790171	22.99591	18.326325	
## 153	9.344918	21.30055	7.847138	8.507111	9.580745	25.42788	14.002123	
## 155	10.113600	19.62256	10.336654	11.690665	10.798740	23.75737	12.101815	
## 156	9.677846	16.56573	7.916451	8.172702	9.524207	26.10599	18.523070	
## 158	8.701905	20.94546	7.665722	8.340444	9.444841	24.42321	16.724064	
##	PRF1	RETNLB	SOCS1	TICAM1	TNF	IL.17A	GAPDH	IL.13
## 1	27.53290	11.389996	13.025961	19.82281	21.01065	NA	NA	NA
## 2	26.26383	7.857130	10.292493	17.66099	22.36282	27.31730	NA	NA
## 3	NA	9.184355	9.205008	19.11736	22.81213	22.76158	NA	NA
## 4	23.24062	3.920192	10.692568	15.46167	18.96024	23.59277	NA	NA
## 5	27.09015	8.711133	10.586118	17.03506	24.77639	27.66435	NA	NA
## 6	27.84301	15.803676	10.037031	18.92915	25.01909	28.88865	NA	NA
## 7	23.54348	11.930951	10.137282	17.89026	20.40686	NA	NA	NA
## 8	28.00436	10.795116	10.187464	17.98634	21.91510	26.90213	NA	NA
## 9	NA	11.763447	9.833251	20.04689	25.99834	29.39321	NA	NA
## 10	20.45141	4.079604	11.242170	15.12650	18.21831	23.50087	NA	NA
## 11	NA	12.512554	8.390115	17.00279	24.39284	27.71849	NA	NA
## 12	21.01384	3.598778	8.892853	14.34632	18.18376	24.03781	NA	NA
## 13	25.10224	11.645965	10.674034	15.64940	20.93638	25.66384	NA	NA
## 15	27.17679	12.534258	11.718299	17.56715	20.51972	23.02245	NA	NA

## 16	24.64252	11.212956	10.034478	16.84957	22.49043	25.13329	NA	NA
## 17	22.71284	6.937463	10.044808	15.08446	17.05868	29.06355	NA	NA
## 18	26.20900	5.973854	10.589004	17.65482	19.35511	21.39723	NA	NA
## 19	25.66098	14.362461	10.790189	18.71333	23.10196	24.22595	NA	NA
## 20	NA	5.662282	10.323638	15.91257	19.63243	24.44564	NA	NA
## 21	23.09671	6.708141	9.097796	16.83769	19.32845	27.21590	NA	NA
## 23	25.16968	8.373846	10.727382	15.39051	19.76802	NA	NA	NA
## 24	22.09717	3.437346	10.438836	13.27494	18.82194	27.67691	NA	NA
## 25	22.59840	4.203089	9.684278	13.27406	22.08087	17.21984	NA	NA
## 26	24.78750	4.605416	10.017204	15.04402	23.69131	25.87087	NA	NA
## 27	25.69449	9.644582	12.041930	19.34746	26.10923	NA	NA	NA
## 28	26.11614	6.063100	9.980612	14.75829	18.44981	23.57426	NA	NA
## 29	NA	12.795983	9.838008	22.32244	29.87482	24.34957	NA	NA
## 30	28.71924	13.919183	15.560557	16.95622	20.43844	NA	NA	NA
## 31	29.16415	9.982388	9.482890	14.86344	21.08135	24.11874	NA	NA
## 32	21.10798	5.917482	11.194286	13.04953	16.84558	22.43741	NA	NA
## 33	28.50238	10.511800	11.429176	16.45653	24.00758	NA	NA	NA
## 34	29.53929	10.842803	12.155859	17.76277	21.50840	NA	NA	NA
## 35	25.38933	11.824440	9.660671	15.41369	20.83225	24.01816	NA	NA
## 36	25.56295	7.036342	8.830993	15.62009	20.40643	25.94759	NA	NA
## 37	NA	12.132540	9.535813	16.56348	22.45497	NA	NA	NA
## 38	NA	9.879838	11.097173	16.94929	24.08582	NA	NA	NA
## 39	21.14482	8.466972	12.429422	15.73371	16.46384	23.22126	NA	NA
## 40	18.08027	3.785109	10.974022	12.41300	13.78664	20.40108	NA	NA
## 41	24.78306	5.259263	10.307205	14.37050	19.70445	24.74768	NA	NA
## 42	NA	11.495341	11.487913	16.29785	20.60002	22.43801	NA	NA
## 43	NA	7.758496	11.493739	17.45863	22.01304	29.55073	NA	NA
## 44	29.51591	9.225770	9.632405	17.44476	21.63822	24.71555	NA	NA
## 45	20.38618	4.346449	11.657992	15.33566	15.86004	18.20036	NA	NA
## 46	28.11725	9.187486	10.970666	19.30253	21.39020	26.03227	NA	NA
## 47	21.15985	4.867295	11.106637	15.25927	16.16250	21.86356	NA	NA
## 48	21.54708	3.690941	10.228503	13.47368	18.09514	29.17745	NA	NA
## 49	23.41759	8.189116	10.139407	15.24493	17.65270	24.21543	NA	NA
## 52	25.89262	4.204721	10.569843	12.91764	17.50383	24.76340	NA	NA
## 53	19.92611	3.577107	10.324091	14.54200	16.01331	19.44051	NA	NA
## 54	26.01465	10.749170	11.024760	21.19794	21.01304	25.25417	NA	NA
## 55	27.09819	9.755923	10.478270	22.50241	21.56508	28.39958	NA	NA
## 56	27.12899	10.841208	12.989070	16.99448	20.03119	24.29158	NA	NA
## 57	27.18535	9.478791	10.607035	21.82549	21.98348	27.18482	NA	NA
## 58	25.41207	12.030827	13.123553	21.09282	21.07389	21.40125	NA	NA
## 62	21.79024	9.145387	10.833533	15.29784	19.01250	24.39017	NA	NA
## 64	26.41866	9.278296	11.303618	21.34152	21.31616	26.73246	NA	NA
## 65	25.29939	9.923647	11.828319	19.06670	21.78523	NA	NA	NA
## 66	NA	8.262385	8.890513	20.80948	23.70044	NA	NA	NA
## 67	25.11673	9.047844	11.867247	16.30778	18.36694	22.32878	NA	NA
## 68	28.88317	9.635853	12.837053	19.15818	22.89580	25.95189	NA	NA
## 69	23.85662	9.703631	11.627023	21.52452	22.65241	27.28047	NA	NA
## 70	NA	18.572389	8.318661	29.57724	23.13135	25.03445	NA	NA
## 72	NA	17.913556	10.084373	25.58661	NA	NA	NA	NA
## 74	27.59474	20.897073	9.482244	24.73153	27.59754	27.80751	NA	NA
## 76	NA	16.332964	9.665532	21.42768	23.91542	26.29502	NA	NA
## 78	NA	9.493187	11.330597	26.12898	26.67485	26.83890	NA	NA
## 80	NA	14.714598	8.041715	24.10520	28.93255	28.74184	NA	NA
## 82	25.43324	20.720319	7.087203	26.26861	27.69078	24.88612	NA	NA

## 84	NA	10.975465	9.162248	19.60484	29.13404	24.18267	NA	NA		
## 86	NA	22.021335	13.581984	NA	28.37664	NA	NA	NA		
## 88	26.78273	13.342864	8.919463	19.84097	25.19713	25.20945	NA	NA		
## 90	26.69613	20.083060	7.158283	23.30618	28.17372	26.81986	NA	NA		
## 92	28.62742	22.004654	8.871887	23.74250	28.31769	25.16803	NA	NA		
## 94	26.19344	9.526062	11.755902	21.52548	20.79691	25.44602	NA	NA		
## 95	28.89657	18.031914	9.895583	25.98677	NA	26.98194	NA	NA		
## 97	29.79103	15.178442	10.393341	22.46358	27.50077	28.02264	NA	NA		
## 98	25.55363	9.661429	12.013956	18.22035	19.84642	26.38589	NA	NA		
## 99	24.21456	8.805372	11.222371	20.81727	19.51511	22.68459	NA	NA		
## 100	NA	16.855267	8.065261	20.60755	23.72752	NA	NA	NA		
## 101	26.21215	9.441200	11.032251	20.47256	20.23849	23.74437	NA	NA		
## 102	23.15837	9.722345	12.451737	20.65242	17.12110	22.29789	NA	NA		
## 103	26.79236	13.220426	14.919748	20.57782	22.50920	25.33117	NA	NA		
## 104	27.50508	10.058471	12.308402	22.04861	23.31357	25.23458	NA	NA		
## 105	24.06304	10.004453	11.728596	24.10621	21.72844	26.79136	NA	NA		
## 106	23.62678	9.365788	11.073955	17.51909	19.97281	27.93933	NA	NA		
## 107	23.77440	9.192797	11.689073	18.09591	20.75239	29.78785	NA	NA		
## 108	23.93945	15.923781	7.757090	27.17214	25.43076	25.57618	2.748428	24.65534		
## 110	25.88464	11.281775	12.009186	21.10553	22.98131	23.67780	5.193404	18.29073		
## 111	NA	10.982572	12.330284	20.82249	21.80276	25.19757	5.124103	20.04791		
## 112	NA	10.944685	11.589537	23.26258	20.96380	23.87070	4.732154	21.35713		
## 113	27.10505	8.885230	11.076750	16.22269	18.16059	21.48596	3.773862	15.43664		
## 114	24.29967	10.008384	10.705349	22.69601	20.23189	23.14650	3.883404	17.92247		
## 115	NA	10.995071	10.401308	20.49431	21.47300	26.50184	3.781868	18.98706		
## 116	19.06725	7.547668	11.758377	17.68614	16.26408	20.58902	4.826666	14.23954		
## 117	25.49845	9.999622	9.756697	21.55859	21.56077	23.34107	3.288691	19.69519		
## 119	26.64396	9.906633	10.453336	22.37117	22.84888	22.98972	3.764242	20.64206		
## 121	28.07379	9.665312	9.605007	20.07661	20.12716	24.11843	3.583590	17.74507		
## 123	23.49281	9.661908	9.225406	21.56845	22.03168	23.95907	3.530609	19.52374		
## 125	23.94627	12.576263	12.867410	20.08692	20.32090	27.45492	6.323172	17.34487		
## 126	24.18033	11.724569	10.427714	27.52816	26.40631	26.25363	4.399915	22.61048		
## 128	23.92448	7.985537	9.284697	19.19948	18.33022	24.26162	3.236068	16.52889		
## 130	28.09646	5.846103	10.089456	18.04099	19.42994	22.77294	4.566144	15.64012		
## 132	22.17432	8.544338	9.708748	19.40001	18.85483	23.09182	3.565913	15.96387		
## 134	25.97794	11.387807	11.285548	22.13123	21.26313	24.48532	5.064094	19.78487		
## 136	NA	10.488427	11.445105	22.62902	25.72357	26.97360	4.605335	23.10120		
## 140	22.26847	10.541307	9.678177	16.57747	17.42194	23.16217	3.620965	14.96183		
## 142	24.50357	8.477857	10.166476	17.26136	17.46136	23.57394	4.168857	15.84020		
## 144	23.04488	10.740533	11.861010	20.43164	17.80555	26.62705	5.525789	16.83008		
## 145	22.51975	10.484425	12.108359	20.85134	16.34527	23.47938	5.455238	15.73607		
## 147	25.18772	11.220518	9.548208	22.43535	22.25967	25.85111	3.645127	21.41995		
## 149	24.28532	10.960531	8.968065	23.16068	23.48999	23.41591	3.068848	21.10862		
## 151	24.24964	10.019037	8.531568	21.37614	20.82249	22.83479	2.998611	20.67509		
## 153	NA	8.590075	8.871211	17.57769	19.73392	23.30303	3.760593	16.81424		
## 155	20.88617	6.927890	13.408973	17.53509	16.57800	25.73077	6.531429	14.49658		
## 156	28.46406	10.098975	10.393635	23.04097	22.15808	23.81269	3.633117	20.31023		
## 158	27.33021	10.388094	8.474758	19.93831	21.28205	25.62297	2.765972	20.25871		
##	Position	CD4	Treg	Div_Treg	Treg17	Th1	Div_Th1	Th17	Div_Th17	CD8
## 1	mLN	44.900	6.385	16.205	13.520	6.780	71.200	0.890	46.875	14.390
## 2	mLN	46.145	7.005	21.365	11.565	10.920	75.115	1.075	42.390	13.840
## 3	mLN	56.220	7.150	12.455	9.505	2.965	19.840	1.630	30.055	10.020
## 4	mLN	40.590	6.450	23.760	12.780	9.250	81.210	1.705	78.305	25.305
## 5	mLN	52.245	8.695	13.465	14.400	2.545	27.850	1.060	27.445	17.550

## 6	mLN	46.895	6.890	13.355	7.035	2.900	25.520	0.695	32.195	7.490
## 7	mLN	49.470	6.065	24.795	13.950	6.870	76.515	1.110	65.735	9.065
## 8	mLN	45.740	6.520	17.115	8.645	9.585	51.870	1.090	40.600	13.995
## 9	mLN	46.330	6.465	21.000	14.540	7.020	67.360	1.615	65.055	8.840
## 10	mLN	43.325	8.915	13.090	6.825	7.710	79.020	1.185	55.835	26.505
## 11	mLN	68.010	3.630	14.110	14.350	1.730	14.310	0.925	33.075	13.900
## 12	mLN	37.435	9.045	20.515	9.260	9.100	64.370	0.805	49.910	31.115
## 13	mLN	53.250	6.895	7.850	9.015	2.505	19.190	0.945	28.815	18.080
## 15	mLN	47.340	6.465	16.775	13.315	4.840	54.635	0.970	35.275	19.235
## 16	mLN	61.525	5.650	12.710	9.660	1.875	29.575	0.535	21.155	17.080
## 17	mLN	51.475	6.690	12.110	7.535	1.455	21.435	0.550	22.920	28.360
## 18	mLN	36.155	8.875	24.110	8.970	11.540	90.780	4.050	67.780	24.175
## 19	mLN	54.575	5.110	13.005	9.130	1.835	22.300	1.075	30.890	11.410
## 20	mLN	58.920	5.075	16.575	15.280	4.445	48.205	0.795	28.355	17.805
## 21	mLN	49.925	7.915	15.795	4.280	3.710	75.720	0.765	46.720	33.620
## 23	mLN	53.240	5.215	41.605	11.280	6.795	59.590	1.225	36.960	12.140
## 24	mLN	49.350	9.015	8.260	4.370	1.535	22.665	0.580	19.230	26.665
## 25	mLN	28.295	27.230	38.210	8.875	5.925	65.700	1.935	41.455	35.575
## 26	mLN	53.270	6.670	23.525	7.885	3.540	53.200	1.360	24.045	17.865
## 27	mLN	54.265	9.475	10.550	4.220	1.425	22.075	1.070	31.665	27.880
## 28	mLN	48.490	5.220	36.585	17.105	3.370	72.075	0.620	38.040	27.135
## 29	mLN	56.780	4.835	16.835	13.005	1.735	11.910	1.120	50.070	18.020
## 30	mLN	67.430	3.900	13.000	12.720	1.855	13.035	1.440	19.120	14.640
## 31	mLN	53.510	4.525	30.580	17.135	5.615	41.680	0.975	22.355	7.365
## 32	mLN	49.935	6.265	43.855	12.800	5.395	56.130	0.875	30.460	13.720
## 33	mLN	42.860	8.465	8.225	10.045	1.780	31.145	1.110	63.235	20.855
## 34	mLN	55.305	7.315	22.150	12.340	1.835	34.180	1.010	12.905	12.335
## 35	mLN	52.100	5.205	31.795	18.210	2.740	21.990	0.730	27.275	18.260
## 36	mLN	48.705	11.315	19.245	7.590	3.110	35.555	1.435	39.995	26.645
## 37	mLN	42.070	5.530	31.595	9.750	3.055	29.220	0.840	30.170	7.725
## 38	mLN	55.005	4.635	17.730	12.165	1.510	28.170	0.660	9.700	21.500
## 39	mLN	55.135	4.955	19.550	6.445	1.305	27.140	0.485	19.200	27.155
## 40	mLN	48.920	14.300	52.620	14.605	7.425	79.505	1.730	69.700	21.090
## 41	mLN	60.705	3.740	36.475	18.505	5.280	48.670	1.940	24.220	18.575
## 42	mLN	49.850	4.700	26.940	8.940	3.020	22.305	1.400	21.805	10.375
## 43	mLN	53.755	9.235	19.495	6.415	1.375	27.520	0.830	28.285	29.465
## 44	mLN	48.380	6.965	36.775	9.390	4.130	60.855	0.680	27.710	24.340
## 45	mLN	46.695	9.310	34.995	6.330	2.810	76.265	0.635	46.690	28.860
## 46	mLN	58.170	7.095	12.905	5.325	1.330	22.600	0.630	23.055	33.330
## 47	mLN	50.800	9.805	35.235	8.230	5.480	76.185	1.430	59.040	34.585
## 48	mLN	57.615	5.520	13.720	5.700	1.235	29.350	0.590	20.910	32.530
## 49	mLN	67.755	3.245	22.775	17.040	1.835	15.255	1.080	12.220	14.995
## 52	mLN	NA	NA	NA	NA	NA	NA	NA	NA	NA
## 53	mLN	48.125	10.595	33.980	5.645	4.170	58.705	0.520	39.065	28.025
## 54	mLN	NA	NA	NA	NA	NA	NA	NA	NA	NA
## 55	mLN	NA	NA	NA	NA	NA	NA	NA	NA	NA
## 56	mLN	NA	NA	NA	NA	NA	NA	NA	NA	NA
## 57	mLN	NA	NA	NA	NA	NA	NA	NA	NA	NA
## 58	mLN	NA	NA	NA	NA	NA	NA	NA	NA	NA
## 62	mLN	NA	NA	NA	NA	NA	NA	NA	NA	NA
## 64	mLN	NA	NA	NA	NA	NA	NA	NA	NA	NA
## 65	mLN	NA	NA	NA	NA	NA	NA	NA	NA	NA
## 66	mLN	NA	NA	NA	NA	NA	NA	NA	NA	NA
## 67	mLN	NA	NA	NA	NA	NA	NA	NA	NA	NA

## 68	mLN	NA	NA	NA	NA	NA	NA	NA	NA	NA
## 69	mLN	NA	NA	NA	NA	NA	NA	NA	NA	NA
## 70	Spleen	13.200	19.100	22.500	1.810	10.600	37.200	1.350	37.000	6.110
## 72	mLN	17.900	11.800	34.500	11.500	13.100	63.500	3.160	64.200	9.980
## 74	mLN	27.200	11.500	25.600	9.050	4.780	54.900	2.170	42.700	8.930
## 76	mLN	52.600	14.400	8.070	3.230	4.830	15.800	1.530	13.300	15.400
## 78	Spleen	16.300	20.500	21.400	2.740	18.000	47.700	2.440	48.800	4.880
## 80	mLN	20.300	11.100	30.600	12.100	6.870	63.100	3.790	65.800	5.870
## 82	mLN	25.400	12.000	23.200	9.410	9.080	49.700	2.060	52.400	6.140
## 84	mLN	31.500	17.500	13.600	17.500	5.730	19.400	2.350	12.400	14.700
## 86	Spleen	15.800	21.500	21.900	3.680	19.500	46.400	1.900	53.600	7.310
## 88	mLN	37.700	7.470	21.600	10.500	2.700	27.500	1.510	54.300	10.500
## 90	mLN	25.300	7.830	41.200	8.040	6.850	83.700	1.190	73.900	7.560
## 92	mLN	28.300	16.700	45.100	5.680	7.260	70.200	1.450	47.700	5.790
## 94	mLN	NA	NA	NA	NA	NA	NA	NA	NA	NA
## 95	Spleen	21.200	18.200	14.900	2.220	7.110	12.200	0.790	12.100	5.170
## 97	mLN	NA	NA	NA	NA	NA	NA	NA	NA	NA
## 98	mLN	NA	NA	NA	NA	NA	NA	NA	NA	NA
## 99	mLN	NA	NA	NA	NA	NA	NA	NA	NA	NA
## 100	mLN	NA	NA	NA	NA	NA	NA	NA	NA	NA
## 101	mLN	NA	NA	NA	NA	NA	NA	NA	NA	NA
## 102	mLN	NA	NA	NA	NA	NA	NA	NA	NA	NA
## 103	mLN	NA	NA	NA	NA	NA	NA	NA	NA	NA
## 104	mLN	NA	NA	NA	NA	NA	NA	NA	NA	NA
## 105	mLN	NA	NA	NA	NA	NA	NA	NA	NA	NA
## 106	mLN	NA	NA	NA	NA	NA	NA	NA	NA	NA
## 107	mLN	NA	NA	NA	NA	NA	NA	NA	NA	NA
## 108	mLN	NA	NA	NA	NA	NA	NA	NA	NA	NA
## 110	mLN	NA	NA	NA	NA	NA	NA	NA	NA	NA
## 111	mLN	NA	NA	NA	NA	NA	NA	NA	NA	NA
## 112	mLN	NA	NA	NA	NA	NA	NA	NA	NA	NA
## 113	mLN	NA	NA	NA	NA	NA	NA	NA	NA	NA
## 114	mLN	NA	NA	NA	NA	NA	NA	NA	NA	NA
## 115	mLN	NA	NA	NA	NA	NA	NA	NA	NA	NA
## 116	mLN	NA	NA	NA	NA	NA	NA	NA	NA	NA
## 117	Spleen	27.200	5.900	19.300	4.270	4.400	21.700	0.920	19.200	6.860
## 119	Spleen	36.000	5.160	22.100	4.980	4.950	22.500	1.080	17.600	8.610
## 121	Spleen	29.600	4.970	15.700	6.010	6.720	48.900	1.510	25.300	7.570
## 123	mLN	48.200	12.400	17.900	7.520	3.990	52.900	2.200	36.600	26.100
## 125	mLN	NA	NA	NA	NA	NA	NA	NA	NA	NA
## 126	Spleen	27.300	6.370	19.500	4.390	8.860	53.900	1.100	25.800	6.360
## 128	Spleen	17.100	12.700	17.800	2.590	4.080	43.200	2.100	16.300	17.600
## 130	Spleen	13.300	13.400	18.000	6.200	6.450	47.000	4.140	27.000	11.100
## 132	mLN	41.600	12.900	23.000	6.090	3.800	56.500	2.160	35.900	25.200
## 134	mLN	44.300	6.690	40.900	11.000	6.350	71.900	1.470	56.200	13.900
## 136	Spleen	33.700	5.690	24.100	4.150	6.420	24.400	1.370	13.800	7.680
## 140	mLN	43.400	5.480	24.900	13.100	5.660	62.700	1.320	36.100	14.500
## 142	mLN	46.300	8.690	32.700	13.300	9.290	51.800	1.280	27.100	13.900
## 144	mLN	NA	NA	NA	NA	NA	NA	NA	NA	NA
## 145	Spleen	15.200	16.400	32.700	2.320	5.290	73.100	2.400	20.000	16.700
## 147	Spleen	17.500	12.900	15.800	2.960	6.210	23.300	1.720	20.500	16.700
## 149	Spleen	19.800	12.800	14.600	2.220	4.100	25.400	1.910	17.400	16.800
## 151	mLN	60.000	5.260	16.000	9.450	3.040	26.100	0.780	15.100	17.500
## 153	Spleen	28.900	6.130	14.600	5.400	4.660	35.400	1.310	25.400	9.000

## 155	mLN	NA	NA	NA	NA	NA	NA	NA	NA	NA
## 156	Spleen	36.000	5.900	20.500	4.530	5.780	22.600	0.790	14.600	7.230
## 158	Spleen	32.600	5.930	14.600	4.570	4.560	30.100	0.970	20.100	7.800
##	Act_CD8	Div_Act_CD8	IFNy_CD4	IFNy_CD8	OPG_0	IFNy_FEC	Caecum			
## 1	11.500	49.520	4.915	21.740	15567.7656	7.0252612	pos			
## 2	13.205	59.090	9.085	27.535	79646.0177	4.9987531	pos			
## 3	10.915	11.535	3.045	41.360	0.0000	1.6566446	neg			
## 4	11.105	55.935	9.085	38.165	53380.7829	0.8876691	pos			
## 5	9.815	12.830	2.005	19.390	0.0000	1.7767341	pos			
## 6	5.395	21.310	2.795	19.230	0.0000	4.8692310	neg			
## 7	8.900	55.690	8.455	34.310	41411.0429	5.9821940	pos			
## 8	9.200	55.970	8.755	28.690	5263.1579	2.1203409	pos			
## 9	8.375	45.895	12.910	46.265	33261.8026	0.9399154	pos			
## 10	18.260	38.450	4.590	27.800	157608.6957	3.4798154	pos			
## 11	3.785	8.985	1.690	13.755	0.0000	5.6873089	pos			
## 12	13.460	38.515	9.600	30.505	1798.5612	5.6173881	pos			
## 13	3.455	8.710	1.950	13.490	350.1401	5.7496557	pos			
## 15	4.930	44.240	4.355	23.725	2767.5277	1.6243585	pos			
## 16	4.755	15.410	1.810	11.825	0.0000	10.7285611	pos			
## 17	5.640	6.335	1.650	16.100	0.0000	6.3485357	neg			
## 18	20.500	29.365	3.240	27.110	65602.8369	7.0619458	pos			
## 19	4.455	12.675	2.580	22.560	0.0000	3.4229556	neg			
## 20	7.630	39.930	4.845	26.830	11986.3014	6.9702448	pos			
## 21	13.385	33.365	1.740	16.375	34836.0656	2.8337684	pos			
## 23	10.910	47.475	2.620	16.955	0.0000	NA	neg			
## 24	4.740	7.560	1.760	14.625	0.0000	0.0000000	neg			
## 25	19.175	31.745	3.055	19.105	1760.5634	NA	neg			
## 26	11.125	29.020	2.900	23.535	32051.2821	NA	pos			
## 27	6.615	10.910	1.110	20.565	0.0000	15.6812527	neg			
## 28	6.945	43.535	2.015	11.530	1020.4082	NA	neg			
## 29	2.365	6.815	1.130	8.335	0.0000	9.6548723	neg			
## 30	4.765	7.740	1.825	15.605	0.0000	4.7844621	neg			
## 31	16.415	45.830	5.475	31.365	0.0000	NA	pos			
## 32	7.845	51.610	5.170	21.410	0.0000	NA	neg			
## 33	3.855	10.130	1.360	8.335	0.0000	1.6566446	neg			
## 34	3.985	23.610	1.225	10.585	0.0000	NA	neg			
## 35	2.810	15.015	2.010	8.880	0.0000	NA	neg			
## 36	17.735	27.745	3.215	34.270	0.0000	NA	neg			
## 37	6.500	18.930	3.605	22.265	0.0000	NA	neg			
## 38	3.325	12.075	0.410	3.605	0.0000	NA	neg			
## 39	3.900	6.500	1.020	7.420	0.0000	NA	neg			
## 40	21.605	36.210	2.315	14.775	4545.4545	NA	neg			
## 41	8.135	46.220	2.310	17.460	0.0000	NA	pos			
## 42	6.720	17.135	2.780	18.350	0.0000	NA	neg			
## 43	4.220	16.695	0.830	9.825	0.0000	NA	neg			
## 44	7.410	46.670	1.325	4.500	1666.6667	NA	pos			
## 45	7.460	43.700	1.455	7.310	85714.2857	NA	pos			
## 46	8.910	6.915	0.400	5.010	0.0000	NA	neg			
## 47	15.035	35.205	1.540	9.265	1968.5039	NA	pos			
## 48	7.580	9.960	0.430	4.315	0.0000	NA	neg			
## 49	5.160	6.565	1.070	9.730	0.0000	NA	neg			
## 52	NA	NA	NA	NA	NA	NA	<NA>			
## 53	12.985	49.650	2.520	14.905	37500.0000	NA	pos			
## 54	NA	NA	NA	NA	NA	NA	<NA>			

## 55	NA	NA	NA	NA	NA	NA	<NA>
## 56	NA	NA	NA	NA	NA	NA	<NA>
## 57	NA	NA	NA	NA	NA	NA	<NA>
## 58	NA	NA	NA	NA	NA	NA	<NA>
## 62	NA	NA	NA	NA	NA	NA	<NA>
## 64	NA	NA	NA	NA	NA	NA	<NA>
## 65	NA	NA	NA	NA	NA	NA	<NA>
## 66	NA	NA	NA	NA	NA	NA	<NA>
## 67	NA	NA	NA	NA	NA	NA	<NA>
## 68	NA	NA	NA	NA	NA	NA	<NA>
## 69	NA	NA	NA	NA	NA	NA	<NA>
## 70	29.500	17.000	8.740	51.000	NA	NA	<NA>
## 72	16.200	22.800	8.400	37.700	NA	NA	<NA>
## 74	12.400	30.600	2.850	23.700	NA	NA	<NA>
## 76	13.700	6.070	3.050	21.500	NA	NA	<NA>
## 78	43.000	25.100	13.500	54.900	NA	NA	<NA>
## 80	12.800	16.600	3.910	28.900	NA	NA	<NA>
## 82	20.500	22.500	9.130	50.100	NA	NA	<NA>
## 84	3.370	11.800	6.590	7.210	NA	NA	<NA>
## 86	21.000	22.100	17.300	31.300	NA	NA	<NA>
## 88	7.520	7.410	2.720	20.300	NA	NA	<NA>
## 90	26.500	42.500	3.110	22.000	NA	NA	<NA>
## 92	25.900	62.700	2.700	14.500	NA	NA	<NA>
## 94	NA	NA	NA	NA	NA	NA	<NA>
## 95	22.900	7.810	5.550	34.200	NA	NA	<NA>
## 97	NA	NA	NA	NA	NA	NA	<NA>
## 98	NA	NA	NA	NA	NA	NA	<NA>
## 99	NA	NA	NA	NA	NA	NA	<NA>
## 100	NA	NA	NA	NA	NA	NA	<NA>
## 101	NA	NA	NA	NA	NA	NA	<NA>
## 102	NA	NA	NA	NA	NA	NA	<NA>
## 103	NA	NA	NA	NA	NA	NA	<NA>
## 104	NA	NA	NA	NA	NA	NA	<NA>
## 105	NA	NA	NA	NA	NA	NA	<NA>
## 106	NA	NA	NA	NA	NA	NA	<NA>
## 107	NA	NA	NA	NA	NA	NA	<NA>
## 108	NA	NA	NA	NA	NA	NA	<NA>
## 110	NA	NA	NA	NA	NA	NA	<NA>
## 111	NA	NA	NA	NA	NA	NA	<NA>
## 112	NA	NA	NA	NA	NA	NA	<NA>
## 113	NA	NA	NA	NA	NA	NA	<NA>
## 114	NA	NA	NA	NA	NA	NA	<NA>
## 115	NA	NA	NA	NA	NA	NA	<NA>
## 116	NA	NA	NA	NA	NA	NA	<NA>
## 117	12.500	20.300	5.360	38.100	NA	NA	<NA>
## 119	10.700	13.000	3.670	17.600	NA	NA	<NA>
## 121	11.900	37.600	6.430	32.100	NA	NA	<NA>
## 123	14.000	38.100	1.670	21.100	NA	NA	<NA>
## 125	NA	NA	NA	NA	NA	NA	<NA>
## 126	17.500	44.700	6.430	32.200	NA	NA	<NA>
## 128	10.400	40.700	3.110	4.030	NA	NA	<NA>
## 130	5.070	40.400	8.720	13.200	NA	NA	<NA>
## 132	10.700	44.300	2.050	15.100	NA	NA	<NA>
## 134	20.900	52.200	2.920	31.400	NA	NA	<NA>

## 136	15.400	14.600	5.660	33.100	NA	NA	<NA>
## 140	18.600	40.200	1.890	16.700	NA	NA	<NA>
## 142	19.400	32.900	6.730	28.300	NA	NA	<NA>
## 144	NA	NA	NA	NA	NA	NA	<NA>
## 145	14.200	28.300	4.770	3.420	NA	NA	<NA>
## 147	11.300	20.100	4.750	14.200	NA	NA	<NA>
## 149	11.700	18.700	3.410	14.900	NA	NA	<NA>
## 151	8.380	7.740	1.700	14.500	NA	NA	<NA>
## 153	12.600	25.800	5.430	38.400	NA	NA	<NA>
## 155	NA	NA	NA	NA	NA	NA	<NA>
## 156	14.200	14.100	3.880	19.300	NA	NA	<NA>
## 158	9.610	24.600	5.460	32.600	NA	NA	<NA>
##	Treg_prop	IL17A_CD4	batch	max_dpi	max_OOC	max_WL	death
## 1	93.605	0.415	<NA>	8	245000	95.89271	challenge
## 2	92.970	0.385	<NA>	8	875000	100.00000	challenge
## 3	92.845	0.575	<NA>	8	0	96.43232	challenge
## 4	93.505	0.850	<NA>	8	1257500	98.74335	challenge
## 5	91.305	0.250	<NA>	8	0	100.00000	challenge
## 6	93.110	0.270	<NA>	8	0	99.93282	challenge
## 7	93.935	0.295	<NA>	8	1057500	97.89377	challenge
## 8	93.460	0.280	<NA>	8	377500	97.70174	challenge
## 9	93.535	0.610	<NA>	8	792500	88.95238	challenge
## 10	91.075	0.335	<NA>	8	437500	93.92239	challenge
## 11	96.360	0.385	<NA>	8	0	95.15714	challenge
## 12	90.935	0.640	<NA>	8	317500	100.00000	challenge
## 13	93.100	0.165	<NA>	8	12500	95.57685	challenge
## 15	93.510	0.730	<NA>	8	370000	91.07280	challenge
## 16	94.330	0.380	<NA>	8	0	94.30052	challenge
## 17	93.290	0.270	<NA>	8	0	94.26523	challenge
## 18	91.015	1.075	<NA>	8	317500	93.04491	challenge
## 19	94.870	0.480	<NA>	8	0	100.00000	challenge
## 20	94.905	0.420	<NA>	8	282500	89.84615	challenge
## 21	92.060	0.515	<NA>	8	605000	91.89463	challenge
## 23	94.730	0.600	<NA>	8	290000	89.59338	challenge
## 24	90.950	0.250	<NA>	8	0	93.03136	challenge
## 25	72.660	0.460	<NA>	8	102500	98.95883	challenge
## 26	93.260	0.760	<NA>	8	322500	95.67059	challenge
## 27	90.525	0.395	<NA>	8	0	98.71365	challenge
## 28	94.700	1.225	<NA>	8	135000	89.78434	challenge
## 29	95.165	0.385	<NA>	8	0	81.82957	challenge
## 30	96.080	0.525	<NA>	8	0	90.45106	challenge
## 31	95.405	0.465	<NA>	8	47500	91.25000	challenge
## 32	93.705	1.410	<NA>	8	180000	94.18167	challenge
## 33	91.535	0.350	<NA>	8	2500	93.44330	challenge
## 34	92.525	0.620	<NA>	8	0	98.81423	challenge
## 35	94.675	0.460	<NA>	8	0	95.25346	challenge
## 36	88.400	0.860	<NA>	8	0	100.00000	challenge
## 37	94.400	1.315	<NA>	8	0	100.00000	challenge
## 38	95.245	0.385	<NA>	8	0	89.44724	challenge
## 39	94.960	0.475	<NA>	8	0	100.00000	challenge
## 40	85.590	2.340	<NA>	8	205000	95.59719	challenge
## 41	96.200	0.600	<NA>	8	242500	100.00000	challenge
## 42	95.235	0.710	<NA>	8	0	100.00000	challenge
## 43	90.600	0.745	<NA>	8	0	96.33508	challenge

## 44	92.955	0.850	<NA>	8	242500	97.72220	challenge
## 45	90.590	1.605	<NA>	8	385000	97.27226	challenge
## 46	92.620	0.430	<NA>	8	0	98.32197	challenge
## 47	90.045	1.405	<NA>	8	200000	100.00000	challenge
## 48	94.320	0.335	<NA>	8	0	96.20061	challenge
## 49	96.645	0.180	<NA>	8	0	90.13790	challenge
## 52	NA	NA	<NA>	8	0	95.27483	challenge
## 53	89.265	2.040	<NA>	8	317500	97.82609	challenge
## 54	NA	NA	<NA>	8	47500	96.29630	challenge
## 55	NA	NA	<NA>	8	740000	91.00000	challenge
## 56	NA	NA	<NA>	8	2500	95.34884	challenge
## 57	NA	NA	<NA>	8	0	97.02128	challenge
## 58	NA	NA	<NA>	8	217500	83.74761	challenge
## 62	NA	NA	<NA>	8	5000	92.72388	challenge
## 64	NA	NA	<NA>	8	237500	83.63309	challenge
## 65	NA	NA	<NA>	8	0	93.62832	challenge
## 66	NA	NA	<NA>	8	-Inf	96.09053	challenge
## 67	NA	NA	<NA>	8	877500	89.18919	challenge
## 68	NA	NA	<NA>	8	10000	92.85714	challenge
## 69	NA	NA	<NA>	8	7500	87.40955	challenge
## 70	NA	NA	<NA>	8	680000	92.42640	challenge
## 72	NA	NA	<NA>	8	692500	92.33926	challenge
## 74	NA	NA	<NA>	8	1150000	95.22209	challenge
## 76	NA	NA	<NA>	8	0	100.00000	challenge
## 78	NA	NA	<NA>	8	307500	94.99249	challenge
## 80	NA	NA	<NA>	8	107500	84.42470	challenge
## 82	NA	NA	<NA>	8	1132500	87.68116	challenge
## 84	NA	NA	<NA>	8	0	97.31719	challenge
## 86	NA	NA	<NA>	8	280000	82.02273	challenge
## 88	NA	NA	<NA>	8	0	96.38135	challenge
## 90	NA	NA	<NA>	8	1420000	81.90944	challenge
## 92	NA	NA	<NA>	8	1270000	77.93483	challenge
## 94	NA	NA	<NA>	8	380000	84.21604	challenge
## 95	NA	NA	<NA>	8	0	93.92379	challenge
## 97	NA	NA	<NA>	8	330000	92.70073	challenge
## 98	NA	NA	<NA>	8	252500	91.33938	challenge
## 99	NA	NA	<NA>	8	870000	90.00549	challenge
## 100	NA	NA	<NA>	8	1107500	86.13021	challenge
## 101	NA	NA	<NA>	8	595000	79.90448	challenge
## 102	NA	NA	<NA>	8	170000	80.27901	challenge
## 103	NA	NA	<NA>	8	0	100.00000	challenge
## 104	NA	NA	<NA>	8	0	96.00216	challenge
## 105	NA	NA	<NA>	8	0	95.72031	challenge
## 106	NA	NA	<NA>	8	472500	91.56379	challenge
## 107	NA	NA	<NA>	8	205000	92.51337	challenge
## 108	NA	NA	<NA>	8	0	100.00000	challenge
## 110	NA	NA	<NA>	8	0	97.05285	challenge
## 111	NA	NA	<NA>	8	0	97.69611	challenge
## 112	NA	NA	<NA>	8	0	100.00000	challenge
## 113	NA	NA	<NA>	8	352500	96.27361	challenge
## 114	NA	NA	<NA>	8	802500	88.93849	challenge
## 115	NA	NA	<NA>	8	995000	100.00000	challenge
## 116	NA	NA	<NA>	8	350000	81.21109	challenge
## 117	NA	NA	b	8	0	95.29086	challenge

## 119	NA	NA	b	8	0	97.59101	challenge
## 121	NA	NA	b	8	307500	83.68759	challenge
## 123	NA	NA	b	8	222500	88.26446	challenge
## 125	NA	NA	<NA>	8	122500	77.00535	challenge
## 126	NA	NA	b	8	82500	92.01597	challenge
## 128	NA	NA	b	8	1447500	77.80488	challenge
## 130	NA	NA	b	8	17500	89.00647	challenge
## 132	NA	NA	b	8	155000	83.27273	challenge
## 134	NA	NA	b	8	72500	78.11052	challenge
## 136	NA	NA	b	8	0	95.77811	challenge
## 140	NA	NA	b	8	132500	75.33199	challenge
## 142	NA	NA	b	8	10000	90.31579	challenge
## 144	NA	NA	<NA>	8	0	80.74667	challenge
## 145	NA	NA	b	8	315000	73.44595	challenge
## 147	NA	NA	b	8	0	94.09011	challenge
## 149	NA	NA	b	8	0	97.17833	challenge
## 151	NA	NA	b	8	0	98.91892	challenge
## 153	NA	NA	b	8	70000	87.36789	challenge
## 155	NA	NA	<NA>	8	0	80.47099	challenge
## 156	NA	NA	b	8	0	94.55754	challenge
## 158	NA	NA	b	8	15000	88.39378	challenge
##	hybrid_status	Parasite_primary	Parasite_challenge	dpi_max	origin	Sex	
## 1	F1 hybrid	E_falciformis	E_ferrisi	8	Lab	<NA>	
## 2	F1 hybrid	E_falciformis	E_ferrisi	8	Lab	<NA>	
## 3	F0 M. m. domesticus	E_falciformis	uninfected	8	Lab	<NA>	
## 4	F1 hybrid	E_falciformis	E_ferrisi	8	Lab	<NA>	
## 5	F1 hybrid	E_falciformis	uninfected	8	Lab	<NA>	
## 6	F0 M. m. domesticus	E_falciformis	uninfected	8	Lab	<NA>	
## 7	F0 M. m. domesticus	E_falciformis	E_ferrisi	8	Lab	<NA>	
## 8	F1 M. m. domesticus	E_falciformis	E_ferrisi	8	Lab	<NA>	
## 9	F0 M. m. domesticus	E_falciformis	E_ferrisi	8	Lab	<NA>	
## 10	F1 M. m. musculus	E_falciformis	E_ferrisi	8	Lab	<NA>	
## 11	F0 M. m. domesticus	E_falciformis	uninfected	8	Lab	<NA>	
## 12	F1 hybrid	E_falciformis	E_ferrisi	8	Lab	<NA>	
## 13	F1 M. m. domesticus	E_falciformis	uninfected	8	Lab	<NA>	
## 15	F1 M. m. domesticus	E_falciformis	E_ferrisi	8	Lab	<NA>	
## 16	F1 hybrid	E_falciformis	uninfected	8	Lab	<NA>	
## 17	F1 hybrid	E_falciformis	uninfected	8	Lab	<NA>	
## 18	F0 M. m. musculus	E_falciformis	E_ferrisi	8	Lab	<NA>	
## 19	F0 M. m. domesticus	E_falciformis	uninfected	8	Lab	<NA>	
## 20	F0 M. m. domesticus	E_falciformis	E_ferrisi	8	Lab	<NA>	
## 21	F1 M. m. musculus	E_ferrisi	E_ferrisi	8	Lab	<NA>	
## 23	F0 M. m. domesticus	E_ferrisi	E_ferrisi	8	Lab	<NA>	
## 24	F1 hybrid	E_ferrisi	uninfected	8	Lab	<NA>	
## 25	F0 M. m. musculus	E_ferrisi	E_ferrisi	8	Lab	<NA>	
## 26	F1 hybrid	E_ferrisi	E_ferrisi	8	Lab	<NA>	
## 27	F0 M. m. musculus	E_ferrisi	uninfected	8	Lab	<NA>	
## 28	F1 hybrid	E_ferrisi	E_ferrisi	8	Lab	<NA>	
## 29	F1 M. m. domesticus	E_ferrisi	uninfected	8	Lab	<NA>	
## 30	F0 M. m. domesticus	E_ferrisi	uninfected	8	Lab	<NA>	
## 31	F1 M. m. domesticus	E_ferrisi	E_ferrisi	8	Lab	<NA>	
## 32	F1 M. m. domesticus	E_ferrisi	E_ferrisi	8	Lab	<NA>	
## 33	F1 hybrid	E_ferrisi	uninfected	8	Lab	<NA>	
## 34	F1 hybrid	E_ferrisi	uninfected	8	Lab	<NA>	

## 35	F1 M. m. domesticus	E_ferrisi	uninfected	8	Lab <NA>
## 36	F1 hybrid	E_ferrisi	uninfected	8	Lab <NA>
## 37	FO M. m. domesticus	E_ferrisi	uninfected	8	Lab <NA>
## 38	F1 hybrid	E_ferrisi	uninfected	8	Lab <NA>
## 39	F1 hybrid	E_ferrisi	uninfected	8	Lab <NA>
## 40	FO M. m. musculus	E_ferrisi	E_ferrisi	8	Lab <NA>
## 41	FO M. m. domesticus	E_ferrisi	E_ferrisi	8	Lab <NA>
## 42	FO M. m. domesticus	E_ferrisi	uninfected	8	Lab <NA>
## 43	FO M. m. musculus	E_ferrisi	uninfected	8	Lab <NA>
## 44	F1 hybrid	E_ferrisi	E_ferrisi	8	Lab <NA>
## 45	FO M. m. musculus	E_ferrisi	E_ferrisi	8	Lab <NA>
## 46	F1 M. m. musculus	E_ferrisi	uninfected	8	Lab <NA>
## 47	F1 M. m. musculus	E_ferrisi	E_ferrisi	8	Lab <NA>
## 48	F1 M. m. musculus	E_ferrisi	uninfected	8	Lab <NA>
## 49	FO M. m. domesticus	E_ferrisi	uninfected	8	Lab <NA>
## 52	FO M. m. musculus	E_ferrisi	uninfected	8	Lab <NA>
## 53	FO M. m. musculus	E_ferrisi	E_ferrisi	8	Lab <NA>
## 54	other	E_falciformis	E_falciformis	8	Lab <NA>
## 55	other	E_falciformis	E_ferrisi	8	Lab <NA>
## 56	other	E_falciformis	uninfected	8	Lab <NA>
## 57	other	E_falciformis	uninfected	8	Lab <NA>
## 58	other	E_falciformis	E_ferrisi	8	Lab <NA>
## 62	other	E_ferrisi	uninfected	8	Lab <NA>
## 64	other	E_ferrisi	E_ferrisi	8	Lab <NA>
## 65	other	E_ferrisi	uninfected	8	Lab <NA>
## 66	other	uninfected	E_falciformis	2	Lab <NA>
## 67	other	uninfected	E_ferrisi	8	Lab <NA>
## 68	other	uninfected	uninfected	8	Lab <NA>
## 69	other	E_falciformis	E_falciformis	8	Lab <NA>
## 70	other	E_ferrisi	E_falciformis	8	Lab <NA>
## 72	other	E_ferrisi	E_falciformis	8	Lab <NA>
## 74	other	E_ferrisi	E_ferrisi	8	Lab <NA>
## 76	other	E_ferrisi	uninfected	8	Lab <NA>
## 78	other	E_falciformis	E_falciformis	8	Lab <NA>
## 80	other	E_falciformis	E_falciformis	8	Lab <NA>
## 82	other	E_falciformis	E_ferrisi	8	Lab <NA>
## 84	other	E_falciformis	uninfected	8	Lab <NA>
## 86	other	E_falciformis	E_falciformis	8	Lab <NA>
## 88	other	E_falciformis	uninfected	8	Lab <NA>
## 90	other	uninfected	E_falciformis	8	Lab <NA>
## 92	other	uninfected	E_falciformis	8	Lab <NA>
## 94	other	uninfected	E_ferrisi	5	Lab <NA>
## 95	other	uninfected	uninfected	8	Lab <NA>
## 97	FO M. m. domesticus	E_ferrisi	E_ferrisi	8	Lab <NA>
## 98	FO M. m. domesticus	E_ferrisi	E_ferrisi	8	Lab <NA>
## 99	FO M. m. musculus	E_ferrisi	E_ferrisi	8	Lab <NA>
## 100	FO M. m. domesticus	E_ferrisi	E_falciformis	8	Lab <NA>
## 101	FO M. m. domesticus	E_ferrisi	E_falciformis	8	Lab <NA>
## 102	FO M. m. musculus	E_ferrisi	E_falciformis	8	Lab <NA>
## 103	FO M. m. domesticus	E_ferrisi	uninfected	8	Lab <NA>
## 104	FO M. m. domesticus	E_ferrisi	uninfected	8	Lab <NA>
## 105	FO M. m. musculus	E_ferrisi	uninfected	8	Lab <NA>
## 106	FO M. m. domesticus	E_falciformis	E_falciformis	8	Lab <NA>
## 107	FO M. m. domesticus	E_falciformis	E_ferrisi	8	Lab <NA>

## 108	FO M. m. domesticus	E_falciformis	uninfected	8	Lab <NA>
## 110	FO M. m. domesticus	uninfected	uninfected	8	Lab <NA>
## 111	FO M. m. musculus	uninfected	uninfected	8	Lab <NA>
## 112	FO M. m. musculus	uninfected	uninfected	8	Lab <NA>
## 113	FO M. m. domesticus	uninfected	E_ferrisi	8	Lab <NA>
## 114	FO M. m. musculus	uninfected	E_ferrisi	8	Lab <NA>
## 115	FO M. m. domesticus	uninfected	E_falciformis	8	Lab <NA>
## 116	FO M. m. musculus	uninfected	E_falciformis	8	Lab <NA>
## 117	FO M. m. domesticus	E_ferrisi	E_ferrisi	8	Lab <NA>
## 119	FO M. m. domesticus	uninfected	uninfected	8	Lab <NA>
## 121	FO M. m. domesticus	uninfected	E_ferrisi	8	Lab <NA>
## 123	FO M. m. musculus	E_ferrisi	E_ferrisi	8	Lab <NA>
## 125	FO M. m. domesticus	uninfected	E_falciformis	7	Lab <NA>
## 126	FO M. m. domesticus	uninfected	E_ferrisi	8	Lab <NA>
## 128	FO M. m. musculus	E_ferrisi	E_falciformis	8	Lab <NA>
## 130	FO M. m. musculus	E_ferrisi	E_ferrisi	8	Lab <NA>
## 132	FO M. m. musculus	E_ferrisi	E_falciformis	8	Lab <NA>
## 134	FO M. m. domesticus	uninfected	E_ferrisi	8	Lab <NA>
## 136	FO M. m. domesticus	E_ferrisi	uninfected	8	Lab <NA>
## 140	FO M. m. domesticus	E_ferrisi	E_falciformis	8	Lab <NA>
## 142	FO M. m. domesticus	E_falciformis	E_falciformis	8	Lab <NA>
## 144	FO M. m. musculus	uninfected	E_ferrisi	6	Lab <NA>
## 145	FO M. m. musculus	E_ferrisi	E_falciformis	8	Lab <NA>
## 147	FO M. m. musculus	E_ferrisi	uninfected	8	Lab <NA>
## 149	FO M. m. musculus	uninfected	uninfected	8	Lab <NA>
## 151	FO M. m. domesticus	E_falciformis	uninfected	8	Lab <NA>
## 153	FO M. m. domesticus	E_falciformis	E_ferrisi	8	Lab <NA>
## 155	FO M. m. musculus	E_falciformis	E_ferrisi	6	Lab <NA>
## 156	FO M. m. domesticus	uninfected	uninfected	8	Lab <NA>
## 158	FO M. m. domesticus	E_ferrisi	E_ferrisi	8	Lab <NA>

[illegible]

[illegible]

[illegible]

[illegible]

51

[illegible]

## 155	<NA>	NA		NA	<NA>	<NA>	NA
## 156	<NA>	NA		NA	<NA>	<NA>	NA
## 158	<NA>	NA		NA	<NA>	<NA>	NA
##	Catenotaenia_pusilla	Address	Status	Left_Embryo	Right_Embryo	Worms_presence	
## 1		NA	<NA>	<NA>	NA	NA	NA
## 2		NA	<NA>	<NA>	NA	NA	NA
## 3		NA	<NA>	<NA>	NA	NA	NA
## 4		NA	<NA>	<NA>	NA	NA	NA
## 5		NA	<NA>	<NA>	NA	NA	NA
## 6		NA	<NA>	<NA>	NA	NA	NA
## 7		NA	<NA>	<NA>	NA	NA	NA
## 8		NA	<NA>	<NA>	NA	NA	NA
## 9		NA	<NA>	<NA>	NA	NA	NA
## 10		NA	<NA>	<NA>	NA	NA	NA
## 11		NA	<NA>	<NA>	NA	NA	NA
## 12		NA	<NA>	<NA>	NA	NA	NA
## 13		NA	<NA>	<NA>	NA	NA	NA
## 15		NA	<NA>	<NA>	NA	NA	NA
## 16		NA	<NA>	<NA>	NA	NA	NA
## 17		NA	<NA>	<NA>	NA	NA	NA
## 18		NA	<NA>	<NA>	NA	NA	NA
## 19		NA	<NA>	<NA>	NA	NA	NA
## 20		NA	<NA>	<NA>	NA	NA	NA
## 21		NA	<NA>	<NA>	NA	NA	NA
## 23		NA	<NA>	<NA>	NA	NA	NA
## 24		NA	<NA>	<NA>	NA	NA	NA
## 25		NA	<NA>	<NA>	NA	NA	NA
## 26		NA	<NA>	<NA>	NA	NA	NA
## 27		NA	<NA>	<NA>	NA	NA	NA
## 28		NA	<NA>	<NA>	NA	NA	NA
## 29		NA	<NA>	<NA>	NA	NA	NA
## 30		NA	<NA>	<NA>	NA	NA	NA
## 31		NA	<NA>	<NA>	NA	NA	NA
## 32		NA	<NA>	<NA>	NA	NA	NA
## 33		NA	<NA>	<NA>	NA	NA	NA
## 34		NA	<NA>	<NA>	NA	NA	NA
## 35		NA	<NA>	<NA>	NA	NA	NA
## 36		NA	<NA>	<NA>	NA	NA	NA
## 37		NA	<NA>	<NA>	NA	NA	NA
## 38		NA	<NA>	<NA>	NA	NA	NA
## 39		NA	<NA>	<NA>	NA	NA	NA
## 40		NA	<NA>	<NA>	NA	NA	NA
## 41		NA	<NA>	<NA>	NA	NA	NA
## 42		NA	<NA>	<NA>	NA	NA	NA
## 43		NA	<NA>	<NA>	NA	NA	NA
## 44		NA	<NA>	<NA>	NA	NA	NA
## 45		NA	<NA>	<NA>	NA	NA	NA
## 46		NA	<NA>	<NA>	NA	NA	NA
## 47		NA	<NA>	<NA>	NA	NA	NA
## 48		NA	<NA>	<NA>	NA	NA	NA
## 49		NA	<NA>	<NA>	NA	NA	NA
## 52		NA	<NA>	<NA>	NA	NA	NA
## 53		NA	<NA>	<NA>	NA	NA	NA
## 54		NA	<NA>	<NA>	NA	NA	NA

[illegible]

## 136	NA	<NA>	<NA>	NA	NA	NA
## 140	NA	<NA>	<NA>	NA	NA	NA
## 142	NA	<NA>	<NA>	NA	NA	NA
## 144	NA	<NA>	<NA>	NA	NA	NA
## 145	NA	<NA>	<NA>	NA	NA	NA
## 147	NA	<NA>	<NA>	NA	NA	NA
## 149	NA	<NA>	<NA>	NA	NA	NA
## 151	NA	<NA>	<NA>	NA	NA	NA
## 153	NA	<NA>	<NA>	NA	NA	NA
## 155	NA	<NA>	<NA>	NA	NA	NA
## 156	NA	<NA>	<NA>	NA	NA	NA
## 158	NA	<NA>	<NA>	NA	NA	NA
##	Heligmosomoides_polygurus	Heterakis_sp	counter	Date_count	N_oocysts_sq1	
## 1		NA	NA	<NA>	<NA>	NA
## 2		NA	NA	<NA>	<NA>	NA
## 3		NA	NA	<NA>	<NA>	NA
## 4		NA	NA	<NA>	<NA>	NA
## 5		NA	NA	<NA>	<NA>	NA
## 6		NA	NA	<NA>	<NA>	NA
## 7		NA	NA	<NA>	<NA>	NA
## 8		NA	NA	<NA>	<NA>	NA
## 9		NA	NA	<NA>	<NA>	NA
## 10		NA	NA	<NA>	<NA>	NA
## 11		NA	NA	<NA>	<NA>	NA
## 12		NA	NA	<NA>	<NA>	NA
## 13		NA	NA	<NA>	<NA>	NA
## 15		NA	NA	<NA>	<NA>	NA
## 16		NA	NA	<NA>	<NA>	NA
## 17		NA	NA	<NA>	<NA>	NA
## 18		NA	NA	<NA>	<NA>	NA
## 19		NA	NA	<NA>	<NA>	NA
## 20		NA	NA	<NA>	<NA>	NA
## 21		NA	NA	<NA>	<NA>	NA
## 23		NA	NA	<NA>	<NA>	NA
## 24		NA	NA	<NA>	<NA>	NA
## 25		NA	NA	<NA>	<NA>	NA
## 26		NA	NA	<NA>	<NA>	NA
## 27		NA	NA	<NA>	<NA>	NA
## 28		NA	NA	<NA>	<NA>	NA
## 29		NA	NA	<NA>	<NA>	NA
## 30		NA	NA	<NA>	<NA>	NA
## 31		NA	NA	<NA>	<NA>	NA
## 32		NA	NA	<NA>	<NA>	NA
## 33		NA	NA	<NA>	<NA>	NA
## 34		NA	NA	<NA>	<NA>	NA
## 35		NA	NA	<NA>	<NA>	NA
## 36		NA	NA	<NA>	<NA>	NA
## 37		NA	NA	<NA>	<NA>	NA
## 38		NA	NA	<NA>	<NA>	NA
## 39		NA	NA	<NA>	<NA>	NA
## 40		NA	NA	<NA>	<NA>	NA
## 41		NA	NA	<NA>	<NA>	NA
## 42		NA	NA	<NA>	<NA>	NA
## 43		NA	NA	<NA>	<NA>	NA

[illegible]

## 119		NA	NA	<NA>	<NA>	NA
## 121		NA	NA	<NA>	<NA>	NA
## 123		NA	NA	<NA>	<NA>	NA
## 125		NA	NA	<NA>	<NA>	NA
## 126		NA	NA	<NA>	<NA>	NA
## 128		NA	NA	<NA>	<NA>	NA
## 130		NA	NA	<NA>	<NA>	NA
## 132		NA	NA	<NA>	<NA>	NA
## 134		NA	NA	<NA>	<NA>	NA
## 136		NA	NA	<NA>	<NA>	NA
## 140		NA	NA	<NA>	<NA>	NA
## 142		NA	NA	<NA>	<NA>	NA
## 144		NA	NA	<NA>	<NA>	NA
## 145		NA	NA	<NA>	<NA>	NA
## 147		NA	NA	<NA>	<NA>	NA
## 149		NA	NA	<NA>	<NA>	NA
## 151		NA	NA	<NA>	<NA>	NA
## 153		NA	NA	<NA>	<NA>	NA
## 155		NA	NA	<NA>	<NA>	NA
## 156		NA	NA	<NA>	<NA>	NA
## 158		NA	NA	<NA>	<NA>	NA
##	N_oocysts_sq2	N_oocysts_sq3	N_oocysts_sq4	N_oocysts_sq5	N_oocysts_sq6	
## 1	NA	NA	NA	NA	NA	
## 2	NA	NA	NA	NA	NA	
## 3	NA	NA	NA	NA	NA	
## 4	NA	NA	NA	NA	NA	
## 5	NA	NA	NA	NA	NA	
## 6	NA	NA	NA	NA	NA	
## 7	NA	NA	NA	NA	NA	
## 8	NA	NA	NA	NA	NA	
## 9	NA	NA	NA	NA	NA	
## 10	NA	NA	NA	NA	NA	
## 11	NA	NA	NA	NA	NA	
## 12	NA	NA	NA	NA	NA	
## 13	NA	NA	NA	NA	NA	
## 15	NA	NA	NA	NA	NA	
## 16	NA	NA	NA	NA	NA	
## 17	NA	NA	NA	NA	NA	
## 18	NA	NA	NA	NA	NA	
## 19	NA	NA	NA	NA	NA	
## 20	NA	NA	NA	NA	NA	
## 21	NA	NA	NA	NA	NA	
## 23	NA	NA	NA	NA	NA	
## 24	NA	NA	NA	NA	NA	
## 25	NA	NA	NA	NA	NA	
## 26	NA	NA	NA	NA	NA	
## 27	NA	NA	NA	NA	NA	
## 28	NA	NA	NA	NA	NA	
## 29	NA	NA	NA	NA	NA	
## 30	NA	NA	NA	NA	NA	
## 31	NA	NA	NA	NA	NA	
## 32	NA	NA	NA	NA	NA	
## 33	NA	NA	NA	NA	NA	
## 34	NA	NA	NA	NA	NA	

## 35	NA	NA	NA	NA	NA
## 36	NA	NA	NA	NA	NA
## 37	NA	NA	NA	NA	NA
## 38	NA	NA	NA	NA	NA
## 39	NA	NA	NA	NA	NA
## 40	NA	NA	NA	NA	NA
## 41	NA	NA	NA	NA	NA
## 42	NA	NA	NA	NA	NA
## 43	NA	NA	NA	NA	NA
## 44	NA	NA	NA	NA	NA
## 45	NA	NA	NA	NA	NA
## 46	NA	NA	NA	NA	NA
## 47	NA	NA	NA	NA	NA
## 48	NA	NA	NA	NA	NA
## 49	NA	NA	NA	NA	NA
## 52	NA	NA	NA	NA	NA
## 53	NA	NA	NA	NA	NA
## 54	NA	NA	NA	NA	NA
## 55	NA	NA	NA	NA	NA
## 56	NA	NA	NA	NA	NA
## 57	NA	NA	NA	NA	NA
## 58	NA	NA	NA	NA	NA
## 62	NA	NA	NA	NA	NA
## 64	NA	NA	NA	NA	NA
## 65	NA	NA	NA	NA	NA
## 66	NA	NA	NA	NA	NA
## 67	NA	NA	NA	NA	NA
## 68	NA	NA	NA	NA	NA
## 69	NA	NA	NA	NA	NA
## 70	NA	NA	NA	NA	NA
## 72	NA	NA	NA	NA	NA
## 74	NA	NA	NA	NA	NA
## 76	NA	NA	NA	NA	NA
## 78	NA	NA	NA	NA	NA
## 80	NA	NA	NA	NA	NA
## 82	NA	NA	NA	NA	NA
## 84	NA	NA	NA	NA	NA
## 86	NA	NA	NA	NA	NA
## 88	NA	NA	NA	NA	NA
## 90	NA	NA	NA	NA	NA
## 92	NA	NA	NA	NA	NA
## 94	NA	NA	NA	NA	NA
## 95	NA	NA	NA	NA	NA
## 97	NA	NA	NA	NA	NA
## 98	NA	NA	NA	NA	NA
## 99	NA	NA	NA	NA	NA
## 100	NA	NA	NA	NA	NA
## 101	NA	NA	NA	NA	NA
## 102	NA	NA	NA	NA	NA
## 103	NA	NA	NA	NA	NA
## 104	NA	NA	NA	NA	NA
## 105	NA	NA	NA	NA	NA
## 106	NA	NA	NA	NA	NA
## 107	NA	NA	NA	NA	NA

## 108	NA	NA	NA	NA	NA	NA	
## 110	NA	NA	NA	NA	NA	NA	
## 111	NA	NA	NA	NA	NA	NA	
## 112	NA	NA	NA	NA	NA	NA	
## 113	NA	NA	NA	NA	NA	NA	
## 114	NA	NA	NA	NA	NA	NA	
## 115	NA	NA	NA	NA	NA	NA	
## 116	NA	NA	NA	NA	NA	NA	
## 117	NA	NA	NA	NA	NA	NA	
## 119	NA	NA	NA	NA	NA	NA	
## 121	NA	NA	NA	NA	NA	NA	
## 123	NA	NA	NA	NA	NA	NA	
## 125	NA	NA	NA	NA	NA	NA	
## 126	NA	NA	NA	NA	NA	NA	
## 128	NA	NA	NA	NA	NA	NA	
## 130	NA	NA	NA	NA	NA	NA	
## 132	NA	NA	NA	NA	NA	NA	
## 134	NA	NA	NA	NA	NA	NA	
## 136	NA	NA	NA	NA	NA	NA	
## 140	NA	NA	NA	NA	NA	NA	
## 142	NA	NA	NA	NA	NA	NA	
## 144	NA	NA	NA	NA	NA	NA	
## 145	NA	NA	NA	NA	NA	NA	
## 147	NA	NA	NA	NA	NA	NA	
## 149	NA	NA	NA	NA	NA	NA	
## 151	NA	NA	NA	NA	NA	NA	
## 153	NA	NA	NA	NA	NA	NA	
## 155	NA	NA	NA	NA	NA	NA	
## 156	NA	NA	NA	NA	NA	NA	
## 158	NA	NA	NA	NA	NA	NA	
##	N_oocysts_sq7	N_oocysts_sq8	mean_neubauer	PBS_dil_in_mL	OPG	Ncells	Region
## 1	NA	NA	NA	NA	NA	NA	<NA>
## 2	NA	NA	NA	NA	NA	NA	<NA>
## 3	NA	NA	NA	NA	NA	NA	<NA>
## 4	NA	NA	NA	NA	NA	NA	<NA>
## 5	NA	NA	NA	NA	NA	NA	<NA>
## 6	NA	NA	NA	NA	NA	NA	<NA>
## 7	NA	NA	NA	NA	NA	NA	<NA>
## 8	NA	NA	NA	NA	NA	NA	<NA>
## 9	NA	NA	NA	NA	NA	NA	<NA>
## 10	NA	NA	NA	NA	NA	NA	<NA>
## 11	NA	NA	NA	NA	NA	NA	<NA>
## 12	NA	NA	NA	NA	NA	NA	<NA>
## 13	NA	NA	NA	NA	NA	NA	<NA>
## 15	NA	NA	NA	NA	NA	NA	<NA>
## 16	NA	NA	NA	NA	NA	NA	<NA>
## 17	NA	NA	NA	NA	NA	NA	<NA>
## 18	NA	NA	NA	NA	NA	NA	<NA>
## 19	NA	NA	NA	NA	NA	NA	<NA>
## 20	NA	NA	NA	NA	NA	NA	<NA>
## 21	NA	NA	NA	NA	NA	NA	<NA>
## 23	NA	NA	NA	NA	NA	NA	<NA>
## 24	NA	NA	NA	NA	NA	NA	<NA>
## 25	NA	NA	NA	NA	NA	NA	<NA>

## 26	NA	NA	NA	NA	NA	NA	<NA>
## 27	NA	NA	NA	NA	NA	NA	<NA>
## 28	NA	NA	NA	NA	NA	NA	<NA>
## 29	NA	NA	NA	NA	NA	NA	<NA>
## 30	NA	NA	NA	NA	NA	NA	<NA>
## 31	NA	NA	NA	NA	NA	NA	<NA>
## 32	NA	NA	NA	NA	NA	NA	<NA>
## 33	NA	NA	NA	NA	NA	NA	<NA>
## 34	NA	NA	NA	NA	NA	NA	<NA>
## 35	NA	NA	NA	NA	NA	NA	<NA>
## 36	NA	NA	NA	NA	NA	NA	<NA>
## 37	NA	NA	NA	NA	NA	NA	<NA>
## 38	NA	NA	NA	NA	NA	NA	<NA>
## 39	NA	NA	NA	NA	NA	NA	<NA>
## 40	NA	NA	NA	NA	NA	NA	<NA>
## 41	NA	NA	NA	NA	NA	NA	<NA>
## 42	NA	NA	NA	NA	NA	NA	<NA>
## 43	NA	NA	NA	NA	NA	NA	<NA>
## 44	NA	NA	NA	NA	NA	NA	<NA>
## 45	NA	NA	NA	NA	NA	NA	<NA>
## 46	NA	NA	NA	NA	NA	NA	<NA>
## 47	NA	NA	NA	NA	NA	NA	<NA>
## 48	NA	NA	NA	NA	NA	NA	<NA>
## 49	NA	NA	NA	NA	NA	NA	<NA>
## 52	NA	NA	NA	NA	NA	NA	<NA>
## 53	NA	NA	NA	NA	NA	NA	<NA>
## 54	NA	NA	NA	NA	NA	NA	<NA>
## 55	NA	NA	NA	NA	NA	NA	<NA>
## 56	NA	NA	NA	NA	NA	NA	<NA>
## 57	NA	NA	NA	NA	NA	NA	<NA>
## 58	NA	NA	NA	NA	NA	NA	<NA>
## 62	NA	NA	NA	NA	NA	NA	<NA>
## 64	NA	NA	NA	NA	NA	NA	<NA>
## 65	NA	NA	NA	NA	NA	NA	<NA>
## 66	NA	NA	NA	NA	NA	NA	<NA>
## 67	NA	NA	NA	NA	NA	NA	<NA>
## 68	NA	NA	NA	NA	NA	NA	<NA>
## 69	NA	NA	NA	NA	NA	NA	<NA>
## 70	NA	NA	NA	NA	NA	NA	<NA>
## 72	NA	NA	NA	NA	NA	NA	<NA>
## 74	NA	NA	NA	NA	NA	NA	<NA>
## 76	NA	NA	NA	NA	NA	NA	<NA>
## 78	NA	NA	NA	NA	NA	NA	<NA>
## 80	NA	NA	NA	NA	NA	NA	<NA>
## 82	NA	NA	NA	NA	NA	NA	<NA>
## 84	NA	NA	NA	NA	NA	NA	<NA>
## 86	NA	NA	NA	NA	NA	NA	<NA>
## 88	NA	NA	NA	NA	NA	NA	<NA>
## 90	NA	NA	NA	NA	NA	NA	<NA>
## 92	NA	NA	NA	NA	NA	NA	<NA>
## 94	NA	NA	NA	NA	NA	NA	<NA>
## 95	NA	NA	NA	NA	NA	NA	<NA>
## 97	NA	NA	NA	NA	NA	NA	<NA>
## 98	NA	NA	NA	NA	NA	NA	<NA>

## 99	NA	NA	NA	NA	NA	NA	<NA>
## 100	NA	NA	NA	NA	NA	NA	<NA>
## 101	NA	NA	NA	NA	NA	NA	<NA>
## 102	NA	NA	NA	NA	NA	NA	<NA>
## 103	NA	NA	NA	NA	NA	NA	<NA>
## 104	NA	NA	NA	NA	NA	NA	<NA>
## 105	NA	NA	NA	NA	NA	NA	<NA>
## 106	NA	NA	NA	NA	NA	NA	<NA>
## 107	NA	NA	NA	NA	NA	NA	<NA>
## 108	NA	NA	NA	NA	NA	NA	<NA>
## 110	NA	NA	NA	NA	NA	NA	<NA>
## 111	NA	NA	NA	NA	NA	NA	<NA>
## 112	NA	NA	NA	NA	NA	NA	<NA>
## 113	NA	NA	NA	NA	NA	NA	<NA>
## 114	NA	NA	NA	NA	NA	NA	<NA>
## 115	NA	NA	NA	NA	NA	NA	<NA>
## 116	NA	NA	NA	NA	NA	NA	<NA>
## 117	NA	NA	NA	NA	NA	NA	<NA>
## 119	NA	NA	NA	NA	NA	NA	<NA>
## 121	NA	NA	NA	NA	NA	NA	<NA>
## 123	NA	NA	NA	NA	NA	NA	<NA>
## 125	NA	NA	NA	NA	NA	NA	<NA>
## 126	NA	NA	NA	NA	NA	NA	<NA>
## 128	NA	NA	NA	NA	NA	NA	<NA>
## 130	NA	NA	NA	NA	NA	NA	<NA>
## 132	NA	NA	NA	NA	NA	NA	<NA>
## 134	NA	NA	NA	NA	NA	NA	<NA>
## 136	NA	NA	NA	NA	NA	NA	<NA>
## 140	NA	NA	NA	NA	NA	NA	<NA>
## 142	NA	NA	NA	NA	NA	NA	<NA>
## 144	NA	NA	NA	NA	NA	NA	<NA>
## 145	NA	NA	NA	NA	NA	NA	<NA>
## 147	NA	NA	NA	NA	NA	NA	<NA>
## 149	NA	NA	NA	NA	NA	NA	<NA>
## 151	NA	NA	NA	NA	NA	NA	<NA>
## 153	NA	NA	NA	NA	NA	NA	<NA>
## 155	NA	NA	NA	NA	NA	NA	<NA>
## 156	NA	NA	NA	NA	NA	NA	<NA>
## 158	NA	NA	NA	NA	NA	NA	<NA>
##	Body_Weight	Body_Length	Ectoparasites_Logical	Left_Epididymis	Fleas	Liver	
## 1	NA	NA	NA	NA	NA	NA	NA
## 2	NA	NA	NA	NA	NA	NA	NA
## 3	NA	NA	NA	NA	NA	NA	NA
## 4	NA	NA	NA	NA	NA	NA	NA
## 5	NA	NA	NA	NA	NA	NA	NA
## 6	NA	NA	NA	NA	NA	NA	NA
## 7	NA	NA	NA	NA	NA	NA	NA
## 8	NA	NA	NA	NA	NA	NA	NA
## 9	NA	NA	NA	NA	NA	NA	NA
## 10	NA	NA	NA	NA	NA	NA	NA
## 11	NA	NA	NA	NA	NA	NA	NA
## 12	NA	NA	NA	NA	NA	NA	NA
## 13	NA	NA	NA	NA	NA	NA	NA
## 15	NA	NA	NA	NA	NA	NA	NA

## 16	NA	NA	NA	NA	NA	NA
## 17	NA	NA	NA	NA	NA	NA
## 18	NA	NA	NA	NA	NA	NA
## 19	NA	NA	NA	NA	NA	NA
## 20	NA	NA	NA	NA	NA	NA
## 21	NA	NA	NA	NA	NA	NA
## 23	NA	NA	NA	NA	NA	NA
## 24	NA	NA	NA	NA	NA	NA
## 25	NA	NA	NA	NA	NA	NA
## 26	NA	NA	NA	NA	NA	NA
## 27	NA	NA	NA	NA	NA	NA
## 28	NA	NA	NA	NA	NA	NA
## 29	NA	NA	NA	NA	NA	NA
## 30	NA	NA	NA	NA	NA	NA
## 31	NA	NA	NA	NA	NA	NA
## 32	NA	NA	NA	NA	NA	NA
## 33	NA	NA	NA	NA	NA	NA
## 34	NA	NA	NA	NA	NA	NA
## 35	NA	NA	NA	NA	NA	NA
## 36	NA	NA	NA	NA	NA	NA
## 37	NA	NA	NA	NA	NA	NA
## 38	NA	NA	NA	NA	NA	NA
## 39	NA	NA	NA	NA	NA	NA
## 40	NA	NA	NA	NA	NA	NA
## 41	NA	NA	NA	NA	NA	NA
## 42	NA	NA	NA	NA	NA	NA
## 43	NA	NA	NA	NA	NA	NA
## 44	NA	NA	NA	NA	NA	NA
## 45	NA	NA	NA	NA	NA	NA
## 46	NA	NA	NA	NA	NA	NA
## 47	NA	NA	NA	NA	NA	NA
## 48	NA	NA	NA	NA	NA	NA
## 49	NA	NA	NA	NA	NA	NA
## 52	NA	NA	NA	NA	NA	NA
## 53	NA	NA	NA	NA	NA	NA
## 54	NA	NA	NA	NA	NA	NA
## 55	NA	NA	NA	NA	NA	NA
## 56	NA	NA	NA	NA	NA	NA
## 57	NA	NA	NA	NA	NA	NA
## 58	NA	NA	NA	NA	NA	NA
## 62	NA	NA	NA	NA	NA	NA
## 64	NA	NA	NA	NA	NA	NA
## 65	NA	NA	NA	NA	NA	NA
## 66	NA	NA	NA	NA	NA	NA
## 67	NA	NA	NA	NA	NA	NA
## 68	NA	NA	NA	NA	NA	NA
## 69	NA	NA	NA	NA	NA	NA
## 70	NA	NA	NA	NA	NA	NA
## 72	NA	NA	NA	NA	NA	NA
## 74	NA	NA	NA	NA	NA	NA
## 76	NA	NA	NA	NA	NA	NA
## 78	NA	NA	NA	NA	NA	NA
## 80	NA	NA	NA	NA	NA	NA
## 82	NA	NA	NA	NA	NA	NA

## 84	NA	NA	NA	NA	NA	NA
## 86	NA	NA	NA	NA	NA	NA
## 88	NA	NA	NA	NA	NA	NA
## 90	NA	NA	NA	NA	NA	NA
## 92	NA	NA	NA	NA	NA	NA
## 94	NA	NA	NA	NA	NA	NA
## 95	NA	NA	NA	NA	NA	NA
## 97	NA	NA	NA	NA	NA	NA
## 98	NA	NA	NA	NA	NA	NA
## 99	NA	NA	NA	NA	NA	NA
## 100	NA	NA	NA	NA	NA	NA
## 101	NA	NA	NA	NA	NA	NA
## 102	NA	NA	NA	NA	NA	NA
## 103	NA	NA	NA	NA	NA	NA
## 104	NA	NA	NA	NA	NA	NA
## 105	NA	NA	NA	NA	NA	NA
## 106	NA	NA	NA	NA	NA	NA
## 107	NA	NA	NA	NA	NA	NA
## 108	NA	NA	NA	NA	NA	NA
## 110	NA	NA	NA	NA	NA	NA
## 111	NA	NA	NA	NA	NA	NA
## 112	NA	NA	NA	NA	NA	NA
## 113	NA	NA	NA	NA	NA	NA
## 114	NA	NA	NA	NA	NA	NA
## 115	NA	NA	NA	NA	NA	NA
## 116	NA	NA	NA	NA	NA	NA
## 117	NA	NA	NA	NA	NA	NA
## 119	NA	NA	NA	NA	NA	NA
## 121	NA	NA	NA	NA	NA	NA
## 123	NA	NA	NA	NA	NA	NA
## 125	NA	NA	NA	NA	NA	NA
## 126	NA	NA	NA	NA	NA	NA
## 128	NA	NA	NA	NA	NA	NA
## 130	NA	NA	NA	NA	NA	NA
## 132	NA	NA	NA	NA	NA	NA
## 134	NA	NA	NA	NA	NA	NA
## 136	NA	NA	NA	NA	NA	NA
## 140	NA	NA	NA	NA	NA	NA
## 142	NA	NA	NA	NA	NA	NA
## 144	NA	NA	NA	NA	NA	NA
## 145	NA	NA	NA	NA	NA	NA
## 147	NA	NA	NA	NA	NA	NA
## 149	NA	NA	NA	NA	NA	NA
## 151	NA	NA	NA	NA	NA	NA
## 153	NA	NA	NA	NA	NA	NA
## 155	NA	NA	NA	NA	NA	NA
## 156	NA	NA	NA	NA	NA	NA
## 158	NA	NA	NA	NA	NA	NA
##	Right_Ovary_Weight	Left_Ovary_Weight	Seminal_Vesicles_Weight			
## 1	NA	NA	NA			
## 2	NA	NA	NA			
## 3	NA	NA	NA			
## 4	NA	NA	NA			
## 5	NA	NA	NA			

## 6	NA	NA	NA
## 7	NA	NA	NA
## 8	NA	NA	NA
## 9	NA	NA	NA
## 10	NA	NA	NA
## 11	NA	NA	NA
## 12	NA	NA	NA
## 13	NA	NA	NA
## 15	NA	NA	NA
## 16	NA	NA	NA
## 17	NA	NA	NA
## 18	NA	NA	NA
## 19	NA	NA	NA
## 20	NA	NA	NA
## 21	NA	NA	NA
## 23	NA	NA	NA
## 24	NA	NA	NA
## 25	NA	NA	NA
## 26	NA	NA	NA
## 27	NA	NA	NA
## 28	NA	NA	NA
## 29	NA	NA	NA
## 30	NA	NA	NA
## 31	NA	NA	NA
## 32	NA	NA	NA
## 33	NA	NA	NA
## 34	NA	NA	NA
## 35	NA	NA	NA
## 36	NA	NA	NA
## 37	NA	NA	NA
## 38	NA	NA	NA
## 39	NA	NA	NA
## 40	NA	NA	NA
## 41	NA	NA	NA
## 42	NA	NA	NA
## 43	NA	NA	NA
## 44	NA	NA	NA
## 45	NA	NA	NA
## 46	NA	NA	NA
## 47	NA	NA	NA
## 48	NA	NA	NA
## 49	NA	NA	NA
## 52	NA	NA	NA
## 53	NA	NA	NA
## 54	NA	NA	NA
## 55	NA	NA	NA
## 56	NA	NA	NA
## 57	NA	NA	NA
## 58	NA	NA	NA
## 62	NA	NA	NA
## 64	NA	NA	NA
## 65	NA	NA	NA
## 66	NA	NA	NA
## 67	NA	NA	NA

## 68	NA	NA	NA
## 69	NA	NA	NA
## 70	NA	NA	NA
## 72	NA	NA	NA
## 74	NA	NA	NA
## 76	NA	NA	NA
## 78	NA	NA	NA
## 80	NA	NA	NA
## 82	NA	NA	NA
## 84	NA	NA	NA
## 86	NA	NA	NA
## 88	NA	NA	NA
## 90	NA	NA	NA
## 92	NA	NA	NA
## 94	NA	NA	NA
## 95	NA	NA	NA
## 97	NA	NA	NA
## 98	NA	NA	NA
## 99	NA	NA	NA
## 100	NA	NA	NA
## 101	NA	NA	NA
## 102	NA	NA	NA
## 103	NA	NA	NA
## 104	NA	NA	NA
## 105	NA	NA	NA
## 106	NA	NA	NA
## 107	NA	NA	NA
## 108	NA	NA	NA
## 110	NA	NA	NA
## 111	NA	NA	NA
## 112	NA	NA	NA
## 113	NA	NA	NA
## 114	NA	NA	NA
## 115	NA	NA	NA
## 116	NA	NA	NA
## 117	NA	NA	NA
## 119	NA	NA	NA
## 121	NA	NA	NA
## 123	NA	NA	NA
## 125	NA	NA	NA
## 126	NA	NA	NA
## 128	NA	NA	NA
## 130	NA	NA	NA
## 132	NA	NA	NA
## 134	NA	NA	NA
## 136	NA	NA	NA
## 140	NA	NA	NA
## 142	NA	NA	NA
## 144	NA	NA	NA
## 145	NA	NA	NA
## 147	NA	NA	NA
## 149	NA	NA	NA
## 151	NA	NA	NA
## 153	NA	NA	NA

## 155		NA		NA		NA
## 156		NA		NA		NA
## 158		NA		NA		NA
##	Left_Testis	Right_Testis	Tail_Length	Trap_Date	eimeriaSpecies	Ct.Eimeria
## 1	NA	NA	NA	<NA>	<NA>	NA
## 2	NA	NA	NA	<NA>	<NA>	NA
## 3	NA	NA	NA	<NA>	<NA>	NA
## 4	NA	NA	NA	<NA>	<NA>	NA
## 5	NA	NA	NA	<NA>	<NA>	NA
## 6	NA	NA	NA	<NA>	<NA>	NA
## 7	NA	NA	NA	<NA>	<NA>	NA
## 8	NA	NA	NA	<NA>	<NA>	NA
## 9	NA	NA	NA	<NA>	<NA>	NA
## 10	NA	NA	NA	<NA>	<NA>	NA
## 11	NA	NA	NA	<NA>	<NA>	NA
## 12	NA	NA	NA	<NA>	<NA>	NA
## 13	NA	NA	NA	<NA>	<NA>	NA
## 15	NA	NA	NA	<NA>	<NA>	NA
## 16	NA	NA	NA	<NA>	<NA>	NA
## 17	NA	NA	NA	<NA>	<NA>	NA
## 18	NA	NA	NA	<NA>	<NA>	NA
## 19	NA	NA	NA	<NA>	<NA>	NA
## 20	NA	NA	NA	<NA>	<NA>	NA
## 21	NA	NA	NA	<NA>	<NA>	NA
## 23	NA	NA	NA	<NA>	<NA>	NA
## 24	NA	NA	NA	<NA>	<NA>	NA
## 25	NA	NA	NA	<NA>	<NA>	NA
## 26	NA	NA	NA	<NA>	<NA>	NA
## 27	NA	NA	NA	<NA>	<NA>	NA
## 28	NA	NA	NA	<NA>	<NA>	NA
## 29	NA	NA	NA	<NA>	<NA>	NA
## 30	NA	NA	NA	<NA>	<NA>	NA
## 31	NA	NA	NA	<NA>	<NA>	NA
## 32	NA	NA	NA	<NA>	<NA>	NA
## 33	NA	NA	NA	<NA>	<NA>	NA
## 34	NA	NA	NA	<NA>	<NA>	NA
## 35	NA	NA	NA	<NA>	<NA>	NA
## 36	NA	NA	NA	<NA>	<NA>	NA
## 37	NA	NA	NA	<NA>	<NA>	NA
## 38	NA	NA	NA	<NA>	<NA>	NA
## 39	NA	NA	NA	<NA>	<NA>	NA
## 40	NA	NA	NA	<NA>	<NA>	NA
## 41	NA	NA	NA	<NA>	<NA>	NA
## 42	NA	NA	NA	<NA>	<NA>	NA
## 43	NA	NA	NA	<NA>	<NA>	NA
## 44	NA	NA	NA	<NA>	<NA>	NA
## 45	NA	NA	NA	<NA>	<NA>	NA
## 46	NA	NA	NA	<NA>	<NA>	NA
## 47	NA	NA	NA	<NA>	<NA>	NA
## 48	NA	NA	NA	<NA>	<NA>	NA
## 49	NA	NA	NA	<NA>	<NA>	NA
## 52	NA	NA	NA	<NA>	<NA>	NA
## 53	NA	NA	NA	<NA>	<NA>	NA
## 54	NA	NA	NA	<NA>	<NA>	NA

[illegible]

## 136	NA	NA	NA	<NA>	<NA>	NA
## 140	NA	NA	NA	<NA>	<NA>	NA
## 142	NA	NA	NA	<NA>	<NA>	NA
## 144	NA	NA	NA	<NA>	<NA>	NA
## 145	NA	NA	NA	<NA>	<NA>	NA
## 147	NA	NA	NA	<NA>	<NA>	NA
## 149	NA	NA	NA	<NA>	<NA>	NA
## 151	NA	NA	NA	<NA>	<NA>	NA
## 153	NA	NA	NA	<NA>	<NA>	NA
## 155	NA	NA	NA	<NA>	<NA>	NA
## 156	NA	NA	NA	<NA>	<NA>	NA
## 158	NA	NA	NA	<NA>	<NA>	NA
##	Ct.Mus	Oocyst_Predict_Crypto	ILWE_Crypto_Ct	ILWE_DNA_Content_ng.microliter		
## 1	NA	NA	NA			NA
## 2	NA	NA	NA			NA
## 3	NA	NA	NA			NA
## 4	NA	NA	NA			NA
## 5	NA	NA	NA			NA
## 6	NA	NA	NA			NA
## 7	NA	NA	NA			NA
## 8	NA	NA	NA			NA
## 9	NA	NA	NA			NA
## 10	NA	NA	NA			NA
## 11	NA	NA	NA			NA
## 12	NA	NA	NA			NA
## 13	NA	NA	NA			NA
## 15	NA	NA	NA			NA
## 16	NA	NA	NA			NA
## 17	NA	NA	NA			NA
## 18	NA	NA	NA			NA
## 19	NA	NA	NA			NA
## 20	NA	NA	NA			NA
## 21	NA	NA	NA			NA
## 23	NA	NA	NA			NA
## 24	NA	NA	NA			NA
## 25	NA	NA	NA			NA
## 26	NA	NA	NA			NA
## 27	NA	NA	NA			NA
## 28	NA	NA	NA			NA
## 29	NA	NA	NA			NA
## 30	NA	NA	NA			NA
## 31	NA	NA	NA			NA
## 32	NA	NA	NA			NA
## 33	NA	NA	NA			NA
## 34	NA	NA	NA			NA
## 35	NA	NA	NA			NA
## 36	NA	NA	NA			NA
## 37	NA	NA	NA			NA
## 38	NA	NA	NA			NA
## 39	NA	NA	NA			NA
## 40	NA	NA	NA			NA
## 41	NA	NA	NA			NA
## 42	NA	NA	NA			NA
## 43	NA	NA	NA			NA

## 44	NA	NA	NA	NA
## 45	NA	NA	NA	NA
## 46	NA	NA	NA	NA
## 47	NA	NA	NA	NA
## 48	NA	NA	NA	NA
## 49	NA	NA	NA	NA
## 52	NA	NA	NA	NA
## 53	NA	NA	NA	NA
## 54	NA	NA	NA	NA
## 55	NA	NA	NA	NA
## 56	NA	NA	NA	NA
## 57	NA	NA	NA	NA
## 58	NA	NA	NA	NA
## 62	NA	NA	NA	NA
## 64	NA	NA	NA	NA
## 65	NA	NA	NA	NA
## 66	NA	NA	NA	NA
## 67	NA	NA	NA	NA
## 68	NA	NA	NA	NA
## 69	NA	NA	NA	NA
## 70	NA	NA	NA	NA
## 72	NA	NA	NA	NA
## 74	NA	NA	NA	NA
## 76	NA	NA	NA	NA
## 78	NA	NA	NA	NA
## 80	NA	NA	NA	NA
## 82	NA	NA	NA	NA
## 84	NA	NA	NA	NA
## 86	NA	NA	NA	NA
## 88	NA	NA	NA	NA
## 90	NA	NA	NA	NA
## 92	NA	NA	NA	NA
## 94	NA	NA	NA	NA
## 95	NA	NA	NA	NA
## 97	NA	NA	NA	NA
## 98	NA	NA	NA	NA
## 99	NA	NA	NA	NA
## 100	NA	NA	NA	NA
## 101	NA	NA	NA	NA
## 102	NA	NA	NA	NA
## 103	NA	NA	NA	NA
## 104	NA	NA	NA	NA
## 105	NA	NA	NA	NA
## 106	NA	NA	NA	NA
## 107	NA	NA	NA	NA
## 108	NA	NA	NA	NA
## 110	NA	NA	NA	NA
## 111	NA	NA	NA	NA
## 112	NA	NA	NA	NA
## 113	NA	NA	NA	NA
## 114	NA	NA	NA	NA
## 115	NA	NA	NA	NA
## 116	NA	NA	NA	NA
## 117	NA	NA	NA	NA

##	119	NA	NA	NA	NA
##	121	NA	NA	NA	NA
##	123	NA	NA	NA	NA
##	125	NA	NA	NA	NA
##	126	NA	NA	NA	NA
##	128	NA	NA	NA	NA
##	130	NA	NA	NA	NA
##	132	NA	NA	NA	NA
##	134	NA	NA	NA	NA
##	136	NA	NA	NA	NA
##	140	NA	NA	NA	NA
##	142	NA	NA	NA	NA
##	144	NA	NA	NA	NA
##	145	NA	NA	NA	NA
##	147	NA	NA	NA	NA
##	149	NA	NA	NA	NA
##	151	NA	NA	NA	NA
##	153	NA	NA	NA	NA
##	155	NA	NA	NA	NA
##	156	NA	NA	NA	NA
##	158	NA	NA	NA	NA

##	Ticks	Host	Aspiculuris_sp	Syphacia_sp	Taenia_sp	Hymenolepis_sp	Sperm
##	1	NA <NA>	NA	NA	NA	NA	NA
##	2	NA <NA>	NA	NA	NA	NA	NA
##	3	NA <NA>	NA	NA	NA	NA	NA
##	4	NA <NA>	NA	NA	NA	NA	NA
##	5	NA <NA>	NA	NA	NA	NA	NA
##	6	NA <NA>	NA	NA	NA	NA	NA
##	7	NA <NA>	NA	NA	NA	NA	NA
##	8	NA <NA>	NA	NA	NA	NA	NA
##	9	NA <NA>	NA	NA	NA	NA	NA
##	10	NA <NA>	NA	NA	NA	NA	NA
##	11	NA <NA>	NA	NA	NA	NA	NA
##	12	NA <NA>	NA	NA	NA	NA	NA
##	13	NA <NA>	NA	NA	NA	NA	NA
##	15	NA <NA>	NA	NA	NA	NA	NA
##	16	NA <NA>	NA	NA	NA	NA	NA
##	17	NA <NA>	NA	NA	NA	NA	NA
##	18	NA <NA>	NA	NA	NA	NA	NA
##	19	NA <NA>	NA	NA	NA	NA	NA
##	20	NA <NA>	NA	NA	NA	NA	NA
##	21	NA <NA>	NA	NA	NA	NA	NA
##	23	NA <NA>	NA	NA	NA	NA	NA
##	24	NA <NA>	NA	NA	NA	NA	NA
##	25	NA <NA>	NA	NA	NA	NA	NA
##	26	NA <NA>	NA	NA	NA	NA	NA
##	27	NA <NA>	NA	NA	NA	NA	NA
##	28	NA <NA>	NA	NA	NA	NA	NA
##	29	NA <NA>	NA	NA	NA	NA	NA
##	30	NA <NA>	NA	NA	NA	NA	NA
##	31	NA <NA>	NA	NA	NA	NA	NA
##	32	NA <NA>	NA	NA	NA	NA	NA
##	33	NA <NA>	NA	NA	NA	NA	NA
##	34	NA <NA>	NA	NA	NA	NA	NA

## 35	NA <NA>	NA	NA	NA	NA	NA
## 36	NA <NA>	NA	NA	NA	NA	NA
## 37	NA <NA>	NA	NA	NA	NA	NA
## 38	NA <NA>	NA	NA	NA	NA	NA
## 39	NA <NA>	NA	NA	NA	NA	NA
## 40	NA <NA>	NA	NA	NA	NA	NA
## 41	NA <NA>	NA	NA	NA	NA	NA
## 42	NA <NA>	NA	NA	NA	NA	NA
## 43	NA <NA>	NA	NA	NA	NA	NA
## 44	NA <NA>	NA	NA	NA	NA	NA
## 45	NA <NA>	NA	NA	NA	NA	NA
## 46	NA <NA>	NA	NA	NA	NA	NA
## 47	NA <NA>	NA	NA	NA	NA	NA
## 48	NA <NA>	NA	NA	NA	NA	NA
## 49	NA <NA>	NA	NA	NA	NA	NA
## 52	NA <NA>	NA	NA	NA	NA	NA
## 53	NA <NA>	NA	NA	NA	NA	NA
## 54	NA <NA>	NA	NA	NA	NA	NA
## 55	NA <NA>	NA	NA	NA	NA	NA
## 56	NA <NA>	NA	NA	NA	NA	NA
## 57	NA <NA>	NA	NA	NA	NA	NA
## 58	NA <NA>	NA	NA	NA	NA	NA
## 62	NA <NA>	NA	NA	NA	NA	NA
## 64	NA <NA>	NA	NA	NA	NA	NA
## 65	NA <NA>	NA	NA	NA	NA	NA
## 66	NA <NA>	NA	NA	NA	NA	NA
## 67	NA <NA>	NA	NA	NA	NA	NA
## 68	NA <NA>	NA	NA	NA	NA	NA
## 69	NA <NA>	NA	NA	NA	NA	NA
## 70	NA <NA>	NA	NA	NA	NA	NA
## 72	NA <NA>	NA	NA	NA	NA	NA
## 74	NA <NA>	NA	NA	NA	NA	NA
## 76	NA <NA>	NA	NA	NA	NA	NA
## 78	NA <NA>	NA	NA	NA	NA	NA
## 80	NA <NA>	NA	NA	NA	NA	NA
## 82	NA <NA>	NA	NA	NA	NA	NA
## 84	NA <NA>	NA	NA	NA	NA	NA
## 86	NA <NA>	NA	NA	NA	NA	NA
## 88	NA <NA>	NA	NA	NA	NA	NA
## 90	NA <NA>	NA	NA	NA	NA	NA
## 92	NA <NA>	NA	NA	NA	NA	NA
## 94	NA <NA>	NA	NA	NA	NA	NA
## 95	NA <NA>	NA	NA	NA	NA	NA
## 97	NA <NA>	NA	NA	NA	NA	NA
## 98	NA <NA>	NA	NA	NA	NA	NA
## 99	NA <NA>	NA	NA	NA	NA	NA
## 100	NA <NA>	NA	NA	NA	NA	NA
## 101	NA <NA>	NA	NA	NA	NA	NA
## 102	NA <NA>	NA	NA	NA	NA	NA
## 103	NA <NA>	NA	NA	NA	NA	NA
## 104	NA <NA>	NA	NA	NA	NA	NA
## 105	NA <NA>	NA	NA	NA	NA	NA
## 106	NA <NA>	NA	NA	NA	NA	NA
## 107	NA <NA>	NA	NA	NA	NA	NA

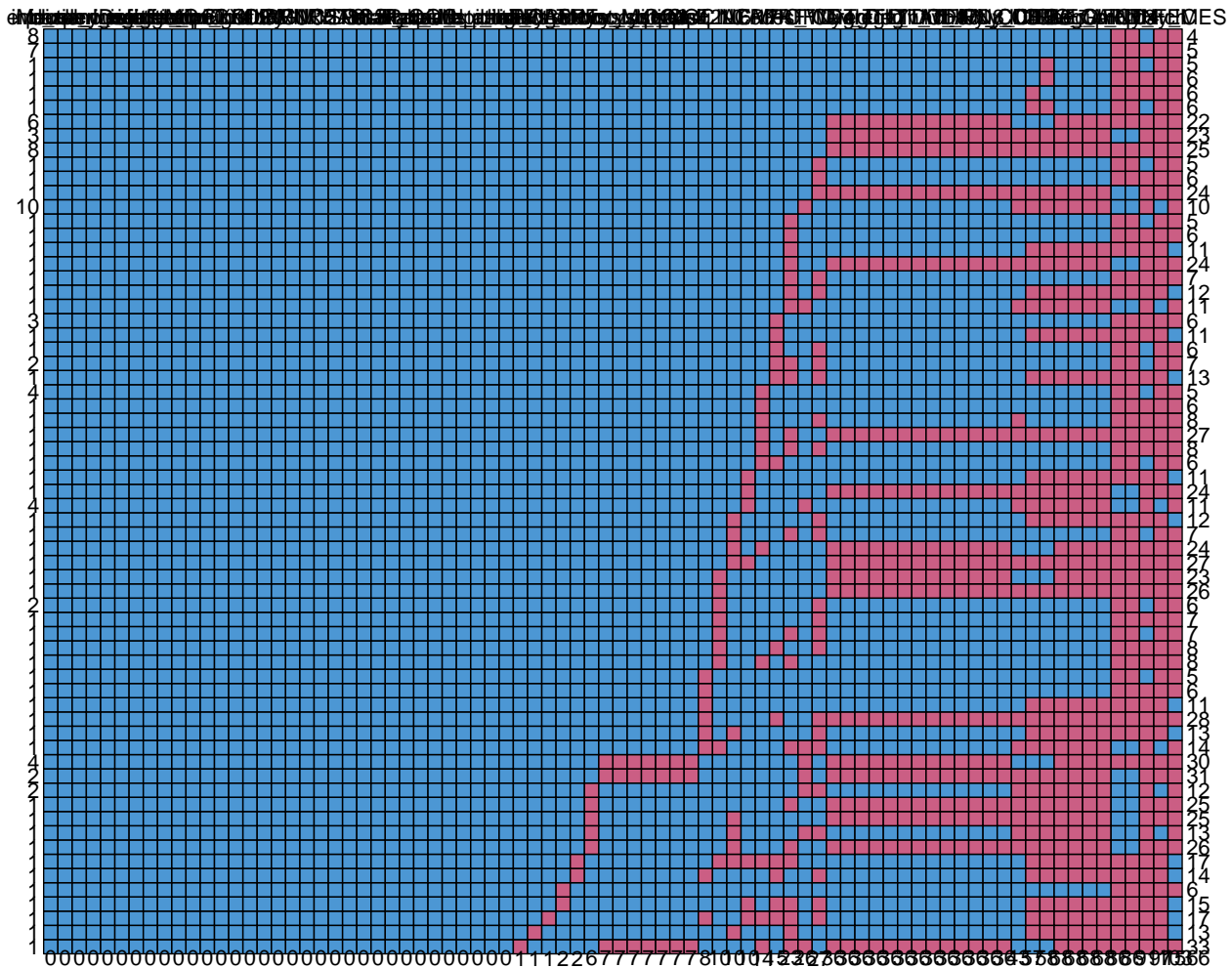
## 108	NA <NA>	NA	NA	NA	NA	NA
## 110	NA <NA>	NA	NA	NA	NA	NA
## 111	NA <NA>	NA	NA	NA	NA	NA
## 112	NA <NA>	NA	NA	NA	NA	NA
## 113	NA <NA>	NA	NA	NA	NA	NA
## 114	NA <NA>	NA	NA	NA	NA	NA
## 115	NA <NA>	NA	NA	NA	NA	NA
## 116	NA <NA>	NA	NA	NA	NA	NA
## 117	NA <NA>	NA	NA	NA	NA	NA
## 119	NA <NA>	NA	NA	NA	NA	NA
## 121	NA <NA>	NA	NA	NA	NA	NA
## 123	NA <NA>	NA	NA	NA	NA	NA
## 125	NA <NA>	NA	NA	NA	NA	NA
## 126	NA <NA>	NA	NA	NA	NA	NA
## 128	NA <NA>	NA	NA	NA	NA	NA
## 130	NA <NA>	NA	NA	NA	NA	NA
## 132	NA <NA>	NA	NA	NA	NA	NA
## 134	NA <NA>	NA	NA	NA	NA	NA
## 136	NA <NA>	NA	NA	NA	NA	NA
## 140	NA <NA>	NA	NA	NA	NA	NA
## 142	NA <NA>	NA	NA	NA	NA	NA
## 144	NA <NA>	NA	NA	NA	NA	NA
## 145	NA <NA>	NA	NA	NA	NA	NA
## 147	NA <NA>	NA	NA	NA	NA	NA
## 149	NA <NA>	NA	NA	NA	NA	NA
## 151	NA <NA>	NA	NA	NA	NA	NA
## 153	NA <NA>	NA	NA	NA	NA	NA
## 155	NA <NA>	NA	NA	NA	NA	NA
## 156	NA <NA>	NA	NA	NA	NA	NA
## 158	NA <NA>	NA	NA	NA	NA	NA
##	FEC_Eim_Ct	MC.Eimeria.FEC	MCs			
## 1	NA	NA <NA>				
## 2	NA	NA <NA>				
## 3	NA	NA <NA>				
## 4	NA	NA <NA>				
## 5	NA	NA <NA>				
## 6	NA	NA <NA>				
## 7	NA	NA <NA>				
## 8	NA	NA <NA>				
## 9	NA	NA <NA>				
## 10	NA	NA <NA>				
## 11	NA	NA <NA>				
## 12	NA	NA <NA>				
## 13	NA	NA <NA>				
## 15	NA	NA <NA>				
## 16	NA	NA <NA>				
## 17	NA	NA <NA>				
## 18	NA	NA <NA>				
## 19	NA	NA <NA>				
## 20	NA	NA <NA>				
## 21	NA	NA <NA>				
## 23	NA	NA <NA>				
## 24	NA	NA <NA>				
## 25	NA	NA <NA>				

## 26	NA	NA <NA>
## 27	NA	NA <NA>
## 28	NA	NA <NA>
## 29	NA	NA <NA>
## 30	NA	NA <NA>
## 31	NA	NA <NA>
## 32	NA	NA <NA>
## 33	NA	NA <NA>
## 34	NA	NA <NA>
## 35	NA	NA <NA>
## 36	NA	NA <NA>
## 37	NA	NA <NA>
## 38	NA	NA <NA>
## 39	NA	NA <NA>
## 40	NA	NA <NA>
## 41	NA	NA <NA>
## 42	NA	NA <NA>
## 43	NA	NA <NA>
## 44	NA	NA <NA>
## 45	NA	NA <NA>
## 46	NA	NA <NA>
## 47	NA	NA <NA>
## 48	NA	NA <NA>
## 49	NA	NA <NA>
## 52	NA	NA <NA>
## 53	NA	NA <NA>
## 54	NA	NA <NA>
## 55	NA	NA <NA>
## 56	NA	NA <NA>
## 57	NA	NA <NA>
## 58	NA	NA <NA>
## 62	NA	NA <NA>
## 64	NA	NA <NA>
## 65	NA	NA <NA>
## 66	NA	NA <NA>
## 67	NA	NA <NA>
## 68	NA	NA <NA>
## 69	NA	NA <NA>
## 70	NA	NA <NA>
## 72	NA	NA <NA>
## 74	NA	NA <NA>
## 76	NA	NA <NA>
## 78	NA	NA <NA>
## 80	NA	NA <NA>
## 82	NA	NA <NA>
## 84	NA	NA <NA>
## 86	NA	NA <NA>
## 88	NA	NA <NA>
## 90	NA	NA <NA>
## 92	NA	NA <NA>
## 94	NA	NA <NA>
## 95	NA	NA <NA>
## 97	NA	NA <NA>
## 98	NA	NA <NA>

```
## 99      NA      NA <NA>
## 100     NA      NA <NA>
## 101     NA      NA <NA>
## 102     NA      NA <NA>
## 103     NA      NA <NA>
## 104     NA      NA <NA>
## 105     NA      NA <NA>
## 106     NA      NA <NA>
## 107     NA      NA <NA>
## 108     NA      NA <NA>
## 110     NA      NA <NA>
## 111     NA      NA <NA>
## 112     NA      NA <NA>
## 113     NA      NA <NA>
## 114     NA      NA <NA>
## 115     NA      NA <NA>
## 116     NA      NA <NA>
## 117     NA      NA <NA>
## 119     NA      NA <NA>
## 121     NA      NA <NA>
## 123     NA      NA <NA>
## 125     NA      NA <NA>
## 126     NA      NA <NA>
## 128     NA      NA <NA>
## 130     NA      NA <NA>
## 132     NA      NA <NA>
## 134     NA      NA <NA>
## 136     NA      NA <NA>
## 140     NA      NA <NA>
## 142     NA      NA <NA>
## 144     NA      NA <NA>
## 145     NA      NA <NA>
## 147     NA      NA <NA>
## 149     NA      NA <NA>
## 151     NA      NA <NA>
## 153     NA      NA <NA>
## 155     NA      NA <NA>
## 156     NA      NA <NA>
## 158     NA      NA <NA>
```

```
# really removing empty columns
lab_gene <- lab_gene %>%
  discard(~all(is.na(.) | . == ""))

# looking at patterns of nas
pattern_na <- as.data.frame(md.pattern(lab_gene))
```



```
# genes
#select the relevant columns to use for the imputation
lab_genes <- lab_gene %>%
  dplyr::select(c(Mouse_ID, experiment, primary_infection, challenge_infection,
    mouse_strain, weight, weight_dpi0, relative_weight,
    oocyst_sq1, oocyst_sq2, oocyst_sq3, oocyst_sq4, 004sq, 00C,
    MC.Eimeria, delta_ct_cewe_MminusE, IFNy_CEWE, IFNy_MES,
    all_of(Gene_lab)))
```

```
# The frequency distribution of the missing cases per variable can be obtained
# as:
init <- mice(lab_genes, maxit = 0)
```

```
## Warning: Number of logged events: 1
```

```
#we want to impute only the specific variables
```

```
meth <- init$method
```

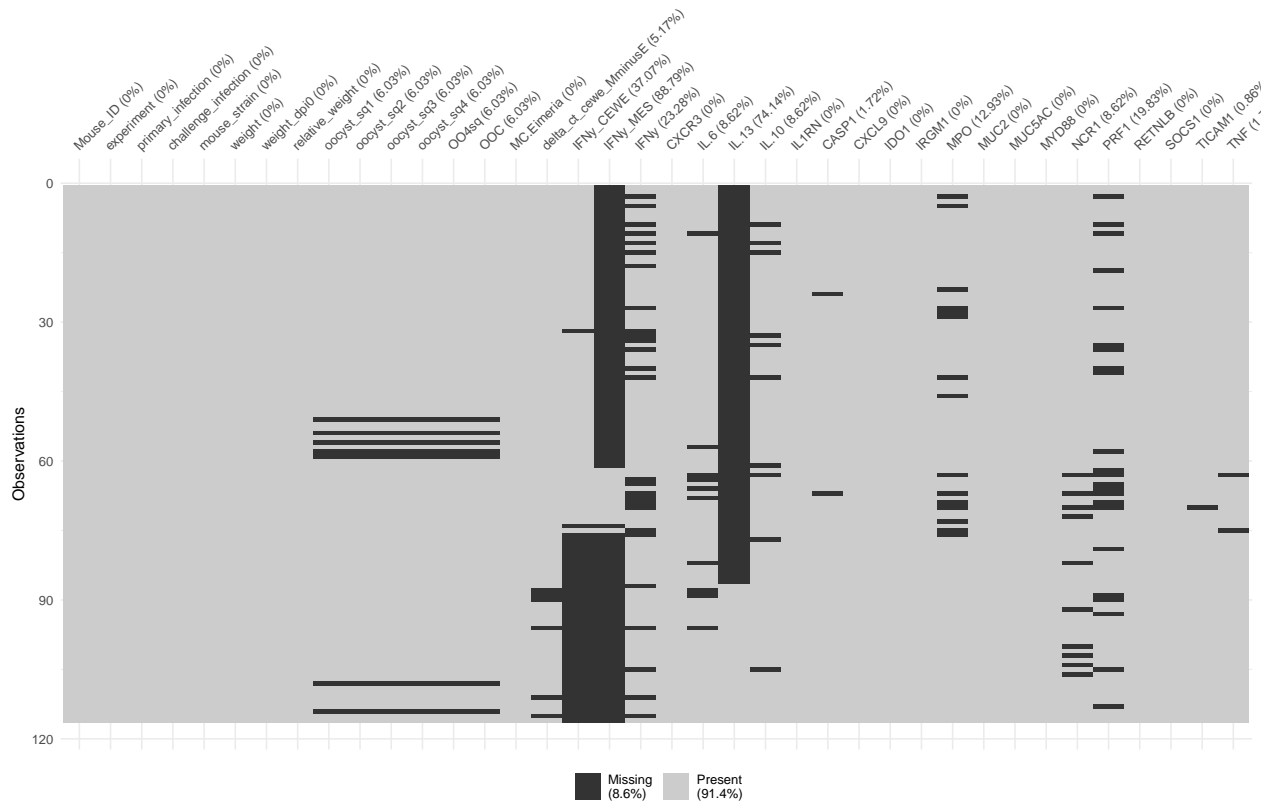
```
vis_miss(lab_genes)
```

```
## Warning: `gather_()` was deprecated in tidyr 1.2.0.
```

```
## i Please use `gather()` instead.
```

```
## i The deprecated feature was likely used in the visdat package.
```

Please report the issue at <<https://github.com/ropensci/visdat/issues>>.



```
#select all the colnames ending in std (the standardized ones)
#std <- colnames(lab %>% dplyr::select(ends_with("_std")))

# set every variable that is not one of your variables of interest to ""
#You can supply a vector to the method argument of mice::mice. This vector should contain the methods to use
#meth[!(names(meth) %in% all_of(std))] <- ""

# repeat the imputation only for the specific variables
#init <- mice(lab, maxit = 0, method = meth)

# table of amount of variables with the amount of missing values
#table(init$nmis)

# which method is used for imputation? In this case the package mice
# uses the default method for continuous variable,
# which is pmm, or predictive mean matching

# now impute the data and save it as the object:
# igf

#vis_miss(lab)

#sapply(lab, function(x) sum(is.na(x)))

# which column numbers end in Std
#grep("_std", colnames(lab) )
```

```
#imp <- mice(lab, print = FALSE)
```

```
# m=5 refers to the number of imputed datasets. Five is the default value.
```

```
igf <- mice(lab_genes, m = 5, seed = 500) # method = meth,
```

```
##
## iter imp variable
## 1 1 oocyst_sq1* oocyst_sq2* oocyst_sq3* oocyst_sq4* 004sq* delta_ct_cewe_MminusE* IFNy_CEW
## 1 2 oocyst_sq1* oocyst_sq2* oocyst_sq3* oocyst_sq4* 004sq* delta_ct_cewe_MminusE* IFNy_CEW
## 1 3 oocyst_sq1* oocyst_sq2* oocyst_sq3* oocyst_sq4* 004sq* delta_ct_cewe_MminusE* IFNy_CEW
## 1 4 oocyst_sq1* oocyst_sq2* oocyst_sq3* oocyst_sq4* 004sq* delta_ct_cewe_MminusE* IFNy_CEW
## 1 5 oocyst_sq1* oocyst_sq2* oocyst_sq3* oocyst_sq4* 004sq* delta_ct_cewe_MminusE* IFNy_CEW
## 2 1 oocyst_sq1* oocyst_sq2* oocyst_sq3* oocyst_sq4* 004sq* delta_ct_cewe_MminusE* IFNy_CEW
## 2 2 oocyst_sq1* oocyst_sq2* oocyst_sq3* oocyst_sq4* 004sq* delta_ct_cewe_MminusE* IFNy_CEW
## 2 3 oocyst_sq1* oocyst_sq2* oocyst_sq3* oocyst_sq4* 004sq* delta_ct_cewe_MminusE* IFNy_CEW
## 2 4 oocyst_sq1* oocyst_sq2* oocyst_sq3* oocyst_sq4* 004sq* delta_ct_cewe_MminusE* IFNy_CEW
## 2 5 oocyst_sq1* oocyst_sq2* oocyst_sq3* oocyst_sq4* 004sq* delta_ct_cewe_MminusE* IFNy_CEW
## 3 1 oocyst_sq1* oocyst_sq2* oocyst_sq3* oocyst_sq4* 004sq* delta_ct_cewe_MminusE* IFNy_CEW
## 3 2 oocyst_sq1* oocyst_sq2* oocyst_sq3* oocyst_sq4* 004sq* delta_ct_cewe_MminusE* IFNy_CEW
## 3 3 oocyst_sq1* oocyst_sq2* oocyst_sq3* oocyst_sq4* 004sq* delta_ct_cewe_MminusE* IFNy_CEW
## 3 4 oocyst_sq1* oocyst_sq2* oocyst_sq3* oocyst_sq4* 004sq* delta_ct_cewe_MminusE* IFNy_CEW
## 3 5 oocyst_sq1* oocyst_sq2* oocyst_sq3* oocyst_sq4* 004sq* delta_ct_cewe_MminusE* IFNy_CEW
## 4 1 oocyst_sq1* oocyst_sq2* oocyst_sq3* oocyst_sq4* 004sq* delta_ct_cewe_MminusE* IFNy_CEW
## 4 2 oocyst_sq1* oocyst_sq2* oocyst_sq3* oocyst_sq4* 004sq* delta_ct_cewe_MminusE* IFNy_CEW
## 4 3 oocyst_sq1* oocyst_sq2* oocyst_sq3* oocyst_sq4* 004sq* delta_ct_cewe_MminusE* IFNy_CEW
## 4 4 oocyst_sq1* oocyst_sq2* oocyst_sq3* oocyst_sq4* 004sq* delta_ct_cewe_MminusE* IFNy_CEW
## 4 5 oocyst_sq1* oocyst_sq2* oocyst_sq3* oocyst_sq4* 004sq* delta_ct_cewe_MminusE* IFNy_CEW
## 5 1 oocyst_sq1* oocyst_sq2* oocyst_sq3* oocyst_sq4* 004sq* delta_ct_cewe_MminusE* IFNy_CEW
## 5 2 oocyst_sq1* oocyst_sq2* oocyst_sq3* oocyst_sq4* 004sq* delta_ct_cewe_MminusE* IFNy_CEW
## 5 3 oocyst_sq1* oocyst_sq2* oocyst_sq3* oocyst_sq4* 004sq* delta_ct_cewe_MminusE* IFNy_CEW
## 5 4 oocyst_sq1* oocyst_sq2* oocyst_sq3* oocyst_sq4* 004sq* delta_ct_cewe_MminusE* IFNy_CEW
## 5 5 oocyst_sq1* oocyst_sq2* oocyst_sq3* oocyst_sq4* 004sq* delta_ct_cewe_MminusE* IFNy_CEW
```

```
## Warning: Number of logged events: 991
```

```
summary(igf)
```

```
## Class: mids
```

```
## Number of multiple imputations: 5
```

```
## Imputation methods:
```

```
##      Mouse_ID      experiment      primary_infection
##      " " " " " "
## challenge_infection      mouse_strain      weight
##      " " " " " "
##      weight_dpi0      relative_weight      oocyst_sq1
##      " " " " "pmm"
##      oocyst_sq2      oocyst_sq3      oocyst_sq4
##      "pmm" "pmm" "pmm"
##      004sq      00C      MC.Eimeria
##      "pmm" " " " "
## delta_ct_cewe_MminusE      IFNy_CEW      IFNy_MES
##      "pmm" "pmm" "pmm"
##      IFNy      CXCR3      IL.6
##      "pmm" " " "pmm"
```

```

##          IL.13          IL.10          IL1RN
##          "pmm"          "pmm"          ""
##          CASP1          CXCL9          IDO1
##          "pmm"          ""          ""
##          IRGM1          MPO          MUC2
##          ""          "pmm"          ""
##          MUC5AC          MYD88          NCR1
##          ""          ""          "pmm"
##          PRF1          RETNLB          SOCS1
##          "pmm"          ""          ""
##          TICAM1          TNF
##          "pmm"          "pmm"
## PredictorMatrix:
##          Mouse_ID experiment primary_infection challenge_infection
## Mouse_ID          0          1          1          1
## experiment        1          0          1          1
## primary_infection  1          1          0          1
## challenge_infection 1          1          1          0
## mouse_strain       1          1          1          1
## weight            1          1          1          1
##          mouse_strain weight weight_dpi0 relative_weight oocyst_sq1
## Mouse_ID          1          1          1          1          1
## experiment        1          1          1          1          1
## primary_infection  1          1          1          1          1
## challenge_infection 1          1          1          1          1
## mouse_strain       0          1          1          1          1
## weight            1          0          1          1          1
##          oocyst_sq2 oocyst_sq3 oocyst_sq4 004sq 00C MC.Eimeria
## Mouse_ID          1          1          1          1          0          1
## experiment        1          1          1          1          0          1
## primary_infection  1          1          1          1          0          1
## challenge_infection 1          1          1          1          0          1
## mouse_strain       1          1          1          1          0          1
## weight            1          1          1          1          0          1
##          delta_ct_cewe_MminusE IFNy_CEWE IFNy_MES IFNy CXCR3 IL.6
## Mouse_ID          1          1          1          1          1          1
## experiment        1          1          1          1          1          1
## primary_infection  1          1          1          1          1          1
## challenge_infection 1          1          1          1          1          1
## mouse_strain       1          1          1          1          1          1
## weight            1          1          1          1          1          1
##          IL.13 IL.10 IL1RN CASP1 CXCL9 IDO1 IRGM1 MPO MUC2 MUC5AC
## Mouse_ID          1          1          1          1          1          1          1          1          1
## experiment        1          1          1          1          1          1          1          1          1
## primary_infection  1          1          1          1          1          1          1          1          1
## challenge_infection 1          1          1          1          1          1          1          1          1
## mouse_strain       1          1          1          1          1          1          1          1          1
## weight            1          1          1          1          1          1          1          1          1
##          MYD88 NCR1 PRF1 RETNLB SOCS1 TICAM1 TNF
## Mouse_ID          1          1          1          1          1          1          1
## experiment        1          1          1          1          1          1          1
## primary_infection  1          1          1          1          1          1          1
## challenge_infection 1          1          1          1          1          1          1
## mouse_strain       1          1          1          1          1          1          1

```

```
## weight          1    1    1        1        1        1    1
## Number of logged events: 991
##   it im      dep      meth
## 1  0  0          collinear
## 2  1  1 oocyst_sq1      pmm
## 3  1  1 oocyst_sq1      pmm
## 4  1  1 oocyst_sq1      pmm
## 5  1  1 oocyst_sq2      pmm
## 6  1  1 oocyst_sq2      pmm
##
## 1
## 2
## 3          Mouse_IDAA_0048, Mouse_IDAA_0049, Mouse_IDAA_0050, Mouse_IDAA_0051, Mouse_ID
## 4
## 5
## 6 Mouse_IDAA_0048, Mouse_IDAA_0049, Mouse_IDAA_0050, Mouse_IDAA_0051, Mouse_IDAA_0052, Mouse_IDAA_00
```

```
# to check each column with imputed data
```

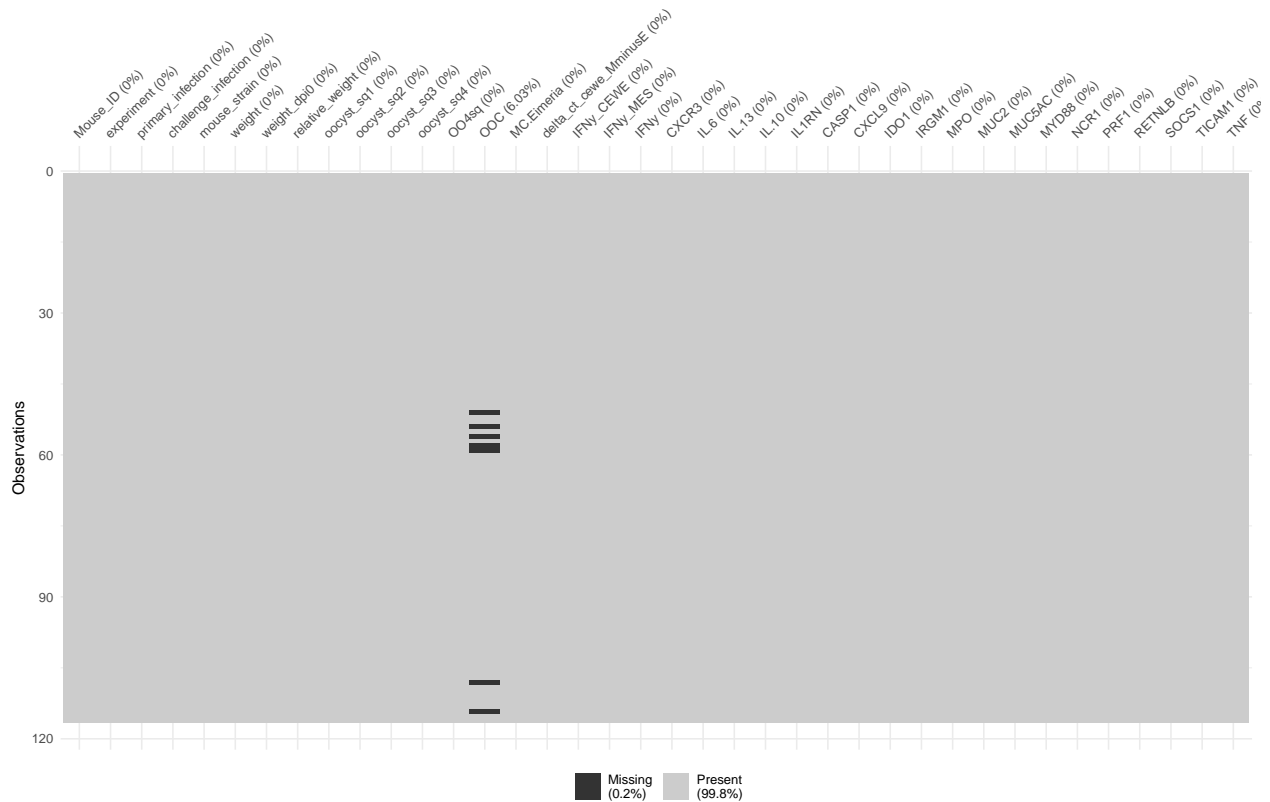
```
## igf$imp$IFNy
```

```
#Now we can get back the completed dataset using the complete()
```

```
complete_lab_gene <- complete(igf, 1)
```

```
#visualize missingness
```

```
vis_miss(complete_lab_gene)
```



```
#apply(complete_lab, function(x) sum(is.na(x)))
```

```
imp_lab_gene <- complete_lab_gene %>%
```

```

dplyr::select(all_of(Gene_lab))

#add an ending to the imputed columns
colnames(imp_lab_gene) <- paste(colnames(imp_lab_gene), "imp", sep = "_")

lab_gene <- lab_gene %>%
  dplyr::select(Mouse_ID)

#now join it to the full data set of the laboratory infections
lab_gene <- cbind(lab_gene, imp_lab_gene)

lab_gene <- unique(lab_gene)

lab <- lab %>%
  left_join(lab_gene, by = "Mouse_ID")

lab <- unique(lab)

```

Now repeat for the lab facs

Lab Facs

```

gf_lab <- lab %>%
  dplyr::select(all_of(Facs_lab))

#remove rows with only nas
gf_lab <- gf_lab[,colSums(is.na(gf_lab))<nrow(gf_lab)]

#remove columns with only nas
gf_lab <- gf_lab[rowSums(is.na(gf_lab)) != ncol(gf_lab), ]

vis_dat(gf_lab)

```




```
# no need to impute
```

```
write.csv(lab, "output_data/Lab_imputed.csv", row.names = FALSE)
```