

viability_selection_mr_lifespan

Contents

Libraries	1
Download data and do preliminary parsing	2
Calculating metabolic rates	3
Controlling for blank controls	28
Figure of Metabolic Rate between Hosts	37
Repeat above, but with day 15, starting with time sequence	51
Double Checking Eclosion for Pupal Deaths	93
Merging pupal death data sheet lifespans	93
Negative binomial regression reanalyzed with pupal death data	95
Kaplan-Meier Survival Estimate	105
Cox Regression	115
Session Info	118

Libraries

```
library(dplyr) #data parsing library

##
## Attaching package: 'dplyr'
## The following objects are masked from 'package:stats':
##
##   filter, lag
## The following objects are masked from 'package:base':
##
##   intersect, setdiff, setequal, union
library(data.table) #data parsing library mainly for reading and writing out

##
## Attaching package: 'data.table'
## The following objects are masked from 'package:dplyr':
##
##   between, first, last
library(ggplot2) #data visualization library
library(lubridate) #package to deal with time variables

##
## Attaching package: 'lubridate'
```

```
## The following objects are masked from 'package:data.table':
##
##   hour, isoweek, mday, minute, month, quarter, second, wday,
##   week, yday, year

## The following object is masked from 'package:base':
##
##   date

library(curl) #incorporate URLs
library(DiagrammeR) #figure aesthetics
library(MASS) #Functions and datasets to support
```

```
##
## Attaching package: 'MASS'

## The following object is masked from 'package:dplyr':
##
##   select

library(BBmisc) #Miscellaneous functions
```

```
##
## Attaching package: 'BBmisc'

## The following objects are masked from 'package:dplyr':
##
##   coalesce, collapse

## The following object is masked from 'package:base':
##
##   isFALSE

library(survival) #survival data analysis
library(survminer) #survival data analysis
```

```
## Loading required package: ggpubr
## Loading required package: magrittr

library(gridExtra) #figure aesthetics
```

```
##
## Attaching package: 'gridExtra'

## The following object is masked from 'package:dplyr':
##
##   combine
```

Download data and do preliminary parsing

Data are publicly available via github

```
data<- readr::read_csv("https://raw.githubusercontent.com/adnguyen/Circadian_rhythm_runs_seasonal_timing/master/Data.csv")

#look at summary of data
library(dplyr)
glimpse(data)

## Observations: 1,909
```

```

## Variables: 44
## $ Ind_ID <int> 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 1...
## $ tape <chr> "blue", "blue", "blue", "blue", "blu...
## $ Site_name <chr> "OG", "Ferris", "Ferris", "Ferris", ...
## $ mass_day10 <dbl> 6.938, 11.175, 6.719, 10.719, 3.848,...
## $ purge_time_1 <chr> "13:38", "13:39", "13:39", "13:40", ...
## $ purge1 <dbl> NA, NA, NA, NA, NA, NA, NA, NA, NA, ...
## $ collection_date <chr> "2017-08-21", "2017-08-21", "2017-08...
## $ day10 <chr> "2017-09-04", "2017-09-04", "2017-09...
## $ cohort_date <chr> "2017-08-25", "2017-08-25", "2017-08...
## $ cohort_day <int> 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, ...
## $ Host <chr> "Apple", "Apple", "Apple", "Apple", ...
## $ `Li-cor_1` <int> 6262, 6262, 6262, 6262, 6262, 6262, ...
## $ resp_time_1 <chr> "", "10:13:15", "10:14:47", "10:16:4...
## $ resp_day11 <dbl> NA, 0.2941100, 0.1052925, 1.3445380,...
## $ mass_day14 <dbl> 6.187, 9.967, 6.118, 9.539, 3.479, 6...
## $ purge_time_2 <chr> "10:51", "", "", "", "", "", "", "", ...
## $ resp_time_2 <chr> "10:13:48", "10:16:22", "10:18:10", ...
## $ resp_day15 <dbl> 0.1432514, 0.1702350, 0.1076286, 1.3...
## $ Li_cor2 <int> 6262, 6262, 6262, 6262, 6262, 6262, ...
## $ treatment_day15 <chr> "2017-09-09", "", "", "", "", "2017-...
## $ exit_fridge_date <chr> "2018-01-22", "", "", "", "", "2018-...
## $ Eclosion_reference_date <chr> "2018-01-22", "", "2017-09-09", "", ...
## $ notes <chr> "", "", "", "", "", "", "", "", "", ...
## $ Resp_code <int> 0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, ...
## $ treatment <chr> "S0", "GC", "RT", "GC", "RT", "S0", ...
## $ uniqueID <chr> "2b1", "2b2", "2b3", "2b4", "2b5", "...
## $ eclosion_date <chr> "2018-03-22", "", "2017-10-29", "", ...
## $ eclosion_days <int> 59, NA, 64, NA, 56, NA, 59, 32, 49, ...
## $ well_id <chr> "A1", "", "A1", "", "A2", "A2", "A3"...
## $ organism <chr> "fly", "", "fly", "", "fly", "", "fl...
## $ Trikinetics_position <int> 17, NA, 8, NA, 15, NA, 7, 30, 27, NA...
## $ Trik_monitor <int> 1, NA, 1, NA, 2, NA, 2, 2, 1, NA, NA...
## $ Trikinetics_entry_LD_time <chr> "12:43", "", "3:34", "", "13:03", ""...
## $ Trikinetic_exit_date <chr> "2018-03-23", "", "2107-11-05", "", ...
## $ Trikinetics_exit_LD_time <chr> "12:57", "", "20:33", "", "9:58", ""...
## $ notes_2 <chr> "", "", "changed water 2017-11-03 11...
## $ Free_run_trik_monitor <int> NA, NA, 4, NA, NA, NA, NA, NA, 3, NA...
## $ Free_run_trik_position <int> NA, NA, 11, NA, NA, NA, NA, NA, 1, N...
## $ Free_run_entry_date <chr> "", "", "2017-11-05", "", "", "", "", ...
## $ Free_run_entry_time <chr> "", "", "20:34", "", "", "", "", ...
## $ Free_run_exit_date <chr> "", "", "2017-12-09", "", "", "", "", ...
## $ Free_run_exit_time <chr> "", "", "20:00", "", "", "", "", ...
## $ notes_3 <chr> "", "", "changed water 2017-11-28", ...
## $ Adult_death_date <chr> "2018-03-23", "", "2017-12-09", "", ...

```

Calculating metabolic rates

Metabolic Rate = CO₂ production/ hours Mass Specific Metabolic Rate = CO₂ production/hrs per mass

Problem with purge_time_1: only start and stop times except for apple cohort 1 **Solution** create time sequence for each cohort from start to end and merge into master data sheet ##Day 11 ###Creating the time sequence

```
glimpse(data$purge_time_1)
```

```
## chr [1:1909] "13:38" "13:39" "13:39" "13:40" "13:41" "13:37" "13:35" ...
```

```
hm(data$purge_time_1)
```

```
## Warning in .parse_hms(..., order = "HM", quiet = quiet): Some strings
```

```
## failed to parse, or all strings are NAs
```

```
## [1] "13H 38M 0S" "13H 39M 0S" "13H 39M 0S" "13H 40M 0S" "13H 41M 0S"
## [6] "13H 37M 0S" "13H 35M 0S" "13H 57M 0S" "13H 41M 0S" "13H 36M 0S"
## [11] "13H 47M 0S" "13H 34M 0S" "13H 48M 0S" "13H 33M 0S" "13H 35M 0S"
## [16] "13H 48M 0S" "13H 34M 0S" "13H 31M 0S" "13H 49M 0S" "13H 33M 0S"
## [21] "13H 50M 0S" "13H 36M 0S" "13H 37M 0S" "13H 51M 0S" "13H 47M 0S"
## [26] "13H 46M 0S" "13H 51M 0S" "13H 30M 0S" "13H 42M 0S" "13H 54M 0S"
## [31] "13H 52M 0S" "13H 54M 0S" "13H 53M 0S" "13H 55M 0S" "13H 30M 0S"
## [36] "13H 31M 0S" "13H 56M 0S" "13H 56M 0S" "13H 32M 0S" "13H 29M 0S"
## [41] "13H 25M 0S" "13H 42M 0S" "13H 27M 0S" "13H 5M 0S" "13H 57M 0S"
## [46] "13H 50M 0S" "13H 27M 0S" "13H 26M 0S" "13H 5M 0S" "13H 10M 0S"
## [51] "13H 10M 0S" "13H 11M 0S" "13H 6M 0S" "13H 11M 0S" "13H 8M 0S"
## [56] "13H 9M 0S" "13H 12M 0S" "13H 13M 0S" "13H 13M 0S" "13H 13M 0S"
## [61] "13H 7M 0S" "13H 14M 0S" "13H 15M 0S" "13H 5M 0S" "13H 8M 0S"
## [66] "13H 7M 0S" "13H 37M 0S" "13H 16M 0S" "13H 18M 0S" "12H 58M 0S"
## [71] "12H 57M 0S" "13H 21M 0S" "13H 17M 0S" "13H 58M 0S" "13H 18M 0S"
## [76] "12H 56M 0S" "13H 4M 0S" "13H 19M 0S" "13H 20M 0S" "13H 19M 0S"
## [81] "13H 6M 0S" "13H 23M 0S" "13H 23M 0S" "12H 55M 0S" "12H 58M 0S"
## [86] "13H 24M 0S" "12H 58M 0S" "13H 24M 0S" "13H 3M 0S" "12H 56M 0S"
## [91] "13H 25M 0S" "13H 3M 0S" "17H 37M 0S" "17H 37M 0S" "17H 36M 0S"
## [96] "17H 36M 0S" "17H 36M 0S" "17H 35M 0S" "17H 35M 0S" "17H 35M 0S"
## [101] "17H 34M 0S" "17H 34M 0S" "17H 34M 0S" "17H 33M 0S" "17H 33M 0S"
## [106] "17H 33M 0S" "17H 33M 0S" "17H 32M 0S" "17H 32M 0S" "17H 31M 0S"
## [111] "17H 31M 0S" "17H 31M 0S" "17H 30M 0S" "17H 30M 0S" "17H 30M 0S"
## [116] "17H 29M 0S" "17H 29M 0S" "17H 28M 0S" "17H 28M 0S" "17H 28M 0S"
## [121] "17H 27M 0S" "17H 27M 0S" "17H 27M 0S" "17H 26M 0S" "17H 26M 0S"
## [126] "17H 26M 0S" "17H 25M 0S" "17H 25M 0S" "17H 24M 0S" "17H 23M 0S"
## [131] "17H 22M 0S" "17H 21M 0S" "17H 21M 0S" "17H 21M 0S" "17H 20M 0S"
## [136] "17H 20M 0S" "17H 20M 0S" "17H 19M 0S" "17H 19M 0S" "17H 19M 0S"
## [141] "17H 18M 0S" "17H 18M 0S" "16H 54M 0S" "16H 53M 0S" "16H 53M 0S"
## [146] "16H 52M 0S" "16H 52M 0S" "16H 51M 0S" "16H 50M 0S" "16H 50M 0S"
## [151] "16H 49M 0S" "16H 49M 0S" "17H 17M 0S" "17H 17M 0S" "17H 16M 0S"
## [156] "17H 16M 0S" "17H 16M 0S" "17H 15M 0S" "17H 15M 0S" "17H 15M 0S"
## [161] "17H 14M 0S" "17H 14M 0S" "17H 13M 0S" "17H 12M 0S" "17H 11M 0S"
## [166] "17H 11M 0S" "17H 11M 0S" "17H 10M 0S" "17H 10M 0S" "17H 10M 0S"
## [171] "17H 9M 0S" "17H 9M 0S" "17H 8M 0S" "17H 8M 0S" "17H 7M 0S"
## [176] "17H 7M 0S" "17H 6M 0S" "17H 5M 0S" "17H 5M 0S" "17H 4M 0S"
## [181] "17H 4M 0S" "17H 4M 0S" "17H 4M 0S" "17H 3M 0S" "17H 3M 0S"
## [186] "17H 2M 0S" "17H 2M 0S" "17H 1M 0S" "17H 1M 0S" "17H 1M 0S"
## [191] "17H 0M 0S" "17H 0M 0S" "16H 59M 0S" "16H 59M 0S" "16H 58M 0S"
## [196] "16H 58M 0S" "16H 58M 0S" "16H 57M 0S" "16H 56M 0S" "16H 55M 0S"
## [201] "16H 55M 0S" "16H 55M 0S" "16H 49M 0S" "16H 48M 0S" "16H 48M 0S"
## [206] "16H 47M 0S" "16H 47M 0S" "16H 47M 0S" "16H 46M 0S" "16H 46M 0S"
## [211] "16H 45M 0S" "13H 16M 0S" NA NA NA
## [216] NA NA NA NA NA
## [221] NA NA NA NA NA
## [226] NA NA NA NA NA
```

##	[231]	NA	NA	NA	NA	NA
##	[236]	NA	NA	NA	NA	NA
##	[241]	NA	NA	NA	NA	NA
##	[246]	NA	NA	NA	NA	NA
##	[251]	NA	NA	NA	NA	NA
##	[256]	NA	NA	NA	NA	NA
##	[261]	NA	NA	NA	NA	NA
##	[266]	NA	NA	NA	NA	NA
##	[271]	NA	NA	NA	NA	NA
##	[276]	NA	NA	NA	NA	NA
##	[281]	NA	NA	NA	NA	NA
##	[286]	NA	NA	NA	"14H 30M 0S"	"14H 30M 0S"
##	[291]	NA	NA	NA	NA	NA
##	[296]	NA	NA	NA	NA	NA
##	[301]	NA	NA	NA	NA	NA
##	[306]	NA	NA	NA	NA	NA
##	[311]	NA	NA	NA	NA	NA
##	[316]	NA	NA	NA	NA	NA
##	[321]	NA	NA	NA	NA	NA
##	[326]	NA	NA	NA	NA	NA
##	[331]	NA	NA	NA	NA	NA
##	[336]	NA	NA	NA	NA	NA
##	[341]	NA	NA	NA	NA	NA
##	[346]	NA	NA	NA	NA	NA
##	[351]	NA	NA	NA	NA	NA
##	[356]	NA	NA	NA	NA	NA
##	[361]	NA	NA	NA	NA	NA
##	[366]	NA	"16H 12M 0S"	"16H 38M 0S"	NA	NA
##	[371]	NA	NA	NA	NA	NA
##	[376]	NA	NA	NA	NA	NA
##	[381]	NA	NA	NA	NA	NA
##	[386]	NA	NA	NA	NA	NA
##	[391]	NA	NA	NA	NA	NA
##	[396]	NA	NA	NA	NA	NA
##	[401]	NA	NA	NA	NA	NA
##	[406]	NA	NA	NA	NA	NA
##	[411]	NA	NA	NA	NA	NA
##	[416]	NA	NA	NA	NA	NA
##	[421]	NA	NA	NA	NA	NA
##	[426]	NA	NA	NA	NA	NA
##	[431]	NA	NA	NA	NA	NA
##	[436]	NA	NA	NA	NA	NA
##	[441]	NA	"17H 25M 0S"	"17H 26M 0S"	NA	NA
##	[446]	NA	NA	NA	NA	NA
##	[451]	NA	NA	NA	NA	NA
##	[456]	NA	NA	NA	NA	NA
##	[461]	NA	NA	NA	NA	NA
##	[466]	NA	NA	NA	NA	NA
##	[471]	NA	NA	NA	NA	NA
##	[476]	NA	NA	NA	NA	NA
##	[481]	NA	NA	NA	NA	NA
##	[486]	NA	NA	NA	NA	NA
##	[491]	NA	NA	NA	NA	NA
##	[496]	NA	NA	NA	NA	NA

##	[501]	NA	NA	NA	NA	NA
##	[506]	NA	NA	NA	NA	NA
##	[511]	NA	NA	NA	NA	NA
##	[516]	NA	NA	NA	"17H 54M 0S"	"18H 59M 0S"
##	[521]	NA	NA	NA	NA	NA
##	[526]	NA	NA	NA	NA	NA
##	[531]	NA	NA	NA	NA	NA
##	[536]	NA	NA	NA	NA	NA
##	[541]	NA	NA	NA	NA	NA
##	[546]	NA	NA	NA	NA	NA
##	[551]	NA	NA	NA	NA	NA
##	[556]	NA	NA	NA	NA	NA
##	[561]	NA	NA	NA	NA	NA
##	[566]	NA	NA	NA	NA	NA
##	[571]	NA	NA	NA	NA	NA
##	[576]	NA	NA	NA	NA	NA
##	[581]	NA	NA	NA	NA	NA
##	[586]	NA	NA	NA	NA	NA
##	[591]	NA	NA	NA	NA	NA
##	[596]	NA	"19H 22M 0S"	"19H 23M 0S"	NA	NA
##	[601]	NA	NA	NA	NA	NA
##	[606]	NA	NA	NA	NA	NA
##	[611]	NA	NA	NA	NA	NA
##	[616]	NA	NA	NA	NA	NA
##	[621]	NA	NA	NA	NA	NA
##	[626]	NA	NA	NA	NA	NA
##	[631]	NA	NA	NA	NA	NA
##	[636]	NA	NA	NA	NA	NA
##	[641]	NA	NA	NA	NA	NA
##	[646]	NA	NA	NA	NA	NA
##	[651]	NA	NA	NA	NA	NA
##	[656]	NA	NA	NA	NA	NA
##	[661]	NA	NA	NA	NA	NA
##	[666]	NA	NA	NA	NA	NA
##	[671]	NA	NA	NA	NA	NA
##	[676]	"19H 49M 0S"	"13H 43M 0S"	NA	NA	NA
##	[681]	NA	NA	NA	NA	NA
##	[686]	NA	NA	NA	NA	NA
##	[691]	NA	NA	NA	NA	NA
##	[696]	NA	NA	NA	NA	NA
##	[701]	NA	NA	NA	NA	NA
##	[706]	NA	NA	NA	NA	NA
##	[711]	NA	NA	NA	NA	NA
##	[716]	NA	NA	NA	NA	NA
##	[721]	NA	NA	NA	NA	NA
##	[726]	NA	NA	NA	NA	NA
##	[731]	NA	NA	NA	NA	NA
##	[736]	NA	NA	NA	NA	NA
##	[741]	NA	NA	NA	NA	NA
##	[746]	"14H 4M 0S"	"14H 4M 0S"	NA	NA	NA
##	[751]	NA	NA	NA	NA	NA
##	[756]	NA	NA	NA	NA	NA
##	[761]	NA	NA	NA	NA	NA
##	[766]	NA	NA	NA	NA	NA

##	[771]	NA	NA	NA	NA	NA
##	[776]	NA	NA	NA	NA	NA
##	[781]	NA	NA	NA	NA	NA
##	[786]	NA	NA	NA	NA	NA
##	[791]	NA	NA	NA	NA	NA
##	[796]	NA	NA	NA	NA	NA
##	[801]	NA	NA	NA	NA	NA
##	[806]	NA	NA	NA	NA	NA
##	[811]	NA	NA	NA	NA	NA
##	[816]	NA	NA	"14H 27M OS"	"17H 4M OS"	NA
##	[821]	NA	NA	NA	NA	NA
##	[826]	NA	NA	NA	NA	NA
##	[831]	NA	NA	NA	NA	NA
##	[836]	NA	NA	NA	NA	NA
##	[841]	NA	NA	NA	NA	NA
##	[846]	NA	NA	NA	NA	NA
##	[851]	NA	NA	NA	NA	NA
##	[856]	NA	NA	NA	NA	NA
##	[861]	NA	NA	NA	NA	NA
##	[866]	NA	NA	NA	NA	NA
##	[871]	NA	NA	NA	NA	NA
##	[876]	NA	NA	NA	NA	NA
##	[881]	NA	NA	NA	NA	NA
##	[886]	NA	NA	NA	NA	NA
##	[891]	NA	NA	NA	NA	"17H 27M OS"
##	[896]	"16H 30M OS"	NA	NA	NA	NA
##	[901]	NA	NA	NA	NA	NA
##	[906]	NA	NA	NA	NA	NA
##	[911]	NA	NA	NA	NA	NA
##	[916]	NA	NA	NA	NA	NA
##	[921]	NA	NA	NA	NA	NA
##	[926]	NA	NA	NA	NA	NA
##	[931]	NA	NA	NA	NA	NA
##	[936]	NA	NA	NA	NA	NA
##	[941]	NA	NA	NA	NA	NA
##	[946]	NA	NA	NA	NA	NA
##	[951]	NA	NA	NA	NA	NA
##	[956]	NA	NA	NA	NA	NA
##	[961]	NA	NA	NA	NA	NA
##	[966]	NA	NA	NA	NA	NA
##	[971]	NA	"17H 3M OS"	"13H 22M OS"	NA	NA
##	[976]	NA	NA	NA	NA	NA
##	[981]	NA	NA	NA	NA	NA
##	[986]	NA	NA	NA	NA	NA
##	[991]	NA	NA	NA	NA	NA
##	[996]	NA	NA	NA	NA	NA
##	[1001]	NA	NA	NA	NA	NA
##	[1006]	NA	NA	NA	NA	NA
##	[1011]	NA	NA	NA	NA	NA
##	[1016]	NA	NA	NA	NA	NA
##	[1021]	NA	NA	NA	NA	NA
##	[1026]	NA	NA	NA	NA	NA
##	[1031]	NA	NA	NA	NA	NA
##	[1036]	NA	NA	NA	NA	NA

##	[1041]	NA	NA	NA	NA
##	[1046]	NA	"14H 53M OS"	"13H 26M OS"	NA
##	[1051]	NA	NA	NA	NA
##	[1056]	NA	NA	NA	NA
##	[1061]	NA	NA	NA	NA
##	[1066]	NA	NA	NA	NA
##	[1071]	NA	NA	NA	NA
##	[1076]	NA	NA	NA	NA
##	[1081]	NA	NA	NA	NA
##	[1086]	NA	NA	NA	NA
##	[1091]	NA	NA	NA	NA
##	[1096]	NA	NA	NA	NA
##	[1101]	NA	NA	NA	NA
##	[1106]	NA	NA	NA	NA
##	[1111]	NA	NA	NA	NA
##	[1116]	NA	NA	NA	NA
##	[1121]	NA	"14H 19M OS"	"17H 28M OS"	NA
##	[1126]	NA	NA	NA	NA
##	[1131]	NA	NA	NA	NA
##	[1136]	NA	NA	NA	NA
##	[1141]	NA	NA	NA	NA
##	[1146]	NA	NA	NA	NA
##	[1151]	NA	NA	NA	NA
##	[1156]	NA	NA	NA	NA
##	[1161]	NA	NA	NA	NA
##	[1166]	NA	NA	NA	NA
##	[1171]	NA	NA	NA	NA
##	[1176]	NA	NA	NA	NA
##	[1181]	NA	NA	NA	NA
##	[1186]	NA	NA	NA	"17H 49M OS"
##	[1191]	"17H 8M OS"	NA	NA	NA
##	[1196]	NA	NA	NA	NA
##	[1201]	NA	NA	NA	NA
##	[1206]	NA	NA	NA	NA
##	[1211]	NA	NA	NA	NA
##	[1216]	NA	NA	NA	NA
##	[1221]	NA	NA	NA	NA
##	[1226]	NA	NA	NA	NA
##	[1231]	NA	NA	NA	NA
##	[1236]	NA	NA	NA	NA
##	[1241]	NA	NA	NA	NA
##	[1246]	NA	NA	NA	NA
##	[1251]	NA	"17H 27M OS"	"14H 58M OS"	NA
##	[1256]	NA	NA	NA	NA
##	[1261]	NA	NA	NA	NA
##	[1266]	NA	NA	NA	NA
##	[1271]	NA	NA	NA	NA
##	[1276]	NA	NA	NA	NA
##	[1281]	NA	NA	NA	NA
##	[1286]	NA	NA	NA	NA
##	[1291]	NA	"15H 12M OS"	"15H 23M OS"	NA
##	[1296]	NA	NA	NA	NA
##	[1301]	NA	NA	NA	NA
##	[1306]	NA	NA	NA	NA

##	[1311]	NA	NA	NA	NA	NA
##	[1316]	NA	NA	NA	NA	NA
##	[1321]	NA	NA	NA	NA	NA
##	[1326]	NA	NA	NA	NA	NA
##	[1331]	"16H 36M OS"	"11H 26M OS"	NA	NA	NA
##	[1336]	NA	NA	NA	NA	NA
##	[1341]	NA	NA	NA	NA	NA
##	[1346]	NA	NA	NA	NA	NA
##	[1351]	NA	NA	NA	NA	NA
##	[1356]	NA	NA	NA	NA	NA
##	[1361]	NA	NA	NA	"11H 45M OS"	"11H 8M OS"
##	[1366]	NA	NA	NA	NA	NA
##	[1371]	NA	NA	NA	NA	NA
##	[1376]	NA	NA	NA	NA	NA
##	[1381]	NA	NA	NA	NA	NA
##	[1386]	NA	NA	NA	NA	NA
##	[1391]	NA	NA	NA	NA	NA
##	[1396]	NA	NA	"11H 25M OS"	"10H 47M OS"	NA
##	[1401]	NA	NA	NA	NA	NA
##	[1406]	NA	NA	NA	NA	NA
##	[1411]	NA	NA	NA	NA	NA
##	[1416]	NA	NA	NA	NA	NA
##	[1421]	NA	NA	NA	NA	NA
##	[1426]	NA	NA	NA	NA	NA
##	[1431]	NA	"11H 4M OS"	"11H 4M OS"	NA	NA
##	[1436]	NA	NA	NA	NA	NA
##	[1441]	NA	NA	NA	NA	NA
##	[1446]	NA	NA	NA	NA	NA
##	[1451]	NA	NA	NA	NA	NA
##	[1456]	NA	NA	NA	NA	NA
##	[1461]	NA	NA	NA	NA	NA
##	[1466]	"11H 19M OS"	"13H 43M OS"	NA	NA	NA
##	[1471]	NA	NA	NA	NA	NA
##	[1476]	NA	NA	NA	NA	NA
##	[1481]	NA	NA	NA	NA	"13H 54M OS"
##	[1486]	"14H 54M OS"	NA	NA	NA	NA
##	[1491]	NA	NA	NA	NA	NA
##	[1496]	NA	NA	NA	NA	NA
##	[1501]	NA	NA	NA	"15H 14M OS"	"15H 15M OS"
##	[1506]	NA	NA	NA	NA	NA
##	[1511]	NA	NA	NA	NA	NA
##	[1516]	NA	NA	NA	NA	NA
##	[1521]	NA	NA	NA	NA	NA
##	[1526]	NA	NA	NA	NA	NA
##	[1531]	NA	NA	NA	NA	NA
##	[1536]	NA	NA	NA	"15H 25M OS"	"15H 2M OS"
##	[1541]	NA	NA	NA	NA	NA
##	[1546]	NA	NA	NA	NA	NA
##	[1551]	NA	NA	NA	NA	NA
##	[1556]	NA	NA	NA	NA	NA
##	[1561]	NA	NA	NA	NA	NA
##	[1566]	NA	NA	NA	NA	NA
##	[1571]	NA	NA	NA	"15H 14M OS"	"11H 53M OS"
##	[1576]	NA	NA	NA	NA	NA

##	[1581]	NA	NA	NA	NA	NA
##	[1586]	NA	NA	NA	NA	NA
##	[1591]	NA	NA	NA	NA	NA
##	[1596]	NA	NA	NA	NA	NA
##	[1601]	NA	"12H 5M OS"	"11H 42M OS"	NA	NA
##	[1606]	NA	NA	NA	NA	NA
##	[1611]	NA	NA	NA	NA	NA
##	[1616]	NA	NA	NA	NA	NA
##	[1621]	NA	NA	NA	NA	NA
##	[1626]	NA	NA	NA	NA	"11H 52M OS"
##	[1631]	"14H 42M OS"	NA	NA	NA	NA
##	[1636]	NA	NA	NA	NA	NA
##	[1641]	NA	NA	NA	NA	NA
##	[1646]	NA	NA	NA	NA	NA
##	[1651]	NA	NA	NA	NA	NA
##	[1656]	"14H 53M OS"	"14H 53M OS"	NA	NA	NA
##	[1661]	NA	NA	NA	NA	NA
##	[1666]	NA	NA	NA	NA	NA
##	[1671]	NA	NA	NA	NA	NA
##	[1676]	NA	NA	NA	NA	NA
##	[1681]	NA	NA	"15H 5M OS"	"14H 12M OS"	NA
##	[1686]	NA	NA	NA	NA	NA
##	[1691]	NA	NA	NA	NA	NA
##	[1696]	NA	NA	NA	NA	NA
##	[1701]	NA	NA	NA	NA	NA
##	[1706]	NA	"14H 20M OS"	"14H 20M OS"	NA	NA
##	[1711]	NA	NA	NA	NA	NA
##	[1716]	NA	NA	NA	NA	NA
##	[1721]	NA	NA	NA	NA	NA
##	[1726]	NA	NA	NA	NA	NA
##	[1731]	"14H 29M OS"	"8H 57M OS"	NA	NA	NA
##	[1736]	NA	NA	NA	NA	NA
##	[1741]	NA	NA	NA	NA	NA
##	[1746]	NA	NA	NA	NA	NA
##	[1751]	NA	NA	NA	NA	NA
##	[1756]	NA	NA	NA	NA	NA
##	[1761]	NA	NA	"9H 5M OS"	"8H 49M OS"	NA
##	[1766]	NA	NA	NA	NA	NA
##	[1771]	NA	NA	NA	NA	NA
##	[1776]	NA	NA	NA	NA	NA
##	[1781]	NA	NA	NA	NA	NA
##	[1786]	NA	NA	NA	NA	NA
##	[1791]	NA	NA	NA	NA	"8H 56M OS"
##	[1796]	"9H 51M OS"	NA	NA	NA	NA
##	[1801]	NA	NA	NA	NA	NA
##	[1806]	NA	NA	NA	NA	NA
##	[1811]	NA	NA	NA	"9H 54M OS"	"9H 46M OS"
##	[1816]	NA	NA	NA	NA	NA
##	[1821]	NA	NA	NA	NA	NA
##	[1826]	NA	NA	NA	NA	NA
##	[1831]	NA	"9H 50M OS"	"12H 2M OS"	NA	NA
##	[1836]	NA	NA	NA	NA	NA
##	[1841]	NA	NA	NA	NA	NA
##	[1846]	NA	NA	NA	NA	NA

```

## [1851] NA          "12H 8M OS"  "11H 56M OS" NA          NA
## [1856] NA          NA          NA          NA          NA
## [1861] NA          NA          NA          NA          NA
## [1866] NA          NA          NA          NA          NA
## [1871] "12H 2M OS"  "15H 14M OS" NA          NA          NA
## [1876] NA          "15H 15M OS" "15H 12M OS" NA          NA
## [1881] NA          NA          "15H 14M OS" "11H 3M OS" NA
## [1886] NA          NA          NA          NA          NA
## [1891] "11H 6M OS"  "11H 6M OS"  NA          NA          NA
## [1896] NA          NA          "11H 8M OS"  "12H 26M OS" NA
## [1901] NA          NA          NA          "12H 28M OS" "12H 20M OS"
## [1906] NA          NA          NA          "12H 21M OS"

data$day10purge <- lubridate::hour(hm(data$purge_time_1))+lubridate::minute(hm(data$purge_time_1))/60

## Warning in .parse_hms(..., order = "HM", quiet = quiet): Some strings
## failed to parse, or all strings are NAs

## Warning in .parse_hms(..., order = "HM", quiet = quiet): Some strings
## failed to parse, or all strings are NAs

#Obtaining start and end (min and max) of purges and sample size for each host, cohort day, and tape
param <- data%>%
  group_by(cohort_day, tape)%>%
  summarise(max=max(day10purge, na.rm=TRUE), min=min(day10purge, na.rm=TRUE), n=length(cohort_day))

#goal: for this section, we want a sequence of times for day 10 purge
data2 <- data%>%
  group_by(cohort_day, tape)%>%
  mutate(.,day10purge.trans=seq(from = min(day10purge, na.rm=TRUE), to = max(day10purge, na.rm=TRUE), 1,
glimpse(data2)

## Observations: 1,909
## Variables: 46
## $ Ind_ID      <int> 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 1...
## $ tape        <chr> "blue", "blue", "blue", "blue", "blu...
## $ Site_name    <chr> "OG", "Ferris", "Ferris", "Ferris", ...
## $ mass_day10   <dbl> 6.938, 11.175, 6.719, 10.719, 3.848,...
## $ purge_time_1 <chr> "13:38", "13:39", "13:39", "13:40", ...
## $ purge1       <dbl> NA, NA, NA, NA, NA, NA, NA, NA, NA, ...
## $ collection_date <chr> "2017-08-21", "2017-08-21", "2017-08...
## $ day10        <chr> "2017-09-04", "2017-09-04", "2017-09...
## $ cohort_date  <chr> "2017-08-25", "2017-08-25", "2017-08...
## $ cohort_day   <int> 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, ...
## $ Host         <chr> "Apple", "Apple", "Apple", "Apple", ...
## $ `Li-cor_1`   <int> 6262, 6262, 6262, 6262, 6262, 6262, ...
## $ resp_time_1  <chr> "", "10:13:15", "10:14:47", "10:16:4...
## $ resp_day11   <dbl> NA, 0.2941100, 0.1052925, 1.3445380,...
## $ mass_day14   <dbl> 6.187, 9.967, 6.118, 9.539, 3.479, 6...
## $ purge_time_2 <chr> "10:51", "", "", "", "", "", "", "",...
## $ resp_time_2  <chr> "10:13:48", "10:16:22", "10:18:10", ...
## $ resp_day15   <dbl> 0.1432514, 0.1702350, 0.1076286, 1.3...
## $ Li_cor2      <int> 6262, 6262, 6262, 6262, 6262, 6262, ...
## $ treatment_day15 <chr> "2017-09-09", "", "", "", "", "2017-...
## $ exit_fridge_date <chr> "2018-01-22", "", "", "", "", "2018-...

```

```
## $ Eclosion_reference_date <chr> "2018-01-22", "", "2017-09-09", "", ...
## $ notes <chr> "", "", "", "", "", "", "", "", "", ...
## $ Resp_code <int> 0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, ...
## $ treatment <chr> "S0", "GC", "RT", "GC", "RT", "S0", ...
## $ uniqueID <chr> "2b1", "2b2", "2b3", "2b4", "2b5", "...
## $ eclosion_date <chr> "2018-03-22", "", "2017-10-29", "", ...
## $ eclosion_days <int> 59, NA, 64, NA, 56, NA, 59, 32, 49, ...
## $ well_id <chr> "A1", "", "A1", "", "A2", "A2", "A3"...
## $ organism <chr> "fly", "", "fly", "", "fly", "", "fl...
## $ Trikinetics_position <int> 17, NA, 8, NA, 15, NA, 7, 30, 27, NA...
## $ Trikinetics_monitor <int> 1, NA, 1, NA, 2, NA, 2, 2, 1, NA, NA...
## $ Trikinetics_entry_LD_time <chr> "12:43", "", "3:34", "", "13:03", ""...
## $ Trikinetic_exit_date <chr> "2018-03-23", "", "2107-11-05", "", ...
## $ Trikinetics_exit_LD_time <chr> "12:57", "", "20:33", "", "9:58", ""...
## $ notes_2 <chr> "", "", "changed water 2017-11-03 11...
## $ Free_run_trik_monitor <int> NA, NA, 4, NA, NA, NA, NA, NA, 3, NA...
## $ Free_run_trik_position <int> NA, NA, 11, NA, NA, NA, NA, NA, 1, N...
## $ Free_run_entry_date <chr> "", "", "2017-11-05", "", "", "", ""...
## $ Free_run_entry_time <chr> "", "", "20:34", "", "", "", "", ""...
## $ Free_run_exit_date <chr> "", "", "2017-12-09", "", "", "", ""...
## $ Free_run_exit_time <chr> "", "", "20:00", "", "", "", "", ""...
## $ notes_3 <chr> "", "", "changed water 2017-11-28", ...
## $ Adult_death_date <chr> "2018-03-23", "", "2017-12-09", "", ...
## $ day10purge <dbl> 13.63333, 13.65000, 13.65000, 13.666...
## $ day10purge.trans <dbl> 13.08333, 13.10924, 13.13514, 13.161...
```

*#cohort 2&3 for apple have the right sequence of purge times so they(day10purge) need to be replaced in
#extract number of rows we want to replace*

```
data2[1:500,]%>%
  filter(cohort_day < 4)%>%
  dim()
```

```
## [1] 211 46
```

```
data2[1:211,46]<- data2[1:211,45]
data2[1:211,46]
```

```
## # A tibble: 211 x 1
##   day10purge.trans
##           <dbl>
## 1           13.6
## 2           13.6
## 3           13.6
## 4           13.7
## 5           13.7
## 6           13.6
## 7           13.6
## 8           14.0
## 9           13.7
## 10          13.6
## # ... with 201 more rows
```

Calculating start and end time for total amount of hours of CO2 production

```
glimpse(data$resp_time_1)
```

```
## chr [1:1909] "" "10:13:15" "10:14:47" "10:16:43" "10:18:41" ...
```

```
hms(data$resp_time_1)
```

```
## Warning in .parse_hms(..., order = "HMS", quiet = quiet): Some strings  
## failed to parse, or all strings are NAs
```

```
## [1] NA "10H 13M 15S" "10H 14M 47S" "10H 16M 43S"  
## [5] "10H 18M 41S" "10H 20M 19S" "10H 22M 7S" "10H 23M 42S"  
## [9] "10H 25M 39S" "10H 27M 14S" "10H 28M 45S" "10H 30M 30S"  
## [13] "10H 32M 10S" "10H 33M 40S" "10H 35M 22S" "10H 37M 13S"  
## [17] "10H 39M 6S" "10H 40M 45S" "10H 42M 26S" "10H 43M 58S"  
## [21] "10H 45M 43S" "10H 47M 22S" "10H 48M 50S" "10H 50M 26S"  
## [25] "10H 52M 9S" "10H 53M 43S" "10H 55M 5S" "10H 56M 34S"  
## [29] "10H 58M 5S" "10H 59M 41S" "11H 1M 17S" "11H 2M 43S"  
## [33] "11H 4M 1S" "11H 5M 17S" "11H 6M 44S" "11H 8M 6S"  
## [37] "11H 9M 27S" "11H 11M 9S" "11H 12M 28S" "11H 13M 50S"  
## [41] "11H 15M 31S" "11H 17M 8S" "11H 18M 48S" "11H 20M 10S"  
## [45] "11H 21M 10S" "11H 22M 33S" "11H 24M 4S" "11H 25M 45S"  
## [49] "11H 27M 25S" NA "10H 13M 15S" "10H 14M 47S"  
## [53] "10H 16M 43S" "10H 18M 41S" "10H 20M 19S" "10H 22M 7S"  
## [57] "10H 23M 42S" "10H 25M 39S" "10H 27M 14S" "10H 28M 45S"  
## [61] "10H 30M 30S" "10H 32M 10S" "10H 33M 40S" "10H 35M 22S"  
## [65] "10H 37M 13S" "10H 39M 6S" "10H 40M 45S" "10H 42M 26S"  
## [69] "10H 43M 58S" "10H 45M 43S" "10H 47M 22S" "10H 48M 50S"  
## [73] "10H 50M 26S" "10H 52M 9S" "10H 53M 43S" "10H 55M 5S"  
## [77] "10H 56M 34S" "10H 58M 5S" "10H 59M 41S" "11H 1M 17S"  
## [81] "11H 2M 43S" "11H 4M 1S" "11H 5M 17S" "11H 6M 44S"  
## [85] "11H 8M 6S" "11H 9M 27S" "11H 11M 9S" "11H 12M 28S"  
## [89] "11H 13M 50S" "11H 15M 31S" "11H 17M 8S" "11H 18M 48S"  
## [93] "9H 14M 1S" "9H 15M 39S" "9H 16M 56S" "9H 18M 20S"  
## [97] "9H 19M 52S" "9H 21M 10S" "9H 22M 45S" "9H 24M 5S"  
## [101] "9H 25M 16S" "9H 26M 48S" "9H 28M 26S" "9H 30M 13S"  
## [105] "9H 31M 37S" "9H 32M 52S" "9H 34M 10S" "9H 35M 31S"  
## [109] "9H 37M 4S" "9H 38M 22S" "9H 39M 47S" "9H 41M 28S"  
## [113] "9H 42M 51S" "9H 44M 11S" "9H 45M 30S" "9H 46M 55S"  
## [117] "9H 48M 9S" "9H 49M 41S" "9H 50M 58S" "9H 52M 21S"  
## [121] "9H 54M 1S" "9H 55M 47S" "9H 57M 18S" "9H 58M 42S"  
## [125] "10H 0M 3S" "10H 1M 30S" "10H 2M 49S" "10H 4M 27S"  
## [129] "10H 6M 7S" "10H 9M 1S" "10H 10M 32S" "10H 11M 52S"  
## [133] "10H 13M 10S" "10H 14M 27S" "10H 15M 43S" "10H 17M 5S"  
## [137] "10H 18M 22S" "10H 19M 35S" "10H 20M 51S" "10H 22M 28S"  
## [141] "10H 23M 41S" "10H 25M 2S" "10H 26M 14S" "10H 27M 38S"  
## [145] "10H 29M 14S" "10H 30M 20S" "10H 31M 38S" "10H 32M 50S"  
## [149] "10H 34M 20S" "10H 35M 48S" "10H 37M 3S" "10H 38M 3S"  
## [153] "9H 14M 1S" "9H 15M 39S" "9H 16M 56S" "9H 18M 20S"  
## [157] "9H 19M 52S" "9H 21M 10S" "9H 22M 45S" "9H 24M 5S"  
## [161] "9H 25M 16S" "9H 26M 48S" "9H 28M 26S" "9H 30M 13S"  
## [165] "9H 31M 37S" "9H 32M 52S" "9H 34M 10S" "9H 35M 31S"  
## [169] "9H 37M 4S" "9H 38M 22S" "9H 39M 47S" "9H 41M 28S"  
## [173] "9H 42M 51S" "9H 44M 11S" "9H 45M 30S" "9H 46M 55S"
```

##	[177]	"9H 48M 9S"	"9H 49M 41S"	"9H 50M 58S"	"9H 52M 21S"
##	[181]	"9H 54M 1S"	"9H 55M 47S"	"9H 57M 18S"	"9H 58M 42S"
##	[185]	"10H 0M 3S"	"10H 1M 30S"	"10H 2M 49S"	"10H 4M 27S"
##	[189]	"10H 6M 7S"	"10H 9M 1S"	"10H 10M 32S"	"10H 11M 52S"
##	[193]	"10H 13M 10S"	"10H 14M 27S"	"10H 15M 43S"	"10H 17M 5S"
##	[197]	"10H 18M 22S"	"10H 19M 35S"	"10H 20M 51S"	"10H 22M 28S"
##	[201]	"10H 23M 41S"	"10H 25M 2S"	"10H 26M 14S"	"10H 27M 38S"
##	[205]	"10H 29M 14S"	"10H 30M 20S"	"10H 31M 38S"	"10H 32M 50S"
##	[209]	"10H 34M 20S"	"10H 35M 48S"	"10H 37M 3S"	"9H 12M 15S"
##	[213]	"9H 13M 32S"	"9H 14M 57S"	"9H 16M 11S"	"9H 17M 23S"
##	[217]	"9H 18M 53S"	"9H 20M 28S"	"9H 22M 6S"	"9H 23M 38S"
##	[221]	"9H 25M 5S"	"9H 26M 27S"	"9H 27M 37S"	"9H 28M 45S"
##	[225]	"9H 30M 6S"	"9H 31M 25S"	"9H 32M 48S"	"9H 34M 19S"
##	[229]	"9H 35M 44S"	"9H 37M 3S"	"9H 38M 34S"	"9H 39M 55S"
##	[233]	"9H 41M 37S"	"9H 43M 0S"	"9H 44M 29S"	"9H 45M 44S"
##	[237]	"9H 46M 57S"	"9H 49M 6S"	"9H 50M 29S"	"9H 51M 51S"
##	[241]	"9H 53M 18S"	"9H 54M 49S"	"9H 55M 55S"	"9H 57M 21S"
##	[245]	"9H 58M 45S"	"10H 0M 2S"	"10H 1M 15S"	"10H 2M 30S"
##	[249]	"10H 3M 38S"	"10H 4M 53S"	"10H 6M 4S"	"10H 7M 33S"
##	[253]	"10H 8M 42S"	"10H 9M 55S"	"10H 11M 11S"	"10H 12M 25S"
##	[257]	"10H 13M 32S"	"10H 14M 36S"	"10H 15M 36S"	"10H 16M 49S"
##	[261]	"10H 18M 0S"	"10H 19M 12S"	"10H 20M 42S"	"10H 22M 5S"
##	[265]	"10H 23M 28S"	"10H 24M 57S"	"10H 26M 15S"	"10H 27M 37S"
##	[269]	"10H 28M 48S"	"10H 30M 12S"	"10H 31M 33S"	"10H 32M 40S"
##	[273]	"10H 34M 6S"	"10H 37M 16S"	"10H 41M 44S"	"10H 42M 55S"
##	[277]	"10H 44M 29S"	"10H 45M 55S"	"10H 47M 13S"	"10H 48M 19S"
##	[281]	"10H 49M 30S"	"10H 50M 42S"	"10H 52M 5S"	"10H 53M 26S"
##	[285]	"10H 54M 41S"	"10H 55M 47S"	"10H 56M 51S"	"10H 58M 11S"
##	[289]	"10H 59M 16S"	"9H 12M 15S"	"9H 13M 32S"	"9H 14M 57S"
##	[293]	"9H 16M 11S"	"9H 17M 23S"	"9H 18M 53S"	"9H 20M 28S"
##	[297]	"9H 22M 6S"	"9H 23M 38S"	"9H 25M 5S"	"9H 26M 27S"
##	[301]	"9H 27M 37S"	"9H 28M 45S"	"9H 30M 6S"	"9H 31M 25S"
##	[305]	"9H 32M 48S"	"9H 34M 19S"	"9H 35M 44S"	"9H 37M 3S"
##	[309]	"9H 38M 34S"	"9H 39M 55S"	"9H 41M 37S"	"9H 43M 0S"
##	[313]	"9H 44M 29S"	"9H 45M 44S"	"9H 46M 57S"	"9H 49M 6S"
##	[317]	"9H 50M 29S"	"9H 51M 51S"	"9H 53M 18S"	"9H 54M 49S"
##	[321]	"9H 55M 55S"	"9H 57M 21S"	"9H 58M 45S"	"10H 0M 2S"
##	[325]	"10H 1M 15S"	"10H 2M 30S"	"10H 3M 38S"	"10H 4M 53S"
##	[329]	"10H 6M 4S"	"10H 7M 33S"	"10H 8M 42S"	"10H 9M 55S"
##	[333]	"10H 11M 11S"	"10H 12M 25S"	"10H 13M 32S"	"10H 14M 36S"
##	[337]	"10H 15M 36S"	"10H 16M 49S"	"10H 18M 0S"	"10H 19M 12S"
##	[341]	"10H 20M 42S"	"10H 22M 5S"	"10H 23M 28S"	"10H 24M 57S"
##	[345]	"10H 26M 15S"	"10H 27M 37S"	"10H 28M 48S"	"10H 30M 12S"
##	[349]	"10H 31M 33S"	"10H 32M 40S"	"10H 34M 6S"	"10H 37M 16S"
##	[353]	"10H 41M 44S"	"10H 42M 55S"	"10H 44M 29S"	"10H 45M 55S"
##	[357]	"10H 47M 13S"	"10H 48M 19S"	"10H 49M 30S"	"10H 50M 42S"
##	[361]	"10H 52M 5S"	"10H 53M 26S"	"10H 54M 41S"	"10H 55M 47S"
##	[365]	"10H 56M 51S"	"10H 58M 11S"	"10H 59M 16S"	"9H 16M 12S"
##	[369]	"9H 19M 9S"	"9H 20M 37S"	"9H 22M 7S"	"9H 23M 51S"
##	[373]	"9H 25M 36S"	"9H 27M 10S"	"9H 29M 35S"	"9H 31M 10S"
##	[377]	"9H 32M 58S"	"9H 34M 27S"	"9H 35M 52S"	"9H 37M 14S"
##	[381]	"9H 38M 39S"	"9H 39M 53S"	"9H 41M 4S"	"9H 42M 33S"
##	[385]	"9H 43M 57S"	"9H 45M 16S"	"9H 46M 20S"	"9H 47M 30S"
##	[389]	"9H 48M 40S"	"9H 50M 6S"	"9H 51M 10S"	"9H 52M 35S"

##	[393]	"9H 53M 46S"	"9H 55M 15S"	"9H 56M 38S"	"9H 57M 56S"
##	[397]	"9H 59M 11S"	"10H 0M 32S"	"10H 1M 36S"	"10H 2M 49S"
##	[401]	"10H 4M 5S"	"10H 5M 24S"	"10H 6M 39S"	"10H 7M 52S"
##	[405]	"10H 9M 13S"	"10H 10M 24S"	"10H 11M 38S"	"10H 12M 47S"
##	[409]	"10H 14M 1S"	"10H 15M 19S"	"10H 16M 26S"	"10H 17M 48S"
##	[413]	"10H 19M 8S"	"10H 20M 14S"	"10H 21M 39S"	"10H 22M 51S"
##	[417]	"10H 24M 9S"	"10H 25M 33S"	"10H 26M 44S"	"10H 28M 7S"
##	[421]	"10H 29M 18S"	"10H 30M 33S"	"10H 31M 54S"	"10H 33M 6S"
##	[425]	"10H 34M 13S"	"10H 35M 34S"	"10H 37M 10S"	"10H 38M 38S"
##	[429]	"10H 45M 21S"	"10H 47M 2S"	"10H 48M 21S"	"10H 49M 50S"
##	[433]	"10H 51M 19S"	"10H 52M 43S"	"10H 54M 9S"	"10H 55M 49S"
##	[437]	"10H 57M 6S"	"10H 58M 22S"	"10H 59M 32S"	"11H 0M 42S"
##	[441]	"11H 2M 6S"	"11H 3M 24S"	"9H 16M 12S"	"9H 19M 9S"
##	[445]	"9H 20M 37S"	"9H 22M 7S"	"9H 23M 51S"	"9H 25M 36S"
##	[449]	"9H 27M 10S"	"9H 29M 35S"	"9H 31M 10S"	"9H 32M 58S"
##	[453]	"9H 34M 27S"	"9H 35M 52S"	"9H 37M 14S"	"9H 38M 39S"
##	[457]	"9H 39M 53S"	"9H 41M 4S"	"9H 42M 33S"	"9H 43M 57S"
##	[461]	"9H 45M 16S"	"9H 46M 20S"	"9H 47M 30S"	"9H 48M 40S"
##	[465]	"9H 50M 6S"	"9H 51M 10S"	"9H 52M 35S"	"9H 53M 46S"
##	[469]	"9H 55M 15S"	"9H 56M 38S"	"9H 57M 56S"	"9H 59M 11S"
##	[473]	"10H 0M 32S"	"10H 1M 36S"	"10H 2M 49S"	"10H 4M 5S"
##	[477]	"10H 5M 24S"	"10H 6M 39S"	"10H 7M 52S"	"10H 9M 13S"
##	[481]	"10H 10M 24S"	"10H 11M 38S"	"10H 12M 47S"	"10H 14M 1S"
##	[485]	"10H 15M 19S"	"10H 16M 26S"	"10H 17M 48S"	"10H 19M 8S"
##	[489]	"10H 20M 14S"	"10H 21M 39S"	"10H 22M 51S"	"10H 24M 9S"
##	[493]	"10H 25M 33S"	"10H 26M 44S"	"10H 28M 7S"	"10H 29M 18S"
##	[497]	"10H 30M 33S"	"10H 31M 54S"	"10H 33M 6S"	"10H 34M 13S"
##	[501]	"10H 35M 34S"	"10H 37M 10S"	"10H 38M 38S"	"10H 45M 21S"
##	[505]	"10H 47M 2S"	"10H 48M 21S"	"10H 49M 50S"	"10H 51M 19S"
##	[509]	"10H 52M 43S"	"10H 54M 9S"	"10H 55M 49S"	"10H 57M 6S"
##	[513]	"10H 58M 22S"	"10H 59M 32S"	"11H 0M 42S"	"11H 2M 6S"
##	[517]	"11H 3M 24S"	"11H 4M 53S"	"11H 6M 0S"	"10H 22M 57S"
##	[521]	"10H 24M 15S"	"10H 25M 34S"	"10H 26M 50S"	"10H 28M 14S"
##	[525]	"10H 29M 33S"	"10H 30M 54S"	"10H 32M 9S"	"10H 33M 28S"
##	[529]	"10H 34M 58S"	"10H 36M 14S"	"10H 37M 53S"	"10H 39M 26S"
##	[533]	"10H 40M 50S"	"10H 42M 19S"	"10H 43M 49S"	"10H 45M 14S"
##	[537]	"10H 46M 32S"	"10H 48M 8S"	"10H 49M 42S"	"10H 51M 18S"
##	[541]	"10H 52M 49S"	"10H 54M 7S"	"10H 55M 34S"	"10H 56M 54S"
##	[545]	"10H 58M 18S"	"10H 59M 42S"	"11H 0M 55S"	"11H 2M 13S"
##	[549]	"11H 3M 35S"	"11H 5M 2S"	"11H 6M 21S"	"11H 7M 42S"
##	[553]	"11H 9M 14S"	"11H 10M 36S"	"11H 11M 49S"	"11H 12M 57S"
##	[557]	"11H 14M 35S"	"11H 16M 19S"	"11H 17M 51S"	"11H 19M 13S"
##	[561]	"11H 20M 35S"	"11H 21M 50S"	"11H 23M 22S"	"11H 24M 38S"
##	[565]	"11H 25M 54S"	"11H 27M 21S"	"11H 28M 35S"	"11H 29M 51S"
##	[569]	"11H 31M 17S"	"11H 32M 35S"	"11H 34M 2S"	"11H 35M 37S"
##	[573]	"11H 37M 5S"	"11H 38M 30S"	"11H 39M 50S"	"11H 41M 19S"
##	[577]	"11H 42M 41S"	"11H 44M 6S"	"11H 45M 22S"	"11H 49M 18S"
##	[581]	"11H 50M 42S"	"11H 52M 9S"	"11H 53M 28S"	"11H 54M 47S"
##	[585]	"11H 55M 59S"	"11H 57M 23S"	"11H 58M 39S"	"12H 0M 0S"
##	[589]	"12H 1M 16S"	"12H 2M 24S"	"12H 4M 2S"	"12H 5M 37S"
##	[593]	"12H 7M 18S"	"12H 8M 36S"	"12H 9M 52S"	"12H 11M 22S"
##	[597]	"12H 12M 53S"	"12H 14M 4S"	"10H 24M 15S"	"10H 25M 34S"
##	[601]	"10H 26M 50S"	"10H 28M 14S"	"10H 29M 33S"	"10H 30M 54S"
##	[605]	"10H 32M 9S"	"10H 33M 28S"	"10H 34M 58S"	"10H 36M 14S"

[609] "10H 37M 53S" "10H 39M 26S" "10H 40M 50S" "10H 42M 19S"
 ## [613] "10H 43M 49S" "10H 45M 14S" "10H 46M 32S" "10H 48M 8S"
 ## [617] "10H 49M 42S" "10H 51M 18S" "10H 52M 49S" "10H 54M 7S"
 ## [621] "10H 55M 34S" "10H 56M 54S" "10H 58M 18S" "10H 59M 42S"
 ## [625] "11H 0M 55S" "11H 2M 13S" "11H 3M 35S" "11H 5M 2S"
 ## [629] "11H 6M 21S" "11H 7M 42S" "11H 9M 14S" "11H 10M 36S"
 ## [633] "11H 11M 49S" "11H 12M 57S" "11H 14M 35S" "11H 16M 19S"
 ## [637] "11H 17M 51S" "11H 19M 13S" "11H 20M 35S" "11H 21M 50S"
 ## [641] "11H 23M 22S" "11H 24M 38S" "11H 25M 54S" "11H 27M 21S"
 ## [645] "11H 28M 35S" "11H 29M 51S" "11H 31M 17S" "11H 32M 35S"
 ## [649] "11H 34M 2S" "11H 35M 37S" "11H 37M 5S" "11H 38M 30S"
 ## [653] "11H 39M 50S" "11H 41M 19S" "11H 42M 41S" "11H 44M 6S"
 ## [657] "11H 45M 22S" "11H 49M 18S" "11H 50M 42S" "11H 52M 9S"
 ## [661] "11H 53M 28S" "11H 54M 47S" "11H 55M 59S" "11H 57M 23S"
 ## [665] "11H 58M 39S" "12H 0M 0S" "12H 1M 16S" "12H 2M 24S"
 ## [669] "12H 4M 2S" "12H 5M 37S" "12H 7M 18S" "12H 8M 36S"
 ## [673] "12H 9M 52S" "12H 11M 22S" "12H 12M 53S" "12H 14M 4S"
 ## [677] "8H 52M 12S" "8H 53M 31S" "8H 54M 52S" "8H 56M 6S"
 ## [681] "8H 57M 17S" "8H 58M 29S" "8H 59M 50S" "9H 1M 17S"
 ## [685] "9H 2M 45S" "9H 4M 12S" "9H 5M 35S" "9H 7M 7S"
 ## [689] "9H 8M 22S" "9H 9M 33S" "9H 10M 59S" "9H 12M 25S"
 ## [693] "9H 13M 34S" "9H 15M 0S" "9H 16M 30S" "9H 18M 10S"
 ## [697] "9H 19M 29S" "9H 20M 59S" "9H 22M 14S" "9H 23M 33S"
 ## [701] "9H 24M 53S" "9H 26M 24S" "9H 27M 55S" "9H 29M 11S"
 ## [705] "9H 30M 30S" "9H 31M 52S" "9H 33M 23S" "9H 34M 28S"
 ## [709] "9H 36M 2S" "9H 37M 15S" "9H 38M 40S" "9H 40M 23S"
 ## [713] "9H 41M 32S" "9H 42M 47S" "9H 44M 2S" "9H 45M 34S"
 ## [717] "9H 47M 4S" "9H 48M 33S" "9H 50M 13S" "9H 51M 47S"
 ## [721] "9H 53M 4S" "9H 54M 34S" "9H 55M 54S" "9H 57M 9S"
 ## [725] "9H 58M 14S" "9H 59M 26S" "10H 0M 40S" "10H 2M 6S"
 ## [729] "10H 3M 31S" "10H 5M 1S" "10H 6M 23S" "10H 7M 40S"
 ## [733] "10H 8M 54S" "10H 10M 8S" "10H 11M 15S" "10H 12M 31S"
 ## [737] "10H 13M 46S" "10H 15M 1S" "10H 16M 23S" "10H 19M 19S"
 ## [741] "10H 20M 31S" "10H 21M 49S" "10H 22M 57S" "10H 24M 20S"
 ## [745] "10H 25M 33S" "10H 26M 40S" "8H 52M 12S" "8H 53M 31S"
 ## [749] "8H 54M 52S" "8H 56M 6S" "8H 57M 17S" "8H 58M 29S"
 ## [753] "8H 59M 50S" "9H 1M 17S" "9H 2M 45S" "9H 4M 12S"
 ## [757] "9H 5M 35S" "9H 7M 7S" "9H 8M 22S" "9H 9M 33S"
 ## [761] "9H 10M 59S" "9H 12M 25S" "9H 13M 34S" "9H 15M 0S"
 ## [765] "9H 16M 30S" "9H 18M 10S" "9H 19M 29S" "9H 20M 59S"
 ## [769] "9H 22M 14S" "9H 23M 33S" "9H 24M 53S" "9H 26M 24S"
 ## [773] "9H 27M 55S" "9H 29M 11S" "9H 30M 30S" "9H 31M 52S"
 ## [777] "9H 33M 23S" "9H 34M 28S" "9H 36M 2S" "9H 37M 15S"
 ## [781] "9H 38M 40S" "9H 40M 23S" "9H 41M 32S" "9H 42M 47S"
 ## [785] "9H 44M 2S" "9H 45M 34S" "9H 47M 4S" "9H 48M 33S"
 ## [789] "9H 50M 13S" "9H 51M 47S" "9H 53M 4S" "9H 54M 34S"
 ## [793] "9H 55M 54S" "9H 57M 9S" "9H 58M 14S" "9H 59M 26S"
 ## [797] "10H 0M 40S" "10H 2M 6S" "10H 3M 31S" "10H 5M 1S"
 ## [801] "10H 6M 23S" "10H 7M 40S" "10H 8M 54S" "10H 10M 8S"
 ## [805] "10H 11M 15S" "10H 12M 31S" "10H 13M 46S" "10H 15M 1S"
 ## [809] "10H 16M 23S" "10H 19M 19S" "10H 20M 31S" "10H 21M 49S"
 ## [813] "10H 22M 57S" "10H 24M 20S" "10H 25M 33S" "10H 26M 40S"
 ## [817] "10H 28M 10S" "10H 29M 14S" "9H 44M 6S" "9H 45M 24S"
 ## [821] "9H 46M 40S" "9H 48M 13S" "9H 49M 33S" "9H 51M 7S"

##	[825]	"9H 52M 49S"	"9H 54M 1S"	"9H 55M 12S"	"9H 56M 39S"
##	[829]	"9H 58M 11S"	"9H 59M 39S"	"10H 0M 52S"	"10H 2M 19S"
##	[833]	"10H 3M 46S"	"10H 5M 3S"	"10H 6M 28S"	"10H 7M 55S"
##	[837]	"10H 9M 8S"	"10H 10M 25S"	"10H 11M 45S"	"10H 12M 55S"
##	[841]	"10H 14M 5S"	"10H 15M 13S"	"10H 16M 46S"	"10H 18M 4S"
##	[845]	"10H 19M 29S"	"10H 20M 50S"	"10H 22M 15S"	"10H 23M 30S"
##	[849]	"10H 25M 11S"	"10H 26M 36S"	"10H 27M 49S"	"10H 29M 20S"
##	[853]	"10H 30M 26S"	"10H 31M 36S"	"10H 32M 49S"	"10H 34M 29S"
##	[857]	"10H 36M 1S"	"10H 37M 25S"	"10H 38M 57S"	"10H 40M 25S"
##	[861]	"10H 41M 32S"	"10H 43M 0S"	"10H 44M 10S"	"10H 45M 21S"
##	[865]	"10H 46M 35S"	"10H 48M 10S"	"10H 49M 18S"	"10H 50M 45S"
##	[869]	"10H 52M 2S"	"10H 53M 31S"	"10H 54M 42S"	"10H 55M 56S"
##	[873]	"10H 57M 18S"	"10H 58M 37S"	"11H 0M 11S"	"11H 1M 15S"
##	[877]	"11H 2M 30S"	"11H 4M 3S"	"11H 6M 47S"	"11H 8M 3S"
##	[881]	"11H 9M 16S"	"11H 10M 28S"	"11H 11M 37S"	"11H 13M 2S"
##	[885]	"11H 14M 24S"	"11H 15M 43S"	"11H 16M 58S"	"11H 18M 13S"
##	[889]	"11H 19M 22S"	"11H 20M 34S"	"11H 22M 22S"	"11H 23M 33S"
##	[893]	"11H 24M 56S"	"11H 26M 22S"	"11H 27M 20S"	"9H 44M 6S"
##	[897]	"9H 45M 24S"	"9H 46M 40S"	"9H 48M 13S"	"9H 49M 33S"
##	[901]	"9H 51M 7S"	"9H 52M 49S"	"9H 54M 1S"	"9H 55M 12S"
##	[905]	"9H 56M 39S"	"9H 58M 11S"	"9H 59M 39S"	"10H 0M 52S"
##	[909]	"10H 2M 19S"	"10H 3M 46S"	"10H 5M 3S"	"10H 6M 28S"
##	[913]	"10H 7M 55S"	"10H 9M 8S"	"10H 10M 25S"	"10H 11M 45S"
##	[917]	"10H 12M 55S"	"10H 14M 5S"	"10H 15M 13S"	"10H 16M 46S"
##	[921]	"10H 18M 4S"	"10H 19M 29S"	"10H 20M 50S"	"10H 22M 15S"
##	[925]	"10H 23M 30S"	"10H 25M 11S"	"10H 26M 36S"	"10H 27M 49S"
##	[929]	"10H 29M 20S"	"10H 30M 26S"	"10H 31M 36S"	"10H 32M 49S"
##	[933]	"10H 34M 29S"	"10H 36M 1S"	"10H 37M 25S"	"10H 38M 57S"
##	[937]	"10H 40M 25S"	"10H 41M 32S"	"10H 43M 0S"	"10H 44M 10S"
##	[941]	"10H 45M 21S"	"10H 46M 35S"	"10H 48M 10S"	"10H 49M 18S"
##	[945]	"10H 50M 45S"	"10H 52M 2S"	"10H 53M 31S"	"10H 54M 42S"
##	[949]	"10H 55M 56S"	"10H 57M 18S"	"10H 58M 37S"	"11H 0M 11S"
##	[953]	"11H 1M 15S"	"11H 2M 30S"	"11H 4M 3S"	"11H 6M 47S"
##	[957]	"11H 8M 3S"	"11H 9M 16S"	"11H 10M 28S"	"11H 11M 37S"
##	[961]	"11H 13M 2S"	"11H 14M 24S"	"11H 15M 43S"	"11H 16M 58S"
##	[965]	"11H 18M 13S"	"11H 19M 22S"	"11H 20M 34S"	"11H 22M 22S"
##	[969]	"11H 23M 33S"	"11H 24M 56S"	"11H 26M 22S"	"11H 27M 20S"
##	[973]	"9H 18M 10S"	"9H 19M 35S"	"9H 20M 47S"	"9H 22M 8S"
##	[977]	"9H 23M 23S"	"9H 24M 31S"	"9H 25M 47S"	"9H 27M 14S"
##	[981]	"9H 28M 32S"	"9H 29M 42S"	"9H 31M 21S"	"9H 32M 58S"
##	[985]	"9H 34M 6S"	"9H 35M 24S"	"9H 36M 32S"	"9H 37M 55S"
##	[989]	"9H 39M 25S"	"9H 40M 46S"	"9H 42M 13S"	"9H 43M 23S"
##	[993]	"9H 44M 32S"	"9H 45M 40S"	"9H 46M 49S"	"9H 48M 17S"
##	[997]	"9H 49M 44S"	"9H 50M 56S"	"9H 52M 3S"	"9H 53M 25S"
##	[1001]	"9H 54M 50S"	"9H 56M 19S"	"9H 57M 28S"	"9H 58M 28S"
##	[1005]	"9H 59M 42S"	"10H 0M 55S"	"10H 2M 12S"	"10H 3M 27S"
##	[1009]	"10H 4M 46S"	"10H 6M 5S"	"10H 7M 12S"	"10H 8M 25S"
##	[1013]	"10H 9M 47S"	"10H 11M 1S"	"10H 12M 15S"	"10H 13M 25S"
##	[1017]	"10H 14M 45S"	"10H 15M 55S"	"10H 17M 12S"	"10H 18M 23S"
##	[1021]	"10H 19M 46S"	"10H 21M 15S"	"10H 22M 29S"	"10H 23M 48S"
##	[1025]	"10H 25M 12S"	"10H 26M 38S"	"10H 27M 51S"	"10H 29M 5S"
##	[1029]	"10H 30M 24S"	"10H 31M 59S"	"10H 33M 19S"	"10H 34M 40S"
##	[1033]	"10H 35M 54S"	"10H 37M 33S"	"10H 38M 51S"	"10H 40M 6S"
##	[1037]	"10H 47M 26S"	"10H 48M 31S"	"10H 49M 50S"	"10H 51M 15S"

[1041] "10H 52M 23S" "10H 53M 48S" "10H 55M 3S" "10H 56M 15S"
 ## [1045] "10H 57M 43S" NA "11H 0M 3S" "9H 18M 10S"
 ## [1049] "9H 19M 35S" "9H 20M 47S" "9H 22M 8S" "9H 23M 23S"
 ## [1053] "9H 24M 31S" "9H 25M 47S" "9H 27M 14S" "9H 28M 32S"
 ## [1057] "9H 29M 42S" "9H 31M 21S" "9H 32M 58S" "9H 34M 6S"
 ## [1061] "9H 35M 24S" "9H 36M 32S" "9H 37M 55S" "9H 39M 25S"
 ## [1065] "9H 40M 46S" "9H 42M 13S" "9H 43M 23S" "9H 44M 32S"
 ## [1069] "9H 45M 40S" "9H 46M 49S" "9H 48M 17S" "9H 49M 44S"
 ## [1073] "9H 50M 56S" "9H 52M 3S" "9H 53M 25S" "9H 54M 50S"
 ## [1077] "9H 56M 19S" "9H 57M 28S" "9H 58M 28S" "9H 59M 42S"
 ## [1081] "10H 0M 55S" "10H 2M 12S" "10H 3M 27S" "10H 4M 46S"
 ## [1085] "10H 6M 5S" "10H 7M 12S" "10H 8M 25S" "10H 9M 47S"
 ## [1089] "10H 11M 1S" "10H 12M 15S" "10H 13M 25S" "10H 14M 45S"
 ## [1093] "10H 15M 55S" "10H 17M 12S" "10H 18M 23S" "10H 19M 46S"
 ## [1097] "10H 21M 15S" "10H 22M 29S" "10H 23M 48S" "10H 25M 12S"
 ## [1101] "10H 26M 38S" "10H 27M 51S" "10H 29M 5S" "10H 30M 24S"
 ## [1105] "10H 31M 59S" "10H 33M 19S" "10H 34M 40S" "10H 35M 54S"
 ## [1109] "10H 37M 33S" "10H 38M 51S" "10H 40M 6S" "10H 47M 26S"
 ## [1113] "10H 48M 31S" "10H 49M 50S" "10H 51M 15S" "10H 52M 23S"
 ## [1117] "10H 53M 48S" "10H 55M 3S" "10H 56M 15S" "10H 57M 43S"
 ## [1121] "11H 0M 3S" NA "11H 1M 35S" "12H 17M 34S"
 ## [1125] "12H 18M 51S" "12H 20M 21S" "12H 21M 30S" "12H 22M 35S"
 ## [1129] "12H 23M 39S" "12H 24M 55S" "12H 26M 2S" "12H 27M 23S"
 ## [1133] "12H 28M 32S" "12H 29M 43S" "12H 30M 50S" "12H 32M 18S"
 ## [1137] "12H 33M 44S" "12H 34M 56S" "12H 36M 9S" "12H 37M 32S"
 ## [1141] "12H 38M 49S" "12H 40M 5S" "12H 41M 13S" "12H 42M 35S"
 ## [1145] "12H 44M 22S" "12H 46M 8S" "12H 47M 32S" "12H 48M 52S"
 ## [1149] NA "12H 51M 9S" "12H 52M 24S" "12H 53M 55S"
 ## [1153] "12H 55M 7S" "12H 56M 21S" "12H 57M 32S" "12H 58M 48S"
 ## [1157] "12H 59M 55S" "13H 1M 7S" "13H 2M 28S" "13H 3M 34S"
 ## [1161] "13H 4M 41S" "13H 5M 52S" "13H 7M 12S" "13H 8M 26S"
 ## [1165] "13H 9M 42S" "13H 10M 53S" "13H 12M 14S" "13H 13M 32S"
 ## [1169] "13H 14M 50S" "13H 16M 1S" "13H 17M 7S" "13H 18M 14S"
 ## [1173] "13H 19M 22S" "13H 20M 47S" "13H 22M 2S" "13H 23M 12S"
 ## [1177] "13H 24M 26S" "13H 25M 43S" "13H 27M 4S" "13H 28M 21S"
 ## [1181] "13H 29M 27S" "13H 30M 38S" "13H 31M 41S" "13H 33M 2S"
 ## [1185] "13H 34M 15S" "13H 35M 37S" "13H 36M 32S" "13H 37M 39S"
 ## [1189] NA "13H 38M 36S" "12H 17M 34S" "12H 18M 51S"
 ## [1193] "12H 20M 21S" "12H 21M 30S" "12H 22M 35S" "12H 23M 39S"
 ## [1197] "12H 24M 55S" "12H 26M 2S" "12H 27M 23S" "12H 28M 32S"
 ## [1201] "12H 29M 43S" "12H 30M 50S" "12H 32M 18S" "12H 33M 44S"
 ## [1205] "12H 34M 56S" "12H 36M 9S" "12H 37M 32S" "12H 38M 49S"
 ## [1209] "12H 40M 5S" "12H 41M 13S" "12H 42M 35S" "12H 44M 22S"
 ## [1213] "12H 46M 8S" "12H 47M 32S" "12H 48M 52S" NA
 ## [1217] "12H 51M 9S" "12H 52M 24S" "12H 53M 55S" "12H 55M 7S"
 ## [1221] "12H 56M 21S" "12H 57M 32S" "12H 58M 48S" "12H 59M 55S"
 ## [1225] "13H 1M 7S" "13H 2M 28S" "13H 3M 34S" "13H 4M 41S"
 ## [1229] "13H 5M 52S" "13H 7M 12S" "13H 8M 26S" "13H 9M 42S"
 ## [1233] "13H 10M 53S" "13H 12M 14S" "13H 13M 32S" "13H 14M 50S"
 ## [1237] "13H 16M 1S" "13H 17M 7S" "13H 18M 14S" "13H 19M 22S"
 ## [1241] "13H 20M 47S" "13H 22M 2S" "13H 23M 12S" "13H 24M 26S"
 ## [1245] "13H 25M 43S" "13H 27M 4S" "13H 28M 21S" "13H 29M 27S"
 ## [1249] "13H 30M 38S" "13H 31M 41S" "13H 33M 2S" "13H 34M 15S"
 ## [1253] "13H 35M 37S" "13H 7M 30S" "13H 9M 22S" "13H 11M 8S"

[1257] "13H 13M 2S" "13H 14M 35S" "13H 14M 35S" "13H 15M 55S"
 ## [1261] "13H 17M 15S" "13H 18M 35S" "13H 19M 49S" "13H 22M 1S"
 ## [1265] "13H 23M 31S" "13H 25M 19S" "13H 27M 22S" "13H 28M 55S"
 ## [1269] "13H 30M 40S" "13H 32M 13S" "13H 33M 41S" "13H 35M 21S"
 ## [1273] "13H 36M 51S" "13H 38M 31S" "13H 40M 2S" "13H 41M 39S"
 ## [1277] "13H 43M 17S" "13H 45M 8S" "13H 46M 45S" "13H 48M 52S"
 ## [1281] "13H 52M 8S" "13H 52M 8S" "13H 54M 19S" "13H 56M 0S"
 ## [1285] "13H 57M 33S" "13H 59M 14S" "14H 1M 29S" "14H 3M 10S"
 ## [1289] "14H 4M 55S" "14H 6M 30S" "14H 8M 9S" "14H 9M 33S"
 ## [1293] "14H 11M 9S" "13H 7M 30S" "13H 9M 22S" "13H 11M 8S"
 ## [1297] "13H 13M 2S" "13H 15M 55S" "13H 17M 15S" "13H 18M 35S"
 ## [1301] "13H 19M 49S" "13H 22M 1S" "13H 23M 31S" "13H 25M 19S"
 ## [1305] "13H 27M 22S" "13H 28M 55S" "13H 30M 40S" "13H 32M 13S"
 ## [1309] "13H 33M 41S" "13H 35M 21S" "13H 36M 51S" "13H 38M 31S"
 ## [1313] "13H 40M 2S" "13H 41M 39S" "13H 43M 17S" "13H 45M 8S"
 ## [1317] "13H 46M 45S" "13H 48M 52S" "13H 54M 19S" "13H 56M 0S"
 ## [1321] "13H 57M 33S" "13H 59M 14S" "14H 1M 29S" "14H 3M 10S"
 ## [1325] "14H 4M 55S" "14H 6M 30S" "14H 8M 9S" "14H 9M 33S"
 ## [1329] "14H 11M 9S" "14H 12M 13S" "14H 13M 28S" "13H 33M 6S"
 ## [1333] "13H 36M 44S" "13H 38M 22S" "13H 40M 19S" "13H 42M 23S"
 ## [1337] "13H 44M 7S" "13H 45M 38S" "13H 47M 24S" "13H 48M 49S"
 ## [1341] "13H 50M 13S" "13H 52M 2S" "13H 54M 9S" "13H 56M 14S"
 ## [1345] "13H 59M 6S" "14H 1M 27S" "14H 3M 14S" "14H 4M 59S"
 ## [1349] "14H 6M 47S" "14H 9M 15S" "14H 10M 44S" NA
 ## [1353] "14H 12M 30S" "14H 14M 7S" "14H 15M 39S" "14H 17M 9S"
 ## [1357] "14H 18M 46S" "14H 20M 16S" "14H 22M 26S" "14H 23M 54S"
 ## [1361] "14H 25M 19S" "14H 26M 49S" "14H 28M 22S" "14H 29M 37S"
 ## [1365] "13H 33M 6S" "13H 36M 44S" "13H 38M 22S" "13H 40M 19S"
 ## [1369] "13H 42M 23S" "13H 44M 7S" "13H 45M 38S" "13H 47M 24S"
 ## [1373] "13H 48M 49S" "13H 50M 13S" "13H 52M 2S" NA
 ## [1377] "13H 54M 9S" "13H 56M 14S" "13H 59M 6S" NA
 ## [1381] "14H 1M 27S" "14H 3M 14S" "14H 4M 59S" "14H 6M 47S"
 ## [1385] NA "14H 9M 15S" "14H 10M 44S" "14H 12M 30S"
 ## [1389] "14H 14M 7S" "14H 15M 39S" "14H 17M 9S" "14H 18M 46S"
 ## [1393] "14H 20M 16S" "14H 22M 26S" "14H 23M 54S" "14H 25M 19S"
 ## [1397] "14H 26M 49S" NA "9H 57M 17S" "9H 59M 0S"
 ## [1401] "10H 0M 38S" "10H 2M 53S" "10H 4M 33S" "10H 6M 25S"
 ## [1405] "10H 8M 16S" "10H 9M 54S" "10H 11M 20S" "10H 12M 57S"
 ## [1409] "10H 17M 39S" "10H 19M 19S" "10H 20M 50S" "10H 22M 31S"
 ## [1413] "10H 24M 24S" "10H 26M 11S" "10H 27M 40S" "10H 29M 15S"
 ## [1417] "10H 30M 59S" "10H 32M 44S" "10H 34M 24S" "10H 35M 57S"
 ## [1421] "10H 37M 38S" "10H 38M 59S" "10H 40M 43S" "10H 42M 26S"
 ## [1425] "10H 43M 58S" "10H 45M 50S" "10H 47M 42S" "10H 49M 20S"
 ## [1429] "10H 53M 8S" "10H 55M 2S" "10H 56M 45S" "10H 57M 56S"
 ## [1433] "9H 57M 17S" "9H 59M 0S" "10H 0M 38S" "10H 2M 53S"
 ## [1437] "10H 4M 33S" "10H 6M 25S" "10H 8M 16S" "10H 9M 54S"
 ## [1441] "10H 11M 20S" "10H 12M 57S" "10H 17M 39S" "10H 19M 19S"
 ## [1445] "10H 20M 50S" "10H 22M 31S" "10H 24M 24S" "10H 26M 11S"
 ## [1449] "10H 27M 40S" "10H 29M 15S" "10H 30M 59S" "10H 32M 44S"
 ## [1453] "10H 34M 24S" "10H 35M 57S" "10H 37M 38S" "10H 38M 59S"
 ## [1457] "10H 40M 43S" "10H 42M 26S" "10H 43M 58S" "10H 45M 50S"
 ## [1461] "10H 47M 42S" "10H 49M 20S" "10H 53M 8S" "10H 55M 2S"
 ## [1465] "10H 56M 45S" "10H 57M 56S" "9H 11M 20S" "9H 12M 44S"
 ## [1469] "9H 14M 22S" "9H 15M 43S" "9H 17M 23S" "9H 18M 52S"

##	[1473]	"9H 20M 42S"	"9H 22M 41S"	"9H 24M 9S"	"9H 25M 39S"
##	[1477]	"9H 27M 7S"	"9H 28M 51S"	"9H 30M 32S"	"9H 32M 6S"
##	[1481]	"9H 33M 47S"	"9H 35M 14S"	"9H 36M 53S"	"9H 38M 53S"
##	[1485]	"9H 40M 1S"	"9H 11M 20S"	"9H 12M 44S"	"9H 14M 22S"
##	[1489]	"9H 15M 43S"	"9H 17M 23S"	"9H 18M 52S"	"9H 20M 42S"
##	[1493]	"9H 22M 41S"	"9H 24M 9S"	"9H 25M 39S"	"9H 27M 7S"
##	[1497]	"9H 28M 51S"	"9H 30M 32S"	"9H 32M 6S"	"9H 33M 47S"
##	[1501]	"9H 35M 14S"	"9H 36M 53S"	"9H 38M 53S"	"9H 40M 1S"
##	[1505]	"9H 35M 9S"	"9H 36M 50S"	"9H 38M 38S"	"9H 44M 55S"
##	[1509]	"9H 46M 45S"	"9H 48M 14S"	"9H 49M 44S"	"9H 51M 10S"
##	[1513]	"9H 52M 36S"	"9H 54M 0S"	"9H 55M 32S"	"9H 57M 11S"
##	[1517]	"9H 58M 48S"	"10H 0M 27S"	"10H 1M 52S"	"10H 3M 19S"
##	[1521]	"10H 4M 56S"	"10H 6M 15S"	"10H 7M 44S"	"10H 9M 10S"
##	[1525]	"10H 10M 40S"	"10H 12M 10S"	"10H 13M 33S"	"10H 14M 55S"
##	[1529]	"10H 16M 9S"	"10H 17M 44S"	"10H 19M 16S"	"10H 20M 48S"
##	[1533]	"10H 22M 18S"	"10H 23M 51S"	"10H 25M 21S"	"10H 26M 39S"
##	[1537]	"10H 27M 56S"	"10H 29M 18S"	"10H 30M 26S"	"9H 35M 9S"
##	[1541]	"9H 36M 50S"	"9H 38M 38S"	"9H 44M 55S"	"9H 46M 45S"
##	[1545]	"9H 48M 14S"	"9H 49M 44S"	"9H 51M 10S"	"9H 52M 36S"
##	[1549]	"9H 54M 0S"	"9H 55M 32S"	"9H 57M 11S"	"9H 58M 48S"
##	[1553]	"10H 0M 27S"	"10H 1M 52S"	"10H 3M 19S"	"10H 4M 56S"
##	[1557]	"10H 6M 15S"	"10H 7M 44S"	"10H 9M 10S"	"10H 10M 40S"
##	[1561]	"10H 12M 10S"	"10H 13M 33S"	"10H 14M 55S"	"10H 16M 9S"
##	[1565]	"10H 17M 44S"	"10H 19M 16S"	"10H 20M 48S"	"10H 22M 18S"
##	[1569]	"10H 23M 51S"	"10H 25M 21S"	"10H 26M 39S"	"10H 27M 56S"
##	[1573]	"10H 29M 18S"	"10H 30M 26S"	"8H 59M 59S"	"9H 1M 28S"
##	[1577]	"9H 2M 51S"	"9H 4M 14S"	"9H 5M 27S"	"9H 6M 53S"
##	[1581]	"9H 8M 20S"	"9H 9M 35S"	"9H 11M 4S"	"9H 12M 34S"
##	[1585]	"9H 13M 51S"	"9H 15M 21S"	"9H 16M 44S"	"9H 18M 2S"
##	[1589]	"9H 19M 28S"	"9H 20M 39S"	"9H 22M 14S"	"9H 23M 45S"
##	[1593]	"9H 25M 2S"	"9H 26M 40S"	"9H 28M 5S"	"9H 29M 18S"
##	[1597]	"9H 30M 48S"	"9H 32M 28S"	"9H 34M 4S"	"9H 35M 32S"
##	[1601]	"9H 36M 57S"	"9H 38M 20S"	"8H 59M 59S"	"9H 1M 28S"
##	[1605]	"9H 2M 51S"	"9H 4M 14S"	"9H 5M 27S"	"9H 6M 53S"
##	[1609]	"9H 8M 20S"	"9H 9M 35S"	"9H 11M 4S"	"9H 12M 34S"
##	[1613]	"9H 13M 51S"	"9H 15M 21S"	"9H 16M 44S"	"9H 18M 2S"
##	[1617]	"9H 19M 28S"	"9H 20M 39S"	"9H 22M 14S"	"9H 23M 45S"
##	[1621]	"9H 25M 2S"	"9H 26M 40S"	"9H 28M 5S"	"9H 29M 18S"
##	[1625]	"9H 30M 48S"	"9H 32M 28S"	"9H 34M 4S"	"9H 35M 32S"
##	[1629]	"9H 36M 57S"	"9H 38M 20S"	"24H 11M 43S"	"24H 13M 29S"
##	[1633]	"24H 15M 0S"	"24H 16M 15S"	"24H 17M 44S"	"24H 19M 14S"
##	[1637]	NA	"24H 22M 13S"	"24H 24M 5S"	"24H 25M 39S"
##	[1641]	"24H 27M 27S"	"24H 28M 59S"	"24H 30M 39S"	"24H 32M 1S"
##	[1645]	"24H 33M 24S"	"24H 34M 54S"	"24H 36M 25S"	"24H 37M 44S"
##	[1649]	"24H 39M 7S"	"24H 40M 38S"	"24H 42M 0S"	"24H 43M 24S"
##	[1653]	"24H 44M 48S"	"24H 46M 17S"	"24H 47M 55S"	"24H 49M 35S"
##	[1657]	"24H 11M 43S"	"24H 13M 29S"	"24H 15M 0S"	"24H 16M 15S"
##	[1661]	"24H 17M 44S"	"24H 19M 14S"	NA	"24H 22M 13S"
##	[1665]	"24H 24M 5S"	"24H 25M 39S"	"24H 27M 27S"	"24H 28M 59S"
##	[1669]	"24H 30M 39S"	"24H 32M 1S"	"24H 33M 24S"	"24H 34M 54S"
##	[1673]	"24H 36M 25S"	"24H 37M 44S"	"24H 39M 7S"	"24H 40M 38S"
##	[1677]	"24H 42M 0S"	"24H 43M 24S"	"24H 44M 48S"	"24H 46M 17S"
##	[1681]	"24H 47M 55S"	"24H 49M 35S"	"24H 50M 41S"	"17H 39M 39S"
##	[1685]	"17H 41M 12S"	"17H 43M 4S"	"17H 44M 53S"	"17H 46M 23S"

[1689] "17H 48M 7S" "17H 50M 2S" "17H 51M 40S" "17H 53M 39S"
 ## [1693] "17H 55M 19S" "17H 57M 55S" "18H 2M 54S" "18H 4M 54S"
 ## [1697] "18H 6M 24S" "18H 8M 14S" "18H 9M 45S" "18H 11M 46S"
 ## [1701] "18H 13M 19S" "18H 15M 8S" "18H 16M 46S" "18H 18M 40S"
 ## [1705] "18H 22M 38S" "18H 25M 8S" "18H 27M 0S" "17H 41M 12S"
 ## [1709] "17H 43M 4S" "17H 44M 53S" "17H 46M 23S" "17H 48M 7S"
 ## [1713] "17H 50M 2S" "17H 51M 40S" "17H 53M 39S" "17H 55M 19S"
 ## [1717] "17H 57M 55S" "18H 2M 54S" "18H 2M 54S" "18H 4M 54S"
 ## [1721] "18H 6M 24S" "18H 8M 14S" "18H 9M 45S" "18H 11M 46S"
 ## [1725] "18H 13M 19S" "18H 15M 8S" "18H 16M 46S" "18H 18M 40S"
 ## [1729] "18H 22M 38S" "18H 25M 8S" "18H 27M 0S" "10H 7M 32S"
 ## [1733] "10H 9M 14S" "10H 10M 34S" "10H 11M 55S" "10H 13M 17S"
 ## [1737] "10H 14M 34S" "10H 15M 52S" "10H 17M 16S" "10H 18M 38S"
 ## [1741] "10H 20M 2S" "10H 21M 37S" "10H 23M 5S" "10H 24M 31S"
 ## [1745] "10H 25M 44S" "10H 26M 54S" "10H 28M 8S" "10H 29M 22S"
 ## [1749] "10H 30M 45S" "10H 32M 8S" "10H 34M 24S" "10H 35M 42S"
 ## [1753] "10H 37M 32S" "10H 38M 53S" "10H 40M 12S" "10H 41M 31S"
 ## [1757] "10H 42M 52S" "10H 44M 11S" "10H 45M 30S" "10H 46M 44S"
 ## [1761] "10H 47M 57S" "10H 49M 26S" "10H 50M 19S" "10H 7M 32S"
 ## [1765] "10H 9M 14S" "10H 10M 34S" "10H 11M 55S" "10H 13M 17S"
 ## [1769] "10H 14M 34S" "10H 15M 52S" "10H 17M 16S" "10H 18M 38S"
 ## [1773] "10H 20M 2S" "10H 21M 37S" "10H 23M 5S" "10H 24M 31S"
 ## [1777] "10H 25M 44S" "10H 26M 54S" "10H 28M 8S" "10H 29M 22S"
 ## [1781] "10H 30M 45S" "10H 32M 8S" "10H 34M 24S" "10H 35M 42S"
 ## [1785] "10H 37M 32S" "10H 38M 53S" "10H 40M 12S" "10H 41M 31S"
 ## [1789] "10H 42M 52S" "10H 44M 11S" "10H 45M 30S" "10H 46M 44S"
 ## [1793] "10H 47M 57S" "10H 49M 26S" "10H 50M 19S" "8H 1M 26S"
 ## [1797] "8H 3M 5S" "8H 4M 46S" "8H 6M 23S" "8H 7M 36S"
 ## [1801] "8H 9M 2S" "8H 10M 22S" "8H 11M 35S" "8H 13M 0S"
 ## [1805] "8H 14M 32S" "8H 15M 44S" "8H 16M 58S" "8H 18M 32S"
 ## [1809] "8H 19M 45S" "8H 21M 9S" "8H 22M 38S" "8H 24M 13S"
 ## [1813] "8H 25M 26S" "8H 26M 27S" "8H 1M 26S" "8H 3M 5S"
 ## [1817] "8H 4M 46S" "8H 6M 23S" "8H 7M 36S" "8H 9M 2S"
 ## [1821] "8H 10M 22S" "8H 11M 35S" "8H 13M 0S" "8H 14M 32S"
 ## [1825] "8H 15M 44S" "8H 16M 58S" "8H 18M 32S" "8H 19M 45S"
 ## [1829] "8H 21M 9S" "8H 22M 38S" "8H 24M 13S" "8H 25M 26S"
 ## [1833] "10H 43M 36S" "10H 46M 28S" "10H 48M 0S" "10H 49M 36S"
 ## [1837] "10H 51M 2S" "10H 52M 38S" "10H 54M 10S" "10H 55M 40S"
 ## [1841] "10H 57M 19S" "10H 58M 54S" "11H 0M 24S" "11H 1M 47S"
 ## [1845] "11H 3M 16S" "11H 4M 40S" "11H 6M 12S" "11H 7M 35S"
 ## [1849] "11H 8M 55S" "11H 10M 19S" "11H 11M 47S" "11H 12M 52S"
 ## [1853] "10H 43M 36S" "10H 46M 28S" "10H 48M 0S" "10H 49M 36S"
 ## [1857] "10H 51M 2S" "10H 52M 38S" "10H 54M 10S" "10H 55M 40S"
 ## [1861] "10H 57M 19S" "10H 58M 54S" "11H 0M 24S" "11H 1M 47S"
 ## [1865] "11H 3M 16S" "11H 4M 40S" "11H 6M 12S" "11H 7M 35S"
 ## [1869] "11H 8M 55S" "11H 10M 19S" "11H 11M 47S" "10H 36M 37S"
 ## [1873] "10H 38M 28S" "10H 39M 44S" "10H 41M 4S" "10H 42M 21S"
 ## [1877] "10H 43M 24S" "10H 36M 37S" "10H 38M 28S" "10H 39M 44S"
 ## [1881] "10H 41M 4S" "10H 42M 21S" "10H 43M 24S" "10H 13M 34S"
 ## [1885] "10H 15M 4S" "10H 16M 27S" "10H 17M 57S" "10H 19M 25S"
 ## [1889] "10H 21M 9S" "10H 22M 29S" "10H 23M 32S" "10H 13M 34S"
 ## [1893] "10H 15M 4S" "10H 16M 27S" "10H 17M 57S" "10H 19M 25S"
 ## [1897] "10H 21M 9S" "10H 22M 29S" "10H 38M 32S" "10H 40M 24S"
 ## [1901] "10H 42M 6S" "10H 43M 56S" "10H 46M 5S" NA

```
## [1905] "10H 44M 39S" "10H 45M 41S" "10H 46M 57S" "10H 48M 1S"
## [1909] "10H 48M 55S"

data2$day10resp <- lubridate::hour(hms(data$resp_time_1))+lubridate::minute(hms(data$resp_time_1))/60

## Warning in .parse_hms(..., order = "HMS", quiet = quiet): Some strings
## failed to parse, or all strings are NAs

## Warning in .parse_hms(..., order = "HMS", quiet = quiet): Some strings
## failed to parse, or all strings are NAs

#reformatting to obtain positive values
data2$total_time_day10 <- (24 - data2$day10purge.trans) + data2$day10resp
```

Metabolic Rate Calculation

```
#getting denominator for mass-specific mr
data2$total_time_day10 * data$mass_day10

##      [1]      NA 229.83250 138.29942 220.81140  79.33293 156.94947
##      [7] 133.28352 191.35817 165.41053 102.06075 134.06937 198.97133
##     [13] 202.73053 174.27900 131.12400 153.31475 148.76400 137.45385
##     [19] 129.41402 124.37533 247.19317 137.31037 196.51778 186.87757
##     [25] 129.05108 191.59152 205.04187 159.63547 130.04567 174.42242
##     [31] 137.74995 171.24340 218.04005 204.34300 102.53520 167.59402
##     [37] 232.00425 206.99625 179.07500 104.12440 141.08700 147.13358
##     [43] 164.42125      NA 239.80840 207.43060 114.60095 168.56820
##     [49]      NA      NA 138.67740 196.90170 314.60017 142.91760
##     [55] 125.05880 113.25457 153.11313 140.15320 157.46640 229.13875
##     [61] 185.82117 133.44450 197.32320 145.49050 215.34893 196.72853
##     [67]  91.35700 165.46533 184.50458 151.48130 178.31283 209.33055
##     [73] 260.69035 164.04410 167.20608 179.64780 110.27360 261.05570
##     [79] 194.20050 214.30920 172.98820 225.70182 220.81920 176.24658
##     [85] 177.44417 146.92125 168.89110 229.35780      NA 186.92440
##     [91] 170.11611      NA 128.57202  72.88260 129.32833 128.61440
##     [97]  89.01920 159.33793  86.82412 112.69375 165.06190 115.35067
##    [103] 143.17950 115.47800 141.54450 117.52545 117.51428 114.32415
##    [109] 156.78033 118.28022 111.65880 107.33050 124.35120 142.86957
##    [115] 115.84625 150.19747 106.20518 117.50745 136.12157 102.05720
##    [121] 136.71595 123.43413 150.84300 120.24693 192.83600 148.08917
##    [127] 114.25620 155.41110 108.33290 122.71523 131.52720 124.16267
##    [133] 147.12793 103.73120 122.45975 189.97560 109.16353 185.47000
##    [139] 121.58408 114.76355 125.13542  85.46352 133.69167 176.58013
##    [145] 138.70560 127.59480 151.10165 189.68912 132.43253 121.99575
##    [151]      NA      NA 193.45755 125.64170 110.72000 104.15253
##    [157]  78.77340 156.23440 129.20732  91.36055 117.78230  83.02500
##    [163]  82.20875 165.95030 108.15933 147.41160 169.86240  78.14333
##    [169] 135.53155 105.65013 143.00550 146.07200 101.76903 163.52660
##    [175] 162.97340 113.43645  83.53340 103.07733 119.24325  92.65200
##    [181] 170.67317 116.43350 144.11613  99.21625 169.68645 122.85743
##    [187] 111.16300 143.25410  97.37500 146.13020 122.15800 112.01815
##    [193] 135.50570 116.38575 177.36157 110.93057 104.31200 118.35383
##    [199] 191.13900 147.22565 118.82573 140.15750 105.29482 137.67000
##    [205] 177.13395 157.43030 149.01320 112.64150 172.85580      NA
```

##	[211]	NA	160.98160	137.55440	184.14926	174.98031	191.56902
##	[217]	130.26728	221.11751	147.21585	185.66552	61.81770	183.90629
##	[223]	118.60771	145.96979	145.70552	128.39497	234.65451	130.91413
##	[229]	171.66903	172.36607	146.29393	227.10513	160.57917	125.69158
##	[235]	154.60008	181.70051	197.00156	184.72090	124.79015	191.41764
##	[241]	148.67394	100.12418	151.71858	162.62494	99.69210	182.48331
##	[247]	147.77721	131.76176	223.66187	220.85404	162.32503	164.41431
##	[253]	138.83681	144.21126	167.93866	117.94359	137.90120	208.16427
##	[259]	117.60693	142.84450	173.28354	125.29670	197.13775	249.00363
##	[265]	87.93122	129.72116	181.50986	221.52903	177.11113	199.71484
##	[271]	143.59812	137.42575	130.97763	100.38239	101.96694	194.29634
##	[277]	238.28225	110.63830	189.79042	83.82351	114.96796	182.28144
##	[283]	129.95645	151.67436	154.74247	186.75853	235.60695	NA
##	[289]	NA	104.58910	114.40759	174.24962	149.94311	166.28462
##	[295]	104.87402	151.05469	108.79407	171.44309	218.38588	119.94811
##	[301]	158.76229	129.99138	180.47169	177.65541	104.29854	84.95010
##	[307]	176.21938	153.05964	137.85460	177.45286	116.44867	118.43806
##	[313]	134.50245	104.22427	152.81204	104.58031	188.10263	97.42360
##	[319]	124.80878	104.22246	179.31408	92.35752	103.95750	226.67892
##	[325]	143.04624	124.33558	220.15066	156.17497	185.22211	173.20529
##	[331]	68.47136	130.34693	167.66992	179.35920	122.53376	169.45778
##	[337]	156.86031	149.63238	223.31825	211.39354	120.14077	85.23373
##	[343]	101.25868	206.39688	139.01981	131.60096	94.97724	90.01493
##	[349]	148.91532	130.76857	169.55661	114.06377	125.39011	202.57852
##	[355]	139.68017	115.63470	125.80445	162.43486	203.74528	156.70339
##	[361]	122.19424	222.66181	147.45711	133.81049	125.63435	NA
##	[367]	NA	114.17120	152.02211	104.25936	180.07640	132.07403
##	[373]	145.75529	105.82967	180.42481	110.82069	139.22719	169.03201
##	[379]	115.78122	102.40206	106.62088	116.57799	149.53794	169.14195
##	[385]	141.70102	94.36315	111.54938	119.39799	164.12316	146.61286
##	[391]	155.96672	102.18130	133.86163	144.72199	113.36554	101.47485
##	[397]	118.34672	150.56059	101.83648	185.19999	122.23608	112.50406
##	[403]	129.96509	148.46465	136.77738	143.86682	145.42596	141.68891
##	[409]	115.95627	147.09597	121.32930	169.93489	147.72194	190.94451
##	[415]	118.29552	143.88231	198.47243	160.72151	161.24418	135.63606
##	[421]	221.81741	119.11098	114.86218	175.14436	99.21399	135.86251
##	[427]	186.36390	109.93696	162.30509	117.68008	166.70285	182.91869
##	[433]	164.85652	130.94903	131.43494	149.60601	127.62350	172.15866
##	[439]	113.35145	179.60115	NA	NA	129.04167	94.89798
##	[445]	135.26804	127.54211	141.51345	90.80238	173.95637	109.27991
##	[451]	153.63981	123.73701	96.88159	111.12977	108.14407	110.95517
##	[457]	125.67430	149.81600	102.16825	71.88306	126.76443	138.24708
##	[463]	142.71816	213.94819	124.31272	154.43764	111.51000	162.63898
##	[469]	140.57957	148.70665	113.75937	161.47634	102.55418	96.53827
##	[475]	161.16447	105.12363	159.67721	112.51355	128.71857	173.07352
##	[481]	143.56650	150.14673	147.38431	164.34063	143.20026	96.61558
##	[487]	176.89015	100.25656	175.56435	97.15781	138.86573	217.30523
##	[493]	119.30236	166.43456	131.89045	167.86442	175.93598	76.46047
##	[499]	105.75255	162.04308	95.74179	115.32514	108.68151	163.93181
##	[505]	97.50559	115.76844	218.95465	86.14281	189.65865	168.06256
##	[511]	144.51311	115.73658	103.61306	107.44191	120.21442	66.77178
##	[517]	112.55024	NA	NA	89.60792	135.99274	92.13925
##	[523]	83.90501	157.98976	143.46973	171.59371	128.85333	103.59508
##	[529]	89.02023	115.16380	84.68511	121.06293	101.38043	125.89552

##	[535]	149.35228	173.32581	107.94427	126.61853	91.03290	170.07970
##	[541]	106.17546	97.83041	76.80043	79.13677	76.23361	114.29979
##	[547]	87.89238	115.97241	200.81198	68.92276	184.30115	152.07273
##	[553]	122.83428	76.83550	54.82412	137.34469	158.10355	132.63194
##	[559]	113.30461	103.90424	131.39523	147.56714	122.57605	88.43900
##	[565]	186.60155	118.16147	110.56058	107.71312	154.63522	167.39581
##	[571]	90.92231	120.61385	97.77491	133.09700	134.84764	103.58501
##	[577]	210.43972	71.55708	138.55393	73.76099	115.49332	122.25481
##	[583]	156.69138	147.05874	71.82052	155.03377	131.96618	86.10923
##	[589]	190.51437	99.85836	111.52131	130.28281	201.18865	143.14706
##	[595]	119.45067	NA	NA	119.63500	115.70564	109.97769
##	[601]	84.11150	101.91854	105.80700	163.05083	132.14667	102.83111
##	[607]	112.81900	116.16443	69.97429	108.60400	77.91131	141.63023
##	[613]	153.76575	142.90833	158.54578	113.14422	129.22849	170.06278
##	[619]	103.38693	116.48976	120.22496	146.42750	98.04133	70.30732
##	[625]	118.30453	101.47312	100.05735	166.76587	182.14980	183.72667
##	[631]	102.60067	89.87078	125.54669	130.33670	107.27396	82.26349
##	[637]	130.84605	131.12493	105.87344	104.90987	154.93172	89.75972
##	[643]	54.86287	99.81554	83.38311	163.82750	168.12778	101.39176
##	[649]	178.41390	109.99351	134.92269	89.47950	100.63481	95.05394
##	[655]	83.93600	94.05100	122.40880	119.65520	95.13611	114.65067
##	[661]	188.32515	112.86920	91.53478	100.66680	177.23608	89.49252
##	[667]	139.70125	116.36451	103.77651	88.98170	112.40042	151.29811
##	[673]	150.25650	88.40724	NA	NA	185.94333	139.95375
##	[679]	131.52484	122.28105	147.64440	171.40194	167.60189	194.89025
##	[685]	181.64644	222.23556	115.13557	86.41585	164.32688	97.10026
##	[691]	91.82586	155.65060	93.46918	228.55036	173.21986	114.20893
##	[697]	189.69403	138.66261	213.11254	94.14771	138.83520	230.59548
##	[703]	152.68302	163.90062	155.20642	188.87217	120.67228	NA
##	[709]	NA	194.23015	255.76490	150.58549	197.82436	202.23543
##	[715]	138.55750	205.08268	260.08189	146.71509	169.98730	149.46466
##	[721]	162.13095	206.64901	89.99596	153.69833	134.64714	126.56377
##	[727]	178.32049	221.48969	153.32440	149.49620	139.70537	187.19701
##	[733]	194.29798	162.31713	155.51597	159.06149	117.90465	298.18559
##	[739]	156.94160	81.61460	124.55479	154.51687	203.50478	107.76720
##	[745]	144.78826	239.55233	123.30920	105.00450	205.05270	198.74050
##	[751]	245.93819	137.16900	100.04887	185.18833	158.71118	194.40355
##	[757]	122.42304	131.01622	195.41531	170.31976	103.96842	195.76287
##	[763]	72.91833	122.18592	149.02107	110.17400	149.69059	84.25531
##	[769]	128.07301	97.24834	116.89326	133.64101	207.95864	198.31675
##	[775]	134.35809	179.77615	158.39652	144.35674	146.46266	208.63462
##	[781]	136.01120	125.82232	243.24489	133.93615	183.81389	155.97689
##	[787]	146.62580	147.93977	155.32271	106.80806	125.03218	139.03290
##	[793]	134.70249	112.61489	198.54930	192.39418	91.57236	151.66250
##	[799]	135.29763	204.36869	131.55925	167.30835	133.11269	133.93418
##	[805]	183.91530	159.39016	245.42675	125.04043	110.31178	64.38848
##	[811]	166.83944	98.92447	113.26006	159.85266	141.63854	NA
##	[817]	NA	242.00267	187.95620	184.30204	90.76780	239.19784
##	[823]	151.60813	155.08402	160.51899	181.45933	125.11891	197.46458
##	[829]	122.67061	182.10020	154.05487	159.32617	212.98948	205.17475
##	[835]	201.18759	116.55287	103.23271	181.79849	74.35889	116.77060
##	[841]	133.41942	209.18082	121.80952	197.57476	235.08032	179.93054
##	[847]	216.40576	205.43619	112.58999	107.09379	90.20766	83.85344
##	[853]	174.02456	164.27322	184.31481	114.06429	150.08956	144.48600

##	[859]	116.34581	117.47332	183.57523	175.96135	174.25034	174.71819
##	[865]	128.04229	184.17562	105.07557	149.20299	74.10898	180.54654
##	[871]	144.42138	108.81461	122.08972	154.36449	143.73694	120.96534
##	[877]	140.39208	151.42382	122.01917	84.88125	194.25631	197.88847
##	[883]	85.62919	110.78646	145.61374	128.43631	157.28490	106.14017
##	[889]	168.42726	164.13566	165.71969	114.48578	112.56015	NA
##	[895]	NA	188.87733	142.77008	100.51128	156.74864	176.45575
##	[901]	170.19481	139.29622	107.68737	55.87789	131.84202	74.13450
##	[907]	122.45263	106.23768	92.04438	142.71279	118.74113	68.81785
##	[913]	102.82762	136.37363	122.26594	104.88081	116.65928	58.99633
##	[919]	133.89875	111.78581	135.08548	197.05147	135.45937	111.61904
##	[925]	175.19706	92.00232	129.38189	207.19922	85.93670	110.57158
##	[931]	97.82292	132.69178	91.53976	187.05555	97.78618	234.27203
##	[937]	138.92104	124.97691	92.23114	154.30114	140.15043	165.45698
##	[943]	134.03450	120.69978	155.56993	167.73295	158.65154	185.67999
##	[949]	134.32867	223.33826	127.07675	100.76959	127.16367	199.24956
##	[955]	174.79408	168.92368	138.27653	137.85677	137.01765	125.33659
##	[961]	132.06652	216.36658	163.19895	130.90068	126.21964	111.30702
##	[967]	125.10399	164.65189	143.44467	161.58900	NA	NA
##	[973]	161.40020	174.14401	147.90829	158.13235	205.00830	125.58432
##	[979]	156.68621	118.60232	194.05737	175.16424	74.65430	125.86896
##	[985]	103.24228	135.42213	107.47118	103.72129	177.16409	117.41503
##	[991]	164.38699	144.11543	138.89903	181.89089	86.55914	183.17073
##	[997]	229.89745	224.88473	201.08884	245.96768	197.49885	123.18913
##	[1003]	166.93640	140.75071	206.67424	123.09466	115.00619	236.09784
##	[1009]	190.81831	186.80620	183.37529	178.06876	123.25473	121.81579
##	[1015]	113.14434	133.19119	192.72084	206.19750	169.09882	142.82576
##	[1021]	189.17990	124.32965	112.68025	131.85116	69.82491	99.12279
##	[1027]	134.56222	103.80503	90.67460	164.44986	90.41556	120.52433
##	[1033]	202.70751	195.15780	107.35823	125.17495	145.96197	100.66644
##	[1039]	195.18495	NA	125.96601	190.89313	NA	135.69220
##	[1045]	161.44438	NA	141.29947	107.26013	179.81771	173.02445
##	[1051]	139.08702	212.86140	149.18889	107.26954	128.97442	136.60285
##	[1057]	174.45017	129.57646	102.74794	80.74769	128.87995	116.41035
##	[1063]	170.49681	82.17580	190.45479	114.25144	131.26973	86.99943
##	[1069]	140.32478	122.85424	64.62802	81.70921	157.14502	139.07834
##	[1075]	211.88930	209.82638	173.82627	233.53173	202.16626	136.24919
##	[1081]	139.99496	171.13063	92.07165	194.57546	140.88791	189.04264
##	[1087]	94.90849	141.45570	176.52654	144.25555	139.56583	184.21939
##	[1093]	182.51914	123.45368	108.81734	160.89824	168.30982	154.25158
##	[1099]	172.50130	158.11884	122.98819	136.85618	86.48502	124.15686
##	[1105]	153.19206	113.89664	NA	118.55089	146.11931	NA
##	[1111]	165.01671	93.25969	192.78520	157.71832	192.02191	130.31452
##	[1117]	142.52142	176.44757	192.40043	193.35538	106.51624	NA
##	[1123]	209.23560	97.79022	94.10250	156.27903	167.25972	175.34618
##	[1129]	178.20969	172.72205	153.63219	109.02387	246.01945	177.27207
##	[1135]	156.58170	101.34316	103.81859	84.09385	108.11119	140.71988
##	[1141]	139.48748	127.58015	121.92127	191.92305	69.28473	100.80842
##	[1147]	110.33112	135.36432	144.10181	NA	131.96697	190.06135
##	[1153]	137.17677	155.07845	62.36154	125.14438	155.71976	127.54945
##	[1159]	105.14225	190.23968	119.31389	95.89143	103.61272	71.39818
##	[1165]	185.35439	115.18859	113.22828	148.26812	114.90293	178.42950
##	[1171]	106.15328	172.19544	183.32464	133.52552	115.99098	71.29650
##	[1177]	81.24250	88.50603	143.59163	193.10940	94.25452	74.10967

##	[1183]	170.72610	118.84786	142.82599	131.15406	96.60050	161.63473
##	[1189]	NA	NA	125.24100	222.38906	102.70373	129.58987
##	[1195]	125.17206	135.80160	166.46853	107.84126	115.13439	199.33492
##	[1201]	109.69509	142.04792	79.38540	153.21543	204.46090	112.86950
##	[1207]	160.72296	120.80817	185.95697	119.01319	137.01073	95.59241
##	[1213]	163.11721	112.68315	145.52526	NA	128.37227	102.99358
##	[1219]	130.54333	124.46763	146.46670	169.47449	174.35393	209.78459
##	[1225]	115.45929	112.96324	178.08848	138.19074	208.48416	129.94223
##	[1231]	76.56976	99.80877	164.27818	125.19515	165.56117	155.14622
##	[1237]	119.98727	139.62845	130.90421	78.71567	154.87000	120.99552
##	[1243]	172.24562	119.87583	185.34973	149.28639	186.82090	132.24814
##	[1249]	NA	120.39153	62.70365	151.27550	181.48187	257.29440
##	[1255]	230.48920	158.78582	165.71771	140.06250	110.67232	159.46962
##	[1261]	129.03784	183.07514	58.86185	195.94564	181.33248	158.52721
##	[1267]	166.06998	103.13712	130.44214	162.12783	184.43924	183.60570
##	[1273]	177.54498	155.28125	217.88771	185.58130	157.22397	151.64100
##	[1279]	245.84774	149.92279	146.18557	148.78407	120.69537	147.61535
##	[1285]	103.04634	163.31440	228.86843	181.84956	94.65262	147.40825
##	[1291]	NA	NA	167.41060	139.91920	177.49981	224.01475
##	[1297]	193.41696	138.99619	171.99369	237.28411	226.08175	234.10107
##	[1303]	224.96252	76.53008	148.76576	129.32995	207.15345	179.11304
##	[1309]	137.60457	121.85052	169.57946	160.39995	163.95529	183.09422
##	[1315]	202.27354	152.36843	152.40566	136.38287	159.67222	129.36755
##	[1321]	209.50420	125.34959	118.65316	128.99707	130.78535	156.07044
##	[1327]	179.40675	132.51138	NA	NA	122.93398	176.52255
##	[1333]	229.00253	255.54501	164.89954	166.59443	111.82722	229.30493
##	[1339]	140.96983	264.11051	154.52414	201.45797	293.41517	109.00732
##	[1345]	166.77159	144.01834	130.03841	161.62988	88.87576	199.54329
##	[1351]	78.46794	NA	166.55057	132.61905	188.86211	227.53687
##	[1357]	157.37313	188.97673	289.72767	115.52040	106.97229	258.29933
##	[1363]	NA	NA	181.21833	269.44909	76.11165	182.23958
##	[1369]	295.94153	228.57671	257.07097	162.91631	114.13193	184.46888
##	[1375]	272.15066	NA	228.21406	117.72246	201.43576	NA
##	[1381]	205.56945	258.47118	132.71567	190.22469	NA	119.85120
##	[1387]	168.58311	112.66252	283.91932	138.41089	180.62476	191.69532
##	[1393]	133.85439	178.69032	173.26437	NA	NA	NA
##	[1399]	105.33883	255.49981	226.82146	168.16674	126.75349	113.50602
##	[1405]	115.39740	148.18314	137.37477	188.60564	155.37624	159.50164
##	[1411]	187.71644	223.54463	199.39100	77.97282	152.39923	248.14182
##	[1417]	140.61874	220.11266	112.58019	143.82033	282.24373	191.37258
##	[1423]	229.81161	170.70195	145.12953	190.37722	205.71058	157.07180
##	[1429]	114.61053	189.86335	NA	NA	117.04825	175.52945
##	[1435]	183.29962	92.76235	142.52697	282.45317	150.12132	226.61818
##	[1441]	192.51811	197.23011	139.58596	143.47117	63.31617	295.51770
##	[1447]	101.15477	175.30460	135.78100	130.45870	144.88385	169.90607
##	[1453]	177.26170	96.37336	260.60725	156.16782	217.39098	95.39339
##	[1459]	134.69075	59.63612	164.27327	97.74488	140.16818	155.90723
##	[1465]	NA	NA	57.03733	117.98780	109.04279	96.53875
##	[1471]	115.12486	125.88637	117.70489	169.94315	143.36794	151.76850
##	[1477]	172.40367	131.71182	93.46892	159.63934	138.42591	155.70029
##	[1483]	115.16696	NA	NA	142.46373	144.03979	93.25622
##	[1489]	171.49212	122.52556	162.22194	144.81884	174.23853	121.74619
##	[1495]	129.73450	125.72552	152.32078	195.37416	138.77211	45.84812
##	[1501]	103.58647	118.07816	NA	NA	171.06479	231.40373

```

## [1507] 133.34522 166.00527 184.10000 164.72538 168.18218 117.46247
## [1513] 230.91246 148.86109 241.87710 124.80000 126.04622 226.17288
## [1519] 141.98321 211.59838 162.37694 182.63900 106.95641 216.76707
## [1525] 228.16920 222.12979 109.03537 226.84534 155.39157 184.90230
## [1531] 124.49999 148.65269 136.98108 176.25465 199.14195 154.42257
## [1537] 214.56905      NA      NA 191.59569 150.94633 165.19561
## [1543] 113.30868 167.63394 87.97359 179.01035 219.64297 183.29902
## [1549] 147.69612 170.90734 192.00438 114.68039 169.89503 173.17221
## [1555] 160.37919 215.30632 148.62550 202.97417 225.21471 124.47839
## [1561] 263.70393 214.53195 168.83965 111.12405 105.38232 167.77002
## [1567] 144.43641 176.89717 154.02407 153.83270 179.99599 171.70137
## [1573]      NA      NA 116.94893 110.09975 99.31155 130.78391
## [1579] 168.97578 155.24691 217.07984 206.01769 96.02860 94.98532
## [1585] 122.37158 171.32545 175.56504 121.48034 147.04657 157.14622
## [1591] 83.97080 174.13751 205.55791 123.29382 138.50174 168.35341
## [1597] 124.97149 139.02230 123.38955 141.90060      NA      NA
## [1603] 155.99566 106.87204 155.74629 147.40216 144.09796 214.62090
## [1609] 127.98428 136.21218 200.43442 126.27453 160.20536 197.56400
## [1615] 193.03993 127.27776 177.49962 200.55889 178.80624 135.99812
## [1621] 187.58995 101.66556 121.15564 200.30916 177.85682 222.77266
## [1627] 75.35852 118.80559      NA      NA 284.63086 248.41157
## [1633] 342.87828 268.42123 168.89510 167.94445      NA 135.95820
## [1639] 348.35425 287.32466 184.03375 271.58357 295.98007 239.65876
## [1645] 357.39165 257.55359 191.05995 285.32195 333.82929 166.41071
## [1651] 391.70711 173.07923 141.63764 242.47639      NA      NA
## [1657] 193.67465 393.91076 244.67326 160.90620 429.54313 258.88923
## [1663]      NA 261.02222 290.47172 215.23385 298.27315 339.98629
## [1669] 303.45588 421.63708 230.37945 237.98462 271.31641 344.85642
## [1675] 240.89971 372.17733 293.00589 396.55512 181.10943 252.37705
## [1681] 341.43129      NA      NA 208.67490 339.26514 233.13299
## [1687] 272.27025 298.62639 245.87831 244.55076 299.53460 166.48503
## [1693] 122.30472 126.88488 195.46997 297.62357 199.33570 246.35248
## [1699] 213.09656 341.29702 279.99078 96.63607 129.15913 236.71715
## [1705] 139.71983      NA      NA 300.60385 218.35745 231.03637
## [1711] 136.90436 207.58799 174.17073 153.68186 282.55217 223.63561
## [1717] 189.79175 196.04115 215.88723 161.86514 220.65230 250.48661
## [1723] 185.54992 309.50275 292.05523 221.33783 326.81631 249.02293
## [1729] 121.85137      NA      NA 300.49000 224.06535 282.25470
## [1735] 299.08908 257.06478 269.13952 205.40337 204.37415 167.69048
## [1741] 292.37558 212.54228 106.41820 196.93909 203.08274 181.90241
## [1747] 203.87173 279.37121 303.91372 134.95179 222.12850 106.63448
## [1753] 157.52470 152.53430 77.87794 258.42837 205.42185 256.04759
## [1759] 214.76853 173.26972 162.83829      NA      NA 268.25590
## [1765] 165.04748 194.73156 190.72314 186.96013 259.66761 188.49696
## [1771] 103.46579 98.40217 175.29615 206.41318 261.27665 242.12741
## [1777] 258.93460 196.56143 298.77908 228.20470 292.11188 182.28691
## [1783] 281.48766 224.67127 180.61264 132.63237 194.59127 289.26213
## [1789] 303.84891 220.00214 282.26321 319.69799 135.20901      NA
## [1795]      NA 273.47017 204.65839 182.75302 197.10565 97.16776
## [1801] 127.81085 206.63180 175.16403 359.52211 251.50889 246.87747
## [1807] 250.52297 225.46683 143.75743 229.28302 265.92420 241.07951
## [1813]      NA      NA 170.01225 192.49412 240.64383 271.07313
## [1819] 232.27686 203.80063 170.66534 190.24117 119.26710 182.65867
## [1825] 282.34700 108.89333 196.79987 192.14163 287.35014 228.00400

```

```
## [1831]      NA      NA 194.32812 192.30220 266.61094 106.91639
## [1837] 109.80647 255.94035 173.66084 285.16990 161.12841 129.67188
## [1843] 203.56829 114.60427 254.57737 215.57163 286.00971 176.85772
## [1849] 272.02362 184.39696      NA      NA 163.99443 157.42036
## [1855] 212.05384 114.49340 198.74667 230.93381 241.30453 186.10239
## [1861] 249.04186 222.06497 231.07758 198.79689 165.42985 245.85451
## [1867] 248.39027 196.69650 193.23200      NA      NA 190.80040
## [1873] 160.06129 157.68684 187.36272      NA      NA 222.82840
## [1879] 153.41239 225.50421 151.69722      NA      NA 258.86433
## [1885] 189.11456 163.90162 276.17524 277.53257 225.61704      NA
## [1891]      NA 272.08317 223.48276 163.59400 210.05217 178.80597
## [1897]      NA      NA 241.96603 239.51537 137.91522 199.50657
## [1903]      NA      NA 212.69424 196.33720 133.97971      NA
## [1909]      NA
```

```
#Metabolic Rate for day 11
```

```
data2$MR11<- data$resp_day11/(data2$total_time_day10)
```

```
#Mass specific Metabolic Rate for day 11
```

```
data2$msMR11<- data$resp_day11/(data2$total_time_day10 * data$mass_day10)
```

Controlling for blank controls

```
#Assign the blanks to an object
```

```
data3 <- data2%>%
  group_by(cohort_day, tape)%>%
  filter(Site_name=="Blank")%>%
  summarise(mean.blank=mean(MR11,na.rm=TRUE))
```

```
#check columns
```

```
glimpse(data3)
```

```
## Observations: 38
## Variables: 3
## $ cohort_day <int> 2, 2, 3, 3, 4, 4, 5, 5, 5, 5, 6, 6, 7, 7, 8, 8, 9, ...
## $ tape      <chr> "blue", "red", "orange", "white", "orange", "white"...
## $ mean.blank <dbl> 0.0011257856, 0.0006226170, 0.0003137692, 0.0038187...
```

```
data3$mean.blank
```

```
## [1] 0.0011257856 0.0006226170 0.0003137692 0.0038187342 0.0006020381
## [6] 0.0005606454 0.0067232397 0.0010034398 0.0004597089 0.0003777458
## [11] 0.0004217324 0.0008299999 0.0010143259 0.0006680801 0.0012768032
## [16] 0.0005854209 0.0010247606 0.0006378185 0.0011384133 0.0005885973
## [21] 0.0004956928 0.0143301474 0.0009422219 0.0008234242 0.0010247213
## [26] 0.0009524855 0.0006771652 0.0006364143 0.0007423115 0.0004865312
## [31] 0.0051276472 0.0004456934 0.0003163145 0.0009844019 0.0006993465
## [36] 0.0004824640 0.0009931376 0.0002493671
```

```
#merge data3 and data2 by cohort day and tape and create a mean blanks column
```

```
data4 <- inner_join(data2, data3, by=c("cohort_day", "tape"))
```

```
data4$mean.blank
```

```
## [1] 0.0011257856 0.0011257856 0.0011257856 0.0011257856 0.0011257856
```

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

```
## [1896] 0.0004956928 0.0004956928 0.0004956928 0.0008234242 0.0008234242
## [1901] 0.0008234242 0.0008234242 0.0008234242 0.0008234242 0.0009524855
## [1906] 0.0009524855 0.0009524855 0.0009524855 0.0009524855 0.0009524855
```

```
#do some corrections
```

```
data5 <- data4%>%
```

```
  mutate(MR11.cor = MR11 - mean.blank, msMR11.cor = msMR11 - mean.blank)
```

```
glimpse(data5)
```

```
## Observations: 1,909
```

```
## Variables: 53
```

```
## $ Ind_ID          <int> 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 1...
## $ tape            <chr> "blue", "blue", "blue", "blue", "blu...
## $ Site_name        <chr> "OG", "Ferris", "Ferris", "Ferris", ...
## $ mass_day10       <dbl> 6.938, 11.175, 6.719, 10.719, 3.848, ...
## $ purge_time_1     <chr> "13:38", "13:39", "13:39", "13:40", ...
## $ purge1          <dbl> NA, NA, NA, NA, NA, NA, NA, NA, NA, ...
## $ collection_date  <chr> "2017-08-21", "2017-08-21", "2017-08...
## $ day10            <chr> "2017-09-04", "2017-09-04", "2017-09...
## $ cohort_date      <chr> "2017-08-25", "2017-08-25", "2017-08...
## $ cohort_day       <int> 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, ...
## $ Host             <chr> "Apple", "Apple", "Apple", "Apple", ...
## $ `Li-cor_1`       <int> 6262, 6262, 6262, 6262, 6262, 6262, ...
## $ resp_time_1      <chr> "", "10:13:15", "10:14:47", "10:16:4...
## $ resp_day11       <dbl> NA, 0.2941100, 0.1052925, 1.3445380, ...
## $ mass_day14       <dbl> 6.187, 9.967, 6.118, 9.539, 3.479, 6...
## $ purge_time_2     <chr> "10:51", "", "", "", "", "", "", "", ...
## $ resp_time_2      <chr> "10:13:48", "10:16:22", "10:18:10", ...
## $ resp_day15       <dbl> 0.1432514, 0.1702350, 0.1076286, 1.3...
## $ Li_cor2          <int> 6262, 6262, 6262, 6262, 6262, 6262, ...
## $ treatment_day15  <chr> "2017-09-09", "", "", "", "", "2017-...
## $ exit_fridge_date <chr> "2018-01-22", "", "", "", "", "2018-...
## $ Eclosion_reference_date <chr> "2018-01-22", "", "2017-09-09", "", ...
## $ notes            <chr> "", "", "", "", "", "", "", "", "", ...
## $ Resp_code        <int> 0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, ...
## $ treatment        <chr> "S0", "GC", "RT", "GC", "RT", "S0", ...
## $ uniqueID         <chr> "2b1", "2b2", "2b3", "2b4", "2b5", "...
## $ eclosion_date     <chr> "2018-03-22", "", "2017-10-29", "", ...
## $ eclosion_days     <int> 59, NA, 64, NA, 56, NA, 59, 32, 49, ...
## $ well_id          <chr> "A1", "", "A1", "", "A2", "A2", "A3"...
## $ organism         <chr> "fly", "", "fly", "", "fly", "", "fl...
## $ Trikinetics_position <int> 17, NA, 8, NA, 15, NA, 7, 30, 27, NA...
## $ Trik_monitor     <int> 1, NA, 1, NA, 2, NA, 2, 2, 1, NA, NA...
## $ Trikinetics_entry_LD_time <chr> "12:43", "", "3:34", "", "13:03", ""...
## $ Trikinetic_exit_date <chr> "2018-03-23", "", "2107-11-05", "", ...
## $ Trikinetics_exit_LD_time <chr> "12:57", "", "20:33", "", "9:58", ""...
## $ notes_2          <chr> "", "", "changed water 2017-11-03 11...
## $ Free_run_trik_monitor <int> NA, NA, 4, NA, NA, NA, NA, NA, 3, NA...
## $ Free_run_trik_position <int> NA, NA, 11, NA, NA, NA, NA, NA, 1, N...
## $ Free_run_entry_date <chr> "", "", "2017-11-05", "", "", "", "", ...
## $ Free_run_entry_time <chr> "", "", "20:34", "", "", "", "", ...
## $ Free_run_exit_date <chr> "", "", "2017-12-09", "", "", "", "", ...
## $ Free_run_exit_time <chr> "", "", "20:00", "", "", "", "", ...
## $ notes_3          <chr> "", "", "changed water 2017-11-28", ...
## $ Adult_death_date <chr> "2018-03-23", "", "2017-12-09", "", ...
```

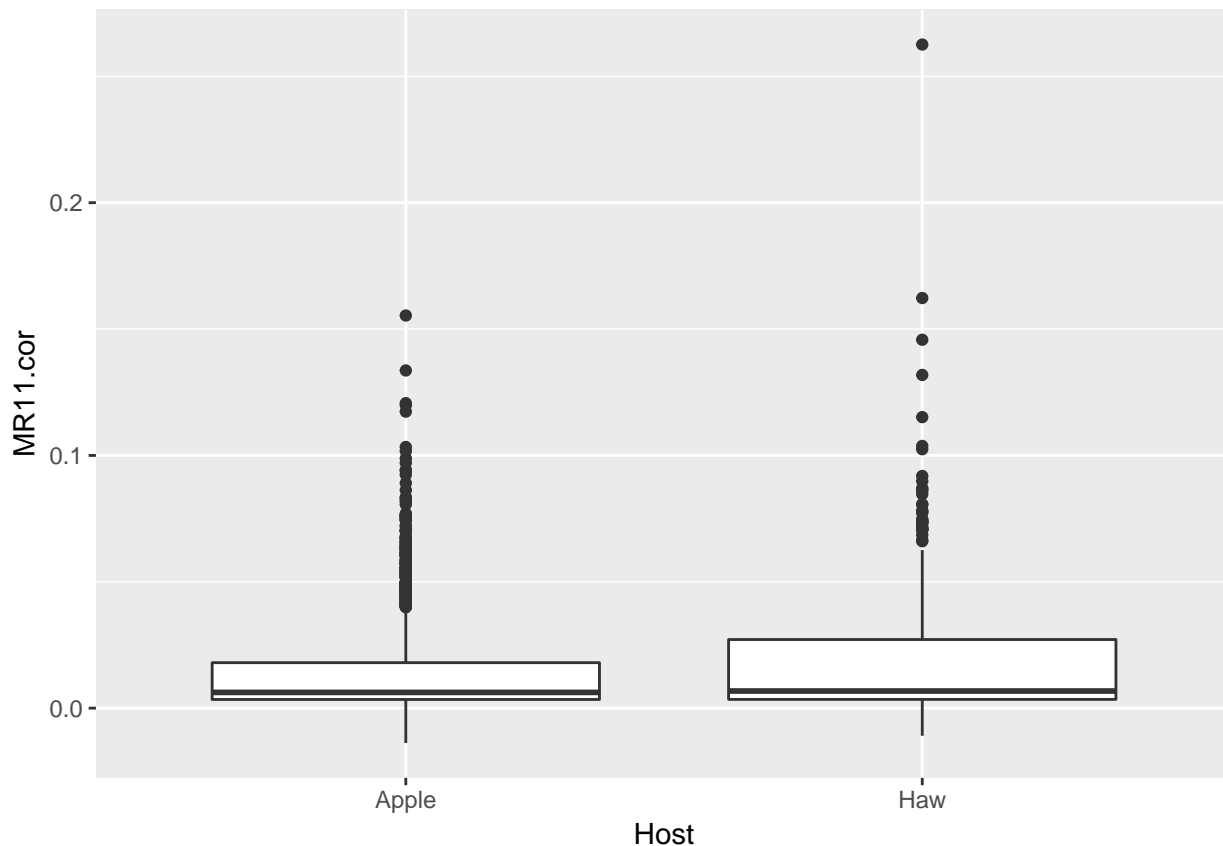
```
## $ day10purge      <dbl> 13.63333, 13.65000, 13.65000, 13.666...
## $ day10purge.trans <dbl> 13.63333, 13.65000, 13.65000, 13.666...
## $ day10resp       <dbl> NA, 10.21667, 10.23333, 10.26667, 10...
## $ total_time_day10 <dbl> NA, 20.56667, 20.58333, 20.60000, 20...
## $ MR11            <dbl> NA, 0.014300324, 0.005115425, 0.0652...
## $ msMR11          <dbl> NA, 0.0012796711, 0.0007613373, 0.00...
## $ mean.blank       <dbl> 0.001125786, 0.001125786, 0.00112578...
## $ MR11.cor         <dbl> NA, 0.013174539, 0.003989640, 0.0641...
## $ msMR11.cor       <dbl> NA, 1.538855e-04, -3.644483e-04, 4.9...
```

```
data5.neg <- data5%>%
  filter(MR11.cor<0)
```

Figure of Metabolic Rate between Hosts

```
#Boxplot
ggplot(data5, aes(x=Host, y=MR11.cor))+geom_boxplot()
```

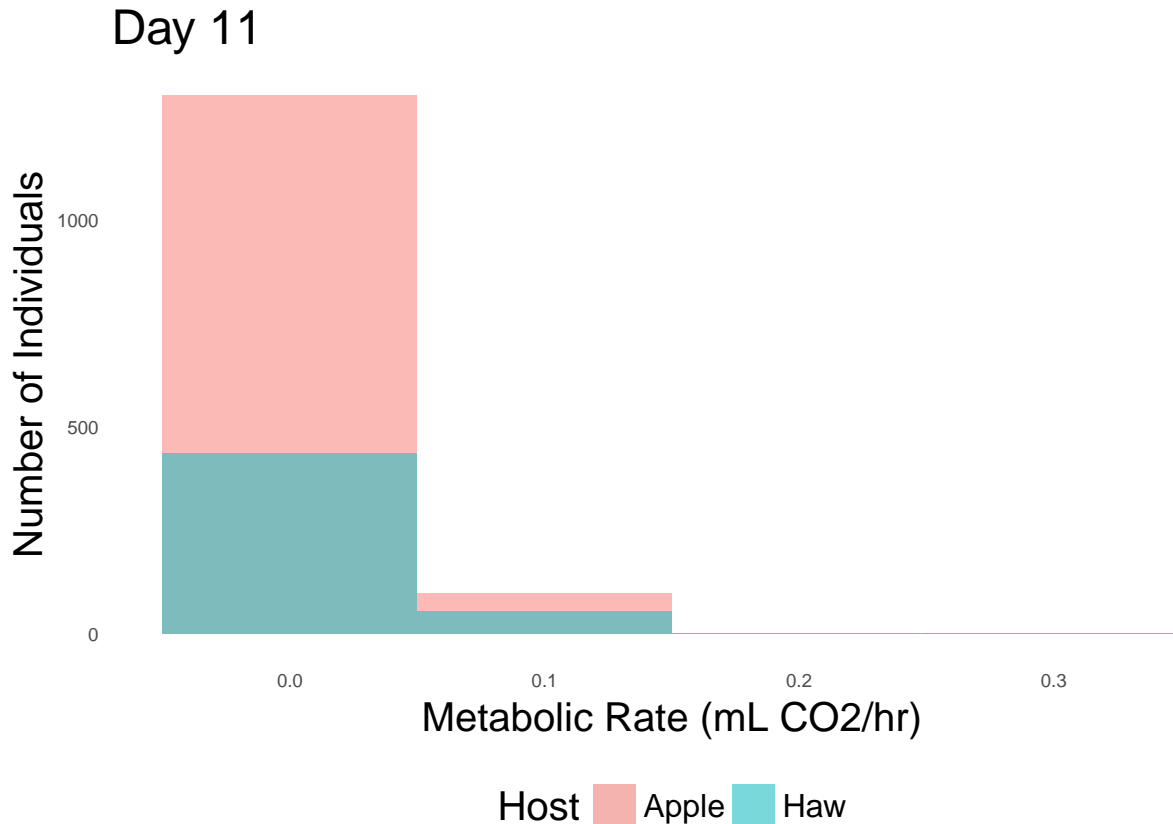
```
## Warning: Removed 13 rows containing non-finite values (stat_boxplot).
```



```
#Histogram
setup<-theme_bw()+theme(axis.text.x=element_blank(),
  axis.ticks.x=element_blank(),legend.position="bottom",
  axis.text.y=element_blank(),
  axis.ticks.y=element_blank(),panel.background = element_blank(),
  panel.grid.major = element_blank(), panel.grid.minor = element_blank(),axis.text=element_text(s
```

```
ggplot(data5, aes(x=MR11.cor, fill=Host))+geom_histogram(position = "identity", alpha=.5, binwidth = .1,
  axis.ticks.x=element_blank(),legend.position="bottom",
  axis.ticks.y=element_blank(),panel.background = element_blank(),
  panel.grid.major = element_blank(), panel.grid.minor = element_blank(),axis.text=element_text(s
```

Warning: Removed 13 rows containing non-finite values (stat_bin).



Calculate eclosion days

```
data5$neweclosions<-difftime(as.Date(data5$eclosion_date), as.Date(data5$Eclosion_reference_date),units="days")
data5$neweclosions <- as.numeric(data5$neweclosions)
```

Figures of eclosion and metabolic rate data

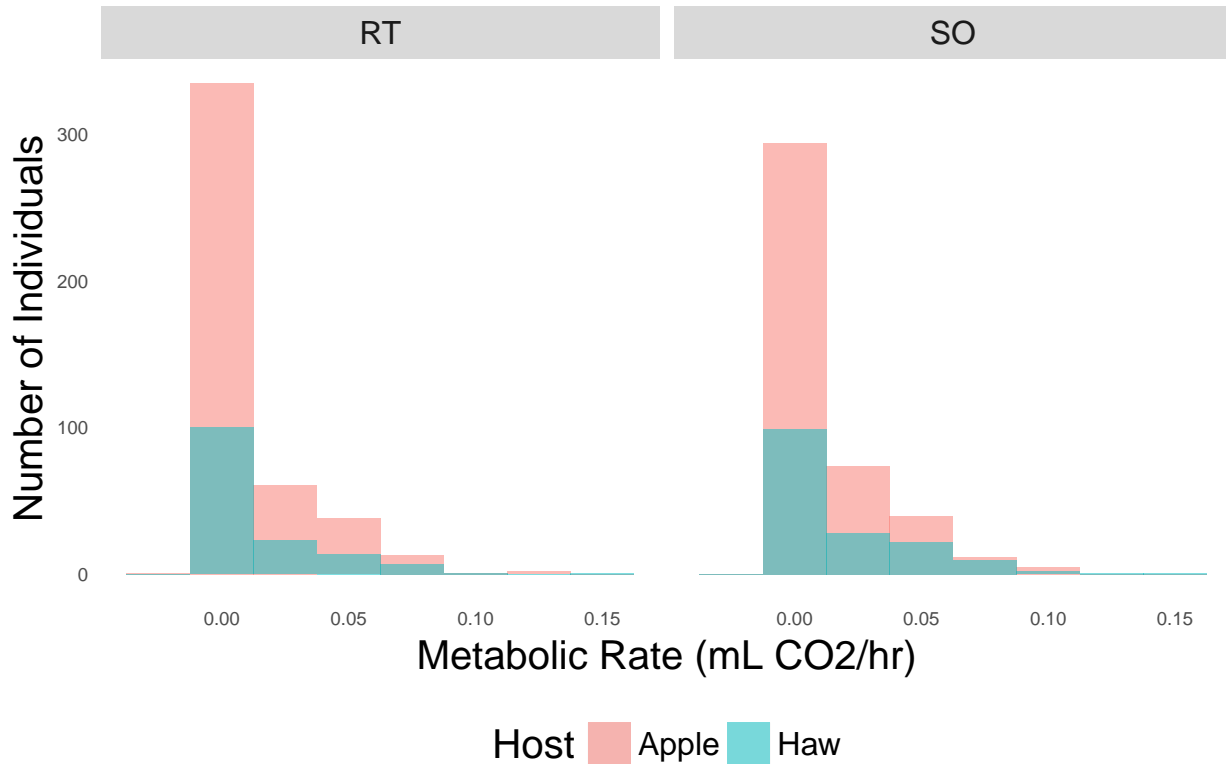
```
data5.treatsub<-data5%>%
  filter(treatment!="GC"&treatment!="")

data5.treatsub$neweclosions<-as.numeric(data5.treatsub$neweclosions)

#Histogram comparison between MR of RT & SO
ggplot(data5.treatsub, aes(x=MR11.cor, fill=Host))+geom_histogram(position = "identity", alpha=.5, binwidth = .1,
  axis.ticks.x=element_blank(),legend.position="bottom",
  axis.ticks.y=element_blank(),panel.background = element_blank(),
  panel.grid.major = element_blank(), panel.grid.minor = element_blank(),axis.text=element_text(s
```

```
## Warning: Removed 4 rows containing non-finite values (stat_bin).
```

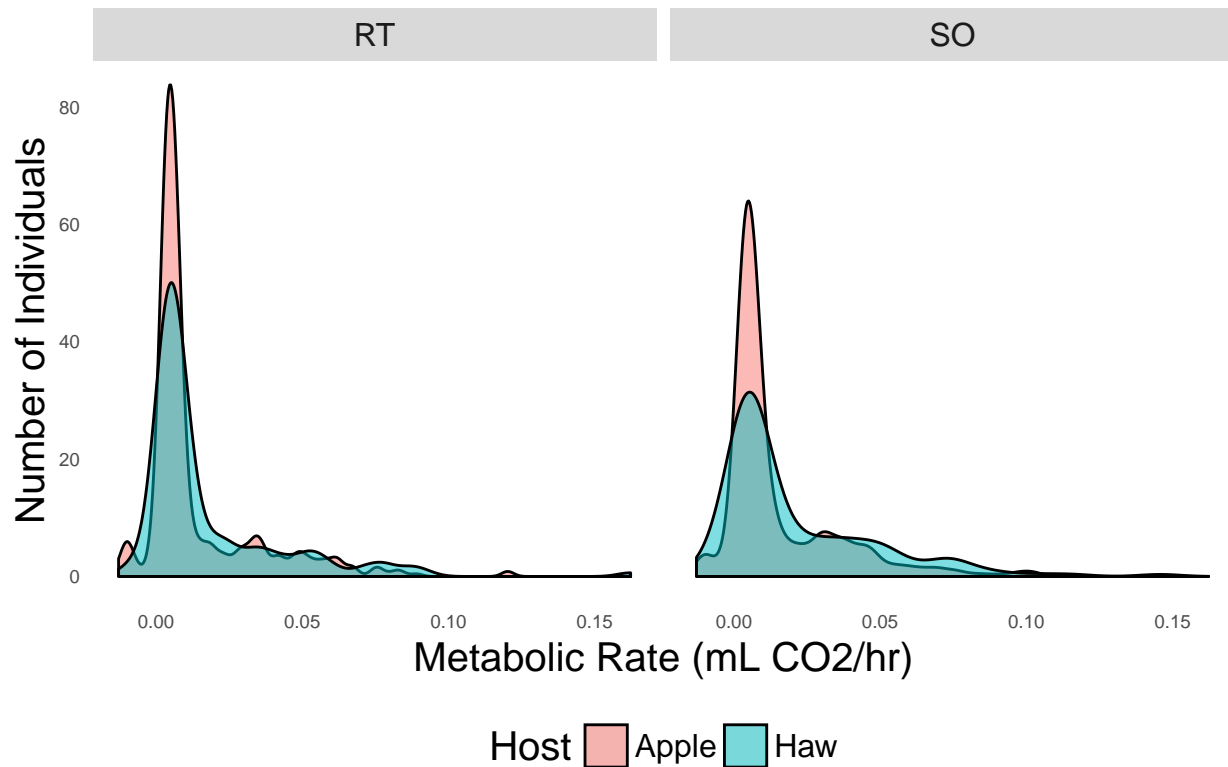
Day 11



```
#Density comparison between MR of RT & SO
ggplot(data5.treatsub, aes(x=MR11.cor, fill=Host))+geom_density(position = "identity", alpha=.5)+facet_
  axis.ticks.x=element_blank(),legend.position="bottom",
  axis.ticks.y=element_blank(),panel.background = element_blank(),
  panel.grid.major = element_blank(), panel.grid.minor = element_blank(),axis.text=element_text(s
```

```
## Warning: Removed 4 rows containing non-finite values (stat_density).
```

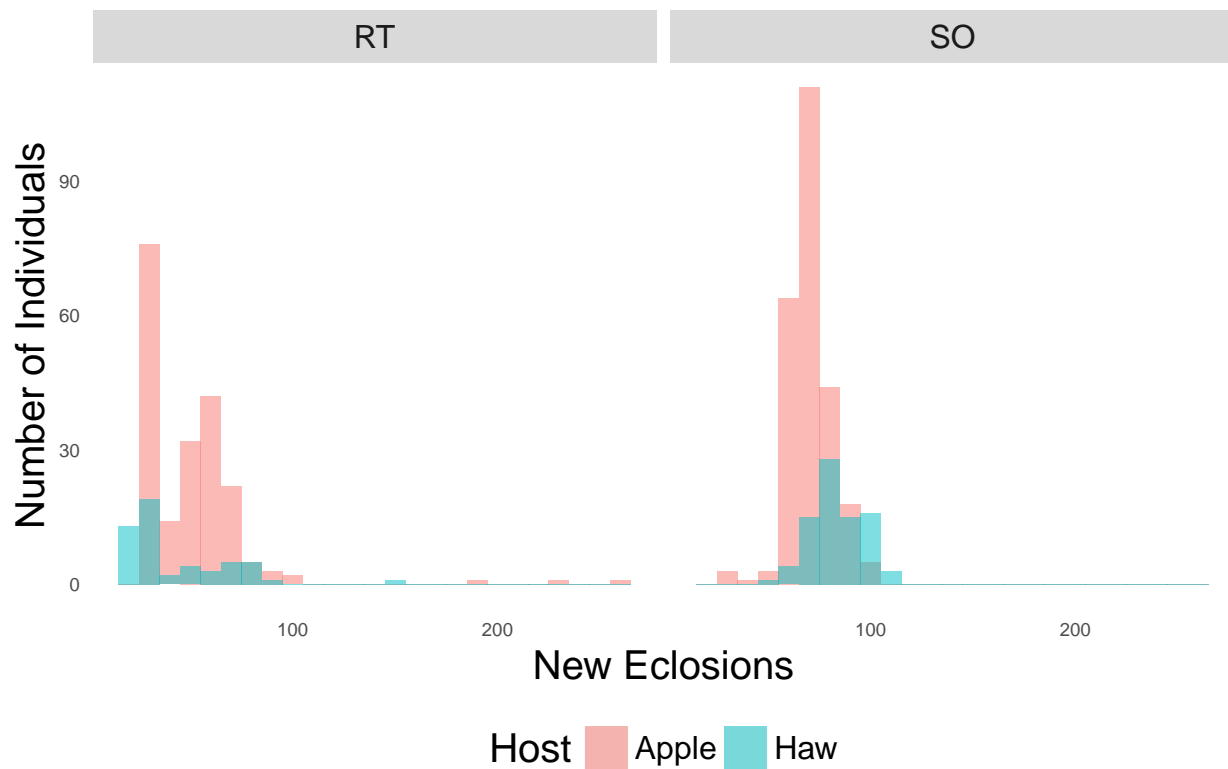
Day 11



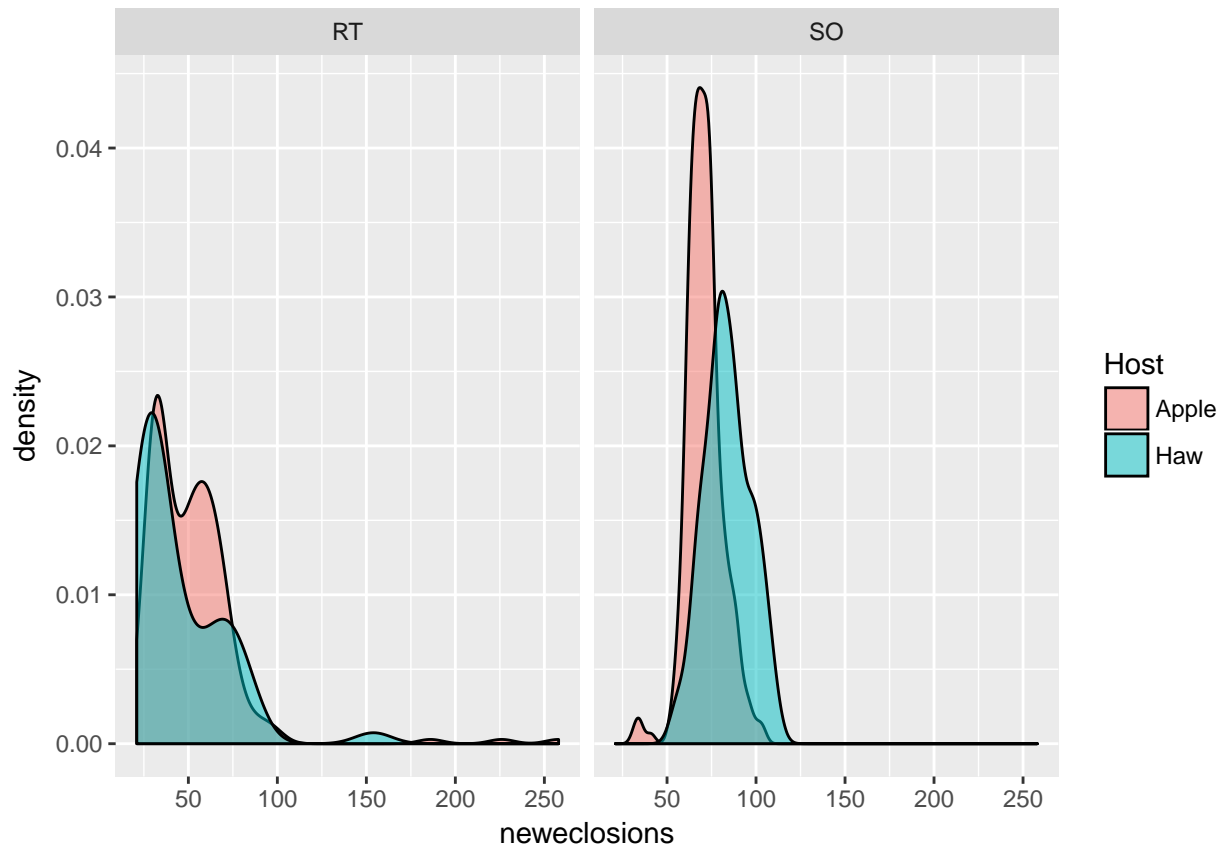
```
#Histogram comparison between eclosion date of RT & SO
ggplot(data5.treatsub, aes(x=neweclosures, fill=Host))+geom_histogram(position = "identity", alpha=.5,
  axis.ticks.x=element_blank(),legend.position="bottom",
  axis.ticks.y=element_blank(),panel.background = element_blank(),
  panel.grid.major = element_blank(), panel.grid.minor = element_blank(),axis.text=element_text(s
```

```
## Warning: Removed 606 rows containing non-finite values (stat_bin).
```


Day 11



```
#Density comparison between eclosion date of RT & SO
ggplot(data5.treatsub, aes(x=neweclosions, fill=Host))+geom_density(position = "identity", alpha=.5)+fa
## Warning: Removed 606 rows containing non-finite values (stat_density).
```



Test differences in eclosion timing between host and experiment

Using ANOVA which tests differences between two or more means * The null hypothesis would be that the two means are equal * Significance would indicate two means are not equal One Way ANOVA compares two means from two independent groups, in this case eclosion date and host (specific to SO and RT)

Two Way ANOVA compares means of two independent variables affecting one dependent variable, in this case the effect of Host and treatment (interacting) on eclosion

```
#Focus only on RT and SO treatments
data5.treatsub<-data5%>%
  filter(treatment!="GC"&treatment!="")

#Two Way ANOVA
mod1<- aov(neweclosions ~ Host*treatment, data=data5.treatsub)
summary(mod1)
```

```
##              Df Sum Sq Mean Sq F value    Pr(>F)
## Host           1   3685    3685    9.705 0.00193 **
## treatment      1  82798   82798  218.056 < 2e-16 ***
## Host:treatment  1   9903    9903   26.080 4.45e-07 ***
## Residuals     579 219851     380
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## 606 observations deleted due to missingness
```

```

#narrow down to SO & RT
data5.SO<-data5.treatsub%>%
  filter(treatment=="SO")

data5.RT<-data5.treatsub%>%
  filter(treatment=="RT")

#One Way ANOVA for RT & SO
mod2RT<-aov(neweclosures~Host, data=data5.RT)
summary(mod2RT)

##              Df Sum Sq Mean Sq F value Pr(>F)
## Host          1    2143   2142.9    2.97  0.086 .
## Residuals    250 180353    721.4
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## 346 observations deleted due to missingness

mod2SO<-aov(neweclosures~Host, data=data5.SO)
summary(mod2SO)

##              Df Sum Sq Mean Sq F value Pr(>F)
## Host          1   10064   10064   83.83 <2e-16 ***
## Residuals    329   39499    120
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## 260 observations deleted due to missingness

#how balanced it is
data5.RT%>%
  group_by(Host)%>%
  summarise(n=length(Host))

## # A tibble: 2 x 2
##   Host      n
##   <chr> <int>
## 1 Apple   452
## 2 Haw     146

```

Explore relationship between eclosion days and MR

scatter plots

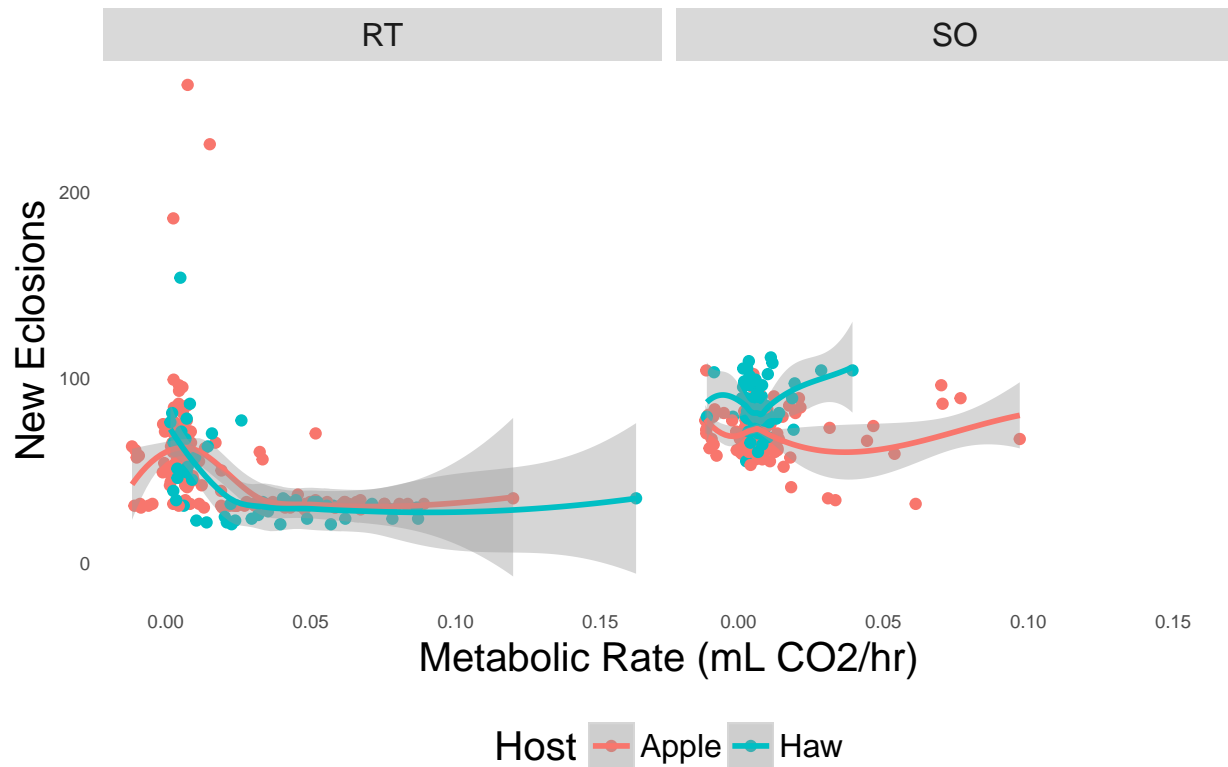
```

ggplot(data5.treatsub,aes(x=MR11.cor, y=neweclosures, colour=Host))+geom_point()+stat_smooth(method="loess",
  axis.ticks.x=element_blank(),legend.position="bottom",
  axis.ticks.y=element_blank(),panel.background = element_blank(),
  panel.grid.major = element_blank(), panel.grid.minor = element_blank(),axis.text=element_text(size=8))

## Warning: Removed 609 rows containing non-finite values (stat_smooth).
## Warning: Removed 609 rows containing missing values (geom_point).

```

Day 11

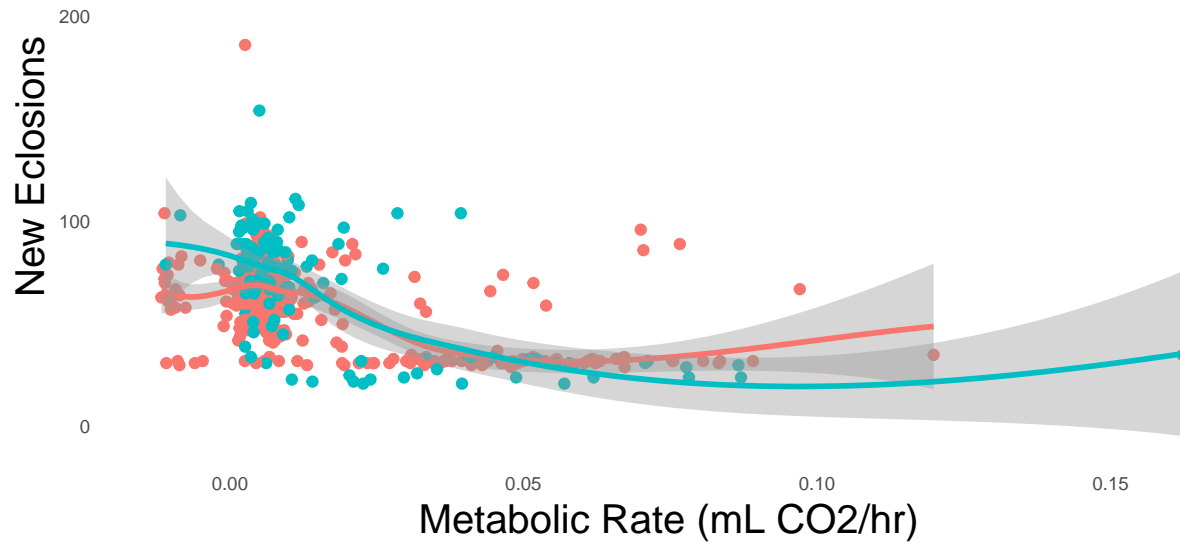


```
#plotting mr11 on the x axis and new eclosions on the y axis; color points by host, fit curve to data
ggplot(data5.treatsub,aes(x=MR11.cor, y=neweclosions, colour=Host))+geom_point()+stat_smooth(method="loess",
axis.ticks.x=element_blank(),legend.position="bottom",
axis.ticks.y=element_blank(),panel.background = element_blank(),
panel.grid.major = element_blank(), panel.grid.minor = element_blank(),axis.text=element_text(size=12))
```

```
## Warning: Removed 609 rows containing non-finite values (stat_smooth).
```

```
## Warning: Removed 609 rows containing missing values (geom_point).
```

Day 11



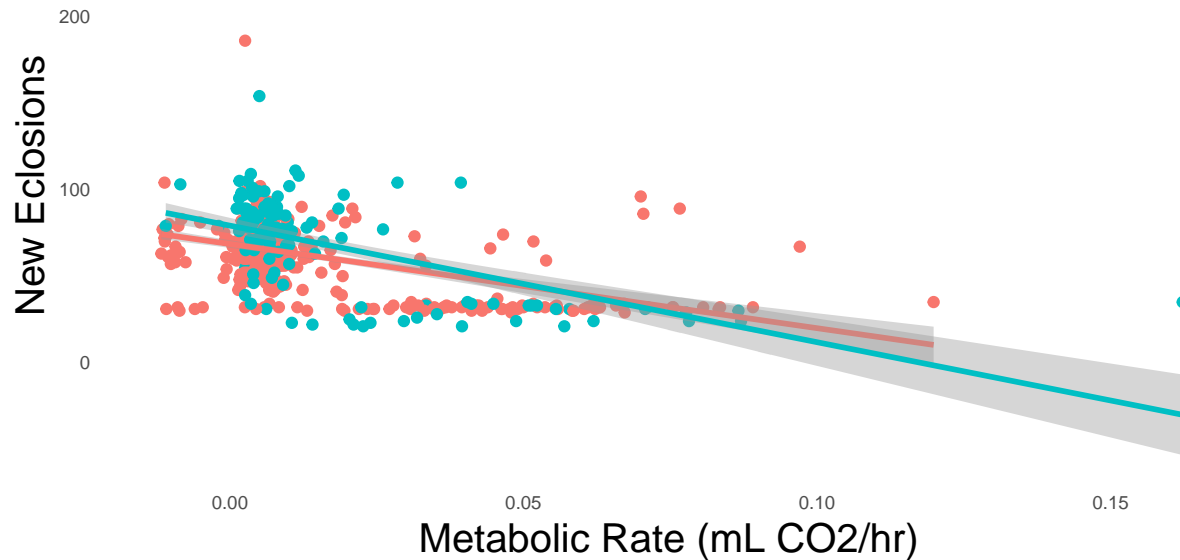
Host —●— Apple —●— Haw

```
#same - fit linear curve to data
ggplot(data5.treatsub,aes(x=MR11.cor, y=neweclosures, colour=Host))+geom_point()+stat_smooth(method="lm",
axis.ticks.x=element_blank(),legend.position="bottom",
axis.ticks.y=element_blank(),panel.background = element_blank(),
panel.grid.major = element_blank(), panel.grid.minor = element_blank(),axis.text=element_text(s
```

```
## Warning: Removed 609 rows containing non-finite values (stat_smooth).
```

```
## Warning: Removed 609 rows containing missing values (geom_point).
```

Day 11



Host —●— Apple —●— Haw

```
#could log transform mr to make it more linear
ggplot(data5.treatsub,aes(x=log10(MR11.cor), y=neweclosions, colour=Host))+geom_point()+stat_smooth(met
  axis.ticks.x=element_blank(),legend.position="bottom",
  axis.ticks.y=element_blank(),panel.background = element_blank(),
  panel.grid.major = element_blank(), panel.grid.minor = element_blank(),axis.text=element_text(s
```

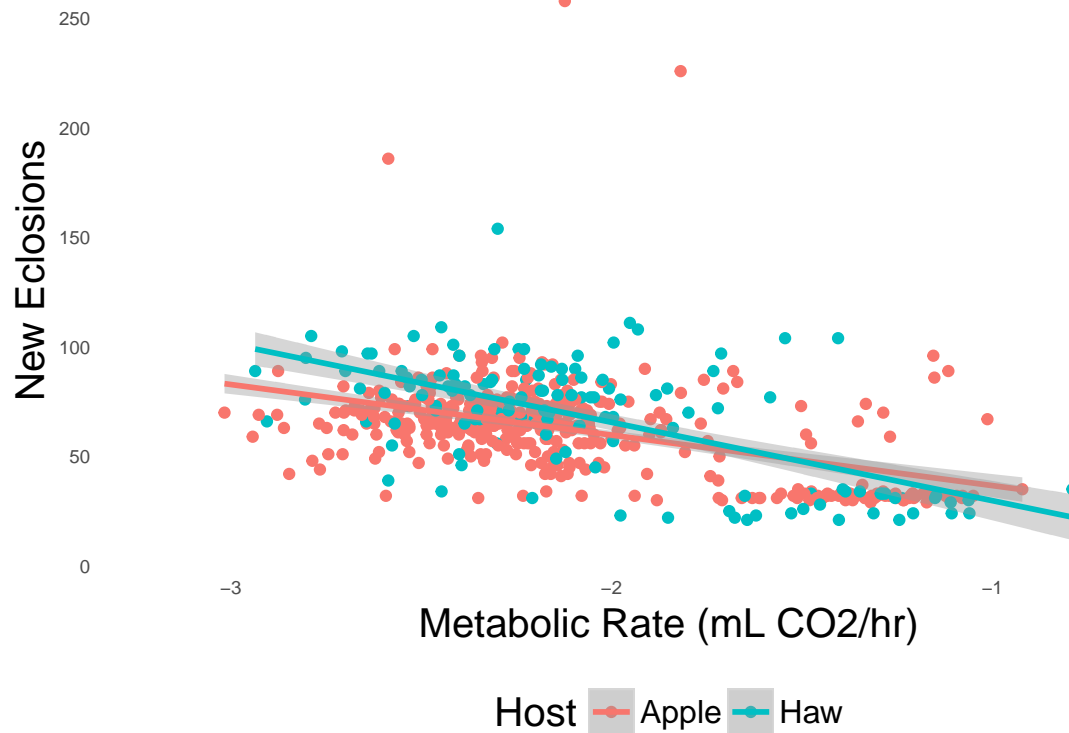
```
## Warning in FUN(X[[i]], ...): NaNs produced
```

```
## Warning in FUN(X[[i]], ...): NaNs produced
```

```
## Warning: Removed 644 rows containing non-finite values (stat_smooth).
```

```
## Warning: Removed 644 rows containing missing values (geom_point).
```

Day 11



Calculating lifespan

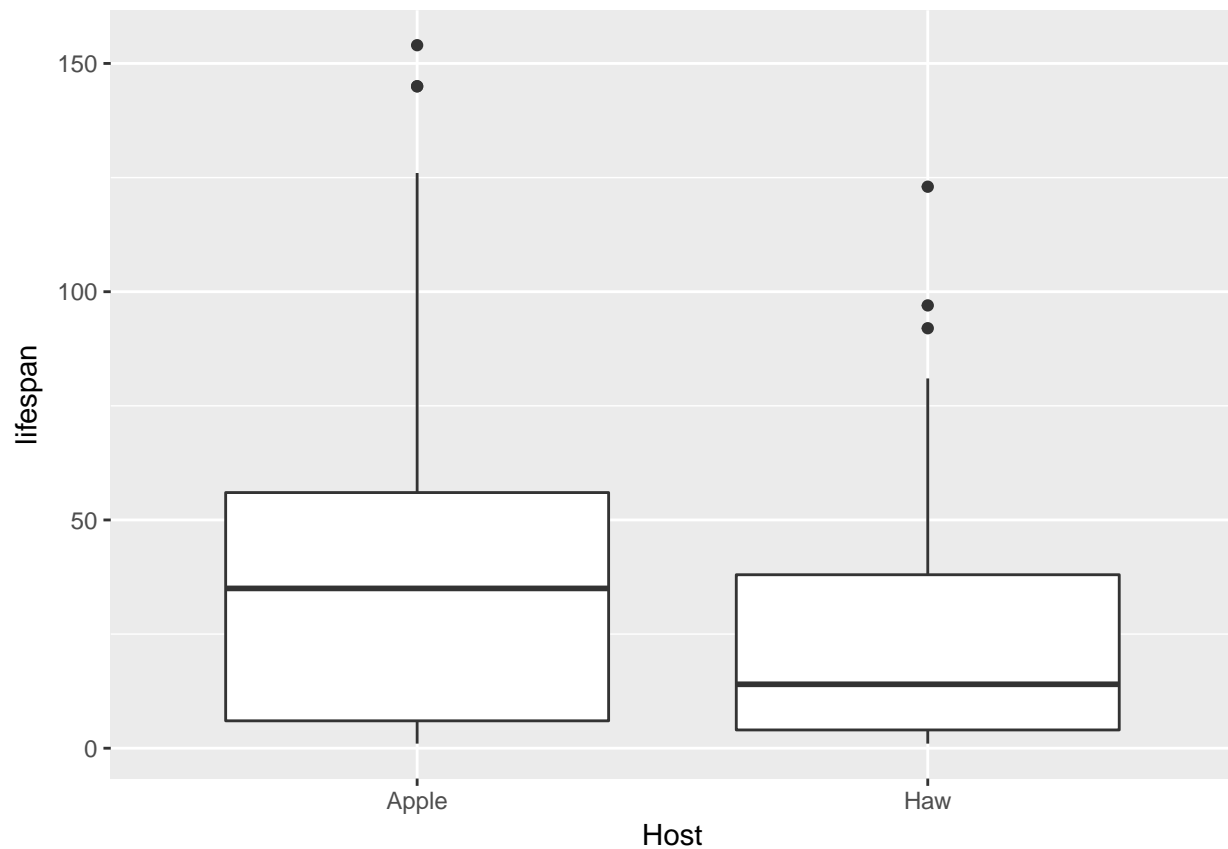
```
data5.treatsub$lifespan<-difftime(as.Date(data5.treatsub$Adult_death_date, na.rm=TRUE), as.Date(data5.treatsub$Adult_hatching_date, na.rm=TRUE))
```

Figures of lifespan between hosts

```
ggplot(data5.treatsub, aes(x=Host, y=lifespan))+geom_boxplot()
```

```
## Don't know how to automatically pick scale for object of type difftime. Defaulting to continuous.
```

```
## Warning: Removed 927 rows containing non-finite values (stat_boxplot).
```

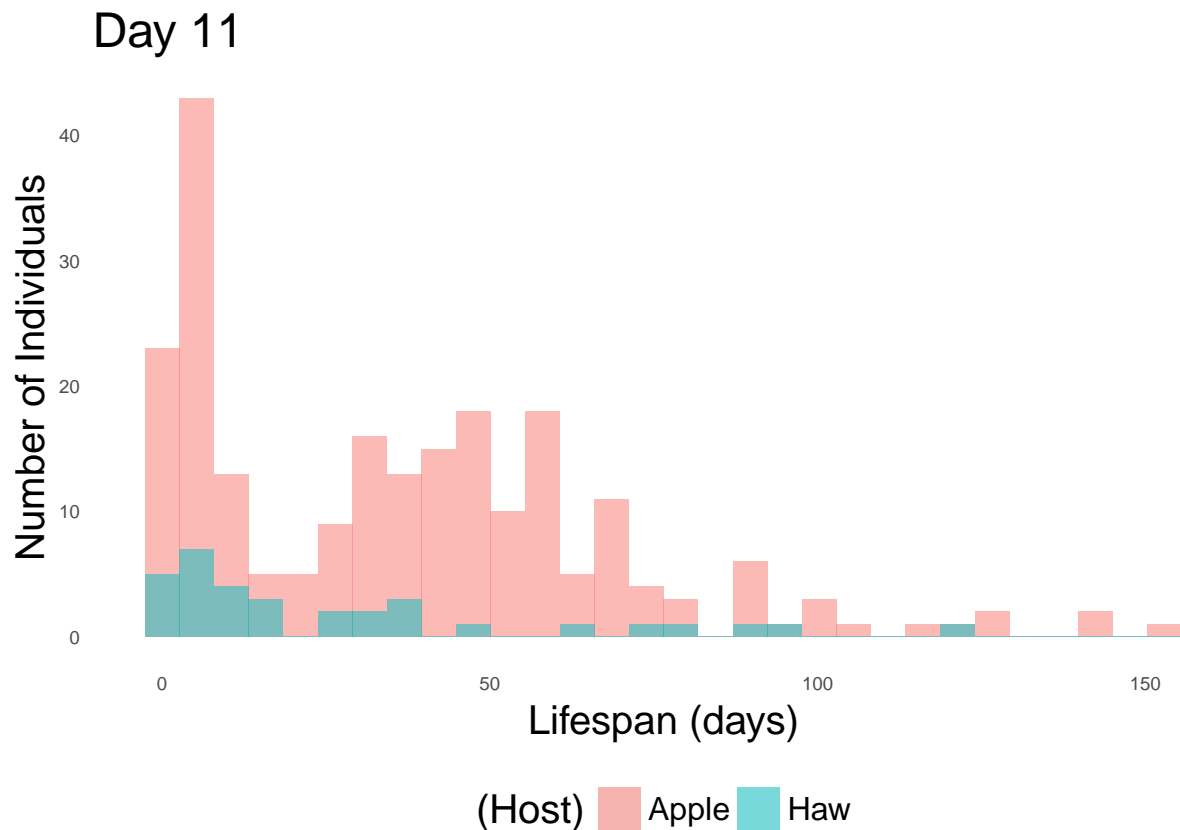


```
ggplot(data5.treatsub, aes(x=lifespan, fill=(Host)))+geom_histogram(position = "identity", alpha=.5) +
  axis.ticks.x=element_blank(),legend.position="bottom",
  axis.ticks.y=element_blank(),panel.background = element_blank(),
  panel.grid.major = element_blank(), panel.grid.minor = element_blank(),axis.text=element_text(s
```

Don't know how to automatically pick scale for object of type difftime. Defaulting to continuous.

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

Warning: Removed 927 rows containing non-finite values (stat_bin).

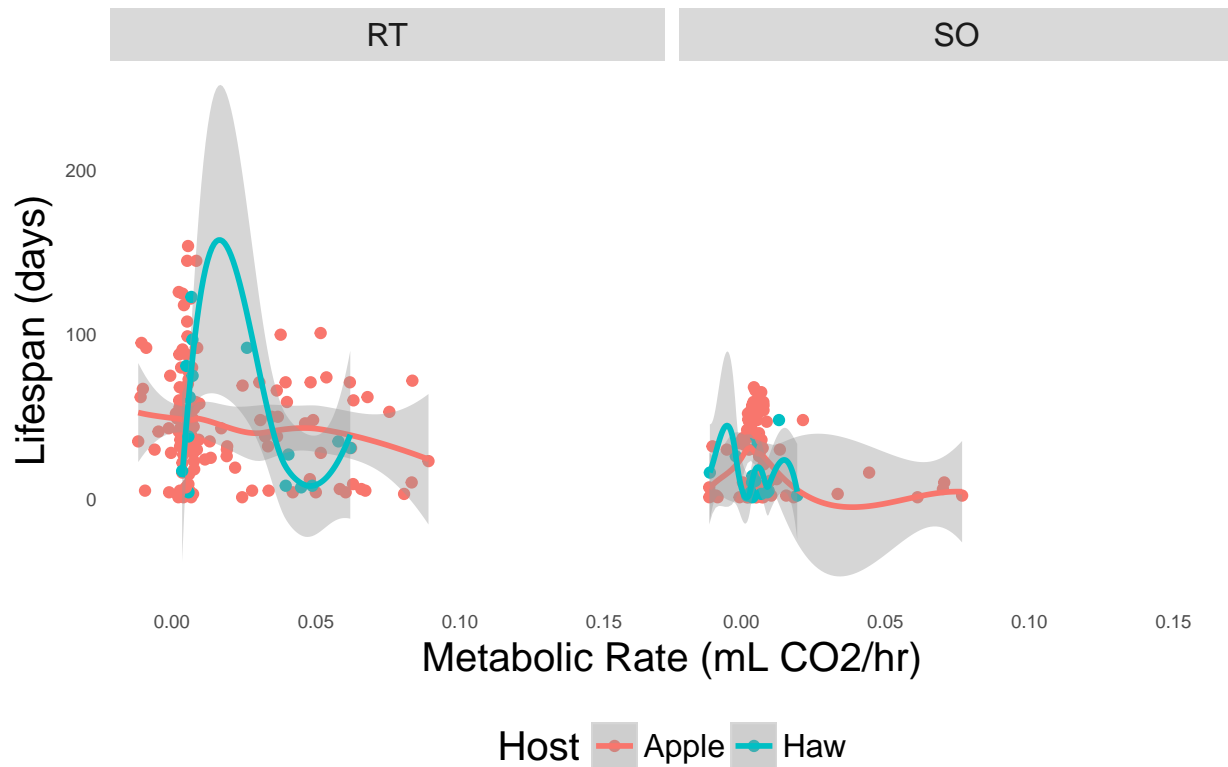


Figures Associating MR with lifespan

```
#Loess
ggplot(data5.treatsub,aes(x= MR11.cor, y=lifespan, colour=Host))+geom_point()+stat_smooth(method="loess",
axis.ticks.x=element_blank(),legend.position="bottom",
axis.ticks.y=element_blank(),panel.background = element_blank(),
panel.grid.major = element_blank(), panel.grid.minor = element_blank(),axis.text=element_text(s

## Don't know how to automatically pick scale for object of type difftime. Defaulting to continuous.
## Warning: Removed 928 rows containing non-finite values (stat_smooth).
## Warning: Removed 928 rows containing missing values (geom_point).
```

Day 11

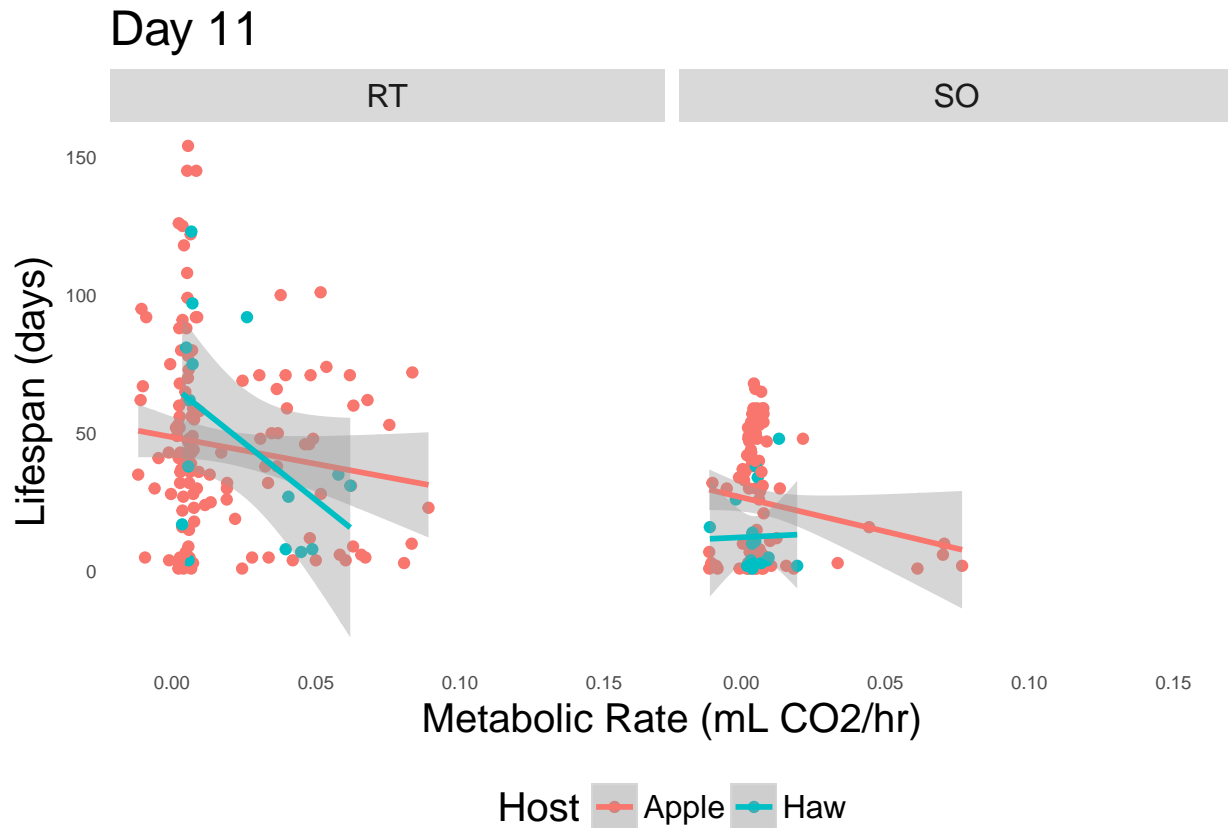


```
#Linear
ggplot(data5.treatsub,aes(x=MR11.cor, y=lifespan, colour=Host))+geom_point()+stat_smooth(method="lm") +
  axis.ticks.x=element_blank(),legend.position="bottom",
  axis.ticks.y=element_blank(),panel.background = element_blank(),
  panel.grid.major = element_blank(), panel.grid.minor = element_blank(),axis.text=element_text(s
```

```
## Don't know how to automatically pick scale for object of type difftime. Defaulting to continuous.
```

```
## Warning: Removed 928 rows containing non-finite values (stat_smooth).
```

```
## Warning: Removed 928 rows containing missing values (geom_point).
```



Repeat above, but with day 15, starting with time sequence

```
glimpse(data$purge_time_2)
```

```
## chr [1:1909] "10:51" "" "" "" "" "" "" "" "" "" "" "" "" "" "" "" "" "" ...
```

```
hm(data$purge_time_2)
```

```
## Warning in .parse_hms(..., order = "HM", quiet = quiet): Some strings
## failed to parse, or all strings are NAs
```

```
##      [1] "10H 51M 0S" NA      NA      NA      NA
##      [6] NA      NA      NA      NA      NA
##     [11] NA      NA      NA      NA      NA
##     [16] NA      NA      NA      NA      NA
##     [21] NA      NA      NA      NA      NA
##     [26] NA      NA      NA      NA      NA
##     [31] NA      NA      NA      NA      NA
##     [36] NA      NA      NA      NA      NA
##     [41] NA      NA      NA      NA      NA
##     [46] NA      NA      NA      "11H 18M 0S" "11H 40M 0S"
##     [51] NA      NA      NA      NA      NA
##     [56] NA      NA      NA      NA      NA
##     [61] NA      NA      NA      NA      NA
##     [66] NA      NA      NA      NA      NA
##     [71] NA      NA      NA      NA      NA
##     [76] NA      NA      NA      NA      NA
```

##	[81]	NA	NA	NA	NA	NA
##	[86]	NA	NA	NA	NA	NA
##	[91]	NA	"11H 56M OS"	"14H 31M OS"	NA	NA
##	[96]	NA	NA	NA	NA	NA
##	[101]	NA	NA	NA	NA	NA
##	[106]	NA	NA	NA	NA	NA
##	[111]	NA	NA	NA	NA	NA
##	[116]	NA	NA	NA	NA	NA
##	[121]	NA	NA	NA	NA	NA
##	[126]	NA	NA	NA	NA	NA
##	[131]	NA	NA	NA	NA	NA
##	[136]	NA	NA	NA	NA	NA
##	[141]	NA	NA	NA	NA	NA
##	[146]	NA	NA	NA	NA	NA
##	[151]	NA	"14H 51M OS"	"14H 9M OS"	NA	NA
##	[156]	NA	NA	NA	NA	NA
##	[161]	NA	NA	NA	NA	NA
##	[166]	NA	NA	NA	NA	NA
##	[171]	NA	NA	NA	NA	NA
##	[176]	NA	NA	NA	NA	NA
##	[181]	NA	NA	NA	NA	NA
##	[186]	NA	NA	NA	NA	NA
##	[191]	NA	NA	NA	NA	NA
##	[196]	NA	NA	NA	NA	NA
##	[201]	NA	NA	NA	NA	NA
##	[206]	NA	NA	NA	NA	NA
##	[211]	"14H 30M OS"	"9H 24M OS"	NA	NA	NA
##	[216]	NA	NA	NA	NA	NA
##	[221]	NA	NA	NA	NA	NA
##	[226]	NA	NA	NA	NA	NA
##	[231]	NA	NA	NA	NA	NA
##	[236]	NA	NA	NA	NA	NA
##	[241]	NA	NA	NA	NA	NA
##	[246]	NA	NA	NA	NA	NA
##	[251]	NA	NA	NA	NA	NA
##	[256]	NA	NA	NA	NA	NA
##	[261]	NA	NA	NA	NA	NA
##	[266]	NA	NA	NA	NA	NA
##	[271]	NA	NA	NA	NA	NA
##	[276]	NA	NA	NA	NA	NA
##	[281]	NA	NA	NA	NA	NA
##	[286]	NA	NA	NA	"9H 45M OS"	"9H 47M OS"
##	[291]	NA	NA	NA	NA	NA
##	[296]	NA	NA	NA	NA	NA
##	[301]	NA	NA	NA	NA	NA
##	[306]	NA	NA	NA	NA	NA
##	[311]	NA	NA	NA	NA	NA
##	[316]	NA	NA	NA	NA	NA
##	[321]	NA	NA	NA	NA	NA
##	[326]	NA	NA	NA	NA	NA
##	[331]	NA	NA	NA	NA	NA
##	[336]	NA	NA	NA	NA	NA
##	[341]	NA	NA	NA	NA	NA
##	[346]	NA	NA	NA	NA	NA

##	[351]	NA	NA	NA	NA	NA
##	[356]	NA	NA	NA	NA	NA
##	[361]	NA	NA	NA	NA	NA
##	[366]	NA	"10H 9M 0S"	"17H 14M 0S"	NA	NA
##	[371]	NA	NA	NA	NA	NA
##	[376]	NA	NA	NA	NA	NA
##	[381]	NA	NA	NA	NA	NA
##	[386]	NA	NA	NA	NA	NA
##	[391]	NA	NA	NA	NA	NA
##	[396]	NA	NA	NA	NA	NA
##	[401]	NA	NA	NA	NA	NA
##	[406]	NA	NA	NA	NA	NA
##	[411]	NA	NA	NA	NA	NA
##	[416]	NA	NA	NA	NA	NA
##	[421]	NA	NA	NA	NA	NA
##	[426]	NA	NA	NA	NA	NA
##	[431]	NA	NA	NA	NA	NA
##	[436]	NA	NA	NA	NA	NA
##	[441]	NA	"17H 36M 0S"	"16H 49M 0S"	NA	NA
##	[446]	NA	NA	NA	NA	NA
##	[451]	NA	NA	NA	NA	NA
##	[456]	NA	NA	NA	NA	NA
##	[461]	NA	NA	NA	NA	NA
##	[466]	NA	NA	NA	NA	NA
##	[471]	NA	NA	NA	NA	NA
##	[476]	NA	NA	NA	NA	NA
##	[481]	NA	NA	NA	NA	NA
##	[486]	NA	NA	NA	NA	NA
##	[491]	NA	NA	NA	NA	NA
##	[496]	NA	NA	NA	NA	NA
##	[501]	NA	NA	NA	NA	NA
##	[506]	NA	NA	NA	NA	NA
##	[511]	NA	NA	NA	NA	NA
##	[516]	NA	NA	NA	"17H 13M 0S"	"12H 38M 0S"
##	[521]	NA	NA	NA	NA	NA
##	[526]	NA	NA	NA	NA	NA
##	[531]	NA	NA	NA	NA	NA
##	[536]	NA	NA	NA	NA	NA
##	[541]	NA	NA	NA	NA	NA
##	[546]	NA	NA	NA	NA	NA
##	[551]	NA	NA	NA	NA	NA
##	[556]	NA	NA	NA	NA	NA
##	[561]	NA	NA	NA	NA	NA
##	[566]	NA	NA	NA	NA	NA
##	[571]	NA	NA	NA	NA	NA
##	[576]	NA	NA	NA	NA	NA
##	[581]	NA	NA	NA	NA	NA
##	[586]	NA	NA	NA	NA	NA
##	[591]	NA	NA	NA	NA	NA
##	[596]	NA	"12H 49M 0S"	"12H 7M 0S"	NA	NA
##	[601]	NA	NA	NA	NA	NA
##	[606]	NA	NA	NA	NA	NA
##	[611]	NA	NA	NA	NA	NA
##	[616]	NA	NA	NA	NA	NA

##	[621]	NA	NA	NA	NA	NA
##	[626]	NA	NA	NA	NA	NA
##	[631]	NA	NA	NA	NA	NA
##	[636]	NA	NA	NA	NA	NA
##	[641]	NA	NA	NA	NA	NA
##	[646]	NA	NA	NA	NA	NA
##	[651]	NA	NA	NA	NA	NA
##	[656]	NA	NA	NA	NA	NA
##	[661]	NA	NA	NA	NA	NA
##	[666]	NA	NA	NA	NA	NA
##	[671]	NA	NA	NA	NA	NA
##	[676]	"12H 38M 0S"	"6H 7M 0S"	NA	NA	NA
##	[681]	NA	NA	NA	NA	NA
##	[686]	NA	NA	NA	NA	NA
##	[691]	NA	NA	NA	NA	NA
##	[696]	NA	NA	NA	NA	NA
##	[701]	NA	NA	NA	NA	NA
##	[706]	NA	NA	NA	NA	NA
##	[711]	NA	NA	NA	NA	NA
##	[716]	NA	NA	NA	NA	NA
##	[721]	NA	NA	NA	NA	NA
##	[726]	NA	NA	NA	NA	NA
##	[731]	NA	NA	NA	NA	NA
##	[736]	NA	NA	NA	NA	NA
##	[741]	NA	NA	NA	NA	NA
##	[746]	"6H 23M 0S"	"6H 24M 0S"	NA	NA	NA
##	[751]	NA	NA	NA	NA	NA
##	[756]	NA	NA	NA	NA	NA
##	[761]	NA	NA	NA	NA	NA
##	[766]	NA	NA	NA	NA	NA
##	[771]	NA	NA	NA	NA	NA
##	[776]	NA	NA	NA	NA	NA
##	[781]	NA	NA	NA	NA	NA
##	[786]	NA	NA	NA	NA	NA
##	[791]	NA	NA	NA	NA	NA
##	[796]	NA	NA	NA	NA	NA
##	[801]	NA	NA	NA	NA	NA
##	[806]	NA	NA	NA	NA	NA
##	[811]	NA	NA	NA	NA	NA
##	[816]	NA	NA	"6H 45M 0S"	"12H 45M 0S"	NA
##	[821]	NA	NA	NA	NA	NA
##	[826]	NA	NA	NA	NA	NA
##	[831]	NA	NA	NA	NA	NA
##	[836]	NA	NA	NA	NA	NA
##	[841]	NA	NA	NA	NA	NA
##	[846]	NA	NA	NA	NA	NA
##	[851]	NA	NA	NA	NA	NA
##	[856]	NA	NA	NA	NA	NA
##	[861]	NA	NA	NA	NA	NA
##	[866]	NA	NA	NA	NA	NA
##	[871]	NA	NA	NA	NA	NA
##	[876]	NA	NA	NA	NA	NA
##	[881]	NA	NA	NA	NA	NA
##	[886]	NA	NA	NA	NA	NA

##	[891]	NA	NA	NA	NA	"13H 26M 0S"
##	[896]	"13H 30M 0S"	NA	NA	NA	NA
##	[901]	NA	NA	NA	NA	NA
##	[906]	NA	NA	NA	NA	NA
##	[911]	NA	NA	NA	NA	NA
##	[916]	NA	NA	NA	NA	NA
##	[921]	NA	NA	NA	NA	NA
##	[926]	NA	NA	NA	NA	NA
##	[931]	NA	NA	NA	NA	NA
##	[936]	NA	NA	NA	NA	NA
##	[941]	NA	NA	NA	NA	NA
##	[946]	NA	NA	NA	NA	NA
##	[951]	NA	NA	NA	NA	NA
##	[956]	NA	NA	NA	NA	NA
##	[961]	NA	NA	NA	NA	NA
##	[966]	NA	NA	NA	NA	NA
##	[971]	NA	"14H 0M 0S"	"12H 28M 0S"	NA	NA
##	[976]	NA	NA	NA	NA	NA
##	[981]	NA	NA	NA	NA	NA
##	[986]	NA	NA	NA	NA	NA
##	[991]	NA	NA	NA	NA	NA
##	[996]	NA	NA	NA	NA	NA
##	[1001]	NA	NA	NA	NA	NA
##	[1006]	NA	NA	NA	NA	NA
##	[1011]	NA	NA	NA	NA	NA
##	[1016]	NA	NA	NA	NA	NA
##	[1021]	NA	NA	NA	NA	NA
##	[1026]	NA	NA	NA	NA	NA
##	[1031]	NA	NA	NA	NA	NA
##	[1036]	NA	NA	NA	NA	NA
##	[1041]	NA	NA	NA	NA	NA
##	[1046]	NA	"13H 16M 0S"	"11H 23M 0S"	NA	NA
##	[1051]	NA	NA	NA	NA	NA
##	[1056]	NA	NA	NA	NA	NA
##	[1061]	NA	NA	NA	NA	NA
##	[1066]	NA	NA	NA	NA	NA
##	[1071]	NA	NA	NA	NA	NA
##	[1076]	NA	NA	NA	NA	NA
##	[1081]	NA	NA	NA	NA	NA
##	[1086]	NA	NA	NA	NA	NA
##	[1091]	NA	NA	NA	NA	NA
##	[1096]	NA	"12H 1M 0S"	"12H 9M 0S"	NA	NA
##	[1101]	NA	NA	NA	NA	NA
##	[1106]	NA	NA	NA	NA	NA
##	[1111]	NA	NA	NA	NA	NA
##	[1116]	NA	NA	NA	NA	NA
##	[1121]	NA	NA	"12H 26M 0S"	"15H 28M 0S"	NA
##	[1126]	NA	NA	NA	NA	NA
##	[1131]	NA	NA	NA	NA	NA
##	[1136]	NA	NA	NA	NA	NA
##	[1141]	NA	NA	NA	NA	NA
##	[1146]	NA	NA	NA	NA	NA
##	[1151]	NA	NA	NA	NA	NA
##	[1156]	NA	NA	NA	NA	NA

##	[1161]	NA	NA	NA	NA	NA
##	[1166]	NA	NA	NA	NA	NA
##	[1171]	NA	NA	NA	NA	NA
##	[1176]	NA	NA	NA	NA	NA
##	[1181]	NA	NA	NA	NA	NA
##	[1186]	NA	NA	NA	NA	"15H 53M OS"
##	[1191]	"14H 56M OS"	NA	NA	NA	NA
##	[1196]	NA	NA	NA	NA	NA
##	[1201]	NA	NA	NA	NA	NA
##	[1206]	NA	NA	NA	NA	NA
##	[1211]	NA	NA	NA	NA	NA
##	[1216]	NA	NA	NA	NA	NA
##	[1221]	NA	NA	NA	NA	NA
##	[1226]	NA	NA	NA	NA	NA
##	[1231]	NA	NA	NA	NA	NA
##	[1236]	NA	NA	NA	NA	NA
##	[1241]	NA	NA	NA	NA	NA
##	[1246]	NA	NA	NA	NA	NA
##	[1251]	NA	NA	"15H 23M OS"	"11H 42M OS"	NA
##	[1256]	NA	NA	NA	NA	NA
##	[1261]	NA	NA	NA	NA	NA
##	[1266]	NA	NA	NA	NA	NA
##	[1271]	NA	NA	NA	NA	NA
##	[1276]	NA	NA	NA	NA	NA
##	[1281]	NA	NA	NA	NA	NA
##	[1286]	NA	NA	NA	NA	NA
##	[1291]	NA	NA	"12H 3M OS"	"12H 7M OS"	NA
##	[1296]	NA	NA	NA	NA	NA
##	[1301]	NA	NA	NA	NA	NA
##	[1306]	NA	NA	NA	NA	NA
##	[1311]	NA	NA	NA	NA	NA
##	[1316]	NA	NA	NA	NA	NA
##	[1321]	NA	NA	NA	NA	NA
##	[1326]	NA	NA	NA	NA	NA
##	[1331]	"12H 20M OS"	"15H 2M OS"	NA	NA	NA
##	[1336]	NA	NA	NA	NA	NA
##	[1341]	NA	NA	NA	NA	NA
##	[1346]	NA	NA	NA	NA	NA
##	[1351]	NA	NA	NA	NA	NA
##	[1356]	NA	NA	NA	NA	NA
##	[1361]	NA	NA	NA	"15H 12M OS"	"15H 13M OS"
##	[1366]	NA	NA	NA	NA	NA
##	[1371]	NA	NA	NA	NA	NA
##	[1376]	NA	NA	NA	NA	NA
##	[1381]	NA	NA	NA	NA	NA
##	[1386]	NA	NA	NA	NA	NA
##	[1391]	NA	NA	NA	NA	NA
##	[1396]	NA	"15H 21M OS"	NA	"13H 7M OS"	NA
##	[1401]	NA	NA	NA	NA	NA
##	[1406]	NA	NA	NA	NA	NA
##	[1411]	NA	NA	NA	NA	NA
##	[1416]	NA	NA	NA	NA	NA
##	[1421]	NA	NA	NA	NA	NA
##	[1426]	NA	NA	NA	NA	NA

##	[1431]	NA	"13H 18M OS"	"12H 54M OS"	NA	NA
##	[1436]	NA	NA	NA	NA	NA
##	[1441]	NA	NA	NA	NA	NA
##	[1446]	NA	NA	NA	NA	NA
##	[1451]	NA	NA	NA	NA	NA
##	[1456]	NA	NA	NA	NA	NA
##	[1461]	NA	NA	NA	NA	NA
##	[1466]	"13H 5M OS"	"14H 58M OS"	NA	NA	NA
##	[1471]	NA	NA	NA	NA	NA
##	[1476]	NA	NA	NA	NA	NA
##	[1481]	NA	NA	NA	"15H 9M OS"	
##	[1486]	"14H 49M OS"	NA	NA	NA	NA
##	[1491]	NA	NA	NA	NA	NA
##	[1496]	NA	NA	NA	NA	NA
##	[1501]	NA	NA	"14H 57M OS"	"9H 41M OS"	
##	[1506]	NA	NA	NA	NA	
##	[1511]	NA	NA	NA	NA	
##	[1516]	NA	NA	NA	NA	
##	[1521]	NA	NA	NA	NA	
##	[1526]	NA	NA	NA	NA	
##	[1531]	NA	NA	NA	NA	
##	[1536]	NA	NA	"9H 59M OS"	"9H 43M OS"	
##	[1541]	NA	NA	NA	NA	
##	[1546]	NA	NA	NA	NA	
##	[1551]	NA	NA	NA	NA	
##	[1556]	NA	NA	NA	NA	
##	[1561]	NA	NA	NA	NA	
##	[1566]	NA	NA	NA	NA	
##	[1571]	NA	NA	"9H 40M OS"	"10H 42M OS"	
##	[1576]	NA	NA	NA	NA	
##	[1581]	NA	NA	NA	NA	
##	[1586]	NA	NA	NA	NA	
##	[1591]	NA	NA	NA	NA	
##	[1596]	NA	NA	NA	NA	
##	[1601]	NA	"10H 49M OS"	"10H 34M OS"	NA	NA
##	[1606]	NA	NA	NA	NA	NA
##	[1611]	NA	NA	NA	NA	NA
##	[1616]	NA	NA	NA	NA	NA
##	[1621]	NA	NA	NA	NA	NA
##	[1626]	NA	NA	NA	"10H 41M OS"	
##	[1631]	"11H 34M OS"	NA	NA	NA	NA
##	[1636]	NA	NA	NA	NA	NA
##	[1641]	NA	NA	NA	NA	NA
##	[1646]	NA	NA	NA	NA	NA
##	[1651]	NA	NA	NA	NA	NA
##	[1656]	"11H 43M OS"	"11H 44M OS"	NA	NA	NA
##	[1661]	NA	NA	NA	NA	NA
##	[1666]	NA	NA	NA	NA	NA
##	[1671]	NA	NA	NA	NA	NA
##	[1676]	NA	NA	NA	NA	NA
##	[1681]	NA	NA	"11H 55M OS"	"14H 35M OS"	NA
##	[1686]	NA	NA	NA	NA	NA
##	[1691]	NA	NA	NA	NA	NA
##	[1696]	NA	NA	NA	NA	NA

```
## [1701] NA NA NA NA NA
## [1706] NA "14H 42M OS" NA NA NA
## [1711] NA NA NA NA NA
## [1716] NA NA NA NA NA
## [1721] NA NA NA NA NA
## [1726] NA NA NA NA NA
## [1731] "14H 49M OS" "11H 23M OS" NA NA NA
## [1736] NA NA NA NA NA
## [1741] NA NA NA NA NA
## [1746] NA NA NA NA NA
## [1751] NA NA NA NA NA
## [1756] NA NA NA NA NA
## [1761] NA NA "11H 34M OS" "11H 8M OS" NA
## [1766] NA NA NA NA NA
## [1771] NA NA NA NA NA
## [1776] NA NA NA NA NA
## [1781] NA NA NA NA NA
## [1786] NA NA NA NA NA
## [1791] NA NA NA "11H 21M OS"
## [1796] "11H 49M OS" NA NA NA
## [1801] NA NA NA NA NA
## [1806] NA NA NA NA NA
## [1811] NA NA NA "11H 59M OS" "11H 59M OS"
## [1816] NA NA NA NA NA
## [1821] NA NA NA NA NA
## [1826] NA NA NA NA NA
## [1831] NA "12H 7M OS" "12H 14M OS" NA NA
## [1836] NA NA NA NA NA
## [1841] NA NA NA NA NA
## [1846] NA NA NA NA NA
## [1851] NA "12H 19M OS" "12H 7M OS" NA NA
## [1856] NA NA NA NA NA
## [1861] NA NA NA NA NA
## [1866] NA NA NA NA NA
## [1871] "12H 13M OS" "11H 40M OS" NA NA NA
## [1876] NA "11H 41M OS" "11H 41M OS" NA NA
## [1881] NA NA "11H 43M OS" "9H 14M OS" NA
## [1886] NA NA NA NA NA
## [1891] "9H 16M OS" "9H 16M OS" NA NA NA
## [1896] NA NA "9H 18M OS" "10H 41M OS" NA
## [1901] NA NA NA "10H 43M OS" "14H 44M OS"
## [1906] NA NA NA "14H 45M OS"
```

```
data$day15purge <- lubridate::hour(hm(data$purge_time_2))+lubridate::minute(hm(data$purge_time_2))/60
```

```
## Warning in .parse_hms(..., order = "HM", quiet = quiet): Some strings
## failed to parse, or all strings are NAs
```

```
## Warning in .parse_hms(..., order = "HM", quiet = quiet): Some strings
## failed to parse, or all strings are NAs
```

```
#Getting start and end (min and max) of purges and sample size for each host, cohort day, and tape
param <- data%>%
```

```
  group_by(cohort_day, tape)%>%
  summarise(max=max(day15purge, na.rm=TRUE), min=min(day10purge, na.rm=TRUE), n=length(cohort_day))
```

#goal: for this section, we want a sequence of times for day 15 purge

```
data2.15 <- data%>%
```

```
  group_by(cohort_day, tape)%>%
```

```
  mutate(.,day15purge.trans=seq(from = min(day15purge, na.rm=TRUE), to = max(day15purge, na.rm=TRUE), 1
```

```
  glimpse(data2.15)
```

```
## Observations: 1,909
```

```
## Variables: 47
```

```
## $ Ind_ID          <int> 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 1...
## $ tape            <chr> "blue", "blue", "blue", "blue", "blu...
## $ Site_name       <chr> "OG", "Ferris", "Ferris", "Ferris", ...
## $ mass_day10      <dbl> 6.938, 11.175, 6.719, 10.719, 3.848,...
## $ purge_time_1    <chr> "13:38", "13:39", "13:39", "13:40", ...
## $ purge1          <dbl> NA, NA, NA, NA, NA, NA, NA, NA, NA, ...
## $ collection_date <chr> "2017-08-21", "2017-08-21", "2017-08...
## $ day10           <chr> "2017-09-04", "2017-09-04", "2017-09...
## $ cohort_date     <chr> "2017-08-25", "2017-08-25", "2017-08...
## $ cohort_day      <int> 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, ...
## $ Host            <chr> "Apple", "Apple", "Apple", "Apple", ...
## $ `Li-cor_1`      <int> 6262, 6262, 6262, 6262, 6262, 6262, ...
## $ resp_time_1     <chr> "", "10:13:15", "10:14:47", "10:16:4...
## $ resp_day11      <dbl> NA, 0.2941100, 0.1052925, 1.3445380,...
## $ mass_day14      <dbl> 6.187, 9.967, 6.118, 9.539, 3.479, 6...
## $ purge_time_2    <chr> "10:51", "", "", "", "", "", "", "", ...
## $ resp_time_2     <chr> "10:13:48", "10:16:22", "10:18:10", ...
## $ resp_day15      <dbl> 0.1432514, 0.1702350, 0.1076286, 1.3...
## $ Li_cor2         <int> 6262, 6262, 6262, 6262, 6262, 6262, ...
## $ treatment_day15 <chr> "2017-09-09", "", "", "", "", "2017-...
## $ exit_fridge_date <chr> "2018-01-22", "", "", "", "", "2018-...
## $ Eclosion_reference_date <chr> "2018-01-22", "", "2017-09-09", "", ...
## $ notes           <chr> "", "", "", "", "", "", "", "", "", ...
## $ Resp_code       <int> 0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, ...
## $ treatment       <chr> "S0", "GC", "RT", "GC", "RT", "S0", ...
## $ uniqueID        <chr> "2b1", "2b2", "2b3", "2b4", "2b5", "...
## $ eclosion_date    <chr> "2018-03-22", "", "2017-10-29", "", ...
## $ eclosion_days    <int> 59, NA, 64, NA, 56, NA, 59, 32, 49, ...
## $ well_id         <chr> "A1", "", "A1", "", "A2", "A2", "A3"...
## $ organism        <chr> "fly", "", "fly", "", "fly", "", "fl...
## $ Trikinetics_position <int> 17, NA, 8, NA, 15, NA, 7, 30, 27, NA...
## $ Trik_monitor     <int> 1, NA, 1, NA, 2, NA, 2, 2, 1, NA, NA...
## $ Trikinetics_entry_LD_time <chr> "12:43", "", "3:34", "", "13:03", ""...
## $ Trikinetic_exit_date <chr> "2018-03-23", "", "2107-11-05", "", ...
## $ Trikinetics_exit_LD_time <chr> "12:57", "", "20:33", "", "9:58", ""...
## $ notes_2         <chr> "", "", "changed water 2017-11-03 11...
## $ Free_run_trik_monitor <int> NA, NA, 4, NA, NA, NA, NA, NA, 3, NA...
## $ Free_run_trik_position <int> NA, NA, 11, NA, NA, NA, NA, NA, 1, N...
## $ Free_run_entry_date <chr> "", "", "2017-11-05", "", "", "", "", ...
## $ Free_run_entry_time <chr> "", "", "20:34", "", "", "", "", ...
## $ Free_run_exit_date <chr> "", "", "2017-12-09", "", "", "", "", ...
## $ Free_run_exit_time <chr> "", "", "20:00", "", "", "", "", ...
## $ notes_3         <chr> "", "", "changed water 2017-11-28", ...
## $ Adult_death_date <chr> "2018-03-23", "", "2017-12-09", "", ...
## $ day10purge      <dbl> 13.63333, 13.65000, 13.65000, 13.666...
```

```
## $ day15purge          <dbl> 10.85, NA, NA, NA, NA, NA, NA, NA, N...
## $ day15purge.trans    <dbl> 9.666667, 9.686345, 9.706024, 9.7257...
```

Calculating start and end time for total amount of hours of CO2 production

```
glimpse(data$resp_time_2)
```

```
## chr [1:1909] "10:13:48" "10:16:22" "10:18:10" "10:19:38" "10:21:23" ...
```

```
hms(data$resp_time_2)
```

```
## Warning in .parse_hms(..., order = "HMS", quiet = quiet): Some strings
## failed to parse, or all strings are NAs
```

```
##      [1] "10H 13M 48S" "10H 16M 22S" "10H 18M 10S" "10H 19M 38S"
##      [5] "10H 21M 23S" "10H 22M 55S" "10H 24M 36S" "10H 25M 57S"
##      [9] "10H 27M 35S" "10H 28M 53S" "10H 30M 9S"  "10H 31M 42S"
##     [13] "10H 32M 53S" "10H 34M 13S" "10H 35M 27S" "10H 36M 50S"
##     [17] "10H 38M 9S"  "10H 39M 32S" "10H 41M 16S" "10H 42M 34S"
##     [21] "10H 44M 12S" "10H 45M 36S" "10H 47M 14S" "10H 49M 15S"
##     [25] "10H 51M 7S"  "10H 52M 44S" "10H 54M 19S" "10H 55M 49S"
##     [29] "10H 57M 20S" "10H 58M 57S" NA      "11H 0M 29S"
##     [33] "11H 2M 2S"   "11H 3M 27S"  "11H 4M 48S"  "11H 6M 33S"
##     [37] "11H 8M 19S"  "11H 10M 19S" "11H 12M 0S"  "11H 13M 23S"
##     [41] "11H 15M 21S" "11H 17M 22S" "11H 19M 14S" "11H 20M 43S"
##     [45] "11H 22M 5S"  "11H 23M 47S" "11H 25M 34S" "11H 27M 24S"
##     [49] "11H 29M 25S" "10H 13M 48S" "10H 16M 22S" "10H 18M 10S"
##     [53] NA            "10H 19M 38S" "10H 21M 23S" "10H 22M 55S"
##     [57] "10H 24M 36S" "10H 25M 57S" "10H 27M 35S" "10H 28M 53S"
##     [61] "10H 30M 9S"  "10H 31M 42S" "10H 32M 53S" "10H 34M 13S"
##     [65] "10H 35M 27S" "10H 36M 50S" "10H 38M 9S"  "10H 39M 32S"
##     [69] "10H 41M 16S" "10H 42M 34S" "10H 44M 12S" "10H 45M 36S"
##     [73] "10H 47M 14S" "10H 49M 15S" "10H 51M 7S"  "10H 52M 44S"
##     [77] "10H 54M 19S" "10H 55M 49S" "10H 57M 20S" "10H 58M 57S"
##     [81] "11H 0M 29S"  "11H 2M 2S"   "11H 3M 27S"  "11H 4M 48S"
##     [85] "11H 6M 33S"  "11H 8M 19S"  "11H 10M 19S" "11H 12M 0S"
##     [89] "11H 13M 23S" NA      "11H 15M 21S" "11H 17M 22S"
##     [93] "7H 49M 59S"  "7H 51M 36S"  "7H 53M 10S"  "7H 54M 52S"
##     [97] "7H 56M 39S"  "7H 58M 23S"  "8H 0M 42S"   "8H 2M 5S"
##    [101] "8H 3M 15S"   "8H 4M 34S"   "8H 5M 53S"   "8H 7M 9S"
##    [105] "8H 8M 23S"   "8H 9M 39S"   "8H 10M 56S"  "8H 12M 21S"
##    [109] "8H 13M 38S"  "8H 14M 39S"  "8H 15M 56S"  NA
##    [113] "8H 17M 16S"  "8H 20M 9S"   "8H 22M 5S"   "8H 23M 24S"
##    [117] "8H 24M 32S"  "8H 25M 52S"  "8H 27M 45S"  "8H 28M 56S"
##    [121] "8H 30M 4S"   "8H 31M 12S"  "8H 32M 30S"  "8H 33M 55S"
##    [125] "8H 35M 0S"   "8H 36M 7S"   "8H 37M 14S"  NA
##    [129] "8H 38M 19S"  "8H 40M 19S"  "8H 42M 36S"  "8H 44M 7S"
##    [133] "8H 45M 32S"  "8H 46M 48S"  "8H 47M 55S"  "8H 49M 5S"
##    [137] "8H 50M 12S"  "8H 51M 58S"  "8H 53M 23S"  "8H 54M 39S"
##    [141] "8H 55M 40S"  "8H 56M 58S"  "8H 58M 49S"  "8H 59M 55S"
##    [145] "9H 1M 15S"   "9H 2M 26S"   "9H 3M 37S"   "9H 5M 3S"
##    [149] "9H 6M 14S"   "9H 7M 22S"   "9H 8M 39S"   "9H 9M 54S"
##    [153] "7H 49M 59S"  "7H 51M 36S"  "7H 53M 10S"  "7H 54M 52S"
##    [157] "7H 56M 39S"  "7H 58M 23S"  "8H 0M 42S"   "8H 2M 5S"
```

##	[161]	"8H 3M 15S"	"8H 4M 34S"	"8H 5M 53S"	"8H 7M 9S"
##	[165]	"8H 8M 23S"	"8H 9M 39S"	"8H 10M 56S"	"8H 12M 21S"
##	[169]	"8H 13M 38S"	"8H 14M 39S"	"8H 15M 56S"	"8H 17M 16S"
##	[173]	"8H 20M 9S"	"8H 22M 5S"	"8H 23M 24S"	"8H 24M 32S"
##	[177]	"8H 25M 52S"	"8H 27M 45S"	"8H 28M 56S"	"8H 30M 4S"
##	[181]	"8H 31M 12S"	"8H 32M 30S"	"8H 33M 55S"	"8H 35M 0S"
##	[185]	"8H 36M 7S"	"8H 37M 14S"	"8H 38M 19S"	"8H 40M 19S"
##	[189]	"8H 42M 36S"	"8H 44M 7S"	"8H 45M 32S"	"8H 46M 48S"
##	[193]	"8H 47M 55S"	"8H 49M 5S"	"8H 50M 12S"	"8H 51M 58S"
##	[197]	"8H 53M 23S"	"8H 54M 39S"	"8H 55M 40S"	"8H 56M 58S"
##	[201]	"8H 58M 49S"	"8H 59M 55S"	"9H 1M 15S"	"9H 2M 26S"
##	[205]	"9H 3M 37S"	"9H 5M 3S"	"9H 6M 14S"	"9H 7M 22S"
##	[209]	"9H 8M 39S"	"9H 9M 54S"	NA	"13H 26M 3S"
##	[213]	NA	"13H 27M 25S"	"13H 28M 45S"	"13H 30M 6S"
##	[217]	"13H 31M 25S"	"13H 32M 48S"	"13H 34M 1S"	"13H 35M 15S"
##	[221]	"13H 36M 26S"	"13H 38M 3S"	"13H 39M 7S"	"13H 40M 16S"
##	[225]	"13H 41M 30S"	"13H 42M 48S"	"13H 43M 52S"	"13H 45M 9S"
##	[229]	"13H 46M 18S"	"13H 47M 34S"	"13H 48M 50S"	"13H 50M 8S"
##	[233]	"13H 51M 19S"	"13H 52M 39S"	"13H 54M 5S"	"13H 55M 8S"
##	[237]	"13H 56M 17S"	"13H 57M 27S"	"13H 58M 38S"	"13H 59M 43S"
##	[241]	"14H 1M 1S"	"14H 2M 24S"	"14H 3M 38S"	"14H 4M 46S"
##	[245]	"14H 5M 54S"	"14H 6M 57S"	"14H 8M 11S"	"14H 9M 19S"
##	[249]	NA	"14H 10M 23S"	"14H 11M 27S"	"14H 12M 39S"
##	[253]	"14H 13M 40S"	"14H 14M 36S"	"14H 15M 40S"	"14H 16M 44S"
##	[257]	"14H 17M 57S"	"14H 19M 10S"	NA	"14H 20M 30S"
##	[261]	"14H 21M 47S"	"14H 23M 2S"	"14H 24M 10S"	"14H 25M 20S"
##	[265]	"14H 26M 33S"	"14H 27M 35S"	"14H 28M 39S"	"14H 29M 54S"
##	[269]	"14H 31M 12S"	"14H 32M 22S"	"14H 33M 36S"	"14H 34M 42S"
##	[273]	"14H 35M 42S"	"14H 36M 59S"	"14H 38M 13S"	"14H 39M 11S"
##	[277]	"14H 40M 15S"	"14H 41M 13S"	"14H 42M 21S"	"14H 43M 25S"
##	[281]	"14H 44M 23S"	"14H 45M 21S"	"14H 46M 48S"	"14H 47M 51S"
##	[285]	"14H 48M 45S"	"14H 49M 39S"	"14H 50M 34S"	"14H 51M 43S"
##	[289]	"14H 52M 37S"	"13H 26M 3S"	"13H 27M 25S"	"13H 28M 45S"
##	[293]	"13H 30M 6S"	"13H 31M 25S"	"13H 32M 48S"	"13H 34M 1S"
##	[297]	"13H 35M 15S"	"13H 36M 26S"	"13H 38M 3S"	"13H 39M 7S"
##	[301]	NA	"13H 40M 16S"	"13H 41M 30S"	NA
##	[305]	"13H 42M 48S"	"13H 43M 52S"	NA	"13H 45M 9S"
##	[309]	"13H 46M 18S"	"13H 47M 34S"	"13H 48M 50S"	"13H 50M 8S"
##	[313]	"13H 51M 19S"	"13H 52M 39S"	"13H 54M 5S"	"13H 55M 8S"
##	[317]	"13H 56M 17S"	"13H 57M 27S"	"13H 58M 38S"	"13H 59M 43S"
##	[321]	"14H 1M 1S"	"14H 2M 24S"	NA	NA
##	[325]	"14H 3M 38S"	"14H 4M 46S"	"14H 5M 54S"	"14H 6M 57S"
##	[329]	"14H 8M 11S"	"14H 9M 19S"	"14H 10M 23S"	"14H 11M 27S"
##	[333]	"14H 12M 39S"	"14H 13M 40S"	"14H 14M 36S"	"14H 15M 40S"
##	[337]	"14H 16M 44S"	"14H 17M 57S"	"14H 19M 10S"	"14H 20M 30S"
##	[341]	"14H 21M 47S"	"14H 23M 2S"	"14H 24M 10S"	"14H 25M 20S"
##	[345]	"14H 26M 33S"	"14H 27M 35S"	"14H 28M 39S"	"14H 29M 54S"
##	[349]	"14H 31M 12S"	"14H 32M 22S"	NA	"14H 33M 36S"
##	[353]	"14H 34M 42S"	NA	"14H 35M 42S"	"14H 36M 59S"
##	[357]	"14H 38M 13S"	"14H 39M 11S"	"14H 40M 15S"	"14H 41M 13S"
##	[361]	"14H 42M 21S"	"14H 43M 25S"	"14H 44M 23S"	"14H 45M 21S"
##	[365]	"14H 46M 48S"	"14H 47M 51S"	"14H 48M 45S"	"10H 1M 23S"
##	[369]	"10H 3M 24S"	"10H 5M 1S"	"10H 6M 37S"	"10H 8M 39S"
##	[373]	"10H 10M 15S"	"10H 11M 32S"	"10H 13M 2S"	"10H 14M 21S"

[377] "10H 15M 46S" "10H 17M 36S" "10H 19M 20S" "10H 20M 34S"
 ## [381] "10H 21M 55S" "10H 23M 15S" "10H 24M 39S" "10H 26M 10S"
 ## [385] "10H 27M 31S" "10H 29M 11S" "10H 30M 38S" "10H 32M 3S"
 ## [389] "10H 33M 27S" "10H 35M 2S" "10H 36M 21S" "10H 38M 1S"
 ## [393] "10H 39M 14S" "10H 40M 54S" "10H 42M 25S" "10H 43M 41S"
 ## [397] "10H 45M 7S" "10H 46M 42S" "10H 47M 59S" "10H 49M 8S"
 ## [401] "10H 50M 22S" "10H 51M 44S" "10H 52M 56S" "10H 54M 9S"
 ## [405] "10H 55M 20S" "10H 56M 32S" "10H 57M 58S" "10H 59M 16S"
 ## [409] "11H 0M 27S" "11H 1M 48S" "11H 3M 1S" "11H 4M 20S"
 ## [413] "11H 5M 31S" "11H 6M 47S" "11H 9M 22S" "11H 10M 31S"
 ## [417] "11H 11M 39S" "11H 12M 57S" "11H 14M 9S" "11H 15M 19S"
 ## [421] "11H 16M 40S" "11H 17M 53S" "11H 19M 2S" "11H 20M 11S"
 ## [425] "11H 21M 25S" "11H 22M 42S" "11H 24M 4S" "11H 25M 21S"
 ## [429] "11H 33M 16S" "11H 34M 34S" "11H 36M 0S" "11H 37M 19S"
 ## [433] "11H 38M 49S" "11H 40M 15S" "11H 41M 27S" "11H 43M 3S"
 ## [437] "11H 44M 19S" "11H 45M 35S" "11H 46M 44S" "11H 47M 56S"
 ## [441] "11H 49M 27S" "11H 50M 49S" "10H 1M 23S" "10H 3M 24S"
 ## [445] "10H 5M 1S" "10H 6M 37S" "10H 8M 39S" "10H 10M 15S"
 ## [449] "10H 11M 32S" "10H 13M 2S" "10H 14M 21S" "10H 15M 46S"
 ## [453] "10H 17M 36S" "10H 19M 20S" "10H 20M 34S" "10H 21M 55S"
 ## [457] "10H 23M 15S" "10H 24M 39S" "10H 26M 10S" "10H 27M 31S"
 ## [461] "10H 29M 11S" "10H 30M 38S" "10H 32M 3S" "10H 33M 27S"
 ## [465] "10H 35M 2S" "10H 36M 21S" "10H 38M 1S" "10H 39M 14S"
 ## [469] "10H 40M 54S" "10H 42M 25S" "10H 43M 41S" "10H 45M 7S"
 ## [473] "10H 46M 42S" "10H 47M 59S" "10H 49M 8S" "10H 50M 22S"
 ## [477] "10H 51M 44S" "10H 52M 56S" "10H 54M 9S" "10H 55M 20S"
 ## [481] "10H 56M 32S" "10H 57M 58S" "10H 59M 16S" "11H 0M 27S"
 ## [485] "11H 1M 48S" "11H 3M 1S" "11H 4M 20S" "11H 5M 31S"
 ## [489] "11H 6M 47S" "11H 9M 22S" "11H 10M 31S" "11H 11M 39S"
 ## [493] "11H 12M 57S" "11H 14M 9S" "11H 15M 19S" "11H 16M 40S"
 ## [497] "11H 17M 53S" "11H 19M 2S" "11H 20M 11S" "11H 21M 25S"
 ## [501] "11H 22M 42S" "11H 24M 4S" "11H 25M 21S" "11H 33M 16S"
 ## [505] "11H 34M 34S" "11H 36M 0S" "11H 37M 19S" "11H 38M 49S"
 ## [509] "11H 40M 15S" "11H 41M 27S" "11H 43M 3S" "11H 44M 19S"
 ## [513] "11H 45M 35S" "11H 46M 44S" "11H 47M 56S" "11H 49M 27S"
 ## [517] "11H 50M 49S" "11H 52M 26S" "11H 54M 6S" "10H 16M 54S"
 ## [521] "10H 17M 50S" "10H 19M 12S" "10H 20M 42S" "10H 21M 58S"
 ## [525] "10H 23M 18S" "10H 24M 32S" "10H 25M 43S" "10H 26M 55S"
 ## [529] "10H 28M 8S" "10H 29M 18S" "10H 30M 36S" "10H 31M 58S"
 ## [533] "10H 33M 21S" "10H 34M 23S" "10H 35M 37S" "10H 36M 52S"
 ## [537] "10H 38M 4S" "10H 39M 24S" "10H 40M 30S" "10H 41M 58S"
 ## [541] "10H 43M 23S" "10H 44M 29S" "10H 45M 39S" "10H 46M 45S"
 ## [545] "10H 47M 58S" "10H 49M 31S" "10H 50M 42S" "10H 51M 59S"
 ## [549] "10H 53M 10S" "10H 54M 32S" "10H 56M 0S" "10H 57M 15S"
 ## [553] "10H 58M 44S" "10H 59M 52S" "11H 1M 4S" "11H 2M 16S"
 ## [557] "11H 3M 29S" "11H 4M 50S" "11H 5M 59S" "11H 7M 13S"
 ## [561] "11H 8M 26S" "11H 9M 39S" "11H 11M 6S" "11H 12M 13S"
 ## [565] "11H 13M 24S" "11H 14M 47S" "11H 16M 9S" "11H 17M 21S"
 ## [569] "11H 18M 51S" "11H 20M 18S" "11H 21M 44S" "11H 22M 57S"
 ## [573] "11H 24M 22S" "11H 25M 46S" "11H 26M 46S" "11H 27M 56S"
 ## [577] "11H 29M 16S" "11H 30M 42S" "11H 31M 56S" "11H 33M 19S"
 ## [581] "11H 34M 33S" "11H 35M 43S" "11H 36M 56S" "11H 38M 2S"
 ## [585] "11H 40M 54S" "11H 42M 30S" "11H 43M 43S" "11H 44M 51S"
 ## [589] "11H 46M 2S" "11H 47M 25S" "11H 48M 33S" "11H 49M 44S"

[593] "11H 51M 0S" "11H 51M 55S" "11H 53M 12S" "11H 54M 31S"
 ## [597] "11H 56M 1S" "10H 16M 54S" "10H 17M 50S" "10H 19M 12S"
 ## [601] "10H 20M 42S" "10H 21M 58S" "10H 23M 18S" "10H 24M 32S"
 ## [605] "10H 25M 43S" "10H 26M 55S" "10H 28M 8S" "10H 29M 18S"
 ## [609] "10H 30M 36S" "10H 31M 58S" "10H 33M 21S" "10H 34M 23S"
 ## [613] "10H 35M 37S" "10H 36M 52S" "10H 38M 4S" "10H 39M 24S"
 ## [617] "10H 40M 30S" "10H 41M 58S" "10H 43M 23S" "10H 44M 29S"
 ## [621] "10H 45M 39S" "10H 46M 45S" "10H 47M 58S" "10H 49M 31S"
 ## [625] "10H 50M 42S" "10H 51M 59S" "10H 53M 10S" "10H 54M 32S"
 ## [629] "10H 56M 0S" "10H 57M 15S" "10H 58M 44S" "10H 59M 52S"
 ## [633] "11H 1M 4S" "11H 2M 16S" "11H 3M 29S" "11H 4M 50S"
 ## [637] "11H 5M 59S" "11H 7M 13S" "11H 8M 26S" "11H 9M 39S"
 ## [641] "11H 11M 6S" "11H 12M 13S" "11H 13M 24S" "11H 14M 47S"
 ## [645] "11H 16M 9S" "11H 17M 21S" "11H 18M 51S" "11H 20M 18S"
 ## [649] "11H 21M 44S" "11H 22M 57S" "11H 24M 22S" "11H 25M 46S"
 ## [653] "11H 26M 46S" "11H 27M 56S" "11H 29M 16S" "11H 30M 42S"
 ## [657] "11H 31M 56S" "11H 33M 19S" "11H 34M 33S" "11H 35M 43S"
 ## [661] "11H 36M 56S" "11H 38M 2S" "11H 40M 54S" "11H 42M 30S"
 ## [665] "11H 43M 43S" "11H 44M 51S" "11H 46M 2S" "11H 47M 25S"
 ## [669] "11H 48M 33S" "11H 49M 44S" "11H 51M 0S" "11H 51M 55S"
 ## [673] "11H 53M 12S" "11H 54M 31S" "11H 56M 1S" "11H 57M 3S"
 ## [677] "9H 27M 20S" "9H 28M 36S" "9H 29M 55S" "9H 31M 12S"
 ## [681] "9H 32M 34S" "9H 34M 19S" "9H 35M 40S" "9H 37M 22S"
 ## [685] "9H 38M 46S" "9H 40M 16S" "9H 41M 45S" "9H 43M 33S"
 ## [689] "9H 45M 26S" "9H 46M 56S" "9H 48M 29S" "9H 51M 1S"
 ## [693] "9H 52M 30S" "9H 54M 12S" "9H 55M 39S" "9H 57M 21S"
 ## [697] "9H 59M 33S" "10H 1M 48S" "10H 3M 12S" "10H 4M 34S"
 ## [701] "10H 5M 57S" "10H 7M 41S" "10H 9M 23S" "10H 10M 48S"
 ## [705] "10H 12M 15S" "10H 13M 32S" "10H 15M 11S" "10H 16M 42S"
 ## [709] "10H 18M 31S" NA "10H 20M 1S" "10H 21M 24S"
 ## [713] "10H 23M 3S" "10H 24M 20S" "10H 25M 50S" NA
 ## [717] "10H 27M 31S" "10H 29M 18S" "10H 30M 56S" "10H 32M 16S"
 ## [721] "10H 33M 59S" "10H 35M 21S" "10H 36M 42S" "10H 38M 26S"
 ## [725] "10H 39M 53S" "10H 41M 27S" "10H 43M 1S" "10H 44M 22S"
 ## [729] "10H 45M 50S" "10H 47M 27S" "10H 49M 4S" "10H 50M 53S"
 ## [733] "11H 0M 26S" NA "11H 2M 11S" "11H 3M 38S"
 ## [737] "11H 5M 6S" "11H 7M 4S" "11H 8M 22S" "11H 9M 42S"
 ## [741] "11H 11M 19S" "11H 13M 2S" "11H 14M 35S" "11H 15M 53S"
 ## [745] "11H 17M 6S" "11H 19M 0S" "9H 27M 20S" "9H 28M 36S"
 ## [749] "9H 29M 55S" "9H 31M 12S" "9H 32M 34S" "9H 34M 19S"
 ## [753] "9H 35M 40S" "9H 37M 22S" "9H 38M 46S" "9H 40M 16S"
 ## [757] "9H 41M 45S" "9H 43M 33S" "9H 45M 26S" "9H 46M 56S"
 ## [761] "9H 48M 29S" "9H 51M 1S" "9H 52M 30S" "9H 54M 12S"
 ## [765] "9H 55M 39S" "9H 57M 21S" "9H 59M 33S" "10H 1M 48S"
 ## [769] "10H 3M 12S" "10H 4M 34S" "10H 5M 57S" "10H 7M 41S"
 ## [773] "10H 9M 23S" "10H 10M 48S" "10H 12M 15S" "10H 13M 32S"
 ## [777] "10H 15M 11S" "10H 16M 42S" "10H 18M 31S" "10H 20M 1S"
 ## [781] "10H 21M 24S" "10H 23M 3S" "10H 24M 20S" "10H 25M 50S"
 ## [785] "10H 27M 31S" "10H 29M 18S" "10H 30M 56S" "10H 32M 16S"
 ## [789] "10H 33M 59S" "10H 35M 21S" "10H 36M 42S" "10H 38M 26S"
 ## [793] "10H 39M 53S" "10H 41M 27S" "10H 43M 1S" "10H 44M 22S"
 ## [797] "10H 45M 50S" "10H 47M 27S" "10H 49M 4S" "10H 50M 53S"
 ## [801] "11H 0M 26S" "11H 2M 11S" "11H 3M 38S" "11H 5M 6S"
 ## [805] "11H 7M 4S" "11H 8M 22S" "11H 9M 42S" "11H 11M 19S"

[809] "11H 13M 2S" "11H 14M 35S" "11H 15M 53S" "11H 17M 6S"
 ## [813] "11H 19M 0S" "11H 20M 38S" "11H 22M 5S" "11H 23M 33S"
 ## [817] "11H 24M 44S" "11H 25M 58S" "9H 37M 50S" "9H 43M 28S"
 ## [821] "9H 45M 0S" "9H 48M 43S" "9H 54M 10S" "9H 55M 57S"
 ## [825] "9H 57M 40S" "9H 59M 9S" "10H 0M 56S" "10H 2M 34S"
 ## [829] "10H 5M 58S" "10H 7M 53S" "10H 9M 30S" "10H 11M 9S"
 ## [833] "10H 12M 42S" "10H 15M 1S" "10H 16M 48S" "10H 19M 16S"
 ## [837] "10H 20M 43S" "10H 22M 8S" "10H 23M 42S" "10H 25M 20S"
 ## [841] "10H 27M 39S" "10H 29M 1S" "10H 30M 46S" "10H 32M 25S"
 ## [845] "10H 34M 17S" "10H 36M 25S" "10H 38M 2S" "10H 39M 57S"
 ## [849] "10H 41M 38S" "10H 43M 20S" "10H 44M 52S" "10H 46M 37S"
 ## [853] "10H 49M 42S" "10H 51M 26S" "10H 52M 58S" "11H 3M 4S"
 ## [857] "11H 4M 46S" "11H 6M 5S" "11H 8M 17S" "11H 9M 38S"
 ## [861] "11H 11M 1S" "11H 36M 39S" "11H 38M 3S" "11H 39M 28S"
 ## [865] "11H 41M 1S" "11H 43M 44S" "11H 45M 14S" "11H 47M 6S"
 ## [869] "11H 48M 40S" "11H 50M 35S" "11H 52M 12S" "11H 53M 41S"
 ## [873] "11H 55M 15S" "11H 57M 53S" "11H 59M 32S" "24H 1M 0S"
 ## [877] "24H 2M 23S" "24H 3M 48S" "24H 5M 11S" "24H 6M 40S"
 ## [881] "24H 9M 12S" "24H 11M 15S" "24H 16M 3S" "24H 17M 39S"
 ## [885] "24H 19M 24S" "24H 20M 49S" "24H 22M 12S" "24H 23M 37S"
 ## [889] "24H 25M 4S" "24H 26M 29S" "24H 27M 55S" "24H 29M 14S"
 ## [893] "24H 30M 44S" "24H 32M 28S" "24H 33M 41S" "9H 37M 50S"
 ## [897] "9H 43M 28S" "9H 45M 0S" "9H 48M 43S" "9H 54M 10S"
 ## [901] "9H 55M 57S" "9H 57M 40S" "9H 59M 9S" "10H 0M 56S"
 ## [905] "10H 2M 34S" "10H 5M 58S" "10H 7M 53S" "10H 9M 30S"
 ## [909] "10H 11M 9S" "10H 12M 42S" "10H 15M 1S" "10H 16M 48S"
 ## [913] "10H 19M 16S" "10H 20M 43S" "10H 22M 8S" "10H 23M 42S"
 ## [917] "10H 25M 20S" "10H 27M 39S" "10H 29M 1S" "10H 30M 46S"
 ## [921] "10H 32M 25S" "10H 34M 17S" "10H 36M 25S" "10H 38M 2S"
 ## [925] "10H 39M 57S" "10H 41M 38S" "10H 43M 20S" "10H 44M 52S"
 ## [929] "10H 46M 37S" "10H 49M 42S" "10H 51M 26S" "10H 52M 58S"
 ## [933] "11H 3M 4S" "11H 4M 46S" "11H 6M 5S" "11H 8M 17S"
 ## [937] "11H 9M 38S" "11H 11M 1S" "11H 36M 39S" "11H 38M 3S"
 ## [941] "11H 39M 28S" "11H 41M 1S" "11H 43M 44S" "11H 45M 14S"
 ## [945] "11H 47M 6S" "11H 48M 40S" "11H 50M 35S" "11H 52M 12S"
 ## [949] "11H 53M 41S" "11H 55M 15S" "11H 57M 53S" "11H 59M 32S"
 ## [953] "24H 1M 0S" "24H 2M 23S" "24H 3M 48S" "24H 5M 11S"
 ## [957] "24H 6M 40S" "24H 9M 12S" "24H 11M 15S" "24H 16M 3S"
 ## [961] "24H 17M 39S" "24H 19M 24S" "24H 20M 49S" "24H 22M 12S"
 ## [965] "24H 23M 37S" "24H 25M 4S" "24H 26M 29S" "24H 27M 55S"
 ## [969] "24H 29M 14S" "24H 30M 44S" "24H 32M 28S" "24H 33M 41S"
 ## [973] "10H 30M 56S" "10H 32M 46S" "10H 34M 33S" "10H 36M 12S"
 ## [977] "10H 38M 5S" "10H 39M 55S" "10H 41M 26S" "10H 44M 3S"
 ## [981] "10H 45M 42S" "10H 47M 15S" "10H 49M 2S" "10H 51M 29S"
 ## [985] "10H 52M 57S" "10H 54M 33S" "10H 55M 56S" "10H 57M 50S"
 ## [989] "10H 59M 54S" "11H 2M 32S" "11H 4M 23S" "11H 6M 4S"
 ## [993] "11H 7M 42S" "11H 9M 33S" "11H 11M 0S" "11H 13M 58S"
 ## [997] "11H 15M 51S" "11H 19M 36S" "11H 23M 21S" "11H 25M 0S"
 ## [1001] "11H 26M 57S" "11H 28M 48S" "11H 30M 37S" "11H 32M 22S"
 ## [1005] "11H 34M 0S" "11H 35M 21S" "11H 37M 0S" "11H 38M 33S"
 ## [1009] "11H 41M 12S" "11H 42M 45S" "11H 44M 13S" "11H 45M 40S"
 ## [1013] "11H 48M 25S" "11H 50M 48S" "11H 52M 19S" "11H 59M 54S"
 ## [1017] "24H 2M 8S" "24H 4M 55S" "24H 7M 3S" "24H 8M 44S"
 ## [1021] "24H 10M 8S" "24H 11M 57S" "24H 14M 37S" "24H 16M 8S"

[1025] "24H 18M 7S" "24H 20M 44S" "24H 22M 11S" "24H 23M 50S"
 ## [1029] "24H 25M 44S" "24H 27M 43S" "24H 29M 8S" "24H 34M 23S"
 ## [1033] "24H 36M 5S" "24H 38M 1S" "24H 39M 37S" "24H 41M 15S"
 ## [1037] "24H 42M 40S" "24H 44M 59S" "24H 46M 42S" "24H 48M 16S"
 ## [1041] "24H 49M 47S" "24H 51M 19S" "24H 53M 11S" "24H 54M 56S"
 ## [1045] "24H 56M 27S" "24H 58M 29S" "13H 0M 18S" "13H 1M 53S"
 ## [1049] "10H 32M 46S" "10H 34M 33S" "10H 36M 12S" "10H 38M 5S"
 ## [1053] "10H 39M 55S" "10H 41M 26S" "10H 44M 3S" "10H 45M 42S"
 ## [1057] "10H 47M 15S" "10H 49M 2S" "10H 51M 29S" "10H 52M 57S"
 ## [1061] "10H 54M 33S" "10H 55M 56S" "10H 57M 50S" "10H 59M 54S"
 ## [1065] "11H 2M 32S" "11H 4M 23S" "11H 6M 4S" "11H 7M 42S"
 ## [1069] "11H 9M 33S" "11H 11M 0S" "11H 13M 58S" "11H 15M 51S"
 ## [1073] "11H 19M 36S" "11H 23M 21S" "11H 25M 0S" "11H 26M 57S"
 ## [1077] "11H 28M 48S" "11H 30M 37S" "11H 32M 22S" "11H 34M 0S"
 ## [1081] "11H 35M 21S" "11H 37M 0S" "11H 38M 33S" "11H 41M 12S"
 ## [1085] "11H 42M 45S" "11H 44M 13S" "11H 45M 40S" "11H 48M 25S"
 ## [1089] "11H 50M 48S" "11H 52M 19S" "11H 59M 54S" "24H 2M 8S"
 ## [1093] "24H 4M 55S" "24H 7M 3S" "24H 8M 44S" "24H 10M 8S"
 ## [1097] "24H 11M 57S" "24H 14M 37S" "24H 16M 8S" "24H 18M 7S"
 ## [1101] "24H 20M 44S" "24H 22M 11S" "24H 23M 50S" "24H 25M 44S"
 ## [1105] "24H 27M 43S" "24H 29M 8S" "24H 34M 23S" "24H 36M 5S"
 ## [1109] "24H 38M 1S" "24H 39M 37S" "24H 41M 15S" "24H 42M 40S"
 ## [1113] "24H 44M 59S" "24H 46M 42S" "24H 48M 16S" "24H 49M 47S"
 ## [1117] "24H 51M 19S" "24H 53M 11S" "24H 54M 56S" "24H 56M 27S"
 ## [1121] "24H 58M 29S" "13H 0M 18S" "13H 1M 53S" "9H 33M 12S"
 ## [1125] "9H 34M 45S" "9H 36M 35S" "9H 38M 42S" "9H 40M 14S"
 ## [1129] "9H 41M 47S" "9H 44M 0S" NA "9H 46M 1S"
 ## [1133] "9H 51M 8S" "9H 52M 42S" "9H 54M 12S" "9H 55M 54S"
 ## [1137] "9H 57M 45S" "9H 59M 29S" "10H 1M 3S" "10H 2M 36S"
 ## [1141] "10H 4M 10S" "10H 5M 44S" "10H 7M 9S" "10H 8M 49S"
 ## [1145] "10H 10M 25S" "10H 12M 4S" "10H 13M 50S" "10H 15M 29S"
 ## [1149] "10H 17M 35S" "10H 19M 47S" "10H 21M 57S" "10H 23M 36S"
 ## [1153] "10H 25M 3S" "10H 26M 42S" "10H 28M 24S" "10H 30M 2S"
 ## [1157] "10H 31M 30S" "10H 32M 58S" "10H 34M 35S" "10H 36M 5S"
 ## [1161] "10H 37M 38S" NA "10H 41M 26S" "10H 43M 7S"
 ## [1165] "10H 44M 43S" "10H 46M 45S" "10H 48M 26S" "10H 50M 8S"
 ## [1169] "10H 51M 33S" NA "10H 58M 17S" "10H 59M 38S"
 ## [1173] "11H 0M 58S" "11H 2M 46S" "11H 4M 35S" "11H 6M 6S"
 ## [1177] "11H 7M 31S" "11H 9M 5S" "11H 11M 4S" "11H 12M 52S"
 ## [1181] "11H 14M 21S" "11H 16M 14S" "11H 17M 52S" "11H 19M 47S"
 ## [1185] "11H 21M 15S" "11H 23M 5S" "11H 24M 34S" "11H 25M 49S"
 ## [1189] NA NA "9H 33M 12S" "9H 34M 45S"
 ## [1193] "9H 36M 35S" "9H 38M 42S" "9H 40M 14S" "9H 41M 47S"
 ## [1197] "9H 44M 0S" "9H 44M 28S" "9H 46M 1S" "9H 51M 8S"
 ## [1201] "9H 52M 42S" "9H 54M 12S" "9H 55M 54S" "9H 57M 45S"
 ## [1205] "9H 59M 29S" "10H 1M 3S" "10H 2M 36S" "10H 4M 10S"
 ## [1209] "10H 5M 44S" "10H 7M 9S" "10H 8M 49S" NA
 ## [1213] "10H 10M 25S" "10H 12M 4S" "10H 13M 50S" "10H 15M 29S"
 ## [1217] "10H 17M 35S" NA "10H 19M 47S" "10H 21M 57S"
 ## [1221] "10H 23M 36S" "10H 25M 3S" "10H 26M 42S" "10H 28M 24S"
 ## [1225] "10H 30M 2S" "10H 31M 30S" "10H 32M 58S" "10H 34M 35S"
 ## [1229] "10H 36M 5S" "10H 37M 38S" "10H 39M 11S" "10H 41M 26S"
 ## [1233] "10H 43M 7S" "10H 44M 43S" "10H 46M 45S" "10H 48M 26S"
 ## [1237] NA "10H 58M 17S" "10H 59M 38S" "11H 0M 58S"

##	[1241]	"11H 2M 46S"	"11H 4M 35S"	"11H 6M 6S"	"11H 7M 31S"
##	[1245]	"11H 9M 5S"	"11H 11M 4S"	"11H 12M 52S"	"11H 14M 21S"
##	[1249]	"11H 16M 14S"	"11H 17M 52S"	"11H 19M 47S"	"11H 21M 15S"
##	[1253]	"11H 23M 5S"	"9H 53M 33S"	"9H 55M 8S"	"9H 57M 0S"
##	[1257]	"9H 58M 26S"	"9H 59M 47S"	"10H 1M 0S"	"10H 2M 26S"
##	[1261]	"10H 4M 4S"	"10H 5M 54S"	NA	"10H 7M 22S"
##	[1265]	"10H 8M 48S"	"10H 10M 25S"	"10H 11M 42S"	"10H 13M 6S"
##	[1269]	"10H 14M 43S"	"10H 16M 22S"	NA	"10H 17M 42S"
##	[1273]	"10H 19M 17S"	"10H 20M 40S"	"10H 22M 0S"	"10H 23M 26S"
##	[1277]	"10H 25M 8S"	"10H 26M 36S"	"10H 27M 58S"	"10H 29M 33S"
##	[1281]	"10H 30M 52S"	"10H 32M 17S"	"10H 33M 34S"	"10H 34M 48S"
##	[1285]	"10H 36M 14S"	"10H 37M 45S"	"10H 39M 2S"	"10H 40M 29S"
##	[1289]	"10H 41M 46S"	"10H 43M 11S"	"10H 44M 25S"	"10H 45M 33S"
##	[1293]	NA	"9H 53M 33S"	"9H 55M 8S"	"9H 57M 0S"
##	[1297]	"9H 58M 26S"	"9H 59M 47S"	"10H 1M 0S"	"10H 2M 26S"
##	[1301]	"10H 4M 4S"	"10H 5M 54S"	"10H 7M 22S"	"10H 8M 48S"
##	[1305]	"10H 10M 25S"	"10H 11M 42S"	"10H 13M 6S"	"10H 14M 43S"
##	[1309]	"10H 16M 22S"	"10H 17M 42S"	"10H 19M 17S"	"10H 20M 40S"
##	[1313]	"10H 22M 0S"	"10H 23M 26S"	"10H 25M 8S"	"10H 26M 36S"
##	[1317]	"10H 27M 58S"	"10H 29M 33S"	"10H 30M 52S"	NA
##	[1321]	"10H 32M 17S"	"10H 33M 34S"	"10H 34M 48S"	"10H 36M 14S"
##	[1325]	"10H 37M 45S"	"10H 39M 2S"	"10H 40M 29S"	"10H 41M 46S"
##	[1329]	"10H 43M 11S"	"10H 44M 25S"	"10H 45M 33S"	"10H 10M 49S"
##	[1333]	"10H 12M 42S"	"10H 14M 16S"	"10H 16M 38S"	"10H 18M 30S"
##	[1337]	"10H 20M 14S"	"10H 22M 5S"	"10H 23M 39S"	"10H 25M 3S"
##	[1341]	NA	"10H 26M 38S"	"10H 28M 27S"	NA
##	[1345]	"10H 30M 15S"	"10H 31M 47S"	"10H 33M 42S"	"10H 35M 14S"
##	[1349]	NA	"10H 37M 7S"	NA	NA
##	[1353]	"10H 38M 48S"	"10H 41M 30S"	"10H 43M 3S"	"10H 44M 44S"
##	[1357]	"10H 46M 30S"	"10H 47M 54S"	"10H 49M 28S"	"10H 51M 3S"
##	[1361]	"10H 52M 35S"	"10H 54M 17S"	"10H 55M 47S"	"10H 57M 15S"
##	[1365]	"10H 10M 49S"	"10H 12M 42S"	NA	"10H 14M 16S"
##	[1369]	"10H 16M 38S"	"10H 18M 30S"	"10H 20M 14S"	"10H 22M 5S"
##	[1373]	"10H 23M 39S"	"10H 25M 3S"	"10H 26M 38S"	NA
##	[1377]	"10H 28M 27S"	"10H 30M 15S"	"10H 31M 47S"	NA
##	[1381]	"10H 33M 42S"	"10H 35M 14S"	"10H 37M 7S"	"10H 38M 48S"
##	[1385]	NA	"10H 41M 30S"	"10H 43M 3S"	"10H 44M 44S"
##	[1389]	"10H 46M 30S"	"10H 47M 54S"	"10H 49M 28S"	"10H 51M 3S"
##	[1393]	"10H 52M 35S"	"10H 54M 17S"	"10H 55M 47S"	"10H 57M 15S"
##	[1397]	"10H 58M 41S"	NA	"9H 25M 26S"	"9H 27M 1S"
##	[1401]	NA	"9H 29M 8S"	"9H 31M 14S"	"9H 33M 57S"
##	[1405]	"9H 36M 0S"	"9H 37M 40S"	"9H 39M 16S"	"9H 40M 53S"
##	[1409]	NA	"9H 42M 29S"	"9H 43M 54S"	"9H 45M 27S"
##	[1413]	"9H 47M 19S"	"9H 49M 40S"	"9H 51M 22S"	"9H 53M 21S"
##	[1417]	"9H 54M 47S"	"9H 56M 23S"	"9H 57M 59S"	"9H 59M 28S"
##	[1421]	"10H 1M 23S"	"10H 3M 7S"	"10H 4M 29S"	"10H 6M 14S"
##	[1425]	"10H 7M 41S"	"10H 9M 46S"	"10H 11M 3S"	"10H 12M 21S"
##	[1429]	"10H 13M 41S"	"10H 15M 9S"	"10H 15M 32S"	"10H 17M 10S"
##	[1433]	"9H 25M 26S"	"9H 27M 1S"	NA	NA
##	[1437]	"9H 29M 8S"	"9H 31M 14S"	"9H 33M 57S"	"9H 36M 0S"
##	[1441]	"9H 37M 40S"	NA	"9H 39M 16S"	"9H 40M 53S"
##	[1445]	NA	"9H 42M 29S"	NA	"9H 43M 54S"
##	[1449]	"9H 45M 27S"	"9H 47M 19S"	"9H 49M 40S"	"9H 51M 22S"
##	[1453]	"9H 53M 21S"	"9H 54M 47S"	"9H 56M 23S"	"9H 57M 59S"

##	[1457]	"9H 59M 28S"	NA	"10H 1M 23S"	"10H 3M 7S"
##	[1461]	"10H 4M 29S"	NA	NA	"10H 6M 14S"
##	[1465]	"10H 7M 41S"	"10H 9M 46S"	"9H 53M 9S"	"9H 57M 11S"
##	[1469]	"9H 59M 12S"	"10H 0M 50S"	"10H 2M 29S"	"10H 8M 13S"
##	[1473]	"10H 10M 48S"	"10H 13M 17S"	"10H 14M 53S"	"10H 17M 17S"
##	[1477]	"10H 18M 45S"	"10H 20M 14S"	"10H 22M 51S"	"10H 23M 58S"
##	[1481]	"10H 25M 23S"	NA	"10H 26M 48S"	"10H 28M 26S"
##	[1485]	"10H 30M 18S"	"9H 53M 9S"	"9H 57M 11S"	NA
##	[1489]	"9H 59M 12S"	"10H 0M 50S"	"10H 2M 29S"	NA
##	[1493]	"10H 8M 13S"	"10H 10M 48S"	"10H 13M 17S"	"10H 14M 53S"
##	[1497]	"10H 17M 17S"	"10H 18M 45S"	"10H 20M 14S"	"10H 22M 51S"
##	[1501]	"10H 23M 58S"	"10H 25M 23S"	"10H 26M 48S"	"10H 28M 26S"
##	[1505]	"9H 7M 6S"	"9H 8M 36S"	"9H 10M 19S"	"9H 11M 59S"
##	[1509]	"9H 13M 21S"	"9H 14M 44S"	"9H 16M 21S"	"9H 17M 44S"
##	[1513]	"9H 19M 22S"	"9H 20M 41S"	"9H 22M 12S"	"9H 24M 2S"
##	[1517]	"9H 25M 49S"	"9H 27M 19S"	"9H 28M 45S"	"9H 30M 10S"
##	[1521]	"9H 31M 39S"	"9H 32M 54S"	"9H 34M 15S"	"9H 36M 3S"
##	[1525]	"9H 37M 36S"	"9H 38M 58S"	"9H 40M 13S"	"9H 41M 35S"
##	[1529]	"9H 44M 7S"	"9H 45M 41S"	"9H 47M 15S"	"9H 48M 46S"
##	[1533]	"9H 50M 10S"	"9H 51M 41S"	"9H 52M 55S"	"9H 54M 1S"
##	[1537]	"9H 55M 24S"	"9H 56M 35S"	"9H 58M 1S"	"9H 7M 6S"
##	[1541]	"9H 8M 36S"	"9H 10M 19S"	"9H 11M 59S"	"9H 13M 21S"
##	[1545]	"9H 14M 44S"	"9H 16M 21S"	"9H 17M 44S"	"9H 19M 22S"
##	[1549]	"9H 20M 41S"	"9H 22M 12S"	"9H 24M 2S"	"9H 25M 49S"
##	[1553]	"9H 27M 19S"	"9H 28M 45S"	"9H 30M 10S"	"9H 31M 39S"
##	[1557]	"9H 32M 54S"	"9H 34M 15S"	"9H 36M 3S"	"9H 37M 36S"
##	[1561]	"9H 38M 58S"	"9H 40M 13S"	"9H 41M 35S"	"9H 44M 7S"
##	[1565]	"9H 45M 41S"	"9H 47M 15S"	"9H 48M 46S"	"9H 50M 10S"
##	[1569]	"9H 51M 41S"	"9H 52M 55S"	"9H 54M 1S"	"9H 55M 24S"
##	[1573]	"9H 56M 35S"	"9H 58M 1S"	"7H 16M 8S"	"7H 17M 26S"
##	[1577]	"7H 18M 47S"	"7H 20M 9S"	"7H 21M 26S"	"7H 23M 0S"
##	[1581]	"7H 24M 12S"	"7H 25M 22S"	"7H 26M 28S"	"7H 27M 52S"
##	[1585]	"7H 29M 10S"	"7H 30M 41S"	"7H 32M 11S"	"7H 33M 29S"
##	[1589]	"7H 34M 56S"	"7H 36M 9S"	"7H 37M 37S"	"7H 39M 2S"
##	[1593]	"7H 40M 19S"	"7H 41M 42S"	"7H 43M 13S"	"7H 44M 23S"
##	[1597]	"7H 45M 48S"	"7H 47M 17S"	"7H 48M 28S"	"7H 49M 37S"
##	[1601]	"7H 50M 43S"	"7H 51M 38S"	"7H 16M 8S"	"7H 17M 26S"
##	[1605]	"7H 18M 47S"	"7H 20M 9S"	"7H 21M 26S"	"7H 23M 0S"
##	[1609]	"7H 24M 12S"	"7H 25M 22S"	"7H 26M 28S"	"7H 27M 52S"
##	[1613]	"7H 29M 10S"	"7H 30M 41S"	"7H 32M 11S"	"7H 33M 29S"
##	[1617]	"7H 34M 56S"	"7H 36M 9S"	"7H 37M 37S"	"7H 39M 2S"
##	[1621]	"7H 40M 19S"	"7H 41M 42S"	"7H 43M 13S"	"7H 44M 23S"
##	[1625]	"7H 45M 48S"	"7H 47M 17S"	"7H 48M 28S"	"7H 49M 37S"
##	[1629]	"7H 50M 43S"	"7H 51M 38S"	"9H 50M 31S"	"9H 52M 47S"
##	[1633]	"9H 54M 21S"	"9H 55M 55S"	"9H 57M 26S"	"9H 58M 47S"
##	[1637]	"10H 0M 17S"	"10H 2M 7S"	"10H 3M 43S"	"10H 5M 14S"
##	[1641]	"10H 6M 42S"	"10H 8M 20S"	"10H 9M 50S"	"10H 11M 10S"
##	[1645]	"10H 12M 37S"	"10H 14M 12S"	"10H 15M 32S"	"10H 16M 55S"
##	[1649]	"10H 18M 15S"	"10H 19M 43S"	"10H 21M 45S"	"10H 23M 1S"
##	[1653]	"10H 24M 33S"	"10H 25M 54S"	"10H 27M 16S"	"10H 28M 20S"
##	[1657]	"9H 50M 31S"	"9H 52M 47S"	"9H 54M 21S"	"9H 55M 55S"
##	[1661]	"9H 57M 26S"	"9H 58M 47S"	"10H 0M 17S"	NA
##	[1665]	"10H 2M 7S"	"10H 3M 43S"	"10H 5M 14S"	"10H 6M 42S"
##	[1669]	"10H 8M 20S"	"10H 9M 50S"	"10H 11M 10S"	"10H 12M 37S"

[1673] "10H 14M 12S" "10H 15M 32S" "10H 16M 55S" "10H 18M 15S"
 ## [1677] NA "10H 21M 45S" "10H 23M 1S" "10H 24M 33S"
 ## [1681] "10H 25M 54S" "10H 27M 16S" "10H 28M 20S" "9H 52M 23S"
 ## [1685] "9H 54M 18S" "9H 56M 1S" "9H 57M 25S" "9H 58M 41S"
 ## [1689] "9H 59M 57S" "10H 1M 26S" "10H 2M 50S" NA
 ## [1693] "10H 6M 18S" "10H 7M 48S" "10H 9M 20S" "10H 10M 42S"
 ## [1697] "10H 11M 56S" "10H 13M 24S" "10H 14M 44S" "10H 16M 11S"
 ## [1701] "10H 17M 39S" "10H 18M 57S" "10H 20M 26S" "10H 21M 57S"
 ## [1705] "10H 23M 13S" "10H 24M 50S" "10H 25M 58S" "9H 52M 23S"
 ## [1709] "9H 54M 18S" "9H 56M 1S" "9H 57M 25S" "9H 58M 41S"
 ## [1713] "9H 59M 57S" "10H 1M 26S" "10H 2M 50S" "10H 6M 18S"
 ## [1717] "10H 7M 48S" "10H 9M 20S" "10H 10M 42S" "10H 11M 56S"
 ## [1721] "10H 13M 24S" "10H 14M 44S" "10H 16M 11S" "10H 17M 39S"
 ## [1725] "10H 18M 57S" "10H 20M 26S" "10H 21M 57S" "10H 23M 13S"
 ## [1729] NA "10H 24M 50S" "10H 25M 58S" "9H 18M 33S"
 ## [1733] "9H 20M 19S" "9H 21M 42S" "9H 22M 57S" "9H 24M 19S"
 ## [1737] "9H 25M 37S" "9H 26M 54S" "9H 28M 10S" "9H 29M 32S"
 ## [1741] "9H 31M 5S" "9H 32M 46S" "9H 34M 20S" "9H 35M 46S"
 ## [1745] "9H 37M 3S" "9H 38M 30S" "9H 39M 49S" "9H 41M 16S"
 ## [1749] "9H 42M 28S" "9H 43M 48S" "9H 45M 7S" "9H 46M 32S"
 ## [1753] "9H 48M 0S" "9H 49M 23S" "9H 51M 0S" "9H 52M 21S"
 ## [1757] "9H 53M 47S" "9H 55M 18S" "9H 56M 31S" "9H 57M 52S"
 ## [1761] "9H 59M 12S" "10H 0M 47S" "10H 2M 2S" "9H 18M 33S"
 ## [1765] "9H 20M 19S" "9H 21M 42S" "9H 22M 57S" "9H 24M 19S"
 ## [1769] "9H 25M 37S" "9H 26M 54S" "9H 28M 10S" "9H 29M 32S"
 ## [1773] "9H 31M 5S" "9H 32M 46S" "9H 34M 20S" "9H 35M 46S"
 ## [1777] "9H 37M 3S" "9H 38M 30S" "9H 39M 49S" "9H 41M 16S"
 ## [1781] "9H 42M 28S" "9H 43M 48S" "9H 45M 7S" "9H 46M 32S"
 ## [1785] "9H 48M 0S" "9H 49M 23S" "9H 51M 0S" "9H 52M 21S"
 ## [1789] "9H 53M 47S" "9H 55M 18S" "9H 56M 31S" "9H 57M 52S"
 ## [1793] "9H 59M 12S" "10H 0M 47S" "10H 2M 2S" "10H 3M 42S"
 ## [1797] "10H 5M 54S" "10H 7M 50S" "10H 9M 52S" "10H 11M 19S"
 ## [1801] "10H 13M 58S" "10H 15M 35S" "10H 17M 26S" "10H 19M 5S"
 ## [1805] "10H 20M 44S" "10H 22M 7S" "10H 23M 29S" "10H 24M 58S"
 ## [1809] "10H 26M 41S" "10H 28M 42S" "10H 30M 30S" "10H 32M 22S"
 ## [1813] "10H 33M 50S" "10H 34M 56S" "10H 3M 42S" "10H 5M 54S"
 ## [1817] "10H 7M 50S" "10H 9M 52S" "10H 11M 19S" "10H 13M 58S"
 ## [1821] "10H 15M 35S" "10H 17M 26S" "10H 19M 5S" "10H 20M 44S"
 ## [1825] "10H 22M 7S" "10H 23M 29S" "10H 24M 58S" "10H 26M 41S"
 ## [1829] "10H 28M 42S" "10H 30M 30S" "10H 32M 22S" "10H 33M 50S"
 ## [1833] "10H 51M 8S" "10H 52M 36S" "10H 54M 1S" "10H 55M 21S"
 ## [1837] "10H 56M 55S" "10H 58M 18S" "10H 59M 45S" "11H 0M 49S"
 ## [1841] "11H 2M 15S" "11H 3M 48S" "11H 5M 15S" "11H 6M 27S"
 ## [1845] "11H 7M 59S" "11H 9M 17S" "11H 11M 4S" "11H 12M 14S"
 ## [1849] "11H 13M 22S" "11H 14M 48S" "11H 16M 20S" "11H 17M 23S"
 ## [1853] "10H 51M 8S" "10H 52M 36S" "10H 54M 1S" "10H 55M 21S"
 ## [1857] "10H 56M 55S" "10H 58M 18S" "10H 59M 45S" "11H 0M 49S"
 ## [1861] "11H 2M 15S" "11H 3M 48S" "11H 5M 15S" "11H 6M 27S"
 ## [1865] "11H 7M 59S" "11H 9M 17S" "11H 11M 4S" "11H 12M 14S"
 ## [1869] "11H 13M 22S" "11H 14M 48S" "11H 16M 20S" "9H 29M 11S"
 ## [1873] "9H 30M 46S" "9H 32M 17S" "9H 33M 48S" "9H 35M 5S"
 ## [1877] "9H 36M 5S" "9H 29M 11S" "9H 30M 46S" "9H 32M 17S"
 ## [1881] "9H 33M 48S" "9H 35M 5S" "9H 36M 5S" "10H 22M 4S"
 ## [1885] "10H 24M 14S" "10H 25M 52S" "10H 27M 49S" "10H 29M 46S"

```
## [1889] "10H 31M 40S" "10H 33M 12S" "10H 34M 42S" "10H 22M 4S"
## [1893] "10H 24M 14S" "10H 25M 52S" "10H 27M 49S" "10H 29M 46S"
## [1897] "10H 31M 40S" "10H 33M 12S" "14H 29M 6S" "14H 30M 24S"
## [1901] "14H 31M 35S" "14H 32M 41S" "14H 33M 40S" "14H 34M 27S"
## [1905] NA NA NA NA
## [1909] NA

data2.15$day15resp <- lubridate::hour(hms(data$resp_time_2))+lubridate::minute(hms(data$resp_time_2))/60

## Warning in .parse_hms(..., order = "HMS", quiet = quiet): Some strings
## failed to parse, or all strings are NAs

## Warning in .parse_hms(..., order = "HMS", quiet = quiet): Some strings
## failed to parse, or all strings are NAs

#Obtaining total time in hours
data2.15$total_time_day15 <- (24 - data2.15$day15purge.trans) + data2.15$day15resp
```

Metabolic Rate Calculation

```
#getting denominator for mass-specific mr
data2.15$total_time_day15 * data$mass_day14

##      [1] 151.89085 244.99206 150.46594 234.57320 85.59947 167.88136
##      [7] 141.24237 206.76750 180.33549 107.08496 145.60199 87.54758
##     [13] 219.72889 188.20758 109.40677 166.33217 159.74371 148.21321
##     [19] 139.29352 132.69243 264.27349 145.03540 200.82687 195.30696
##     [25] 137.22043 205.96616 217.92167 169.64426 135.43424 185.96447
##     [31]      NA 189.15792 235.00100 217.26289 107.62898 177.09695
##     [37] 242.53165 217.52194 183.53694 90.97667 220.16532 155.78098
##     [43] 168.99835      NA 253.48203 220.72387 118.98165 138.53605
##     [49]      NA 222.12480 145.28668 208.30287      NA 152.61490
##     [55] 132.65624 118.17762 164.74597 142.90597 125.99792 239.47423
##     [61] 191.25882 137.47027 203.71383 149.26840 86.66776 205.22603
##     [67] 97.64181 170.79156 195.36288 154.11864 181.02458 219.17927
##     [73] 255.98020 170.75549 171.73724 185.57046 94.75507 113.18864
##     [79] 199.16352 217.87870 176.58789 231.42917 217.81565 147.70479
##     [85] 178.31970 151.90227 172.69412 235.22770      NA      NA
##     [91] 173.43143      NA 161.67000 91.22169 160.17619 88.70424
##     [97] 104.30327 154.93066 100.55314 135.34997 158.52950 142.55519
##    [103] 175.23779 139.58000 169.75765 141.66045 140.31098 131.80457
##    [109] 189.45019 141.89187 128.67182      NA 149.68498 167.49996
##    [115] 135.92331 173.37573 123.86904 91.83773 158.17120 115.64842
##    [121] 156.25751 142.34213 166.27355 136.34649 220.06983 167.20783
##    [127] 132.09796      NA 122.61788 146.20692 147.20671 145.89665
##    [133] 164.58226 115.15517 137.13308 188.94774 120.96411 206.39749
##    [139] 133.42545 123.53940 138.02871 93.64513 140.24610 76.19920
##    [145] 145.25555 132.18991 166.64653 204.62503 138.78969 129.51853
##    [151]      NA      NA 104.29522 153.22821 132.91935 125.37235
##    [157] 94.20718 187.64379 154.92192 109.38803 139.56381 95.03147
##    [163] 96.64490 193.94313 130.03819 171.59728 201.32973 75.63907
##    [169] 157.46692 118.95714 120.10717 170.30659 118.87453 188.22498
##    [175] 188.65869 129.95582 93.55194 117.67849 133.91280 105.32226
##    [181] 187.08785 113.11787 149.29462 103.57299 175.68833 138.54515
```

##	[187]	100.13237	158.88923	102.29142	161.39253	135.52780	125.88503
##	[193]	145.33989	125.99277	194.01531	120.26475	113.70353	133.49780
##	[199]	213.14419	156.11278	127.26062	151.08781	111.35458	145.92023
##	[205]	77.42203	167.94754	159.35110	118.51955	181.54629	NA
##	[211]	NA	210.92280	NA	239.07768	223.58864	248.24841
##	[217]	147.92914	282.79218	160.03243	229.96373	67.66099	240.47365
##	[223]	156.70936	185.37084	188.98484	167.57158	293.79324	169.37080
##	[229]	227.94742	212.17937	193.65370	290.28204	204.75771	166.73981
##	[235]	200.04701	237.14783	217.78539	233.92074	158.65920	235.80375
##	[241]	NA	128.62508	195.07568	213.04145	128.77189	211.25375
##	[247]	188.84655	169.16884	NA	289.22014	180.28914	209.93716
##	[253]	174.98840	189.26678	216.32975	148.26766	176.24423	NA
##	[259]	NA	181.98857	221.75317	157.50294	253.53012	325.74404
##	[265]	84.33469	163.15817	232.00944	286.34917	222.37025	257.77629
##	[271]	156.07641	177.37436	62.72913	106.17287	114.52053	249.50545
##	[277]	115.89834	117.52800	243.54476	109.07969	145.23401	226.83525
##	[283]	134.20610	192.24333	193.13049	237.25176	294.77150	NA
##	[289]	NA	141.73390	153.19699	234.38103	206.95478	222.37235
##	[295]	143.53541	208.47114	150.71091	232.84130	287.52325	169.39526
##	[301]	NA	174.79913	242.34941	NA	145.05671	95.77601
##	[307]	NA	213.37724	187.11563	244.50529	155.81848	161.84259
##	[313]	182.03143	112.76965	205.86262	140.41052	255.69964	53.84486
##	[319]	167.63052	140.58888	243.49872	100.45010	NA	NA
##	[325]	190.53460	164.26525	297.64252	206.97028	250.82632	231.69705
##	[331]	79.80375	176.82501	224.76932	242.91789	165.13514	228.38918
##	[337]	212.14231	195.48392	299.80077	270.92393	162.20514	114.05928
##	[343]	136.39667	273.04876	189.01511	185.60400	100.40243	118.61826
##	[349]	201.64137	172.45530	NA	150.90512	164.05921	NA
##	[355]	184.42703	145.44548	170.38304	215.17668	276.40605	209.48872
##	[361]	159.02165	296.17420	196.56105	180.88194	166.41854	NA
##	[367]	NA	106.67487	137.35168	88.76411	168.85505	118.39758
##	[373]	142.94495	100.82789	166.33404	105.20512	127.10385	158.85221
##	[379]	109.20588	95.85304	98.98832	109.00858	140.12302	157.83592
##	[385]	119.82423	92.39381	104.71804	109.72455	153.32995	139.37617
##	[391]	146.16490	94.09549	124.55999	135.25201	91.96828	96.74815
##	[397]	110.90906	142.39795	95.36705	178.27287	117.45217	106.64339
##	[403]	125.29231	139.78389	130.11250	138.06234	137.08574	132.11241
##	[409]	107.38332	146.45435	112.94472	162.99451	143.87179	182.31400
##	[415]	112.45118	137.21087	190.81286	157.89329	154.95165	130.99045
##	[421]	213.85285	113.13184	106.97173	169.79517	95.25265	130.93571
##	[427]	177.15243	103.61381	153.60891	94.38480	161.91280	176.81406
##	[433]	156.80795	80.57306	125.48539	140.97935	124.67357	165.00013
##	[439]	107.94375	174.47320	NA	NA	129.29240	98.38951
##	[445]	138.61858	57.39732	132.48440	95.36688	144.12392	113.79814
##	[451]	152.27066	125.64837	97.29221	112.23995	113.01147	112.71854
##	[457]	134.97585	146.84429	41.69218	73.92982	127.53707	137.16758
##	[463]	146.45643	174.32481	127.84530	153.82080	111.18386	163.63502
##	[469]	136.81643	145.17647	118.76511	134.58213	102.46473	95.58704
##	[475]	163.10545	106.27280	159.77890	115.69885	131.93143	173.26923
##	[481]	146.03875	151.68940	149.68239	162.22895	141.29655	98.57041
##	[487]	178.88688	99.90326	118.76540	99.20152	140.96040	179.11386
##	[493]	122.69171	167.50831	133.38262	172.47963	178.95173	77.08516
##	[499]	109.29514	168.64010	78.59833	117.25660	108.77277	170.22154
##	[505]	84.95161	120.13937	219.97006	89.17671	200.95708	174.88358

##	[511]	149.52354	118.90944	111.61225	107.44541	116.19183	64.28032
##	[517]	112.54550	NA	NA	119.63233	176.70951	121.92029
##	[523]	97.48770	212.66488	190.25181	226.61630	176.78887	141.70688
##	[529]	120.48896	149.72767	114.02913	162.22790	137.72680	167.46930
##	[535]	198.21471	222.22414	144.31799	168.20951	122.05592	221.65199
##	[541]	138.23713	130.08095	104.97054	108.50448	102.49981	152.72634
##	[547]	114.30883	150.95225	256.50053	58.61762	234.15292	202.58850
##	[553]	166.46562	102.30400	73.83530	176.43906	215.49304	172.10703
##	[559]	149.25629	129.33603	177.53887	199.08242	168.44693	116.91421
##	[565]	242.54057	156.51122	147.17754	138.86507	200.17635	217.63522
##	[571]	119.46102	157.40750	125.33768	180.01474	174.39298	133.33263
##	[577]	268.23300	95.02816	174.07383	99.68096	155.36923	155.35262
##	[583]	202.45228	197.44912	95.08334	196.12843	168.90263	117.00722
##	[589]	247.23883	133.80897	52.08961	168.40112	257.18133	184.64638
##	[595]	158.13157	NA	NA	144.28510	161.79047	152.77798
##	[601]	118.06475	148.65257	146.78588	221.23474	183.70374	146.20556
##	[607]	153.38014	156.39290	100.28556	146.89129	43.57708	200.00809
##	[613]	215.19587	200.90385	222.13625	159.76772	179.72952	235.60384
##	[619]	143.83959	165.56589	169.19188	205.23061	136.60399	96.23867
##	[625]	159.47762	141.69077	81.17816	230.40825	251.64143	246.48242
##	[631]	144.95418	125.70535	169.03649	182.87705	147.04253	117.82683
##	[637]	176.94333	187.24581	145.36384	146.38374	221.59893	123.19011
##	[643]	76.97929	136.66649	115.38099	219.37054	230.25630	142.11877
##	[649]	241.13554	147.05367	101.22302	125.97621	133.53677	129.80641
##	[655]	98.53129	95.76844	163.06612	161.59682	132.83680	153.18395
##	[661]	250.72770	150.98030	123.52719	139.50187	240.54657	125.51468
##	[667]	190.46049	159.52057	146.56710	125.12594	152.86735	203.88902
##	[673]	189.34695	119.51908	NA	NA	236.67933	168.91685
##	[679]	165.23486	90.71093	188.43320	206.56077	202.94191	239.68368
##	[685]	237.39638	274.29968	142.39446	104.20104	204.31214	101.18085
##	[691]	82.51267	190.37467	112.13394	273.50354	212.95399	97.87156
##	[697]	229.50360	168.34751	257.51921	112.89832	170.36071	279.51447
##	[703]	158.15610	178.87214	196.34760	228.83767	150.31899	NA
##	[709]	NA	NA	311.66841	182.39797	228.87327	245.15594
##	[715]	160.90599	NA	314.77844	171.42461	203.05210	175.45414
##	[721]	200.83334	245.11307	104.70096	180.36082	157.88619	144.06367
##	[727]	213.12673	254.52983	176.09792	168.73682	164.26036	210.17226
##	[733]	226.54403	NA	188.52128	182.89847	137.98934	116.97289
##	[739]	186.88617	96.42372	147.47906	176.37094	233.86559	113.55891
##	[745]	165.27355	274.09870	169.22480	109.41060	281.53706	262.80691
##	[751]	320.78118	182.44865	129.90357	251.00006	216.98010	262.31409
##	[757]	164.41188	170.58110	274.51861	230.10616	138.51344	264.17894
##	[763]	101.88259	166.44373	202.28102	146.56193	192.58559	110.35523
##	[769]	172.43764	134.46004	161.91695	178.52947	279.75390	273.48942
##	[775]	179.44321	250.91752	222.00473	186.59735	194.25126	283.03854
##	[781]	181.22456	166.61449	327.83293	179.75373	241.65299	210.24296
##	[787]	91.35382	195.12751	209.76778	141.00363	167.89859	198.79763
##	[793]	183.74838	142.50235	266.73237	255.94424	122.27842	199.87733
##	[799]	177.35375	275.66366	174.81956	218.02028	172.37171	177.11704
##	[805]	260.90900	217.01619	315.04518	149.98952	145.86244	87.65047
##	[811]	224.42390	132.33197	155.25084	212.06302	187.50740	NA
##	[817]	NA	323.41733	169.52080	134.15429	82.67114	221.31699
##	[823]	138.49607	146.33448	144.16308	166.44108	103.64131	188.07572
##	[829]	115.57467	172.78965	143.90616	147.30084	202.85473	201.70344

##	[835]	196.93784	109.24496	98.80317	173.24057	73.20611	111.85256
##	[841]	128.48519	203.65379	116.68310	63.96380	228.85606	171.33080
##	[847]	61.58388	203.32356	110.45579	109.52558	35.35027	30.06423
##	[853]	120.86745	160.90368	179.67191	112.51395	149.79841	138.82326
##	[859]	113.31152	113.91065	187.58133	179.81861	175.59594	177.68839
##	[865]	130.71979	190.95666	107.41615	153.89902	77.57568	187.11961
##	[871]	156.95540	115.77999	125.86917	166.54506	155.09568	140.92224
##	[877]	231.20393	246.98775	201.31696	140.41804	120.57412	322.41481
##	[883]	74.52438	190.33830	243.87155	215.68673	278.05120	184.20396
##	[889]	282.16279	286.47307	281.79190	197.98659	194.85279	NA
##	[895]	NA	198.57162	153.19246	110.29079	173.70045	188.78256
##	[901]	153.36750	153.42593	120.23252	10.85755	67.72840	80.71602
##	[907]	135.94162	116.41159	82.74139	156.12541	NA	74.40171
##	[913]	119.59107	147.51089	134.32303	119.03206	131.75652	NA
##	[919]	145.63663	121.61368	149.12887	209.06062	151.70809	115.55536
##	[925]	201.16650	99.72531	142.23510	223.61960	93.18641	123.62597
##	[931]	108.23865	130.73022	102.05851	205.89768	108.89413	88.75034
##	[937]	154.85725	136.38411	118.33598	170.22920	158.20073	45.55562
##	[943]	152.87023	135.86050	172.23985	192.00503	172.41881	211.03935
##	[949]	150.95938	127.73553	45.61205	115.26292	223.55963	145.55478
##	[955]	306.67086	289.74836	242.09249	249.96737	234.70742	169.80472
##	[961]	234.88993	376.96925	281.22783	234.70519	219.96935	199.25986
##	[967]	212.27750	285.11913	228.85886	290.39371	NA	NA
##	[973]	172.65320	183.68117	153.53304	173.16056	218.29182	137.62199
##	[979]	165.65117	130.70494	210.53709	191.39765	82.18379	137.79446
##	[985]	112.79892	145.01462	114.28057	109.50767	186.99437	130.62650
##	[991]	97.55314	157.44405	154.79311	201.94956	41.72071	116.78201
##	[997]	242.28931	247.22546	223.45850	262.33558	214.46909	132.69326
##	[1003]	183.51150	146.52745	229.40637	132.28060	128.12840	258.12294
##	[1009]	213.89346	210.77450	206.93692	198.02815	133.14584	137.28838
##	[1015]	89.87927	146.90913	322.06512	136.24043	281.08101	228.49547
##	[1021]	319.65530	203.66199	194.20163	87.94538	119.63981	165.24507
##	[1027]	223.05722	178.62372	85.92271	275.72205	145.84070	207.80827
##	[1033]	350.34029	317.86052	96.80861	220.35617	249.10996	171.34718
##	[1039]	328.78355	NA	87.96872	263.14647	NA	92.76666
##	[1045]	284.18584	157.05615	160.41360	129.19200	204.66106	192.72184
##	[1051]	155.20074	245.57807	168.26862	103.52014	133.07120	146.01605
##	[1057]	184.02752	147.88937	116.65658	92.32872	143.53153	127.04844
##	[1063]	192.41222	93.17674	209.88858	128.30998	151.49131	93.93060
##	[1069]	150.97619	137.87455	73.70803	94.66387	182.46425	154.15399
##	[1075]	231.37282	241.40623	193.30175	264.17044	222.21892	149.39019
##	[1081]	155.57885	198.99142	55.31328	218.51867	164.37739	207.83587
##	[1087]	95.92582	161.17564	203.59065	167.62576	157.06691	312.41478
##	[1093]	320.44203	217.00516	179.08850	272.06279	290.17599	263.09970
##	[1099]	301.36289	90.43548	215.14794	231.05793	151.55009	214.66855
##	[1105]	245.46634	183.07296	NA	192.94184	246.54650	NA
##	[1111]	286.82817	153.22174	222.28400	241.36079	332.28417	227.16926
##	[1117]	249.44556	299.97528	334.62067	322.88511	182.84323	181.84777
##	[1123]	241.92458	92.76750	88.69525	143.98714	158.37522	168.04372
##	[1129]	167.24837	165.22573	NA	102.70816	233.88299	153.77298
##	[1135]	147.09475	94.88459	97.82111	75.31639	103.79262	132.26950
##	[1141]	131.70484	122.86012	111.56943	177.57999	65.04169	92.93503
##	[1147]	102.30778	129.49114	137.45966	NA	127.19144	184.66296
##	[1153]	126.92067	149.67364	59.87287	120.78404	146.47512	119.86114

##	[1159]	101.53148	176.75276	113.64982	NA	99.57592	30.16799
##	[1165]	173.08528	107.92759	108.15704	57.41938	69.65494	NA
##	[1171]	102.85278	166.62065	177.47587	97.35236	112.54514	64.98080
##	[1177]	78.49780	85.18404	139.86676	186.89877	90.47459	72.58539
##	[1183]	166.94783	115.54217	54.80953	128.65189	93.57555	146.30151
##	[1189]	NA	NA	119.16528	211.31282	98.11031	117.84093
##	[1195]	119.80105	131.29539	157.27285	103.98303	111.03694	190.83216
##	[1201]	106.52553	132.28334	73.99766	148.52123	188.46066	105.76365
##	[1207]	150.75092	116.24582	172.27732	97.39833	129.09653	NA
##	[1213]	155.50752	104.45643	141.38853	NA	123.47535	NA
##	[1219]	124.42136	120.44197	142.03023	164.46617	168.92029	202.99025
##	[1225]	111.61102	109.46183	167.95669	130.73166	201.91703	125.38394
##	[1231]	73.68412	73.43288	158.84712	118.25260	160.24879	151.06416
##	[1237]	NA	132.88299	127.60735	75.35524	152.17302	113.14416
##	[1243]	168.03050	116.99026	178.99750	143.44193	181.78055	129.02225
##	[1249]	NA	116.18379	53.63977	144.47140	172.36000	244.01667
##	[1255]	218.99005	144.28601	159.90376	131.50459	104.05383	152.88184
##	[1261]	116.89446	166.10940	NA	167.42960	158.55343	137.44062
##	[1267]	154.28527	99.14746	124.24569	139.53881	NA	165.45042
##	[1273]	159.90640	142.29002	79.91002	175.56989	147.75732	134.67985
##	[1279]	234.01888	143.55330	127.20283	102.95157	107.88862	144.19424
##	[1285]	99.46803	149.89772	219.22127	171.91043	89.04474	134.77723
##	[1291]	NA	NA	NA	137.58710	166.13676	208.74563
##	[1297]	145.75332	129.46490	147.67111	217.54619	197.68499	209.92611
##	[1303]	197.96462	71.27602	139.69641	122.65191	189.16305	163.16684
##	[1309]	135.26312	115.26506	168.64854	146.64188	156.49874	176.44331
##	[1315]	202.32102	147.41599	149.97407	132.95669	152.96789	NA
##	[1321]	199.81508	117.15915	117.50567	119.39058	132.41547	151.59490
##	[1327]	182.56528	68.66843	NA	NA	121.83458	116.84727
##	[1333]	163.00653	178.98124	109.34876	113.55042	77.75115	162.04099
##	[1339]	96.31663	179.78079	NA	136.46086	198.04252	NA
##	[1345]	112.12598	77.56403	87.06523	109.86987	NA	132.50968
##	[1351]	NA	NA	111.29147	93.77000	131.89740	157.83322
##	[1357]	110.42440	130.37814	195.87709	77.34572	75.20604	175.04821
##	[1363]	NA	NA	120.90100	181.78367	NA	124.08068
##	[1369]	198.06612	151.11344	174.98207	106.29763	76.63305	126.23087
##	[1375]	178.10913	NA	151.40395	78.69247	132.52953	NA
##	[1381]	136.69206	170.84502	83.74507	127.50795	NA	83.57440
##	[1387]	80.36200	74.95620	190.11447	88.62713	111.68657	131.69102
##	[1393]	88.81461	119.27532	114.94706	NA	NA	NA
##	[1399]	85.11790	208.96956	NA	137.09795	100.60509	NA
##	[1405]	94.15180	110.77646	112.77084	76.34200	NA	130.87021
##	[1411]	85.11067	176.66107	160.55216	46.49058	122.77251	157.58435
##	[1417]	114.85455	180.72516	47.55750	49.82075	222.28067	156.72825
##	[1423]	192.32518	137.86516	118.75153	154.49490	171.13653	127.39541
##	[1429]	41.67827	156.30701	NA	NA	102.52178	139.47623
##	[1435]	NA	NA	119.66567	236.07220	121.74142	189.48305
##	[1441]	162.62837	NA	116.84083	125.88978	NA	244.67069
##	[1447]	NA	139.92927	113.31414	95.29627	48.50283	140.51240
##	[1453]	146.43951	78.81370	218.29109	123.35742	185.91030	NA
##	[1459]	112.36917	46.53600	58.05370	NA	NA	126.67133
##	[1465]	NA	NA	21.98117	58.07681	97.73594	86.29161
##	[1471]	104.33818	39.45489	104.97681	155.53929	128.79015	136.88200
##	[1477]	160.23670	121.34268	90.06578	130.07233	106.71204	NA

##	[1483]	104.33652	NA	NA	139.33920	141.37884	NA
##	[1489]	170.06010	116.97167	160.57186	NA	169.83861	118.96600
##	[1495]	125.37667	119.82736	86.32223	192.16016	133.57331	41.94566
##	[1501]	105.04054	116.81096	NA	NA	209.23848	166.76409
##	[1507]	90.18104	98.32764	177.78933	76.49713	189.06318	232.21556
##	[1513]	198.26908	157.65782	181.37117	172.30585	59.78497	177.88338
##	[1519]	183.95332	167.10854	230.02523	NA	215.54974	201.50898
##	[1525]	112.80392	274.20991	226.16207	158.05350	103.14852	100.17539
##	[1531]	159.97480	119.93497	165.56494	160.68316	164.00951	190.76995
##	[1537]	183.05694	NA	NA	149.10296	214.80001	144.76424
##	[1543]	178.52991	200.31255	175.95890	183.33887	178.24855	245.58114
##	[1549]	147.72093	263.30008	117.47655	118.72364	245.91689	137.95587
##	[1555]	230.63749	177.45229	196.65643	101.93301	236.50376	248.94311
##	[1561]	242.58495	98.23182	245.84062	169.47697	172.44119	114.44906
##	[1567]	166.00263	147.84572	192.37546	220.97363	77.67518	186.77626
##	[1573]	NA	NA	79.43571	92.24309	75.48601	125.34606
##	[1579]	161.20744	68.31486	218.24924	203.77884	78.94708	81.34468
##	[1585]	96.84808	153.67885	170.69681	121.80736	144.49813	156.06282
##	[1591]	73.20968	177.53706	197.98525	94.15520	140.17270	166.06029
##	[1597]	129.86142	140.57108	117.42571	143.67859	NA	NA
##	[1603]	148.85326	103.02119	152.28510	143.84563	136.54512	202.20190
##	[1609]	124.28306	51.67115	191.41012	124.85152	132.82674	195.58169
##	[1615]	192.28484	77.13881	171.38010	172.64505	178.81140	133.37580
##	[1621]	185.69787	NA	121.39132	196.66217	126.38441	166.38630
##	[1627]	67.91207	NA	NA	NA	160.26970	161.05106
##	[1633]	224.63528	174.32319	97.34354	108.46619	193.05100	76.36842
##	[1639]	226.22979	185.55198	94.76189	174.31425	190.58042	159.07028
##	[1645]	231.45871	166.33221	126.24730	183.84861	217.99322	99.20873
##	[1651]	252.68084	96.85710	81.13505	152.40973	NA	NA
##	[1657]	123.73153	239.64653	154.33846	85.85031	265.68861	163.54675
##	[1663]	250.33914	NA	179.42565	114.18896	182.68615	190.13307
##	[1669]	190.54843	262.25482	119.48470	146.59442	169.41549	215.11515
##	[1675]	129.80599	233.69133	NA	246.40602	95.98497	155.47802
##	[1681]	196.01322	NA	NA	134.50125	219.59214	152.04994
##	[1687]	180.25875	195.58610	156.19833	161.23809	197.13476	NA
##	[1693]	75.56701	72.35841	116.12870	194.59992	128.69037	163.67792
##	[1699]	141.03004	225.71903	188.40986	63.21329	76.09883	155.49287
##	[1705]	82.06272	NA	NA	196.38645	142.28533	150.06583
##	[1711]	91.09380	135.44795	114.54000	85.28640	185.15258	144.66357
##	[1717]	105.45520	128.83733	142.08705	96.83333	144.21960	168.10950
##	[1723]	120.18155	199.70853	190.39113	147.54600	217.05440	73.70763
##	[1729]	NA	NA	NA	248.79800	182.77229	232.41392
##	[1735]	244.36720	213.50815	221.64391	169.24760	166.72520	140.56383
##	[1741]	242.17462	172.30871	77.61304	165.98987	177.25161	148.76411
##	[1747]	164.73786	234.53318	253.50825	48.96582	183.86504	76.23554
##	[1753]	129.85366	55.26739	53.70520	213.67313	166.38941	214.57532
##	[1759]	179.90624	132.03194	112.45647	NA	NA	219.78250
##	[1765]	138.01833	156.32913	156.26399	155.67097	217.61147	73.94129
##	[1771]	72.29062	66.85996	145.28368	145.90492	217.95305	199.61770
##	[1777]	215.61712	167.38887	245.40952	81.27106	240.01241	149.43238
##	[1783]	233.98965	187.03385	63.66374	94.71431	161.29734	236.19405
##	[1789]	248.68916	177.33225	233.25807	261.99605	95.61695	NA
##	[1795]	NA	253.88243	190.76824	168.04693	182.70481	77.43916
##	[1801]	116.19455	192.02371	161.06931	201.83333	232.88043	233.91636

```
## [1807] 233.74640 210.00292 130.27605 208.92148 243.84071 218.50840
## [1813]      NA      NA 153.58400 179.45459 219.89365 248.00314
## [1819] 214.50364 189.38241 153.78191 175.82525 93.24695 169.50176
## [1825] 257.13091 88.76400 182.33058 177.13056 262.24014 207.97490
## [1831]      NA      NA 178.46812 177.07151 246.56321 93.49180
## [1837] 100.34719 231.49734 74.55641 263.23700 151.34114 101.99627
## [1843] 187.35244 95.40382 225.77281 196.91302 137.03403 166.55808
## [1849] 251.21986 150.64306      NA      NA 147.06193 145.58719
## [1855] 198.11833 87.37408 185.54678 217.81529 228.37900 172.61262
## [1861] 233.31954 211.46488 216.23507 184.86772 156.03840 226.67209
## [1867] 230.76247 185.24200 183.39856      NA      NA 199.68795
## [1873] 164.27075 164.32162 200.03163      NA      NA 226.41480
## [1879] 157.70811 235.94518 155.81043      NA      NA 260.40647
## [1885] 190.04787 164.00737 274.88237 282.88944 209.70457      NA
## [1891]      NA 275.67330 222.38083 166.19319 211.14833 149.70539
## [1897]      NA      NA 296.31403 301.30817 171.42998 241.50760
## [1903]      NA      NA      NA      NA      NA      NA
## [1909]      NA
```

```
#Metabolic Rate
```

```
data2.15$MR15<- data$resp_day15/(data2.15$total_time_day15)
```

```
#Mass specific metabolic rate
```

```
data2.15$msMR15<- data$resp_day15/(data2.15$total_time_day15 * data$mass_day14)
```

Controlling for Blanks

```
data3.15 <- data2.15%>%
  group_by(cohort_day, tape)%>%
  filter(Site_name=="Blank")%>%
  summarise(mean.blank2=mean(MR15,na.rm=TRUE))
```

```
#check columns
```

```
glimpse(data3.15)
```

```
## Observations: 38
## Variables: 3
## $ cohort_day <int> 2, 2, 3, 3, 4, 4, 5, 5, 5, 5, 6, 6, 7, 7, 8, 8, 9,...
## $ tape <chr> "blue", "red", "orange", "white", "orange", "white..."
## $ mean.blank2 <dbl> 0.0005641578, 0.0004986472, 0.0004491015, 0.001399...
```

```
data3.15$mean.blank2
```

```
## [1] 0.0005641578 0.0004986472 0.0004491015 0.0013998016 0.0007086216
## [6] 0.0004586952 0.0008301721 0.0010078476 0.0006573110 0.0004078814
## [11] 0.0006396536 0.0010072904 0.0009850978 0.0006266569 0.0013045121
## [16] 0.0005749230 0.0006262029 0.0003713112 0.0005021056 0.0006112672
## [21] 0.0004834431 0.0004612535 0.0004729824 0.0005167701 0.0005268374
## [26] 0.0002867896 0.0004687064 0.0003718163 0.0005093972 0.0012094708
## [31] 0.0037153831 0.0004513217 0.0005082236 0.0007341679 0.0004501632
## [36] 0.0002760230 0.0012459416 0.0017019482
```

```
#merge data3 and data2 by cohort day and tape
```

```
data4.15 <- inner_join(data2.15, data3.15, by=c("cohort_day", "tape"))
```

```
data4.15
```

```
## # A tibble: 1,909 x 52
## # Groups:   cohort_day, tape [?]
##   Ind_ID tape Site_name mass_day10 purge_time_1 purge1 collection_date
##   <int> <chr> <chr>         <dbl> <chr>         <dbl> <chr>
## 1     1  1 blue OG             6.94 13:38          NA 2017-08-21
## 2     2  2 blue Ferris        11.2 13:39          NA 2017-08-21
## 3     3  3 blue Ferris         6.72 13:39          NA 2017-08-21
## 4     4  4 blue Ferris        10.7 13:40          NA 2017-08-21
## 5     5  5 blue OG             3.85 13:41          NA 2017-08-21
## 6     6  6 blue OG             7.58 13:37          NA 2017-08-21
## 7     7  7 blue OG             6.41 13:35          NA 2017-08-21
## 8     8  8 blue OG             9.36 13:57          NA 2017-08-21
## 9     9  9 blue Ferris         7.98 13:41          NA 2017-08-21
## 10    10 10 blue OG             4.89 13:36          NA 2017-08-21
## # ... with 1,899 more rows, and 45 more variables: day10 <chr>,
## #   cohort_date <chr>, cohort_day <int>, Host <chr>, `Li-cor_1` <int>,
## #   resp_time_1 <chr>, resp_day11 <dbl>, mass_day14 <dbl>,
## #   purge_time_2 <chr>, resp_time_2 <chr>, resp_day15 <dbl>,
## #   Li_cor2 <int>, treatment_day15 <chr>, exit_fridge_date <chr>,
## #   Eclosion_reference_date <chr>, notes <chr>, Resp_code <int>,
## #   treatment <chr>, uniqueID <chr>, eclosion_date <chr>,
## #   eclosion_days <int>, well_id <chr>, organism <chr>,
## #   Trikinetics_position <int>, Trikinetic_monitor <int>,
## #   Trikinetics_entry_LD_time <chr>, Trikinetic_exit_date <chr>,
## #   Trikinetics_exit_LD_time <chr>, notes_2 <chr>,
## #   Free_run_trik_monitor <int>, Free_run_trik_position <int>,
## #   Free_run_entry_date <chr>, Free_run_entry_time <chr>,
## #   Free_run_exit_date <chr>, Free_run_exit_time <chr>, notes_3 <chr>,
## #   Adult_death_date <chr>, day10purge <dbl>, day15purge <dbl>,
## #   day15purge.trans <dbl>, day15resp <dbl>, total_time_day15 <dbl>,
## #   MR15 <dbl>, msMR15 <dbl>, mean.blank2 <dbl>
```

```
data4.15$mean.blank2
```

```
## [1] 0.0005641578 0.0005641578 0.0005641578 0.0005641578 0.0005641578
## [6] 0.0005641578 0.0005641578 0.0005641578 0.0005641578 0.0005641578
## [11] 0.0005641578 0.0005641578 0.0005641578 0.0005641578 0.0005641578
## [16] 0.0005641578 0.0005641578 0.0005641578 0.0005641578 0.0005641578
## [21] 0.0005641578 0.0005641578 0.0005641578 0.0005641578 0.0005641578
## [26] 0.0005641578 0.0005641578 0.0005641578 0.0005641578 0.0005641578
## [31] 0.0005641578 0.0005641578 0.0005641578 0.0005641578 0.0005641578
## [36] 0.0005641578 0.0005641578 0.0005641578 0.0005641578 0.0005641578
## [41] 0.0005641578 0.0005641578 0.0005641578 0.0005641578 0.0005641578
## [46] 0.0005641578 0.0005641578 0.0005641578 0.0005641578 0.0004986472
## [51] 0.0004986472 0.0004986472 0.0004986472 0.0004986472 0.0004986472
## [56] 0.0004986472 0.0004986472 0.0004986472 0.0004986472 0.0004986472
## [61] 0.0004986472 0.0004986472 0.0004986472 0.0004986472 0.0004986472
## [66] 0.0004986472 0.0004986472 0.0004986472 0.0004986472 0.0004986472
## [71] 0.0004986472 0.0004986472 0.0004986472 0.0004986472 0.0004986472
## [76] 0.0004986472 0.0004986472 0.0004986472 0.0004986472 0.0004986472
## [81] 0.0004986472 0.0004986472 0.0004986472 0.0004986472 0.0004986472
## [86] 0.0004986472 0.0004986472 0.0004986472 0.0004986472 0.0004986472
## [91] 0.0004986472 0.0004986472 0.0004491015 0.0004491015 0.0004491015
## [96] 0.0004491015 0.0004491015 0.0004491015 0.0004491015 0.0004491015
## [101] 0.0004491015 0.0004491015 0.0004491015 0.0004491015 0.0004491015
```

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

```
## [1726] 0.0006573110 0.0006573110 0.0006573110 0.0006573110 0.0006573110
## [1731] 0.0006573110 0.0010072904 0.0010072904 0.0010072904 0.0010072904
## [1736] 0.0010072904 0.0010072904 0.0010072904 0.0010072904 0.0010072904
## [1741] 0.0010072904 0.0010072904 0.0010072904 0.0010072904 0.0010072904
## [1746] 0.0010072904 0.0010072904 0.0010072904 0.0010072904 0.0010072904
## [1751] 0.0010072904 0.0010072904 0.0010072904 0.0010072904 0.0010072904
## [1756] 0.0010072904 0.0010072904 0.0010072904 0.0010072904 0.0010072904
## [1761] 0.0010072904 0.0010072904 0.0010072904 0.0006396536 0.0006396536
## [1766] 0.0006396536 0.0006396536 0.0006396536 0.0006396536 0.0006396536
## [1771] 0.0006396536 0.0006396536 0.0006396536 0.0006396536 0.0006396536
## [1776] 0.0006396536 0.0006396536 0.0006396536 0.0006396536 0.0006396536
## [1781] 0.0006396536 0.0006396536 0.0006396536 0.0006396536 0.0006396536
## [1786] 0.0006396536 0.0006396536 0.0006396536 0.0006396536 0.0006396536
## [1791] 0.0006396536 0.0006396536 0.0006396536 0.0006396536 0.0006396536
## [1796] 0.0006266569 0.0006266569 0.0006266569 0.0006266569 0.0006266569
## [1801] 0.0006266569 0.0006266569 0.0006266569 0.0006266569 0.0006266569
## [1806] 0.0006266569 0.0006266569 0.0006266569 0.0006266569 0.0006266569
## [1811] 0.0006266569 0.0006266569 0.0006266569 0.0006266569 0.0009850978
## [1816] 0.0009850978 0.0009850978 0.0009850978 0.0009850978 0.0009850978
## [1821] 0.0009850978 0.0009850978 0.0009850978 0.0009850978 0.0009850978
## [1826] 0.0009850978 0.0009850978 0.0009850978 0.0009850978 0.0009850978
## [1831] 0.0009850978 0.0009850978 0.0005749230 0.0005749230 0.0005749230
## [1836] 0.0005749230 0.0005749230 0.0005749230 0.0005749230 0.0005749230
## [1841] 0.0005749230 0.0005749230 0.0005749230 0.0005749230 0.0005749230
## [1846] 0.0005749230 0.0005749230 0.0005749230 0.0005749230 0.0005749230
## [1851] 0.0005749230 0.0005749230 0.0013045121 0.0013045121 0.0013045121
## [1856] 0.0013045121 0.0013045121 0.0013045121 0.0013045121 0.0013045121
## [1861] 0.0013045121 0.0013045121 0.0013045121 0.0013045121 0.0013045121
## [1866] 0.0013045121 0.0013045121 0.0013045121 0.0013045121 0.0013045121
## [1871] 0.0013045121 0.0003713112 0.0003713112 0.0003713112 0.0003713112
## [1876] 0.0003713112 0.0003713112 0.0006262029 0.0006262029 0.0006262029
## [1881] 0.0006262029 0.0006262029 0.0006262029 0.0005021056 0.0005021056
## [1886] 0.0005021056 0.0005021056 0.0005021056 0.0005021056 0.0005021056
## [1891] 0.0005021056 0.0004834431 0.0004834431 0.0004834431 0.0004834431
## [1896] 0.0004834431 0.0004834431 0.0004834431 0.0005167701 0.0005167701
## [1901] 0.0005167701 0.0005167701 0.0005167701 0.0005167701 0.0002867896
## [1906] 0.0002867896 0.0002867896 0.0002867896 0.0002867896 0.0002867896
```

```
#do some corrections
```

```
data5.15 <- data4.15%>%
```

```
  mutate(MR15.cor = MR15 - mean.blank2, msMR15.cor = msMR15 - mean.blank2)
```

```
glimpse(data5.15)
```

```
## Observations: 1,909
```

```
## Variables: 54
```

```
## $ Ind_ID          <int> 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 1...
## $ tape            <chr> "blue", "blue", "blue", "blue", "blu...
## $ Site_name       <chr> "OG", "Ferris", "Ferris", "Ferris", ...
## $ mass_day10      <dbl> 6.938, 11.175, 6.719, 10.719, 3.848,...
## $ purge_time_1    <chr> "13:38", "13:39", "13:39", "13:40", ...
## $ purge1          <dbl> NA, NA, NA, NA, NA, NA, NA, NA, NA, ...
## $ collection_date <chr> "2017-08-21", "2017-08-21", "2017-08...
## $ day10           <chr> "2017-09-04", "2017-09-04", "2017-09...
## $ cohort_date     <chr> "2017-08-25", "2017-08-25", "2017-08...
## $ cohort_day      <int> 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, ...
```

```
## $ Host <chr> "Apple", "Apple", "Apple", "Apple", ...
## $ `Li-cor_1` <int> 6262, 6262, 6262, 6262, 6262, 6262, ...
## $ resp_time_1 <chr> "", "10:13:15", "10:14:47", "10:16:4...
## $ resp_day11 <dbl> NA, 0.2941100, 0.1052925, 1.3445380,...
## $ mass_day14 <dbl> 6.187, 9.967, 6.118, 9.539, 3.479, 6...
## $ purge_time_2 <chr> "10:51", "", "", "", "", "", "", "", ...
## $ resp_time_2 <chr> "10:13:48", "10:16:22", "10:18:10", ...
## $ resp_day15 <dbl> 0.1432514, 0.1702350, 0.1076286, 1.3...
## $ Li_cor2 <int> 6262, 6262, 6262, 6262, 6262, 6262, ...
## $ treatment_day15 <chr> "2017-09-09", "", "", "", "", "2017-...
## $ exit_fridge_date <chr> "2018-01-22", "", "", "", "", "2018-...
## $ Eclosion_reference_date <chr> "2018-01-22", "", "2017-09-09", "", ...
## $ notes <chr> "", "", "", "", "", "", "", "", "", "", ...
## $ Resp_code <int> 0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, ...
## $ treatment <chr> "S0", "GC", "RT", "GC", "RT", "S0", ...
## $ uniqueID <chr> "2b1", "2b2", "2b3", "2b4", "2b5", "...
## $ eclosion_date <chr> "2018-03-22", "", "2017-10-29", "", ...
## $ eclosion_days <int> 59, NA, 64, NA, 56, NA, 59, 32, 49, ...
## $ well_id <chr> "A1", "", "A1", "", "A2", "A2", "A3"...
## $ organism <chr> "fly", "", "fly", "", "fly", "", "fl...
## $ Trikinetics_position <int> 17, NA, 8, NA, 15, NA, 7, 30, 27, NA...
## $ Trik_monitor <int> 1, NA, 1, NA, 2, NA, 2, 2, 1, NA, NA...
## $ Trikinetics_entry_LD_time <chr> "12:43", "", "3:34", "", "13:03", ""...
## $ Trikinetic_exit_date <chr> "2018-03-23", "", "2107-11-05", "", ...
## $ Trikinetics_exit_LD_time <chr> "12:57", "", "20:33", "", "9:58", ""...
## $ notes_2 <chr> "", "", "changed water 2017-11-03 11...
## $ Free_run_trik_monitor <int> NA, NA, 4, NA, NA, NA, NA, NA, 3, NA...
## $ Free_run_trik_position <int> NA, NA, 11, NA, NA, NA, NA, NA, 1, N...
## $ Free_run_entry_date <chr> "", "", "2017-11-05", "", "", "", "", ...
## $ Free_run_entry_time <chr> "", "", "20:34", "", "", "", "", ...
## $ Free_run_exit_date <chr> "", "", "2017-12-09", "", "", "", "", ...
## $ Free_run_exit_time <chr> "", "", "20:00", "", "", "", "", ...
## $ notes_3 <chr> "", "", "changed water 2017-11-28", ...
## $ Adult_death_date <chr> "2018-03-23", "", "2017-12-09", "", ...
## $ day10purge <dbl> 13.63333, 13.65000, 13.65000, 13.666...
## $ day15purge <dbl> 10.85, NA, NA, NA, NA, NA, NA, NA, N...
## $ day15purge.trans <dbl> 9.666667, 9.686345, 9.706024, 9.7257...
## $ day15resp <dbl> 10.21667, 10.26667, 10.30000, 10.316...
## $ total_time_day15 <dbl> 24.55000, 24.58032, 24.59398, 24.590...
## $ MR15 <dbl> 0.005835088, 0.006925662, 0.00437621...
## $ msMR15 <dbl> 0.0009431207, 0.0006948592, 0.000715...
## $ mean.blank2 <dbl> 0.0005641578, 0.0005641578, 0.000564...
## $ MR15.cor <dbl> 0.005270930, 0.006361504, 0.00381206...
## $ msMR15.cor <dbl> 3.789629e-04, 1.307014e-04, 1.511443...
```

```
#Filter out negatives
data5.15.neg <- data5.15%>%
  filter(MR15.cor<0)
```

Calculate Eclosions Dates

```
#Focus only on RT and S0 treatments
data5.15.treatsub<-data5%>%
```

```

filter(treatment!="GC"&treatment!="")

data5.15$neweclosions <- difftime(as.Date(data5.15$eclosion_date), as.Date(data5.15$Eclosion_reference_date), units="days")

data5.15.treatsub$neweclosions<-difftime(as.Date(data5.15.treatsub$eclosion_date), as.Date(data5.15.treatsub$Eclosion_reference_date), units="days")

```

Test differences in eclosion timing between host and experiment for Day 15

```

#Two Way ANOVA
mod1<- aov(neweclosions ~ Host*treatment, data=data5.15.treatsub)
summary(mod1)

```

```

##              Df Sum Sq Mean Sq F value    Pr(>F)
## Host           1   3685     3685    9.705 0.00193 **
## treatment      1  82798    82798  218.056 < 2e-16 ***
## Host:treatment  1   9903     9903   26.080 4.45e-07 ***
## Residuals     579 219851      380
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## 606 observations deleted due to missingness

```

```

#narrow down to SO & RT
data5.15SO<-data5.15.treatsub%>%
  filter(treatment=="SO")

```

```

data5.15RT<-data5.15.treatsub%>%
  filter(treatment=="RT")

```

```

#One Way ANOVA for RT & SO
mod2RT15<-aov(neweclosions~Host, data=data5.15)
summary(mod2RT15)

```

```

##              Df Sum Sq Mean Sq F value    Pr(>F)
## Host           1   3685     3685    6.85 0.0091 **
## Residuals     581 312552      538
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## 1326 observations deleted due to missingness

```

```

mod2SO15<-aov(neweclosions~Host, data=data5.15)
summary(mod2SO15)

```

```

##              Df Sum Sq Mean Sq F value    Pr(>F)
## Host           1   3685     3685    6.85 0.0091 **
## Residuals     581 312552      538
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## 1326 observations deleted due to missingness

```

```

#how balanced it is
data5.SO%>%
  group_by(Host)%>%
  summarise(n=length(Host))

```

```

## # A tibble: 2 x 2

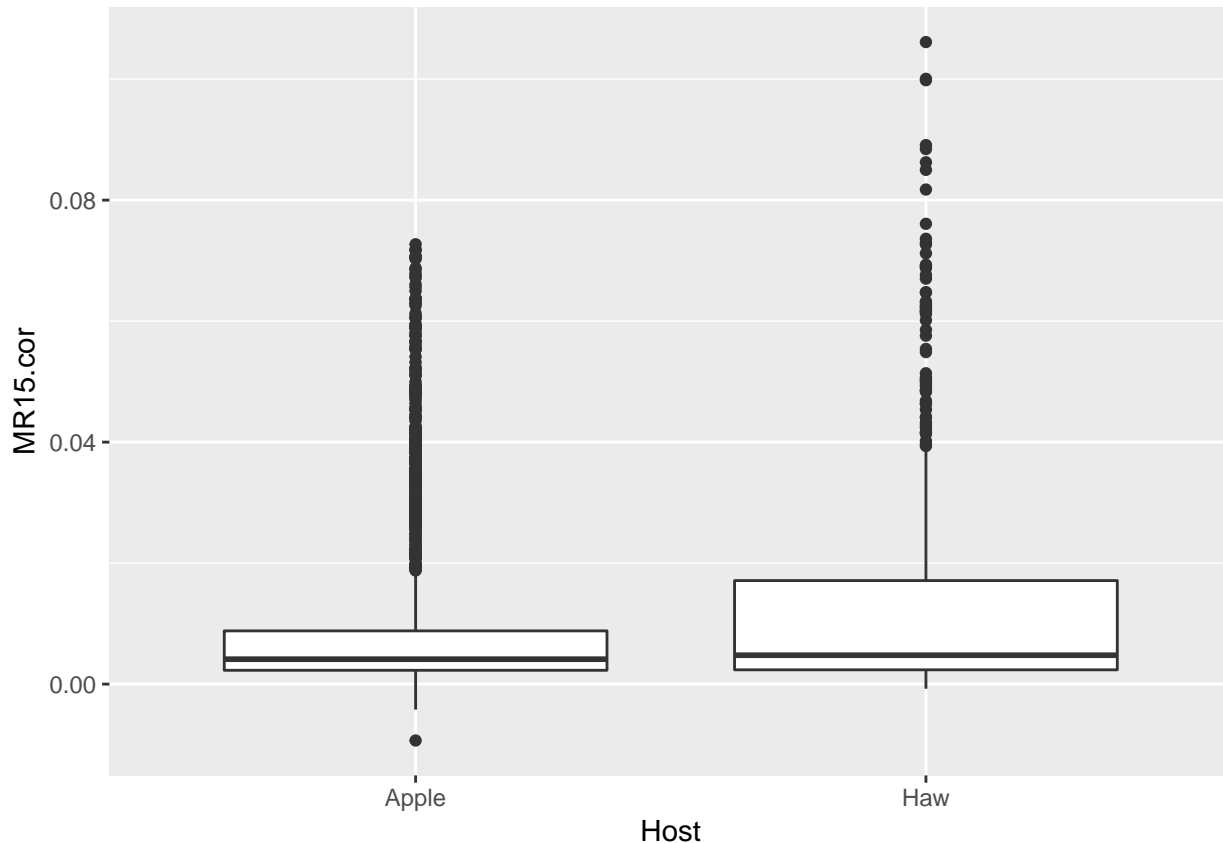
```

```
## Host      n
## <chr> <int>
## 1 Apple  428
## 2 Haw     163
```

Figures looking at MR between hosts

```
ggplot(data5.15, aes(x=Host, y=MR15.cor))+geom_boxplot()
```

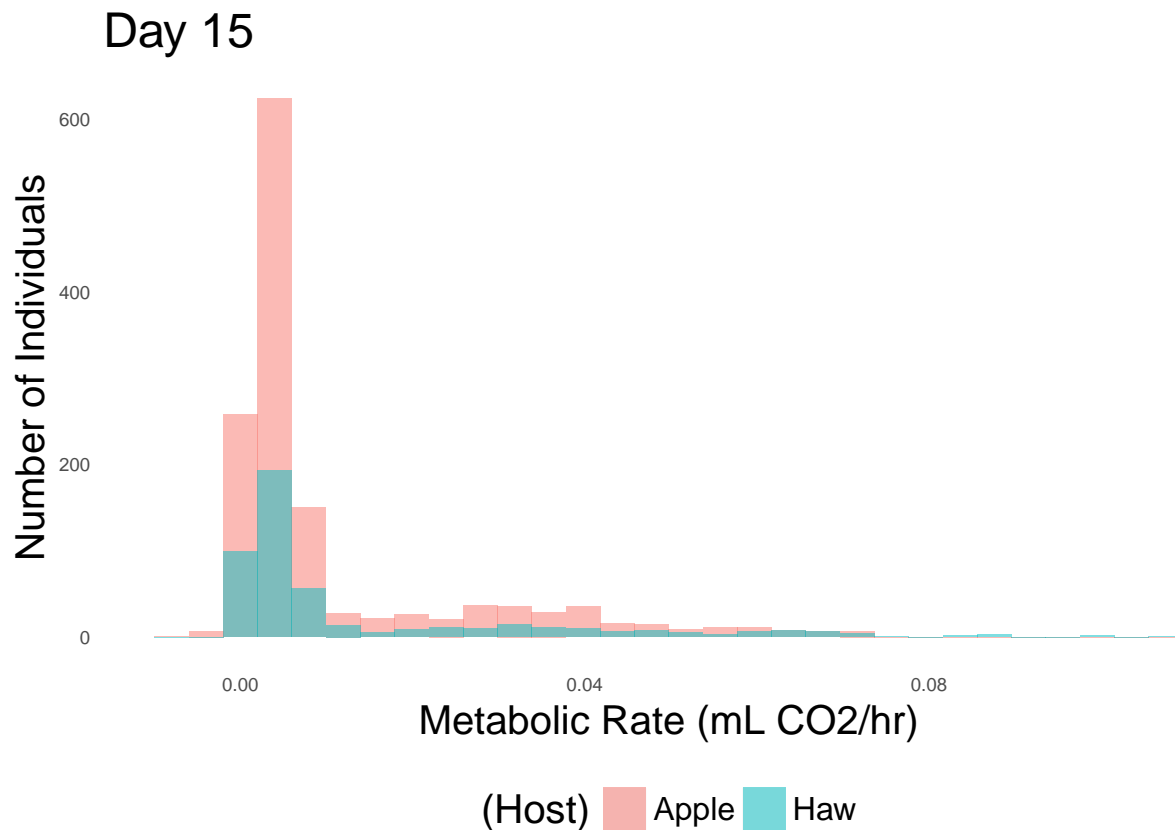
```
## Warning: Removed 63 rows containing non-finite values (stat_boxplot).
```



```
ggplot(data5.15, aes(x=MR15.cor, fill=(Host)))+geom_histogram(position = "identity", alpha=.5) +labs(x = "MR15.cor",
axis.ticks.x=element_blank(),legend.position="bottom",
axis.ticks.y=element_blank(),panel.background = element_blank(),
panel.grid.major = element_blank(), panel.grid.minor = element_blank(),axis.text=element_text(size=12))
```

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

```
## Warning: Removed 63 rows containing non-finite values (stat_bin).
```



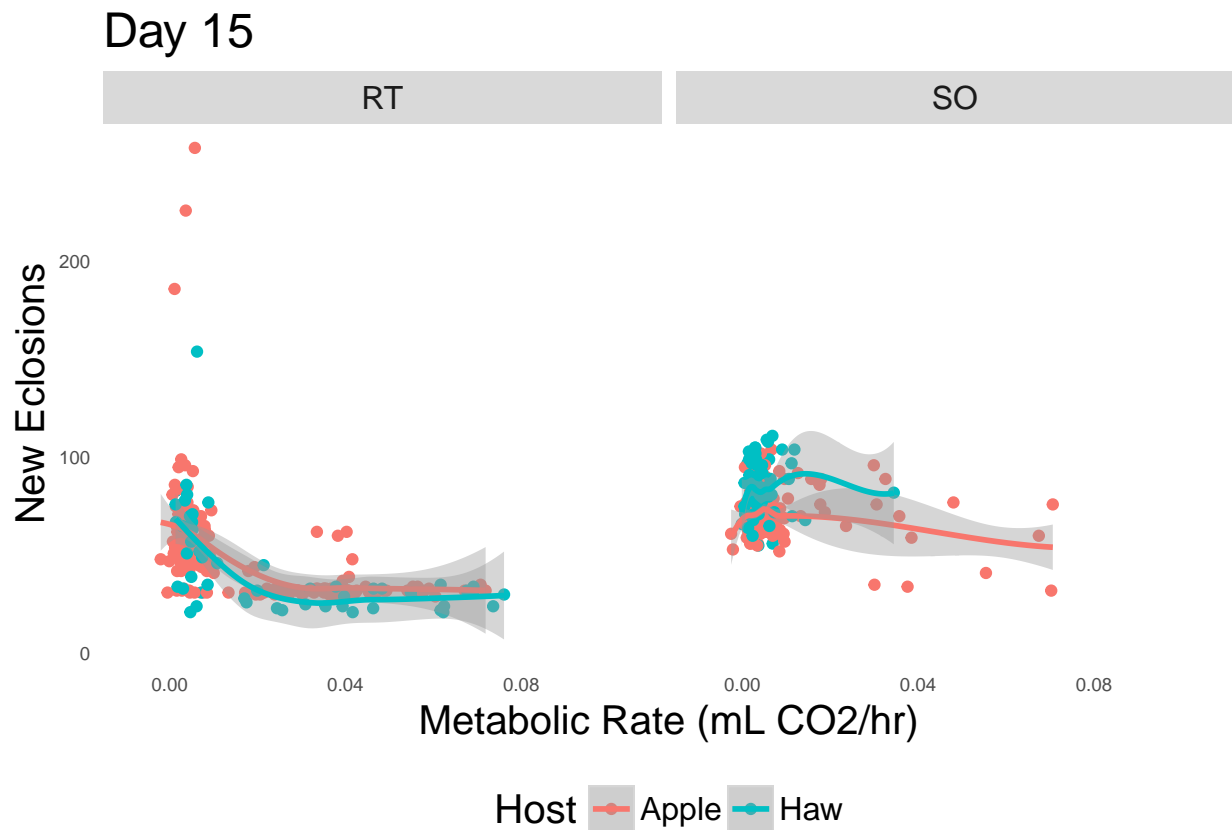
Explore relationship between eclosion days and MR

scatter plots

```
data5.15.treatsub<-data5.15%>%
  filter(treatment!="GC"&treatment!="")

ggplot(data5.15.treatsub, aes(x=MR15.cor, y=neweclosions, colour=Host))+geom_point()+stat_smooth(method="lm",
  axis.ticks.x=element_blank(),legend.position="bottom",
  axis.ticks.y=element_blank(),panel.background = element_blank(),
  panel.grid.major = element_blank(), panel.grid.minor = element_blank(),axis.text=element_text(size=12))

## Don't know how to automatically pick scale for object of type difftime. Defaulting to continuous.
## Warning: Removed 607 rows containing non-finite values (stat_smooth).
## Warning: Removed 607 rows containing missing values (geom_point).
```



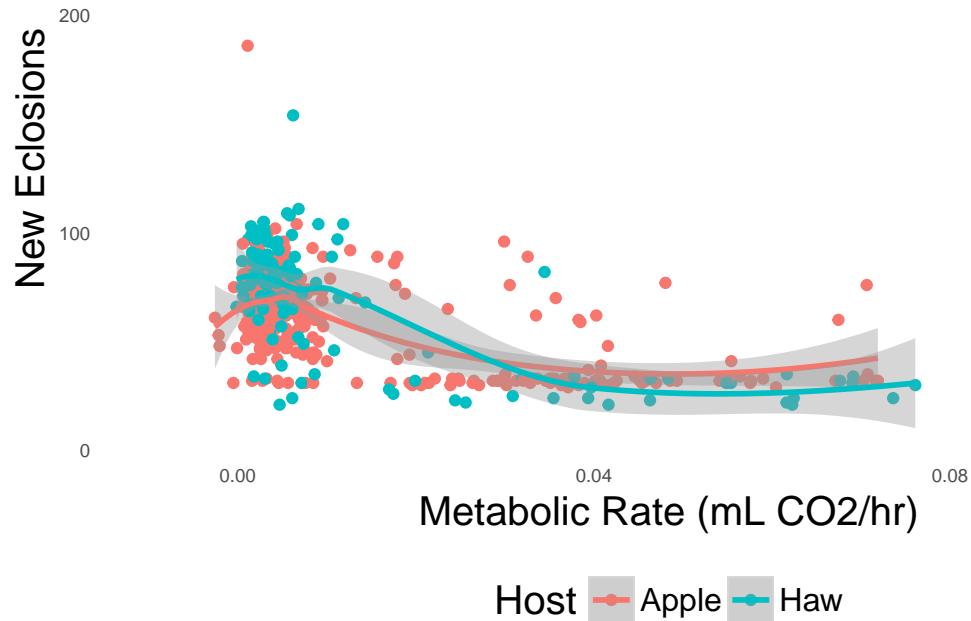
```
#plotting mr15 on the x axis and new eclosions on the y axis; color points by host, fit curve to data
ggplot(data5.15.treatsub,aes(x=MR15.cor, y=neweclosions, colour=Host))+geom_point()+stat_smooth(method=
  axis.ticks.x=element_blank(),legend.position="bottom",
  axis.ticks.y=element_blank(),panel.background = element_blank(),
  panel.grid.major = element_blank(), panel.grid.minor = element_blank(),axis.text=element_text(s
```

```
## Don't know how to automatically pick scale for object of type difftime. Defaulting to continuous.
```

```
## Warning: Removed 607 rows containing non-finite values (stat_smooth).
```

```
## Warning: Removed 607 rows containing missing values (geom_point).
```


Day 15



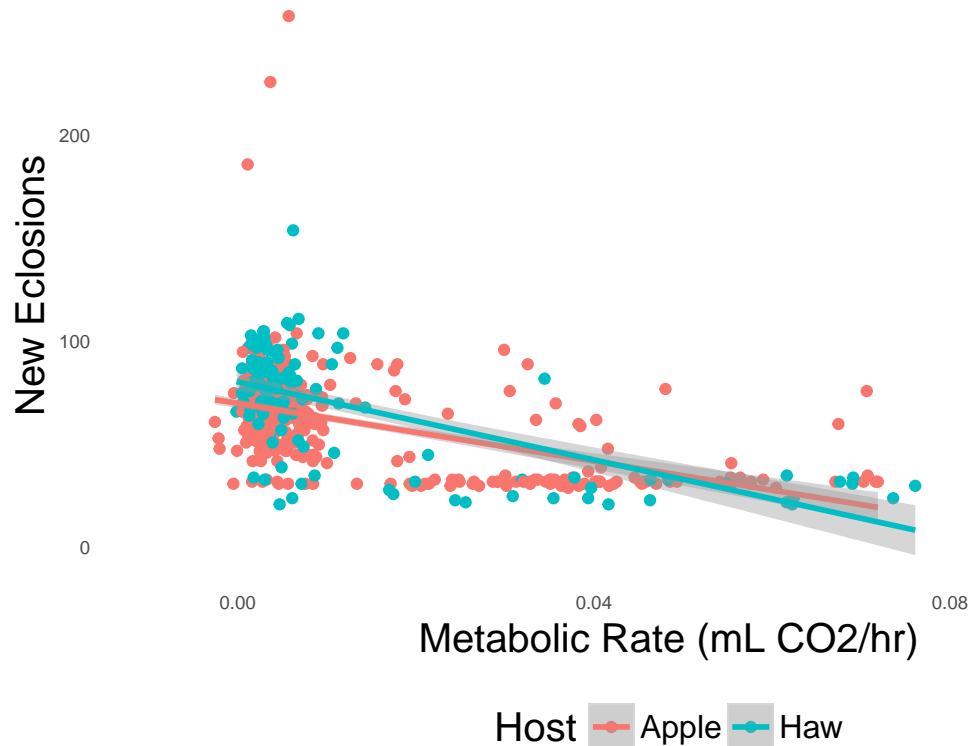
```
#same - fit linear curve to data
ggplot(data5.15.treatsub,aes(x=MR15.cor, y=neweclosions, colour=Host))+geom_point()+stat_smooth(method=
  axis.ticks.x=element_blank(),legend.position="bottom",
  axis.ticks.y=element_blank(),panel.background = element_blank(),
  panel.grid.major = element_blank(), panel.grid.minor = element_blank(),axis.text=element_text(s
```

```
## Don't know how to automatically pick scale for object of type difftime. Defaulting to continuous.
```

```
## Warning: Removed 607 rows containing non-finite values (stat_smooth).
```

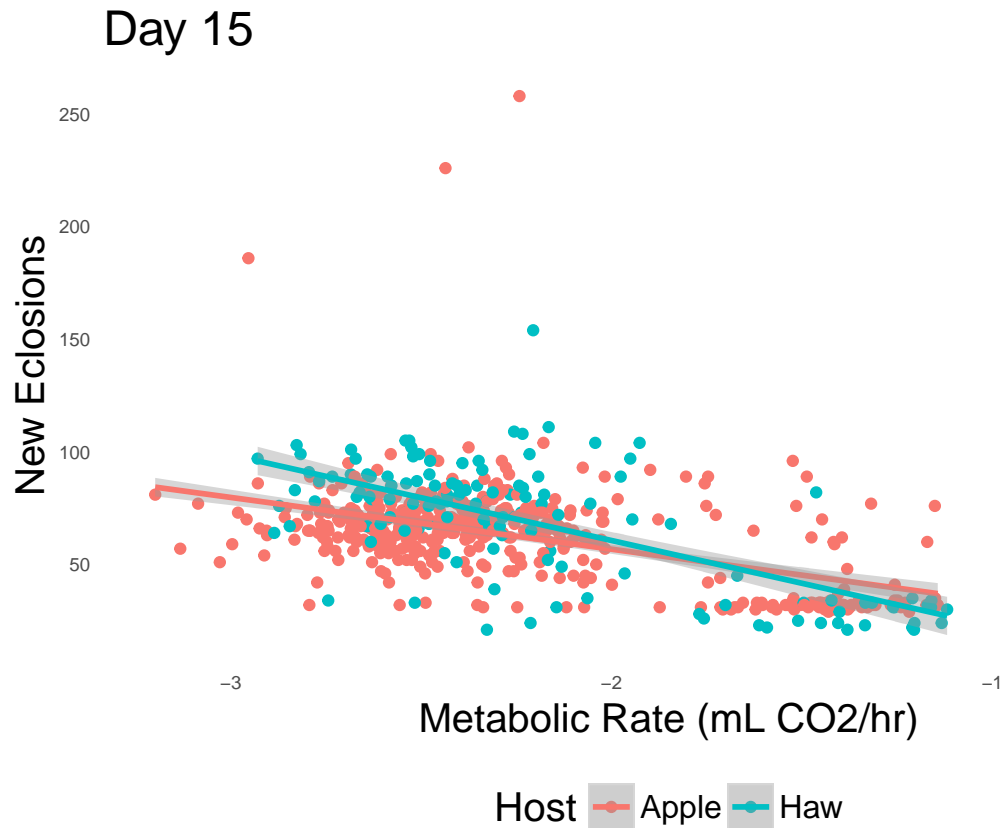
```
## Warning: Removed 607 rows containing missing values (geom_point).
```

Day 15



```
#could log transform mr to make it more linear
ggplot(data5.15.treatsub,aes(x=log10(MR15.cor), y=neweclosions, colour=Host))+geom_point()+stat_smooth(
  axis.ticks.x=element_blank(),legend.position="bottom",
  axis.ticks.y=element_blank(),panel.background = element_blank(),
  panel.grid.major = element_blank(), panel.grid.minor = element_blank(),axis.text=element_text(s
```

```
## Don't know how to automatically pick scale for object of type difftime. Defaulting to continuous.
## Warning in FUN(X[[i]], ...): NaNs produced
## Warning in FUN(X[[i]], ...): NaNs produced
## Warning: Removed 619 rows containing non-finite values (stat_smooth).
## Warning: Removed 619 rows containing missing values (geom_point).
```



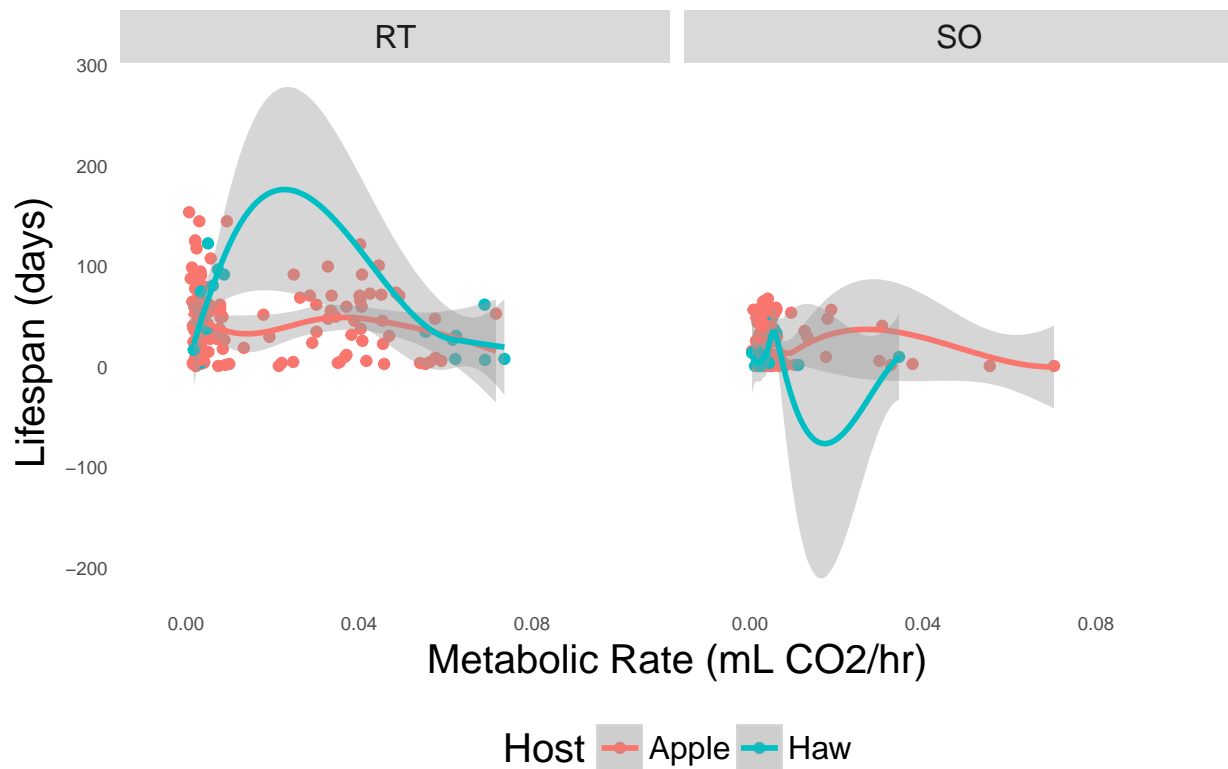
Figures associating MR with lifespan

```
#mr15 w lifespan
data5.15.treatsub$lifespan<-difftime(as.Date(data5.15.treatsub$Adult_death_date, na.rm=TRUE), as.Date(d

ggplot(data5.15.treatsub,aes(x= MR15.cor, y=lifespan, colour=Host))+geom_point()+stat_smooth(method="lo
axis.ticks.x=element_blank(),legend.position="bottom",
axis.ticks.y=element_blank(),panel.background = element_blank(),
panel.grid.major = element_blank(), panel.grid.minor = element_blank(),axis.text=element_text(s

## Don't know how to automatically pick scale for object of type difftime. Defaulting to continuous.
## Warning: Removed 928 rows containing non-finite values (stat_smooth).
## Warning: Removed 928 rows containing missing values (geom_point).
```

Day 15

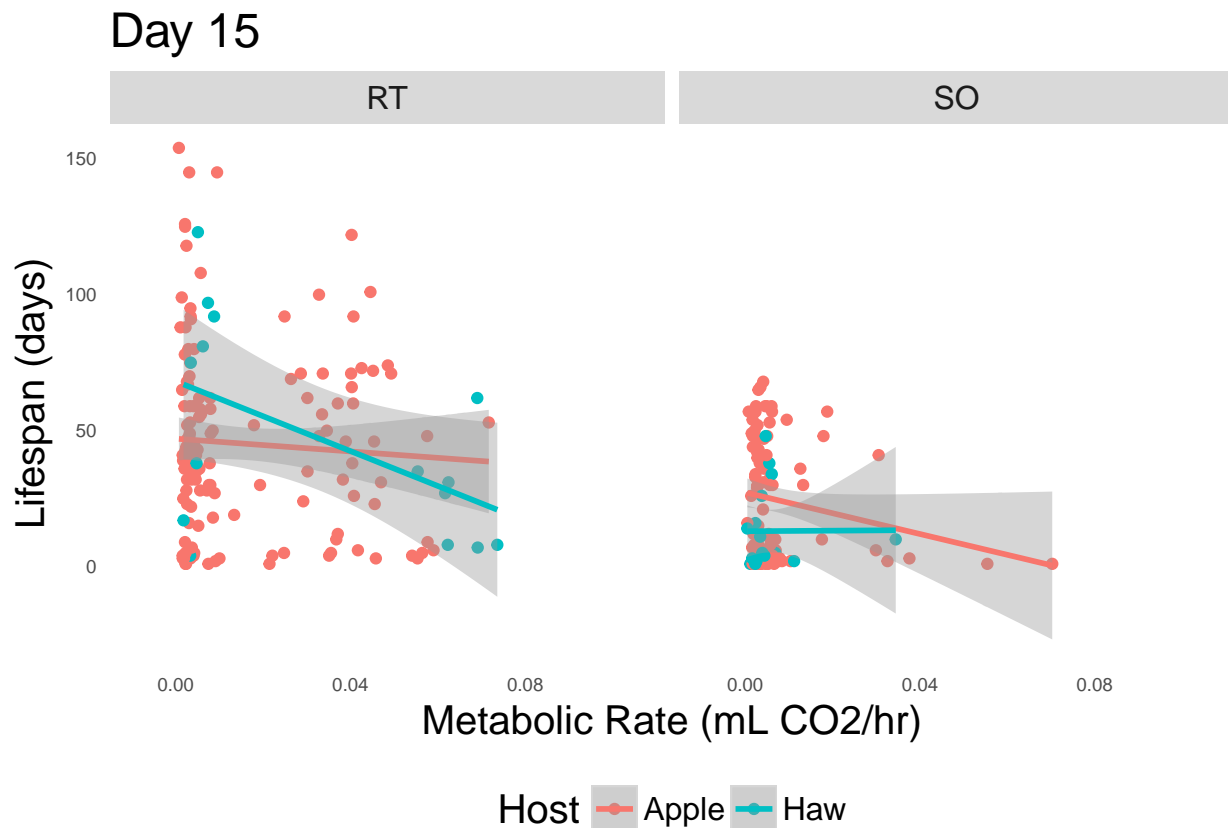


```
ggplot(data5.15.treatsub,aes(x=MR15.cor, y=lifespan, colour=Host))+geom_point()+stat_smooth(method="lm",
axis.ticks.x=element_blank(),legend.position="bottom",
axis.ticks.y=element_blank(),panel.background = element_blank(),
panel.grid.major = element_blank(), panel.grid.minor = element_blank(),axis.text=element_text(s
```

```
## Don't know how to automatically pick scale for object of type difftime. Defaulting to continuous.
```

```
## Warning: Removed 928 rows containing non-finite values (stat_smooth).
```

```
## Warning: Removed 928 rows containing missing values (geom_point).
```



Double Checking Eclosion for Pupal Deaths

```
#Assign names to each column and column bind in order to simplify and find data easily
host <- data[,11]
cd <- data[,10]
wid <- data[,29]
unid<-data[,26]
edate <- data[,27]
dcheck<-cbind(host, cd, wid, unid, edate)
```

Merging pupal death data sheet lifespans

Data available on github

```
pupdeaths<- fread("https://raw.githubusercontent.com/adnguyen/Circadian_rhythm_runs_seasonal_timing/master/pupdeaths.csv")
```

```
#Filter out non-eclosers
data5.na <- data5.15%>%
  mutate(neweclosures=as.numeric(neweclosures))%>%
  #glimpse()
  filter(is.na(neweclosures))
```

```
#Filter out individuals with adult lifespans
data5.ls <- data5.15.treatsub%>%
```

```

filter(!is.na(lifespan))

#Merge the two sets of data (lifespan and non-eclosers) by "Host", "cohort_day", "well_id", and "uniqueID"
mergedat1 <- inner_join(pupdeaths, data5.na, by = c("Host", "cohort_day", "well_id", "uniqueID"))

#column bind the merged data with the lifespan data to check same column dim
cbind(names(data5.ls), names(mergedat1)[-56])

## Warning in cbind(names(data5.ls), names(mergedat1)[-56]): number of rows of
## result is not a multiple of vector length (arg 2)

##      [,1]      [,2]
## [1,] "Ind_ID"   "Host"
## [2,] "tape"     "cohort_day"
## [3,] "Site_name" "well_id"
## [4,] "mass_day10" "uniqueID"
## [5,] "purge_time_1" "lifespan"
## [6,] "purge1"     "Ind_ID"
## [7,] "collection_date" "tape"
## [8,] "day10"      "Site_name"
## [9,] "cohort_date" "mass_day10"
## [10,] "cohort_day" "purge_time_1"
## [11,] "Host"       "purge1"
## [12,] "Li-cor_1"   "collection_date"
## [13,] "resp_time_1" "day10"
## [14,] "resp_day11" "cohort_date"
## [15,] "mass_day14" "Li-cor_1"
## [16,] "purge_time_2" "resp_time_1"
## [17,] "resp_time_2" "resp_day11"
## [18,] "resp_day15" "mass_day14"
## [19,] "Li_cor2"    "purge_time_2"
## [20,] "treatment_day15" "resp_time_2"
## [21,] "exit_fridge_date" "resp_day15"
## [22,] "Eclosion_reference_date" "Li_cor2"
## [23,] "notes"      "treatment_day15"
## [24,] "Resp_code"  "exit_fridge_date"
## [25,] "treatment"  "Eclosion_reference_date"
## [26,] "uniqueID"   "notes"
## [27,] "eclosion_date" "Resp_code"
## [28,] "eclosion_days" "treatment"
## [29,] "well_id"    "eclosion_date"
## [30,] "organism"    "eclosion_days"
## [31,] "Trikinetics_position" "organism"
## [32,] "Trikin_monitor" "Trikinetics_position"
## [33,] "Trikinetics_entry_LD_time" "Trikin_monitor"
## [34,] "Trikinetic_exit_date" "Trikinetics_entry_LD_time"
## [35,] "Trikinetics_exit_LD_time" "Trikinetic_exit_date"
## [36,] "notes_2"      "Trikinetics_exit_LD_time"
## [37,] "Free_run_trik_monitor" "notes_2"
## [38,] "Free_run_trik_position" "Free_run_trik_monitor"
## [39,] "Free_run_entry_date" "Free_run_trik_position"
## [40,] "Free_run_entry_time" "Free_run_entry_date"
## [41,] "Free_run_exit_date" "Free_run_entry_time"
## [42,] "Free_run_exit_time" "Free_run_exit_date"

```

```
## [43,] "notes_3" "Free_run_exit_time"
## [44,] "Adult_death_date" "notes_3"
## [45,] "day10purge" "Adult_death_date"
## [46,] "day15purge" "day10purge"
## [47,] "day15purge.trans" "day15purge"
## [48,] "day15resp" "day15purge.trans"
## [49,] "total_time_day15" "day15resp"
## [50,] "MR15" "total_time_day15"
## [51,] "msMR15" "MR15"
## [52,] "mean.blank2" "msMR15"
## [53,] "MR15.cor" "mean.blank2"
## [54,] "msMR15.cor" "MR15.cor"
## [55,] "neweclosures" "msMR15.cor"
## [56,] "lifespan" "Host"

#once the column dimensions are the same, merge the two sets of data
mergedata<- merge(data5.ls, mergedat1)

#Finally, row bind the data with the desired conditions
finalmerge<- rbind(data5.ls[,c("Host", "cohort_day", "well_id", "uniqueID", "lifespan", "MR15.cor", "msMR15.cor", "lifespan", "mass_day14")], mergedata)

glimpse(finalmerge)

## Observations: 310
## Variables: 9
## $ Host <chr> "Apple", "Apple", "Apple", "Apple", "Apple", "Apple..."
## $ cohort_day <int> 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, ...
## $ well_id <chr> "A1", "A1", "A2", "A3", "A3", "A4", "A5", "A6", "A6..."
## $ uniqueID <chr> "2b1", "2b3", "2b5", "2b7", "2b8", "2b9", "2b13", "...
## $ lifespan <time> 1 days, 41 days, 5 days, 4 days, 9 days, 29 days, ...
## $ MR15.cor <dbl> 0.005270930, 0.003812060, 0.004240981, 0.005942468,...
## $ msMR15.cor <dbl> 3.789629e-04, 1.511443e-04, 8.170260e-04, 5.697959e...
## $ treatment <chr> "S0", "RT", "RT", "S0", "RT", "S0", "S0", "S0", "RT..."
## $ mass_day14 <dbl> 6.187, 6.118, 3.479, 5.738, 8.401, 7.323, 8.921, 4....
```

Negative binomial regression reanalyzed with pupal death data

```
RT15.n <- finalmerge%>%
  filter(treatment=="RT")

S015.n <- finalmerge%>%
  filter(treatment=="S0")

#RT summary (no stat significance)
RT15.n$lifespan <- as.numeric(RT15.n$lifespan)
mod3.n<- glm.nb(lifespan~MR15.cor*Host, data=RT15.n)
summary(mod3.n)

##
## Call:
## glm.nb(formula = lifespan ~ MR15.cor * Host, data = RT15.n, init.theta = 0.4064870624,
## link = log)
##
```

```
## Deviance Residuals:
##      Min       1Q   Median       3Q      Max
## -1.9351  -1.3934  -0.1234   0.3376   1.2813
##
## Coefficients:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept)      3.5189     0.1575  22.345 <2e-16 ***
## MR15.cor          3.6204     7.0097   0.516   0.606
## HostHaw          -0.1046     0.4437  -0.236   0.814
## MR15.cor:HostHaw -7.0638    13.6632  -0.517   0.605
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for Negative Binomial(0.4065) family taken to be 1)
##
##      Null deviance: 231.07  on 195  degrees of freedom
## Residual deviance: 230.28  on 192  degrees of freedom
## AIC: 1705
##
## Number of Fisher Scoring iterations: 1
##
##
##              Theta:  0.4065
##              Std. Err.: 0.0419
##
##      2 x log-likelihood:  -1694.9600
```

```
#summary : HostHaw (in reference to apple) - as lifespan increases, the MR decreases by the estimate (l
#Coefficient describes relationship, i.e. for mod4SO, higher mass=higher life span according to this mo
#mod4 shows interaction b/w host and mr
mod4.nRT<-glm.nb(lifespan~MR15.cor*Host + mass_day14, data=RT15.n)
summary(mod4.nRT)
```

```
##
## Call:
## glm.nb(formula = lifespan ~ MR15.cor * Host + mass_day14, data = RT15.n,
##       init.theta = 0.4249870689, link = log)
##
## Deviance Residuals:
##      Min       1Q   Median       3Q      Max
## -2.0723  -1.3914  -0.2088   0.3326   1.4933
##
## Coefficients:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept)      2.1633     0.3769   5.740 9.49e-09 ***
## MR15.cor          1.4843     7.0176   0.212 0.832488
## HostHaw          -0.4048     0.4368  -0.927 0.353964
## mass_day14         0.2047     0.0553   3.702 0.000214 ***
## MR15.cor:HostHaw -3.2856    13.4285  -0.245 0.806711
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for Negative Binomial(0.425) family taken to be 1)
##
##      Null deviance: 239.80  on 195  degrees of freedom
```



```

## Residual deviance: 230.27 on 191 degrees of freedom
## AIC: 1698.5
##
## Number of Fisher Scoring iterations: 1
##
##
##          Theta: 0.4250
##        Std. Err.: 0.0442
##
## 2 x log-likelihood: -1686.4600
S015.n$lifespan <- as.numeric(S015.n$lifespan)
mod4.nS0<-glm.nb(lifespan~MR15.cor*Host + mass_day14, data=S015.n)
summary(mod4.nS0)

##
## Call:
## glm.nb(formula = lifespan ~ MR15.cor * Host + mass_day14, data = S015.n,
##        init.theta = 0.8729265479, link = log)
##
## Deviance Residuals:
##      Min       1Q   Median       3Q      Max
## -2.2740  -1.2062  -0.2847   0.5513   1.6254
##
## Coefficients:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept)    2.55542    0.42475   6.016 1.78e-09 ***
## MR15.cor       -30.63664    11.28046  -2.716 0.00661 **
## HostHaw        -1.13706     0.37668  -3.019 0.00254 **
## mass_day14       0.11472     0.05573   2.058 0.03956 *
## MR15.cor:HostHaw 33.18788    37.14903   0.893 0.37166
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for Negative Binomial(0.8729) family taken to be 1)
##
##      Null deviance: 139.26 on 111 degrees of freedom
## Residual deviance: 126.36 on 107 degrees of freedom
## (1 observation deleted due to missingness)
## AIC: 923.59
##
## Number of Fisher Scoring iterations: 1
##
##
##          Theta: 0.873
##        Std. Err.: 0.112
##
## 2 x log-likelihood: -911.594
figmod4.nS0<-glm.nb(lifespan~MR15.cor*Host, data=S015.n)
summary(figmod4.nS0)

##
## Call:
## glm.nb(formula = lifespan ~ MR15.cor * Host, data = S015.n, init.theta = 0.8485587795,

```

```

##      link = log)
##
## Deviance Residuals:
##      Min        1Q      Median        3Q        Max
## -2.3936  -1.2487  -0.4853   0.5522   1.5282
##
## Coefficients:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept)      3.3912     0.1375  24.659 < 2e-16 ***
## MR15.cor        -32.9921    11.4113  -2.891  0.00384 **
## HostHaw         -0.8280     0.3668  -2.257  0.02400 *
## MR15.cor:HostHaw  34.0782    37.5036   0.909  0.36353
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for Negative Binomial(0.8486) family taken to be 1)
##
##      Null deviance: 135.74  on 111  degrees of freedom
## Residual deviance: 126.80  on 108  degrees of freedom
##      (1 observation deleted due to missingness)
## AIC: 925.26
##
## Number of Fisher Scoring iterations: 1
##
##
##              Theta:  0.849
##              Std. Err.:  0.108
##
##      2 x log-likelihood:  -915.265
figmod4.nRT<-glm.nb(lifespan~MR15.cor*Host, data=RT15.n)
summary(figmod4.nRT)

##
## Call:
## glm.nb(formula = lifespan ~ MR15.cor * Host, data = RT15.n, init.theta = 0.4064870624,
##      link = log)
##
## Deviance Residuals:
##      Min        1Q      Median        3Q        Max
## -1.9351  -1.3934  -0.1234   0.3376   1.2813
##
## Coefficients:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept)      3.5189     0.1575  22.345 <2e-16 ***
## MR15.cor         3.6204     7.0097   0.516  0.606
## HostHaw        -0.1046     0.4437  -0.236  0.814
## MR15.cor:HostHaw -7.0638    13.6632  -0.517  0.605
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for Negative Binomial(0.4065) family taken to be 1)
##
##      Null deviance: 231.07  on 195  degrees of freedom
## Residual deviance: 230.28  on 192  degrees of freedom

```

```
## AIC: 1705
##
## Number of Fisher Scoring iterations: 1
##
##
##           Theta: 0.4065
##           Std. Err.: 0.0419
##
## 2 x log-likelihood: -1694.9600
```

```
#mod4.1 shows interaction b/w host and msmr
mod4.1.nS0<-glm.nb(lifespan~msMR15.cor*Host, data=S015.n)
summary(mod4.1.nS0)
```

```
##
## Call:
## glm.nb(formula = lifespan ~ msMR15.cor * Host, data = S015.n,
##         init.theta = 0.848594471, link = log)
##
## Deviance Residuals:
##      Min       1Q   Median       3Q      Max
## -2.3703  -1.2461  -0.3624   0.6299   1.5013
##
## Coefficients:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept)      3.2505     0.1172  27.734 < 2e-16 ***
## msMR15.cor      -182.2773    62.8655  -2.899  0.00374 **
## HostHaw         -0.6846     0.2971  -2.304  0.02123 *
## msMR15.cor:HostHaw 224.5755   356.0600   0.631  0.52822
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for Negative Binomial(0.8486) family taken to be 1)
##
##      Null deviance: 135.75  on 111  degrees of freedom
## Residual deviance: 126.85  on 108  degrees of freedom
## (1 observation deleted due to missingness)
## AIC: 925.31
##
## Number of Fisher Scoring iterations: 1
##
##
##           Theta: 0.849
##           Std. Err.: 0.108
##
## 2 x log-likelihood: -915.308
```

```
mod4.1.nRT<-glm.nb(lifespan~msMR15.cor*Host, data=RT15.n)
summary(mod4.1.nRT)
```

```
##
## Call:
## glm.nb(formula = lifespan ~ msMR15.cor * Host, data = RT15.n,
##         init.theta = 0.4071281808, link = log)
##
```

```
## Deviance Residuals:
##      Min       1Q   Median       3Q      Max
## -1.9507  -1.3966  -0.1284   0.3380   1.2736
##
## Coefficients:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept)      3.53929    0.13867  25.524  <2e-16 ***
## msMR15.cor       21.20632    44.94809   0.472   0.637
## HostHaw         -0.08528    0.39366  -0.217   0.828
## msMR15.cor:HostHaw -67.07964    78.15514  -0.858   0.391
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for Negative Binomial(0.4071) family taken to be 1)
##
##      Null deviance: 231.38  on 195  degrees of freedom
## Residual deviance: 230.28  on 192  degrees of freedom
## AIC: 1704.7
##
## Number of Fisher Scoring iterations: 1
##
##              Theta:  0.4071
##              Std. Err.:  0.0420
##
## 2 x log-likelihood:  -1694.6580
```

```
#Likelihood ratio tests of Negative Binomial Models
```

```
m1.nRT <- update(mod4.nRT, . ~ . - prog)
anova(mod4.nRT, m1.nRT)
```

```
## Likelihood ratio tests of Negative Binomial Models
```

```
##
## Response: lifespan
##              Model      theta Resid. df
## 1              MR15.cor * Host + mass_day14 0.4249871      191
## 2 MR15.cor + Host + mass_day14 + MR15.cor:Host 0.4249871      191
##      2 x log-lik.  Test      df      LR stat. Pr(Chi)
## 1              -1686.46
## 2              -1686.46 1 vs 2      0 -3.760033e-08      1
```

```
#Checking model assumption -- is negative binomial regression (NBR) a good model for this data?
```

```
##Values close to 0 (estimates the dispersion parameter) strongly suggest the NBR model is more appropriate
```

```
mod5.n <- glm(lifespan ~ Host*MR15.cor, family = "poisson", data = S015.n)
pchisq(2 * (logLik(mod4.nRT) - logLik(mod5.n)), df = 1, lower.tail = FALSE)
```

```
## 'log Lik.' 6.470061e-238 (df=6)
```

```
mod5.n <- glm(lifespan ~ Host*MR15.cor, family = "poisson", data = S015.n)
pchisq(2 * (logLik(mod4.nS0) - logLik(mod5.n)), df = 1, lower.tail = FALSE)
```

```
## 'log Lik.' 0 (df=6)
```

```
#output below indicates that Hawthorne is 0.432 times less likely to live than apple
#confidence interval
```

```
(est <- cbind(Estimate = coef(mod4.nRT), confint(mod4.nRT)))
```

```
## Waiting for profiling to be done...
```

```
##           Estimate      2.5 %      97.5 %  
## (Intercept)  2.1633428  1.2237554  3.1119932  
## MR15.cor     1.4842992 -11.7040163  15.8181228  
## HostHaw     -0.4048505  -1.2336952  0.5650535  
## mass_day14   0.2047244   0.0676875  0.3465155  
## MR15.cor:HostHaw -3.2855872 -29.3106300  25.7786008
```

```
#incident rate ratio - lifespan ratio  
exp(est)
```

```
##           Estimate      2.5 %      97.5 %  
## (Intercept)  8.70017236 3.399932e+00 2.246578e+01  
## MR15.cor     4.41187261 8.260576e-06 7.408384e+06  
## HostHaw      0.66707656 2.912145e-01 1.759542e+00  
## mass_day14   1.22718686 1.070031e+00 1.414131e+00  
## MR15.cor:HostHaw 0.03741861 1.864469e-13 1.568571e+11
```

```
#Filter out all the NAs in order to have same dimensions for predvalues
```

```
filS015.ms<- S015.n%>%  
  filter(msMR15.cor!= "NA"&lifespan !="NA")
```

```
filRT15.ms<- RT15.n%>%  
  filter(msMR15.cor!= "NA"&lifespan !="NA")
```

```
#Calculate the predicted values for msMR15
```

```
filS015.ms$predvalues <- predict(mod4.1.nS0, type = "response")
```

```
filRT15.ms$predvalues <- predict(mod4.1.nRT, type = "response")
```

```
#Filter out all the NAs in order to have same dimensions for predvalues
```

```
filS015.ms<- S015.n%>%  
  filter(msMR15.cor!= "NA"&lifespan !="NA")
```

```
filRT15.ms<- RT15.n%>%  
  filter(msMR15.cor!= "NA"&lifespan !="NA")
```

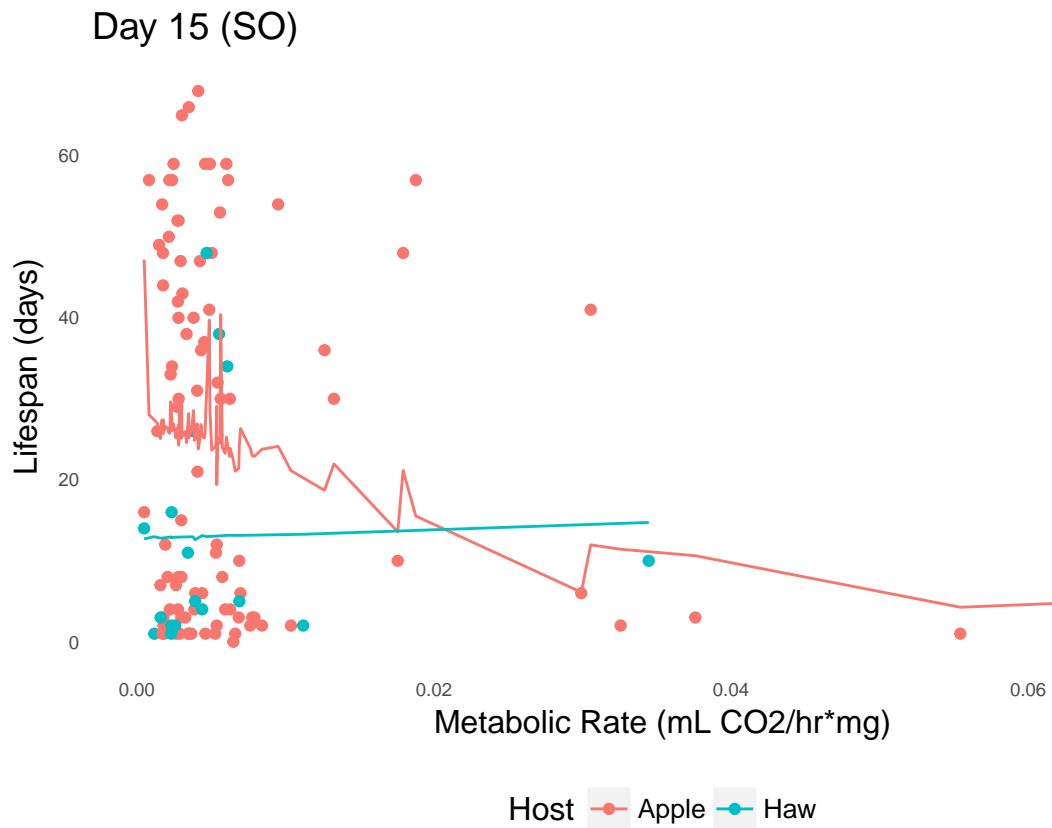
```
#Calculate the predicted values
```

```
filS015.ms$predvalues <- predict(mod4.1.nS0, type = "response")
```

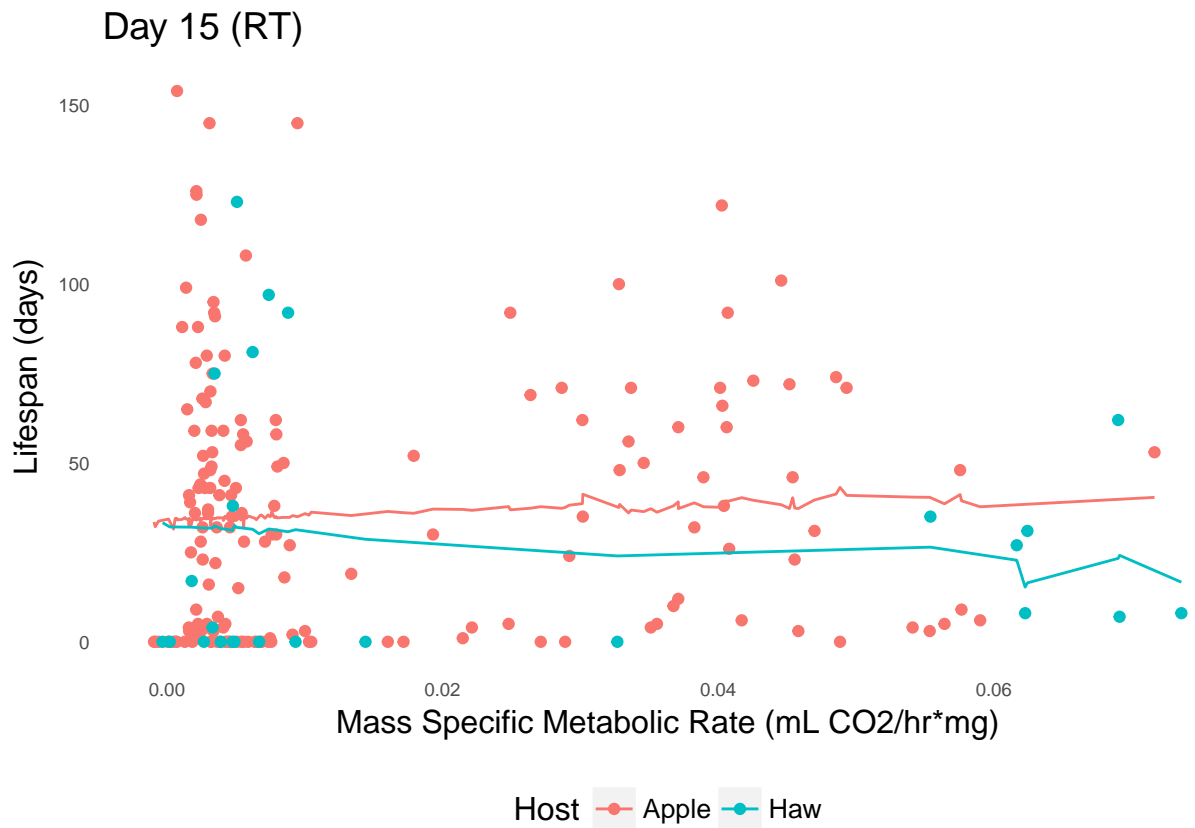
```
filRT15.ms$predvalues <- predict(mod4.1.nRT, type = "response")
```

```
#overlay of real data(points) with predicted values(line) for MR
```

```
ggplot(filS015.ms,aes(x=MR15.cor, y=lifespan, colour=Host))+geom_point()+geom_line(data=filS015.ms, aes  
  axis.ticks.x=element_blank(),legend.position="bottom",  
  axis.ticks.y=element_blank(),panel.background = element_blank(),  
  panel.grid.major = element_blank(), panel.grid.minor = element_blank(),axis.text=element_text(s
```

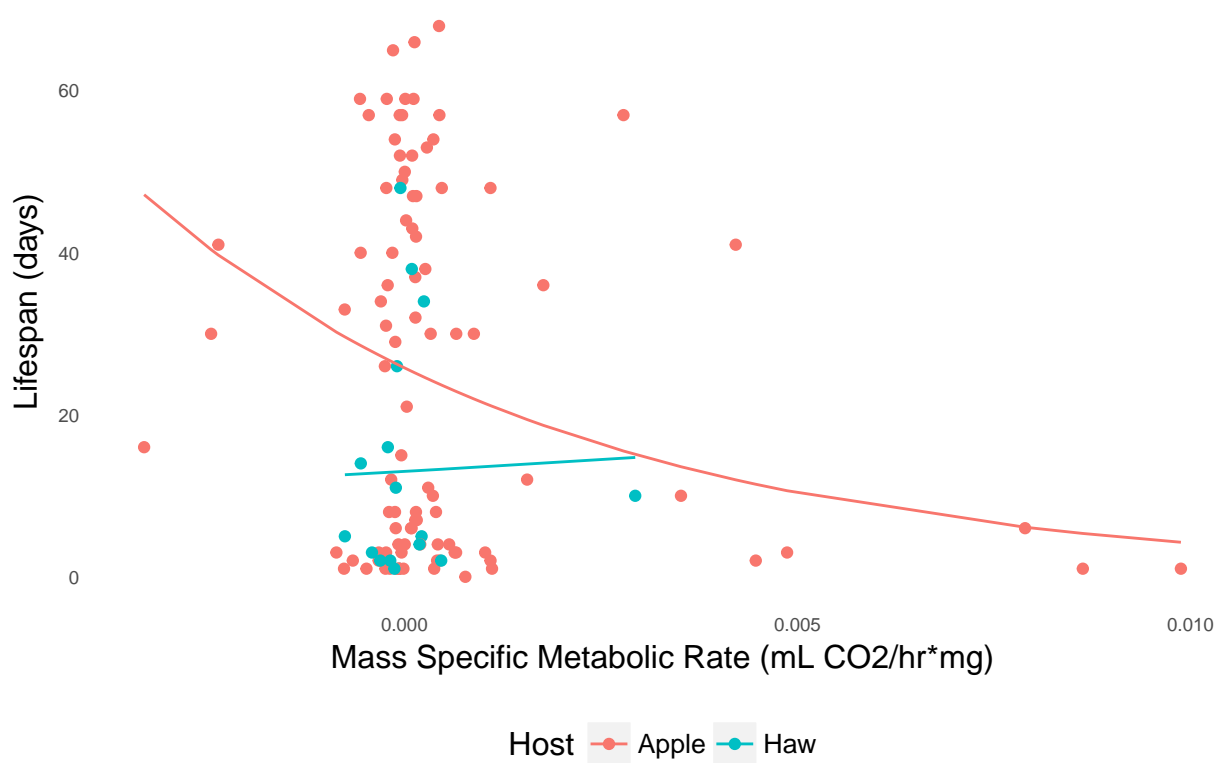


```
ggplot(filRT15.ms,aes(x=MR15.cor, y=lifespan, colour=Host))+geom_point()+geom_line(data=filRT15.ms, aes
axis.ticks.x=element_blank(),legend.position="bottom",
axis.ticks.y=element_blank(),panel.background = element_blank(),
panel.grid.major = element_blank(), panel.grid.minor = element_blank(),axis.text=element_text(s
```



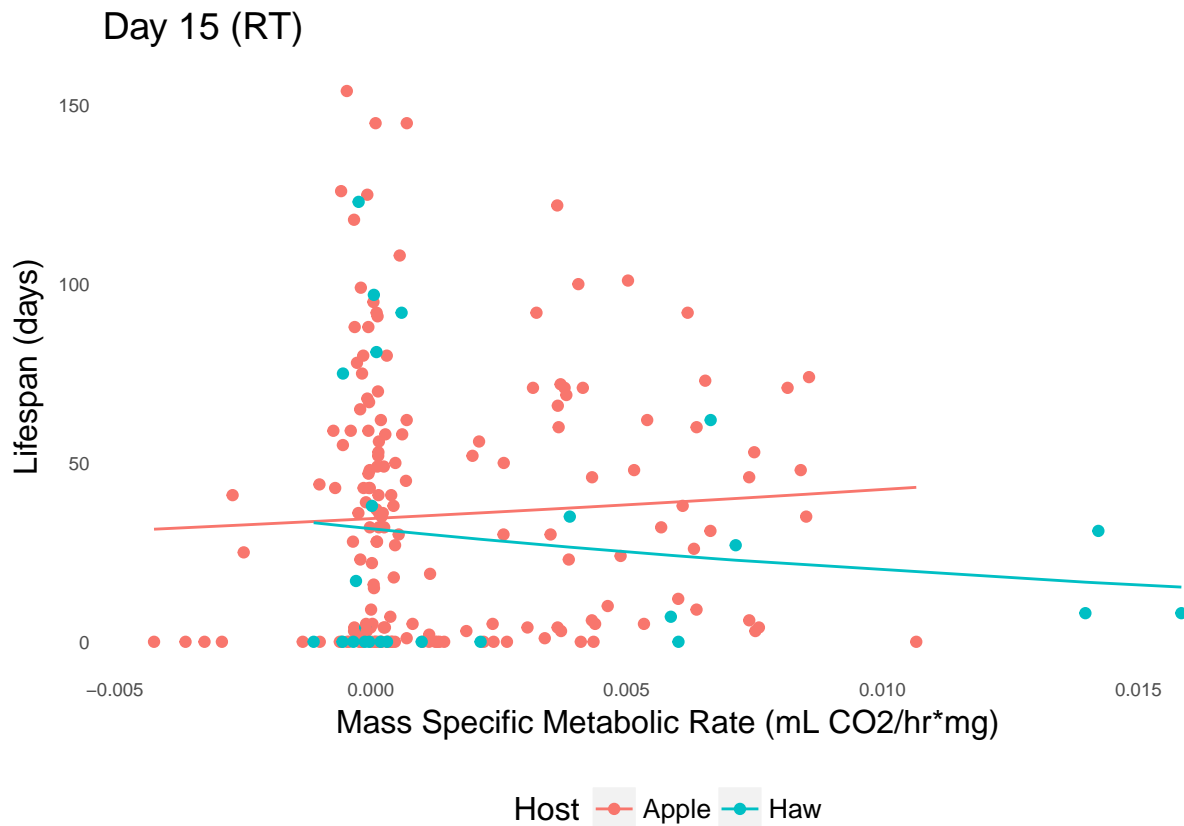
```
#overlay of real data(points) with predicted values(line) for msMR
ggplot(filS015.ms,aes(x=msMR15.cor, y=lifespan, colour=Host))+geom_point()+geom_line(data=filS015.ms, a
axis.ticks.x=element_blank(),legend.position="bottom",
axis.ticks.y=element_blank(),panel.background = element_blank(),
panel.grid.major = element_blank(), panel.grid.minor = element_blank(),axis.text=element_text(s
```

Day 15 (SO)



```
ggplot(filRT15.ms,aes(x=msMR15.cor, y=lifespan, colour=Host))+geom_point()+geom_line(data=filRT15.ms, aes(x=msMR15.cor, y=lifespan, colour=Host))
axis.ticks.x=element_blank(),legend.position="bottom",
axis.ticks.y=element_blank(),panel.background = element_blank(),
panel.grid.major = element_blank(), panel.grid.minor = element_blank(),axis.text=element_text(size=12),

```

Kaplan-Meier Survival Estimate

```
#install.packages(c("survival", "survminer"))
#install.packages(c("ggpubr", "magrittr"))
#Assign censored data and create new column
finalmerge$status[finalmerge$lifespan >= 0] <- 1

## Warning: Unknown or uninitialised column: 'status'.

fmerge <- finalmerge %>%
  filter(treatment != "")
fmergeRT <- finalmerge %>%
  filter(treatment == "RT")
fmergeSO <- finalmerge %>%
  filter(treatment == "SO")

#Normalize data
#install.packages("BBmisc")
n.finalmerge<-normalize(finalmerge [], method = "standardize", range = c(0, 1), margin = 1L, on.constant = 1)

#compute kaplan-Meier survival estimate-so compute the survival probability by host & treatment:
#fit1 computes survival probability by Host only
#fit2 computes survival probability by Treatment only
#fit3 computes survival probability by Host + Treatment

fit1 <- survfit(Surv(lifespan, status) ~ Host, data = finalmerge)
```

```

print(fit1)

## Call: survfit(formula = Surv(lifespan, status) ~ Host, data = finalmerge)
##
##               n events median 0.95LCL 0.95UCL
## Host=Apple 266    266     28      15     33
## Host=Haw   44     44      6       3     17

fit2 <- survfit(Surv(lifespan, status) ~ treatment, data = finalmerge)
print(fit2)

## Call: survfit(formula = Surv(lifespan, status) ~ treatment, data = finalmerge)
##
##               n events median 0.95LCL 0.95UCL
## treatment=    1         1      0      NA      NA
## treatment=RT 196    196     28      17     36
## treatment=SO 113    113     11       7     30

fit3 <- survfit(Surv(lifespan, status) ~ Host + treatment, data = finalmerge)
print(fit3)

## Call: survfit(formula = Surv(lifespan, status) ~ Host + treatment,
##               data = finalmerge)
##
##               n events median 0.95LCL 0.95UCL
## Host=Apple, treatment=RT 171    171     30     22     39
## Host=Apple, treatment=SO  95     95     15      8     33
## Host=Haw, treatment=    1         1      0      NA      NA
## Host=Haw, treatment=RT  25     25      8      0     38
## Host=Haw, treatment=SO  18     18      5      3     26

# Summary of survival curves
summary(fit1)

## Call: survfit(formula = Surv(lifespan, status) ~ Host, data = finalmerge)
##
##               Host=Apple
## time n.risk n.event survival std.err lower 95% CI upper 95% CI
##    0    266     37  0.86090 0.02122    0.820305    0.9035
##    1    229     16  0.80075 0.02449    0.754161    0.8502
##    2    213      7  0.77444 0.02563    0.725803    0.8263
##    3    206     15  0.71805 0.02759    0.665959    0.7742
##    4    191     13  0.66917 0.02885    0.614953    0.7282
##    5    178      6  0.64662 0.02931    0.591649    0.7067
##    6    172      6  0.62406 0.02970    0.568485    0.6851
##    7    166      3  0.61278 0.02987    0.556953    0.6742
##    8    163      4  0.59774 0.03007    0.541629    0.6597
##    9    159      2  0.59023 0.03015    0.533988    0.6524
##   10    157      3  0.57895 0.03027    0.522554    0.6414
##   11    154      1  0.57519 0.03031    0.518749    0.6378
##   12    153      3  0.56391 0.03041    0.507357    0.6268
##   15    150      2  0.55639 0.03046    0.499779    0.6194
##   16    148      2  0.54887 0.03051    0.492216    0.6121
##   18    146      1  0.54511 0.03053    0.488439    0.6084
##   19    145      1  0.54135 0.03055    0.484666    0.6047
##   21    144      1  0.53759 0.03057    0.480896    0.6010

```

##	22	143	1	0.53383	0.03059	0.477129	0.5973
##	23	142	2	0.52632	0.03061	0.469607	0.5899
##	24	140	1	0.52256	0.03063	0.465850	0.5862
##	25	139	1	0.51880	0.03064	0.462097	0.5825
##	26	138	2	0.51128	0.03065	0.454602	0.5750
##	27	136	1	0.50752	0.03065	0.450859	0.5713
##	28	135	3	0.49624	0.03066	0.439651	0.5601
##	29	132	1	0.49248	0.03065	0.435922	0.5564
##	30	131	7	0.46617	0.03059	0.409911	0.5301
##	31	124	2	0.45865	0.03055	0.402510	0.5226
##	32	122	5	0.43985	0.03043	0.384067	0.5037
##	33	117	1	0.43609	0.03041	0.380389	0.4999
##	34	116	1	0.43233	0.03037	0.376714	0.4962
##	35	115	2	0.42481	0.03031	0.369375	0.4886
##	36	113	5	0.40602	0.03011	0.351088	0.4695
##	37	108	2	0.39850	0.03002	0.343798	0.4619
##	38	106	3	0.38722	0.02987	0.332890	0.4504
##	39	103	1	0.38346	0.02981	0.329261	0.4466
##	40	102	2	0.37594	0.02970	0.322015	0.4389
##	41	100	5	0.35714	0.02938	0.303963	0.4196
##	42	95	1	0.35338	0.02931	0.300364	0.4158
##	43	94	5	0.33459	0.02893	0.282428	0.3964
##	44	89	2	0.32707	0.02876	0.275281	0.3886
##	45	87	1	0.32331	0.02868	0.271714	0.3847
##	46	86	2	0.31579	0.02850	0.264591	0.3769
##	47	84	3	0.30451	0.02822	0.253939	0.3652
##	48	81	6	0.28195	0.02759	0.232752	0.3416
##	49	75	3	0.27068	0.02724	0.222219	0.3297
##	50	72	3	0.25940	0.02687	0.211729	0.3178
##	52	69	4	0.24436	0.02635	0.197813	0.3019
##	53	65	3	0.23308	0.02592	0.187431	0.2899
##	54	62	2	0.22556	0.02563	0.180536	0.2818
##	55	60	1	0.22180	0.02547	0.177098	0.2778
##	56	59	2	0.21429	0.02516	0.170238	0.2697
##	57	57	5	0.19549	0.02432	0.153195	0.2495
##	58	52	2	0.18797	0.02395	0.146424	0.2413
##	59	50	7	0.16165	0.02257	0.122952	0.2125
##	60	43	2	0.15414	0.02214	0.116316	0.2043
##	62	41	3	0.14286	0.02146	0.106429	0.1918
##	65	38	2	0.13534	0.02097	0.099886	0.1834
##	66	36	2	0.12782	0.02047	0.093383	0.1750
##	67	34	1	0.12406	0.02021	0.090147	0.1707
##	68	33	2	0.11654	0.01967	0.083711	0.1622
##	69	31	1	0.11278	0.01940	0.080511	0.1580
##	70	30	1	0.10902	0.01911	0.077324	0.1537
##	71	29	4	0.09398	0.01789	0.064717	0.1365
##	72	25	1	0.09023	0.01757	0.061603	0.1321
##	73	24	1	0.08647	0.01723	0.058507	0.1278
##	74	23	1	0.08271	0.01689	0.055428	0.1234
##	75	22	1	0.07895	0.01653	0.052369	0.1190
##	78	21	1	0.07519	0.01617	0.049330	0.1146
##	80	20	2	0.06767	0.01540	0.043318	0.1057
##	88	18	2	0.06015	0.01458	0.037406	0.0967
##	91	16	1	0.05639	0.01414	0.034492	0.0922

```
##      92      15      3  0.04511 0.01273      0.025953      0.0784
##      95      12      1  0.04135 0.01221      0.023186      0.0738
##      99      11      1  0.03759 0.01166      0.020467      0.0691
##     100      10      1  0.03383 0.01109      0.017802      0.0643
##     101       9      1  0.03008 0.01047      0.015199      0.0595
##     108       8      1  0.02632 0.00981      0.012669      0.0547
##     118       7      1  0.02256 0.00910      0.010226      0.0498
##     122       6      1  0.01880 0.00833      0.007889      0.0448
##     125       5      1  0.01504 0.00746      0.005686      0.0398
##     126       4      1  0.01128 0.00647      0.003661      0.0347
##     145       3      2  0.00376 0.00375      0.000532      0.0266
##     154       1      1  0.00000      NaN              NA              NA
```

```
##
##                               Host=Haw
## time n.risk n.event survival std.err lower 95% CI upper 95% CI
##      0      44      11  0.7500  0.0653      0.63237      0.890
##      1      33       2  0.7045  0.0688      0.58185      0.853
##      2      31       3  0.6364  0.0725      0.50898      0.796
##      3      28       1  0.6136  0.0734      0.48539      0.776
##      4      27       3  0.5455  0.0751      0.41650      0.714
##      5      24       2  0.5000  0.0754      0.37209      0.672
##      7      22       1  0.4773  0.0753      0.35033      0.650
##      8      21       2  0.4318  0.0747      0.30768      0.606
##     10      19       1  0.4091  0.0741      0.28681      0.584
##     11      18       1  0.3864  0.0734      0.26624      0.561
##     14      17       1  0.3636  0.0725      0.24599      0.538
##     16      16       1  0.3409  0.0715      0.22605      0.514
##     17      15       1  0.3182  0.0702      0.20646      0.490
##     26      14       1  0.2955  0.0688      0.18721      0.466
##     27      13       1  0.2727  0.0671      0.16834      0.442
##     31      12       1  0.2500  0.0653      0.14986      0.417
##     34      11       1  0.2273  0.0632      0.13180      0.392
##     35      10       1  0.2045  0.0608      0.11422      0.366
##     38       9       2  0.1591  0.0551      0.08065      0.314
##     48       7       1  0.1364  0.0517      0.06483      0.287
##     62       6       1  0.1136  0.0478      0.04979      0.259
##     75       5       1  0.0909  0.0433      0.03571      0.231
##     81       4       1  0.0682  0.0380      0.02287      0.203
##     92       3       1  0.0455  0.0314      0.01174      0.176
##     97       2       1  0.0227  0.0225      0.00327      0.158
##    123       1       1  0.0000      NaN              NA              NA
```

```
summary(fit2)
```

```
## Call: survfit(formula = Surv(lifespan, status) ~ treatment, data = finalmerge)
```

```
##
##               treatment=
##      time      n.risk      n.event      survival      std.err
##      0          1          1          0          NaN
## lower 95% CI upper 95% CI
##      NA          NA
##
##               treatment=RT
##      time n.risk n.event survival std.err lower 95% CI upper 95% CI
##      0     196     46  0.7653 0.03027      0.708216      0.8270
```

##	1	150	4	0.7449	0.03114	0.686303	0.8085
##	2	146	1	0.7398	0.03134	0.680853	0.8038
##	3	145	7	0.7041	0.03260	0.642993	0.7710
##	4	138	9	0.6582	0.03388	0.594999	0.7280
##	5	129	6	0.6276	0.03453	0.563390	0.6990
##	6	123	2	0.6173	0.03472	0.552919	0.6893
##	7	121	2	0.6071	0.03488	0.542479	0.6795
##	8	119	2	0.5969	0.03504	0.532071	0.6697
##	9	117	2	0.5867	0.03517	0.521693	0.6599
##	10	115	1	0.5816	0.03524	0.516515	0.6550
##	12	114	1	0.5765	0.03529	0.511345	0.6500
##	15	113	1	0.5714	0.03535	0.506183	0.6451
##	16	112	1	0.5663	0.03540	0.501028	0.6401
##	17	111	1	0.5612	0.03545	0.495880	0.6352
##	18	110	1	0.5561	0.03549	0.490740	0.6302
##	19	109	1	0.5510	0.03553	0.485607	0.6252
##	22	108	1	0.5459	0.03556	0.480482	0.6203
##	23	107	2	0.5357	0.03562	0.470253	0.6103
##	24	105	1	0.5306	0.03565	0.465149	0.6053
##	25	104	1	0.5255	0.03567	0.460053	0.6003
##	26	103	1	0.5204	0.03568	0.454964	0.5953
##	27	102	2	0.5102	0.03571	0.444808	0.5852
##	28	100	3	0.4949	0.03571	0.429627	0.5701
##	30	97	3	0.4796	0.03568	0.414512	0.5549
##	31	94	2	0.4694	0.03565	0.404471	0.5447
##	32	92	4	0.4490	0.03553	0.384477	0.5243
##	35	88	3	0.4337	0.03540	0.369559	0.5089
##	36	85	3	0.4184	0.03524	0.354707	0.4935
##	37	82	1	0.4133	0.03517	0.349771	0.4883
##	38	81	3	0.3980	0.03496	0.335009	0.4727
##	39	78	1	0.3929	0.03488	0.330104	0.4675
##	41	77	3	0.3776	0.03463	0.315434	0.4519
##	43	74	4	0.3571	0.03423	0.295985	0.4309
##	44	70	1	0.3520	0.03411	0.291143	0.4257
##	45	69	1	0.3469	0.03400	0.286310	0.4204
##	46	68	2	0.3367	0.03376	0.276667	0.4098
##	47	66	1	0.3316	0.03363	0.271858	0.4045
##	48	65	3	0.3163	0.03322	0.257485	0.3886
##	49	62	2	0.3061	0.03292	0.247946	0.3779
##	50	60	2	0.2959	0.03260	0.238445	0.3672
##	52	58	2	0.2857	0.03227	0.228981	0.3565
##	53	56	2	0.2755	0.03191	0.219555	0.3457
##	55	54	1	0.2704	0.03173	0.214857	0.3403
##	56	53	2	0.2602	0.03134	0.205492	0.3295
##	58	51	2	0.2500	0.03093	0.196169	0.3186
##	59	49	3	0.2347	0.03027	0.182268	0.3022
##	60	46	2	0.2245	0.02980	0.173058	0.2912
##	62	44	4	0.2041	0.02879	0.154787	0.2691
##	65	40	1	0.1990	0.02852	0.150252	0.2635
##	66	39	1	0.1939	0.02824	0.145731	0.2579
##	67	38	1	0.1888	0.02795	0.141224	0.2523
##	68	37	1	0.1837	0.02766	0.136731	0.2467
##	69	36	1	0.1786	0.02736	0.132254	0.2411
##	70	35	1	0.1735	0.02705	0.127793	0.2355

##	71	34	4	0.1531	0.02572	0.110115	0.2128
##	72	30	1	0.1480	0.02536	0.105740	0.2070
##	73	29	1	0.1429	0.02499	0.101385	0.2013
##	74	28	1	0.1378	0.02462	0.097050	0.1955
##	75	27	2	0.1276	0.02383	0.088445	0.1839
##	78	25	1	0.1224	0.02341	0.084176	0.1781
##	80	24	2	0.1122	0.02255	0.075714	0.1664
##	81	22	1	0.1071	0.02209	0.071523	0.1605
##	88	21	2	0.0969	0.02113	0.063230	0.1486
##	91	19	1	0.0918	0.02063	0.059132	0.1426
##	92	18	4	0.0714	0.01840	0.043118	0.1183
##	95	14	1	0.0663	0.01778	0.039226	0.1122
##	97	13	1	0.0612	0.01712	0.035387	0.1059
##	99	12	1	0.0561	0.01644	0.031608	0.0997
##	100	11	1	0.0510	0.01572	0.027895	0.0933
##	101	10	1	0.0459	0.01495	0.024257	0.0869
##	108	9	1	0.0408	0.01413	0.020706	0.0805
##	118	8	1	0.0357	0.01326	0.017255	0.0739
##	122	7	1	0.0306	0.01230	0.013924	0.0673
##	123	6	1	0.0255	0.01126	0.010738	0.0606
##	125	5	1	0.0204	0.01010	0.007737	0.0538
##	126	4	1	0.0153	0.00877	0.004980	0.0470
##	145	3	2	0.0051	0.00509	0.000722	0.0360
##	154	1	1	0.0000	NaN	NA	NA

##

treatment=S0

##	time	n.risk	n.event	survival	std.err	lower 95% CI	upper 95% CI
##	0	113	1	0.99115	0.00881	0.97403	1.0000
##	1	112	14	0.86726	0.03192	0.80690	0.9321
##	2	98	9	0.78761	0.03848	0.71570	0.8667
##	3	89	9	0.70796	0.04277	0.62890	0.7970
##	4	80	7	0.64602	0.04499	0.56360	0.7405
##	5	73	2	0.62832	0.04546	0.54525	0.7240
##	6	71	4	0.59292	0.04622	0.50892	0.6908
##	7	67	2	0.57522	0.04650	0.49094	0.6740
##	8	65	4	0.53982	0.04689	0.45532	0.6400
##	10	61	3	0.51327	0.04702	0.42892	0.6142
##	11	58	2	0.49558	0.04703	0.41146	0.5969
##	12	56	2	0.47788	0.04699	0.39411	0.5794
##	14	54	1	0.46903	0.04695	0.38548	0.5707
##	15	53	1	0.46018	0.04689	0.37688	0.5619
##	16	52	2	0.44248	0.04672	0.35976	0.5442
##	21	50	1	0.43363	0.04662	0.35124	0.5353
##	26	49	2	0.41593	0.04637	0.33430	0.5175
##	29	47	1	0.40708	0.04622	0.32587	0.5085
##	30	46	4	0.37168	0.04546	0.29246	0.4724
##	31	42	1	0.36283	0.04523	0.28418	0.4633
##	32	41	1	0.35398	0.04499	0.27594	0.4541
##	33	40	1	0.34513	0.04472	0.26772	0.4449
##	34	39	2	0.32743	0.04415	0.25140	0.4265
##	36	37	2	0.30973	0.04350	0.23521	0.4079
##	37	35	1	0.30088	0.04315	0.22717	0.3985
##	38	34	2	0.28319	0.04238	0.21119	0.3797
##	40	32	2	0.26549	0.04154	0.19537	0.3608

##	41	30	2	0.24779	0.04061	0.17971	0.3417
##	42	28	1	0.23894	0.04012	0.17194	0.3320
##	43	27	1	0.23009	0.03959	0.16422	0.3224
##	44	26	1	0.22124	0.03905	0.15654	0.3127
##	47	25	2	0.20354	0.03788	0.14134	0.2931
##	48	23	4	0.16814	0.03518	0.11158	0.2534
##	49	19	1	0.15929	0.03443	0.10429	0.2433
##	50	18	1	0.15044	0.03363	0.09707	0.2332
##	52	17	2	0.13274	0.03192	0.08286	0.2127
##	53	15	1	0.12389	0.03099	0.07588	0.2023
##	54	14	2	0.10619	0.02898	0.06220	0.1813
##	57	12	5	0.06195	0.02268	0.03023	0.1269
##	59	7	4	0.02655	0.01512	0.00869	0.0811
##	65	3	1	0.01770	0.01240	0.00448	0.0699
##	66	2	1	0.00885	0.00881	0.00126	0.0623
##	68	1	1	0.00000	NaN	NA	NA

```
summary(fit3)
```

```
## Call: survfit(formula = Surv(lifespan, status) ~ Host + treatment,
## data = finalmerge)
```

```
##
```

```
## Host=Apple, treatment=RT
```

##	time	n.risk	n.event	survival	std.err	lower 95% CI	upper 95% CI
##	0	171	36	0.78947	0.03118	0.730674	0.8530
##	1	135	4	0.76608	0.03237	0.705190	0.8322
##	2	131	1	0.76023	0.03265	0.698862	0.8270
##	3	130	7	0.71930	0.03436	0.655007	0.7899
##	4	123	8	0.67251	0.03589	0.605729	0.7467
##	5	115	6	0.63743	0.03676	0.569295	0.7137
##	6	109	2	0.62573	0.03701	0.557244	0.7026
##	7	107	1	0.61988	0.03712	0.551235	0.6971
##	9	106	2	0.60819	0.03733	0.539251	0.6859
##	10	104	1	0.60234	0.03743	0.533275	0.6803
##	12	103	1	0.59649	0.03752	0.527311	0.6747
##	15	102	1	0.59064	0.03760	0.521357	0.6691
##	16	101	1	0.58480	0.03768	0.515413	0.6635
##	18	100	1	0.57895	0.03776	0.509481	0.6579
##	19	99	1	0.57310	0.03783	0.503558	0.6522
##	22	98	1	0.56725	0.03789	0.497647	0.6466
##	23	97	2	0.55556	0.03800	0.485855	0.6353
##	24	95	1	0.54971	0.03805	0.479974	0.6296
##	25	94	1	0.54386	0.03809	0.474104	0.6239
##	26	93	1	0.53801	0.03813	0.468245	0.6182
##	27	92	1	0.53216	0.03816	0.462395	0.6125
##	28	91	3	0.51462	0.03822	0.444908	0.5953
##	30	88	3	0.49708	0.03824	0.427512	0.5780
##	31	85	1	0.49123	0.03823	0.421733	0.5722
##	32	84	4	0.46784	0.03816	0.398722	0.5489
##	35	80	2	0.45614	0.03809	0.387277	0.5372
##	36	78	3	0.43860	0.03795	0.370187	0.5196
##	37	75	1	0.43275	0.03789	0.364511	0.5138
##	38	74	2	0.42105	0.03776	0.353190	0.5020
##	39	72	1	0.41520	0.03768	0.347545	0.4960
##	41	71	3	0.39766	0.03743	0.330674	0.4782


```

##      10      53      2  0.5368  0.0512      0.44538      0.6471
##      11      51      1  0.5263  0.0512      0.43491      0.6369
##      12      50      2  0.5053  0.0513      0.41410      0.6165
##      15      48      1  0.4947  0.0513      0.40376      0.6062
##      16      47      1  0.4842  0.0513      0.39346      0.5959
##      21      46      1  0.4737  0.0512      0.38321      0.5855
##      26      45      1  0.4632  0.0512      0.37300      0.5751
##      29      44      1  0.4526  0.0511      0.36283      0.5647
##      30      43      4  0.4105  0.0505      0.32262      0.5224
##      31      39      1  0.4000  0.0503      0.31268      0.5117
##      32      38      1  0.3895  0.0500      0.30279      0.5010
##      33      37      1  0.3789  0.0498      0.29294      0.4902
##      34      36      1  0.3684  0.0495      0.28314      0.4794
##      36      35      2  0.3474  0.0489      0.26369      0.4576
##      37      33      1  0.3368  0.0485      0.25403      0.4466
##      38      32      1  0.3263  0.0481      0.24443      0.4356
##      40      31      2  0.3053  0.0472      0.22539      0.4134
##      41      29      2  0.2842  0.0463      0.20656      0.3911
##      42      27      1  0.2737  0.0457      0.19723      0.3798
##      43      26      1  0.2632  0.0452      0.18797      0.3684
##      44      25      1  0.2526  0.0446      0.17876      0.3570
##      47      24      2  0.2316  0.0433      0.16055      0.3340
##      48      22      3  0.2000  0.0410      0.13377      0.2990
##      49      19      1  0.1895  0.0402      0.12500      0.2872
##      50      18      1  0.1789  0.0393      0.11632      0.2753
##      52      17      2  0.1579  0.0374      0.09924      0.2512
##      53      15      1  0.1474  0.0364      0.09085      0.2390
##      54      14      2  0.1263  0.0341      0.07444      0.2144
##      57      12      5  0.0737  0.0268      0.03612      0.1503
##      59      7       4  0.0316  0.0179      0.01037      0.0962
##      65      3       1  0.0211  0.0147      0.00534      0.0830
##      66      2       1  0.0105  0.0105      0.00150      0.0740
##      68      1       1  0.0000      NaN          NA          NA
##
##                               Host=Haw, treatment=
##      time      n.risk      n.event      survival      std.err
##      0          1          1          0          NaN
## lower 95% CI upper 95% CI
##      NA          NA
##
##                               Host=Haw, treatment=RT
##      time n.risk n.event survival std.err lower 95% CI upper 95% CI
##      0      25     10     0.60  0.0980     0.43566     0.826
##      4      15      1     0.56  0.0993     0.39563     0.793
##      7      14      1     0.52  0.0999     0.35681     0.758
##      8      13      2     0.44  0.0993     0.28275     0.685
##     17      11      1     0.40  0.0980     0.24749     0.646
##     27      10      1     0.36  0.0960     0.21346     0.607
##     31       9      1     0.32  0.0933     0.18071     0.567
##     35       8      1     0.28  0.0898     0.14934     0.525
##     38       7      1     0.24  0.0854     0.11947     0.482
##     62       6      1     0.20  0.0800     0.09132     0.438
##     75       5      1     0.16  0.0733     0.06517     0.393
##     81       4      1     0.12  0.0650     0.04151     0.347

```

```
##      92      3      1      0.08 0.0543      0.02117      0.302
##      97      2      1      0.04 0.0392      0.00586      0.273
##     123      1      1      0.00    NaN            NA            NA
##
##                               Host=Haw, treatment=SO
## time n.risk n.event survival std.err lower 95% CI upper 95% CI
##    1     18      2  0.8889  0.0741    0.75494    1.000
##    2     16      3  0.7222  0.1056    0.54231    0.962
##    3     13      1  0.6667  0.1111    0.48089    0.924
##    4     12      2  0.5556  0.1171    0.36752    0.840
##    5     10      2  0.4444  0.1171    0.26516    0.745
##   10      8      1  0.3889  0.1149    0.21793    0.694
##   11      7      1  0.3333  0.1111    0.17344    0.641
##   14      6      1  0.2778  0.1056    0.13188    0.585
##   16      5      1  0.2222  0.0980    0.09364    0.527
##   26      4      1  0.1667  0.0878    0.05932    0.468
##   34      3      1  0.1111  0.0741    0.03008    0.410
##   38      2      1  0.0556  0.0540    0.00827    0.373
##   48      1      1  0.0000    NaN            NA            NA
```

Access to the sort summary table

```
summary(fit1)$table
```

```
##               records n.max n.start events   *rmean *se(rmean) median 0.95LCL
## Host=Apple      266   266     266    266 31.47932   1.950047     28     15
## Host=Haw        44    44      44     44 21.15909   4.575576      6      3
##               0.95UCL
## Host=Apple       33
## Host=Haw        17
```

```
summary(fit2)$table
```

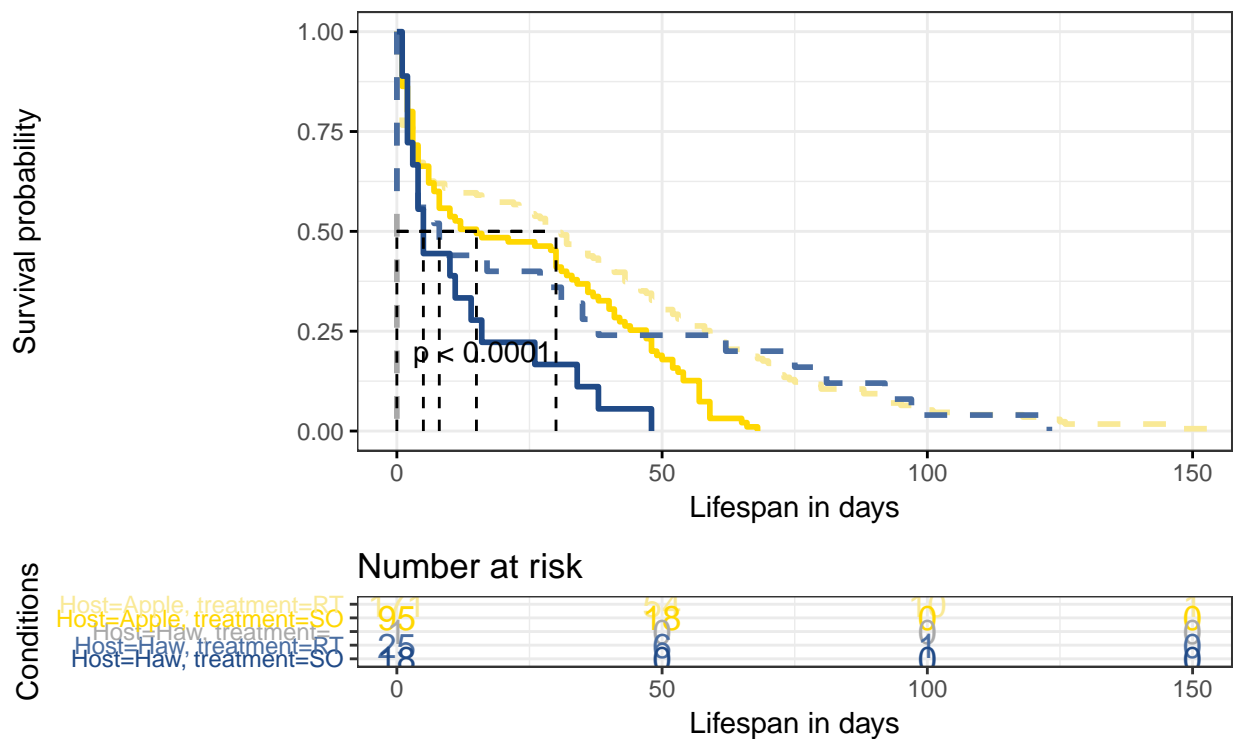
```
##               records n.max n.start events   *rmean *se(rmean) median
## treatment=         1      1      1      1  0.00000   0.000000      0
## treatment=RT      196   196     196    196 29.80102   1.929160     28
## treatment=SO      113   113     113    113 22.44248   2.021458     11
##               0.95LCL 0.95UCL
## treatment=         NA      NA
## treatment=RT       17      36
## treatment=SO        7      30
```

```
summary(fit3)$table
```

```
##               records n.max n.start events   *rmean *se(rmean)
## Host=Apple, treatment=RT    171   171     171    171 30.78363   2.052532
## Host=Apple, treatment=SO    95    95      95     95 24.31579   2.271454
## Host=Haw, treatment=        1      1      1      1  0.00000   0.000000
## Host=Haw, treatment=RT      25    25      25     25 23.08000   5.438800
## Host=Haw, treatment=SO      18    18      18     18 12.55556   3.296296
##               median 0.95LCL 0.95UCL
## Host=Apple, treatment=RT     30     22     39
## Host=Apple, treatment=SO     15      8     33
## Host=Haw, treatment=         0     NA     NA
## Host=Haw, treatment=RT       8      0     38
## Host=Haw, treatment=SO       5      3     26
```

```
# Visualize curves (Change color, linetype by strata, risk.table color by strata)
ggsurvplot(fit3,
  pval = TRUE, conf.int = FALSE,
  risk.table = TRUE, # Add risk table
  risk.table.col = "strata", # Change risk table color by groups
  linetype = c("dashed", "solid", "dashed", "dashed", "solid"), # Change line type
  surv.median.line = "hv", # Specify median survival
  ggtheme = theme_bw(), # Change ggplot2 theme
  palette = c("#F9E996", "#FFD700", "#A9A9A9", "#496DA1", "#204A87"),
  xlab = "Lifespan in days",
  legend.title = "Conditions",
  pval.size=4)
```

ns — Host=Apple, treatment=RT — Host=Apple, treatment=SO — Host=Haw, treatment= — Host=Haw, tre



Cox Regression

```
#Merge the data for censoring (all labeled as status 1 for dead)
covariates <- c("host", "treatment", "MR15.cor", "mass_day14")
#For RT
univ_formulasRT <- sapply(covariates,
  function(x) as.formula(paste('Surv(lifespan, status)~', fmergeRT)))
#For SO
univ_formulasSO <- sapply(covariates,
  function(x) as.formula(paste('Surv(lifespan, status)~', fmergeSO)))
univ_modelsRT <- lapply(univ_formulasRT, function(x){coxph(x, data = fmergeRT)})
```

```

univ_modelsS0 <- lapply(univ_formulasS0, function(x){coxph(x, data = fmergeS0)})

#Multivariate case
#Testing interaction between Host, Treatment, and MR -- Shows interaction b/w treatment & Host
res.cox <- coxph(Surv(lifespan, status) ~ Host*treatment*MR15.cor + mass_day14, data = fmerge)
summary(res.cox)

## Call:
## coxph(formula = Surv(lifespan, status) ~ Host * treatment * MR15.cor +
##       mass_day14, data = fmerge)
##
##      n= 308, number of events= 308
##      (1 observation deleted due to missingness)
##
##              coef exp(coef) se(coef)      z
## HostHaw          2.178e-01  1.243e+00  2.887e-01  0.754
## treatmentS0       3.257e-01  1.385e+00  1.698e-01  1.918
## MR15.cor          -1.494e+00  2.244e-01  4.562e+00 -0.328
## mass_day14        -1.362e-01  8.727e-01  3.457e-02 -3.940
## HostHaw:treatmentS0  6.938e-01  2.001e+00  4.437e-01  1.564
## HostHaw:MR15.cor     5.393e+00  2.198e+02  8.805e+00  0.612
## treatmentS0:MR15.cor  1.858e+01  1.170e+08  1.163e+01  1.597
## HostHaw:treatmentS0:MR15.cor -2.660e+01  2.804e-12  3.695e+01 -0.720
##
##              Pr(>|z|)
## HostHaw          0.4506
## treatmentS0       0.0551
## MR15.cor          0.7432
## mass_day14        8.15e-05 ***
## HostHaw:treatmentS0  0.1179
## HostHaw:MR15.cor    0.5402
## treatmentS0:MR15.cor  0.1102
## HostHaw:treatmentS0:MR15.cor  0.4716
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##              exp(coef) exp(-coef) lower .95 upper .95
## HostHaw          1.243e+00  8.043e-01  7.060e-01  2.190e+00
## treatmentS0       1.385e+00  7.220e-01  9.929e-01  1.932e+00
## MR15.cor          2.244e-01  4.457e+00  2.935e-05  1.715e+03
## mass_day14        8.727e-01  1.146e+00  8.155e-01  9.338e-01
## HostHaw:treatmentS0  2.001e+00  4.997e-01  8.388e-01  4.775e+00
## HostHaw:MR15.cor    2.198e+02  4.550e-03  7.032e-06  6.870e+09
## treatmentS0:MR15.cor  1.170e+08  8.550e-09  1.469e-02  9.314e+17
## HostHaw:treatmentS0:MR15.cor  2.804e-12  3.566e+11  9.964e-44  7.892e+19
##
## Concordance= 0.611 (se = 0.021 )
## Rsquare= 0.107 (max possible= 1 )
## Likelihood ratio test= 34.75 on 8 df, p=3e-05
## Wald test = 36.24 on 8 df, p=2e-05
## Score (logrank) test = 37.24 on 8 df, p=1e-05

#Split up treatments into: S0 & RT
fmergeS0 <- fmerge%>%
  filter(treatment == "S0")

```

```
fmergeRT <- fmerge%>%
  filter(treatment == "RT")
```

#Coefficient describes relationship: for Cox Regression, coefficient describes relationship to likelihood
#Test interaction between Host, RT, and MR

```
res.coxRT <- coxph(Surv(lifespan, status) ~ Host*MR15.cor + mass_day14, data = fmergeRT)
summary(res.coxRT)
```

```
## Call:
## coxph(formula = Surv(lifespan, status) ~ Host * MR15.cor + mass_day14,
##       data = fmergeRT)
##
##      n= 196, number of events= 196
##
##              coef exp(coef) se(coef)      z Pr(>|z|)
## HostHaw         0.26512   1.30358  0.29147  0.910 0.363049
## MR15.cor        -0.50118   0.60582  4.57571 -0.110 0.912782
## mass_day14      -0.15524   0.85621  0.04451 -3.488 0.000488 ***
## HostHaw:MR15.cor  2.90449  18.25589  8.85836  0.328 0.743002
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##              exp(coef) exp(-coef) lower .95 upper .95
## HostHaw             1.3036    0.76712 7.363e-01 2.308e+00
## MR15.cor             0.6058    1.65067 7.718e-05 4.755e+03
## mass_day14          0.8562    1.16794 7.847e-01 9.343e-01
## HostHaw:MR15.cor    18.2559    0.05478 5.262e-07 6.334e+08
##
## Concordance= 0.624 (se = 0.028 )
## Rsquare= 0.068 (max possible= 1 )
## Likelihood ratio test= 13.77 on 4 df,  p=0.008
## Wald test = 13.57 on 4 df,  p=0.009
## Score (logrank) test = 13.62 on 4 df,  p=0.009
```

#Test interaction between Host, SO, and MR

```
res.coxSO <- coxph(Surv(lifespan, status) ~ Host*MR15.cor + mass_day14, data = fmergeSO)
summary(res.coxSO)
```

```
## Call:
## coxph(formula = Surv(lifespan, status) ~ Host * MR15.cor + mass_day14,
##       data = fmergeSO)
##
##      n= 112, number of events= 112
##      (1 observation deleted due to missingness)
##
##              coef exp(coef) se(coef)      z Pr(>|z|)
## HostHaw         1.175e+00 3.238e+00 3.826e-01 3.071 0.00213 **
## MR15.cor         3.096e+01 2.780e+13 1.176e+01 2.632 0.00849 **
## mass_day14      -1.032e-01 9.019e-01 5.506e-02 -1.874 0.06088 .
## HostHaw:MR15.cor -3.888e+01 1.305e-17 3.748e+01 -1.037 0.29962
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
```

```
##               exp(coef) exp(-coef) lower .95 upper .95
## HostHaw      3.238e+00  3.088e-01  1.530e+00  6.853e+00
## MR15.cor     2.780e+13  3.597e-14  2.707e+03  2.855e+23
## mass_day14   9.019e-01  1.109e+00  8.097e-01  1.005e+00
## HostHaw:MR15.cor 1.305e-17  7.663e+16  1.627e-49  1.047e+15
##
## Concordance= 0.593 (se = 0.035 )
## Rsquare= 0.122 (max possible= 0.999 )
## Likelihood ratio test= 14.57 on 4 df, p=0.006
## Wald test          = 16.07 on 4 df, p=0.003
## Score (logrank) test = 16.72 on 4 df, p=0.002
```

Session Info

```
sessionInfo()
```

```
## R version 3.5.0 (2018-04-23)
## Platform: x86_64-apple-darwin15.6.0 (64-bit)
## Running under: macOS High Sierra 10.13.5
##
## Matrix products: default
## BLAS: /Library/Frameworks/R.framework/Versions/3.5/Resources/lib/libRblas.0.dylib
## LAPACK: /Library/Frameworks/R.framework/Versions/3.5/Resources/lib/libRlapack.dylib
##
## locale:
## [1] en_US.UTF-8/en_US.UTF-8/en_US.UTF-8/C/en_US.UTF-8/en_US.UTF-8
##
## attached base packages:
## [1] stats      graphics  grDevices  utils      datasets  methods   base
##
## other attached packages:
## [1] bindrcpp_0.2.2    gridExtra_2.3     survminer_0.4.2
## [4] ggpubr_0.1.6      magrittr_1.5      survival_2.42-3
## [7] BBmisc_1.11       MASS_7.3-49       DiagrammeR_1.0.0
## [10] curl_3.2          lubridate_1.7.4   ggplot2_2.2.1
## [13] data.table_1.11.4 dplyr_0.7.5
##
## loaded via a namespace (and not attached):
## [1] viridis_0.5.1     tidyr_0.8.1       jsonlite_1.5
## [4] viridisLite_0.3.0 splines_3.5.0     assertthat_0.2.0
## [7] yaml_2.1.19       pillar_1.2.3      backports_1.1.2
## [10] lattice_0.20-35   glue_1.2.0        downloader_0.4
## [13] digest_0.6.15     RColorBrewer_1.1-2 checkmate_1.8.5
## [16] colorspace_1.3-2  cmprsk_2.2-7      htmltools_0.3.6
## [19] Matrix_1.2-14     plyr_1.8.4        psych_1.8.4
## [22] XML_3.98-1.11     pkgconfig_2.0.1   broom_0.4.4
## [25] purrr_0.2.5       xtable_1.8-2      scales_0.5.0
## [28] brew_1.0-6        km.ci_0.5-2       KMSurv_0.1-5
## [31] tibble_1.4.2      influenceR_0.1.0   lazyeval_0.2.1
## [34] cli_1.0.0         mnormt_1.5-5      rgexf_0.15.3
## [37] crayon_1.3.4      evaluate_0.10.1   nlme_3.1-137
## [40] foreign_0.8-70    Rook_1.1-1        tools_3.5.0
```

## [43] hms_0.4.2	stringr_1.3.1	munsell_0.4.3
## [46] compiler_3.5.0	rlang_0.2.0	grid_3.5.0
## [49] rstudioapi_0.7	htmlwidgets_1.2	visNetwork_2.0.3
## [52] igraph_1.2.1	labeling_0.3	rmarkdown_1.9
## [55] gtable_0.2.0	reshape2_1.4.3	R6_2.2.2
## [58] zoo_1.8-1	knitr_1.20	survMisc_0.5.4
## [61] utf8_1.1.4	bindr_0.1.1	rprojroot_1.3-2
## [64] readr_1.1.1	stringi_1.2.2	parallel_3.5.0
## [67] Rcpp_0.12.17	tidyselect_0.2.4	