Multivariate analysis of biochemical assayss

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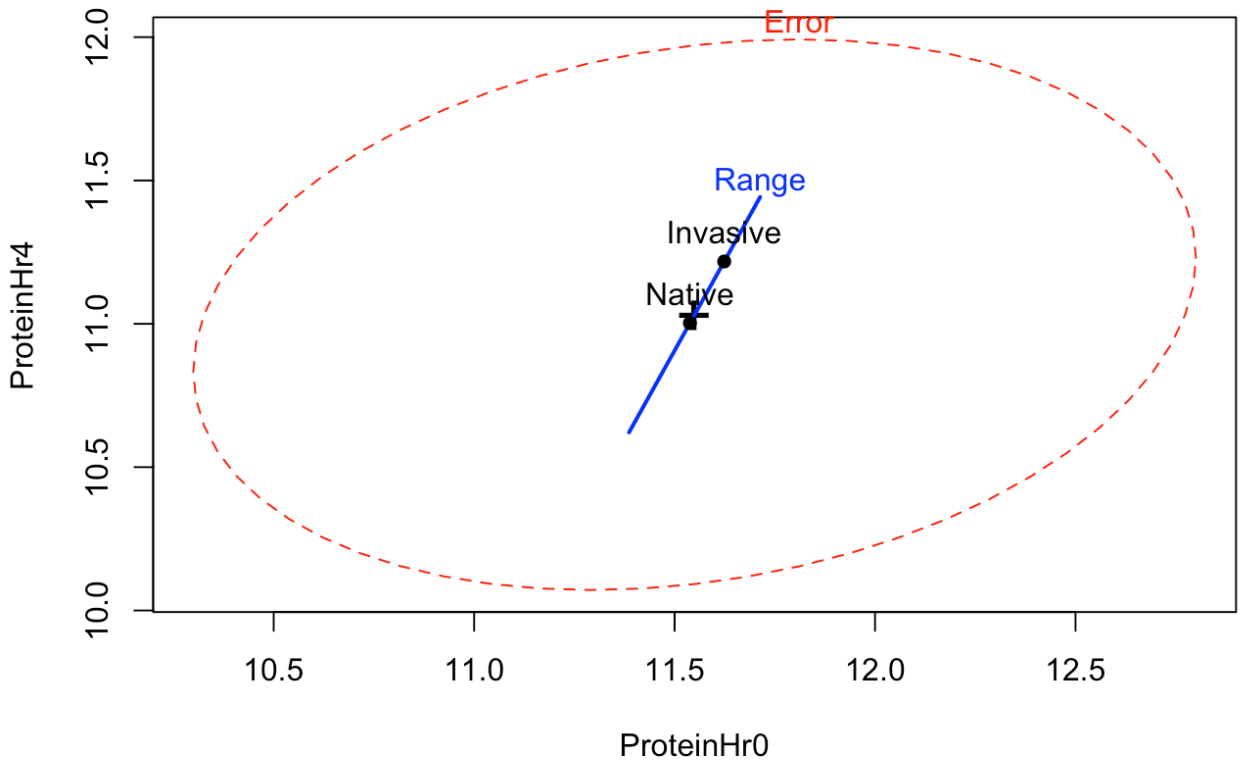
```
library(ggplot2)
library(data.table)
library(scales)
library(plyr)
library(dplyr)
library(reshape2)
library(lme4)
library(effects)
library(multcomp)
library(lmerTest)
library(piecewiseSEM)
library(car)
library(gridExtra)
library(cowplot)
library(Rmisc)
library(Hmisc)
library(heplots)
library(corrplot)
library(PerformanceAnalytics)
```

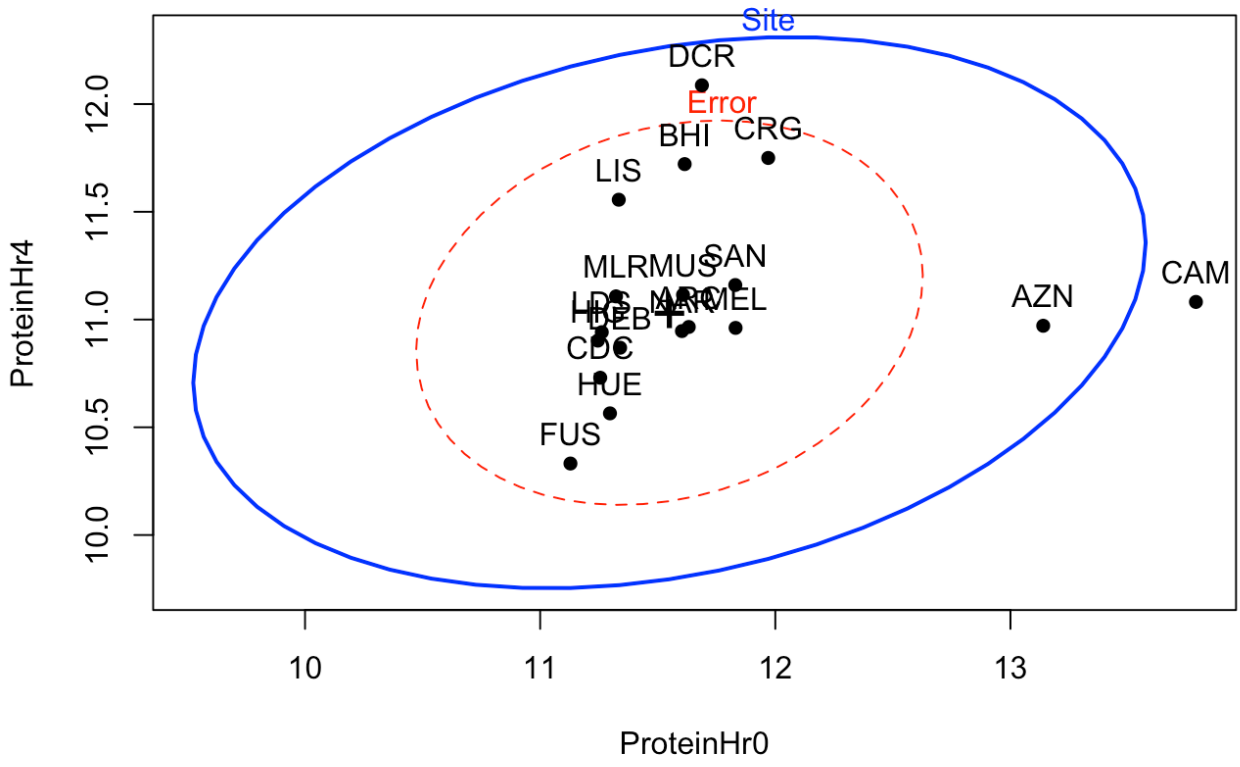
```
BCmod1 <- lm(cbind(ProteinHr0, ProteinHr4, ProteinHr24, PODHr0, PODHr4, PODHr24,P
POHr0, PPOHr4, PPOHr24) ~ Range, data = BiocAssaysWide)

BCmod2 <- lm(cbind(ProteinHr0, ProteinHr4, ProteinHr24, PODHr0, PODHr4, PODHr24,P
POHr0, PPOHr4, PPOHr24) ~ Site, data = BiocAssaysWide)

anova.BCmod1 <- Anova(BCmod1, idata= idata, idesign = ~ Assay * MeasTime, iterm =
"Assay:MeasTime", type = 3)
anova.BCmod2 <- Anova(BCmod2, idata= idata, idesign = ~ Assay * MeasTime,iterm =
"Assay:MeasTime", type = 3)
```

There is a significant effect for Population, but not for Range

```
##
## Type III Repeated Measures MANOVA Tests: Pillai test statistic
##                      Df test stat approx F num Df den Df    Pr(>F)
## (Intercept)           1   0.96839   7383.9      1    241 < 2.2e-16 ***
## Range                 1   0.00017      0.0      1    241  0.838718
## Assay                 1   0.99380  19220.9      2    240 < 2.2e-16 ***
## Range:Assay           1   0.19255     28.6      2    240 7.148e-12 ***
## MeasTime              1   0.05454      6.9      2    240  0.001194 **
## Range:MeasTime        1   0.01028      1.2      2    240  0.289469
## Assay:MeasTime        1   0.37572     35.8      4    238 < 2.2e-16 ***
## Range:Assay:MeasTime  1   0.01993      1.2      4    238  0.307325
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

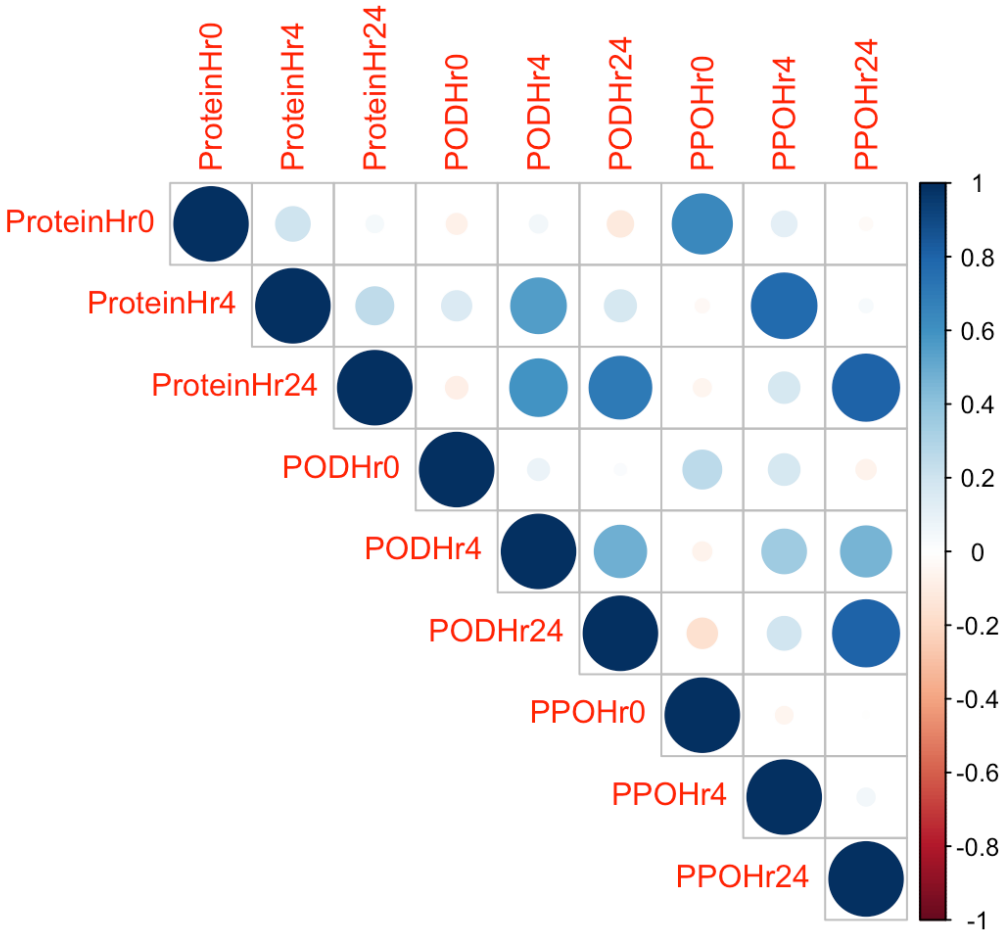


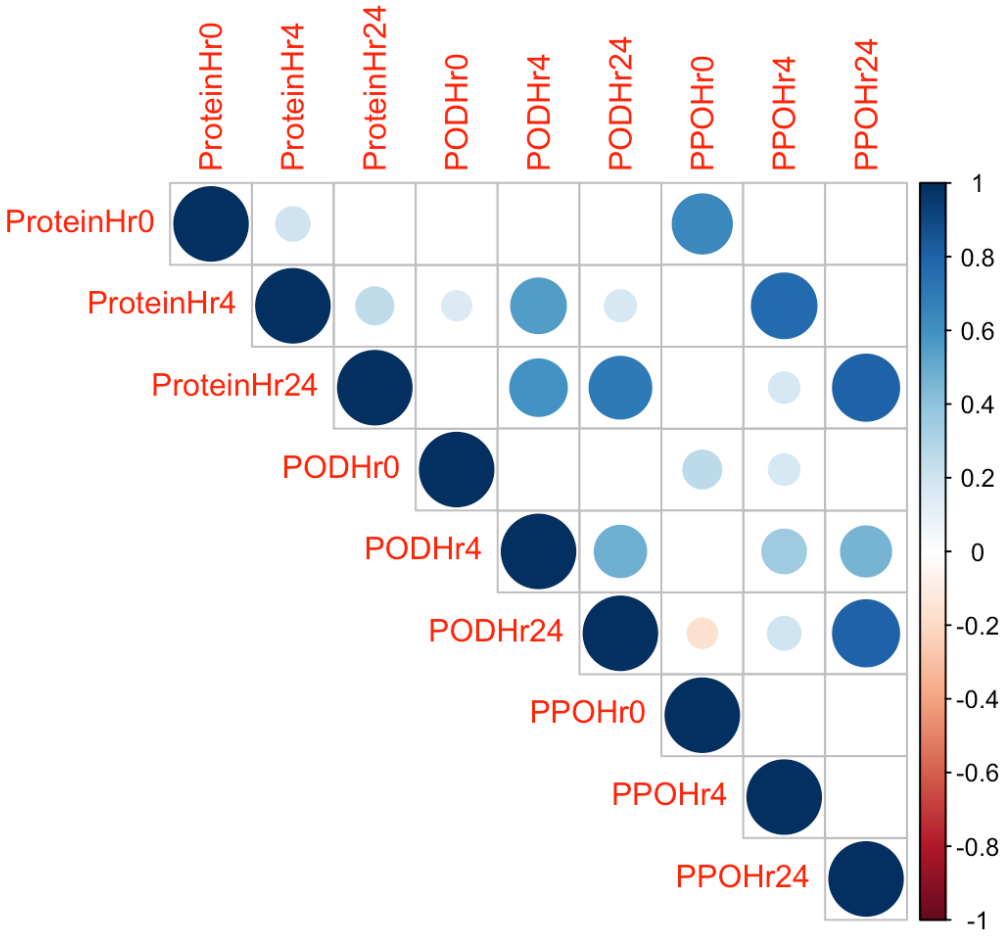
```
##
## Type III Repeated Measures MANOVA Tests: Pillai test statistic
##                     Df test stat approx F num Df den Df    Pr(>F)
## (Intercept)          1   0.95488   4761.6      1    225 < 2.2e-16 ***
## Site                17   0.25524      4.5     17    225 3.985e-08 ***
## Assay                1   0.99167  13330.5      2    224 < 2.2e-16 ***
## Site:Assay          17   0.78610      8.6     34    450 < 2.2e-16 ***
## MeasTime             1   0.06557      7.9      2    224 0.0005026 ***
## Site:MeasTime       17   0.24862      1.9     34    450 0.0024482 **
## Assay:MeasTime       1   0.34750     29.6      4    222 < 2.2e-16 ***
## Site:Assay:MeasTime 17   0.71006      2.9     68    900 2.262e-12 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

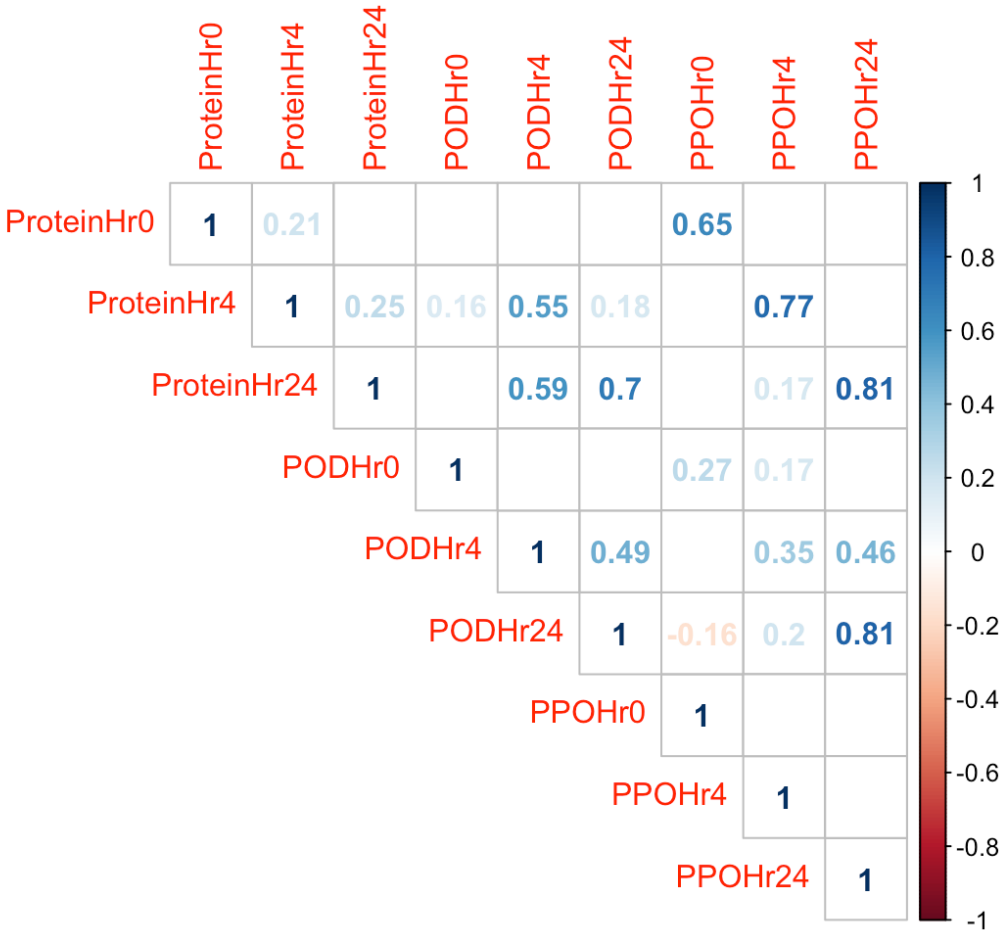


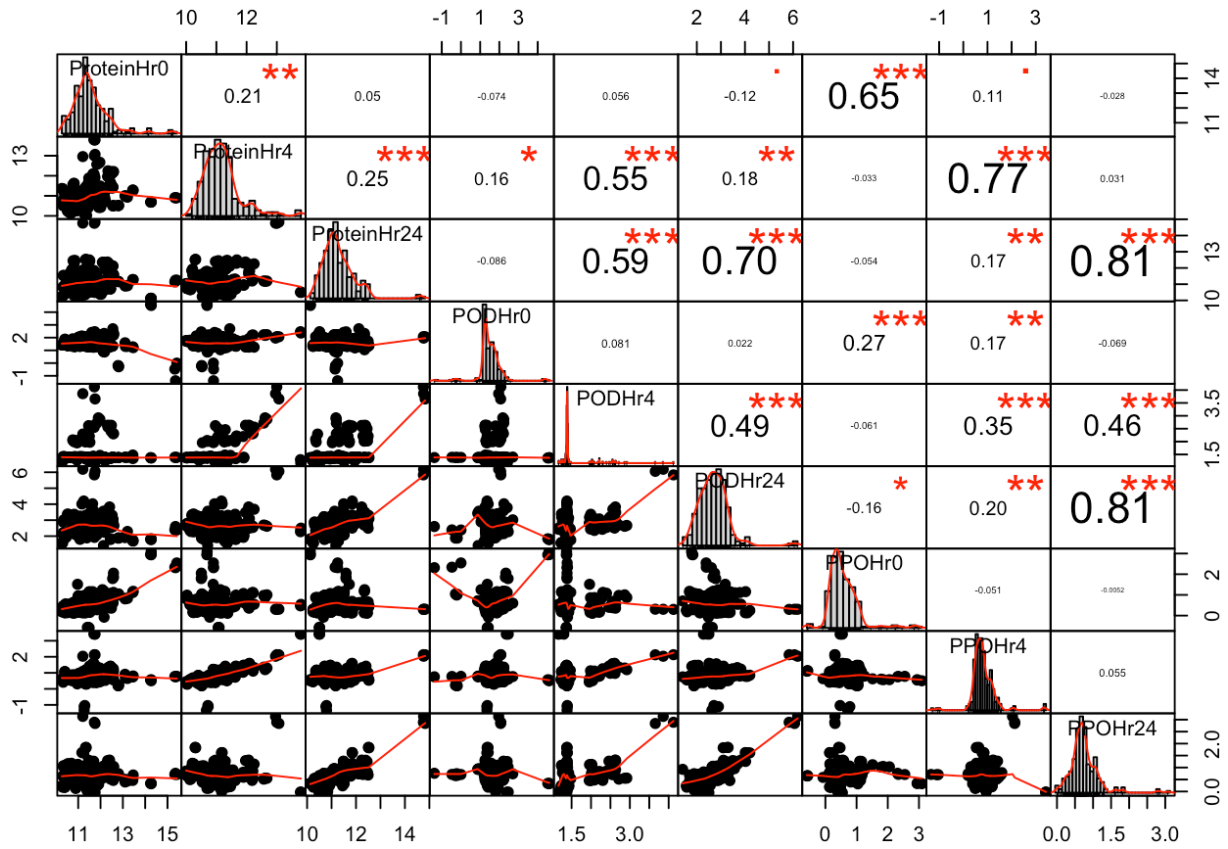
Correlation Data

Plot 1: Correlation plot Plot 2: Keeping only dots that are significant at 0.05 Plot 3: Numbers instead of dot size Plot 4: All the info


ProteinHr0
ProteinHr4
ProteinHr24
PODHr0
PODHr4
PODHr24
PPOHr0
PPOHr4
PPOHr24
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1


ProteinHr0
ProteinHr4
ProteinHr24
PODHr0
PODHr4
PODHr24
PPOHr0
PPOHr4
PPOHr24
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1


ProteinHr0
ProteinHr4
ProteinHr24
PODHr0
PODHr4
PODHr24
PPOHr0
PPOHr4
PPOHr24
1
0.21
0.65
1
0.25
0.16
0.55
0.18
0.77
1
0.59
0.7
0.17
0.81
1
0.27
0.17
1
0.49
0.35
0.46
1
-0.16
0.2
0.81
1
1
1
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1


ProteinHr0
ProteinHr4
ProteinHr24
PODHr0
PODHr4
PODHr24
PPOHr0
PPOHr4
PPOHr24
0.21
0.05
-0.074
0.056
-0.12
0.65
0.11
-0.028
0.25
0.16
0.55
0.18
-0.033
0.77
0.031
0.59
0.70
-0.054
0.17
0.81
0.081
0.022
0.27
0.17
-0.069
0.49
-0.061
0.35
0.46
-0.16
0.20
0.81
-0.051
0.055