

Evaluating the effect of irradiation on the densities of two RNA viruses in *Glossina morsitans morsitans*

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```
#setwd("D:/analysis/iflanegemanuscript2023/final")

library(ggplot2)
library(MASS)
library(rmarkdown)
library(knitr)
library(lme4)

## Loading required package: Matrix

library(MuMIn)
library(ggthemes) # Load
library(datasets)
library(plyr)
library(dplyr)

##
## Attaching package: 'dplyr'

## The following objects are masked from 'package:plyr':
##
##      arrange, count, desc, failwith, id, mutate, rename, summarise,
##      summarize

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

## The following objects are masked from 'package:stats':
##
##      filter, lag

## The following objects are masked from 'package:base':
##
##      intersect, setdiff, setequal, union

library(tidyverse)

## — Attaching packages —————
tidyverse 1.3.1 —
```

```
## ✓ tibble 3.1.7      ✓ purrr 0.3.4
## ✓ tidyr 1.2.0      ✓ stringr 1.4.0
## ✓ readr 2.1.2      ✓ forcats 0.5.1

## — Conflicts —————
tidyverse_conflicts() —
## ✗ dplyr::arrange() masks plyr::arrange()
## ✗ purrr::compact() masks plyr::compact()
## ✗ dplyr::count() masks plyr::count()
## ✗ tidyr::expand() masks Matrix::expand()
## ✗ dplyr::failwith() masks plyr::failwith()
## ✗ dplyr::filter() masks stats::filter()
## ✗ dplyr::id() masks plyr::id()
## ✗ dplyr::lag() masks stats::lag()
## ✗ dplyr::mutate() masks plyr::mutate()
## ✗ tidyr::pack() masks Matrix::pack()
## ✗ dplyr::rename() masks plyr::rename()
## ✗ dplyr::select() masks MASS::select()
## ✗ dplyr::summarise() masks plyr::summarise()
## ✗ dplyr::summarize() masks plyr::summarize()
## ✗ tidyr::unpack() masks Matrix::unpack()
```

Working directory

```
#-----

##Normality for neg, b and C

#Normality for neg

qpcr <- read.csv("Iflaneg_may_2023.csv",sep="," , row.names=NULL)

#qpcr$Life_stage=as.factor(qpcr$Life_stage)
qpcr$Irradiation_dose=as.factor(qpcr$Irradiation_dose)
str(qpcr)

## 'data.frame': 186 obs. of 11 variables:
## $ Target : chr "GmmIV" "GmmIV" "GmmIV" "GmmIV" ...
## $ Sample : chr "17A" "17B" "18A" "18B" ...
## $ Irradiation_dose : Factor w/ 5 levels "0","70","110",...: 1 1
1 1 1 1 1 1 2 2 ...
## $ Dpi : int 3 3 3 3 0 0 0 0 3 3 ...
## $ Life_stage : chr "Adult (3 dpi)" "Adult (3 dpi)"
"Adult (3 dpi)" "Adult (3 dpi)" ...
## $ Irradiation_conditions: chr "Hypoxia" "Hypoxia" "Normoxia"
"Normoxia" ...
## $ Replicate : int 1 1 1 1 1 1 1 1 1 1 ...
## $ Expression : num 0.109 0.125 0.135 0.125 1.013 ...
```

```
## $ Mean.Cq          : num  22 22.2 21.7 21.9 20.1 ...
## $ Normalized_expression : num  0.46 0.529 0.569 0.529 3.096 ...
## $ Transformed        : num  -0.806 -0.658 -0.581 -0.657 1.069
...
```

```
attach(qpcr)
```

```
#head(neg)
```

```
qpcr=na.omit(qpcr)
```

```
qpcr
```

```
##      Target Sample Irradiation_dose Dpi    Life_stage
Irradiation_conditions
## 1      GmmIV      17A                0    3 Adult (3 dpi)
Hypoxia
## 2      GmmIV      17B                0    3 Adult (3 dpi)
Hypoxia
## 3      GmmIV      18A                0    3 Adult (3 dpi)
Normoxia
## 4      GmmIV      18B                0    3 Adult (3 dpi)
Normoxia
## 5      GmmIV       8A                0    0 Pupae (0 dpi)
Hypoxia
## 6      GmmIV       8B                0    0 Pupae (0 dpi)
Hypoxia
## 7      GmmIV       9A                0    0 Pupae (0 dpi)
Normoxia
## 8      GmmIV       9B                0    0 Pupae (0 dpi)
Normoxia
## 9      GmmIV      11A               70    3 Adult (3 dpi)
Hypoxia
## 10     GmmIV      11B               70    3 Adult (3 dpi)
Hypoxia
## 11     GmmIV      14A               70    3 Adult (3 dpi)
Normoxia
## 12     GmmIV      14B               70    3 Adult (3 dpi)
Normoxia
## 13     GmmIV       2A               70    0 Pupae (0 dpi)
Hypoxia
## 14     GmmIV       2B               70    0 Pupae (0 dpi)
Hypoxia
## 15     GmmIV       5A               70    0 Pupae (0 dpi)
Normoxia
## 16     GmmIV       5B               70    0 Pupae (0 dpi)
Normoxia
## 17     GmmIV      12A              110    3 Adult (3 dpi)
Hypoxia
## 18     GmmIV      12B              110    3 Adult (3 dpi)
Hypoxia
## 19     GmmIV      15A              110    3 Adult (3 dpi)
Normoxia
```

## 20	GmmIV	15B	110	3 Adult (3 dpi)
Normoxia				
## 21	GmmIV	3A	110	0 Pupae (0 dpi)
Hypoxia				
## 22	GmmIV	3B	110	0 Pupae (0 dpi)
Hypoxia				
## 23	GmmIV	6A	110	0 Pupae (0 dpi)
Normoxia				
## 24	GmmIV	6B	110	0 Pupae (0 dpi)
Normoxia				
## 25	GmmIV	13A	150	3 Adult (3 dpi)
Hypoxia				
## 26	GmmIV	13B	150	3 Adult (3 dpi)
Hypoxia				
## 27	GmmIV	16B	150	3 Adult (3 dpi)
Normoxia				
## 28	GmmIV	4A	150	0 Pupae (0 dpi)
Hypoxia				
## 29	GmmIV	4B	150	0 Pupae (0 dpi)
Hypoxia				
## 30	GmmIV	7A	150	0 Pupae (0 dpi)
Normoxia				
## 31	GmmIV	7B	150	0 Pupae (0 dpi)
Normoxia				
## 32	GmmIV	1A	0	0 Pupae (0 dpi)
Normoxia				
## 33	GmmIV	1B	0	0 Pupae (0 dpi)
Normoxia				
## 34	GmmIV	1A	0	0 Pupae (0 dpi)
Hypoxia				
## 35	GmmIV	1b	0	0 Pupae (0 dpi)
Hypoxia				
## 36	GmmIV	2a	0	3 Adult (3 dpi)
Hypoxia				
## 37	GmmIV	2b	0	3 Adult (3 dpi)
Hypoxia				
## 38	GmmIV	3a	0	3 Adult (3 dpi)
Normoxia				
## 39	GmmIV	3b	0	3 Adult (3 dpi)
Normoxia				
## 40	GmmIV	21A	70	0 Pupae (0 dpi)
Normoxia				
## 41	GmmIV	21B	70	0 Pupae (0 dpi)
Normoxia				
## 42	GmmIV	3A	70	3 Adult (3 dpi)
Hypoxia				
## 43	GmmIV	3B	70	3 Adult (3 dpi)
Hypoxia				
## 44	GmmIV	6A	70	3 Adult (3 dpi)
Normoxia				

## 45	GmmIV	6B	70	3 Adult (3 dpi)
Normoxia				
## 46	GmmIV	2A	70	0 Pupae (0 dpi)
Hypoxia				
## 47	GmmIV	2B	70	0 Pupae (0 dpi)
Hypoxia				
## 48	GmmIV	22A	110	0 Pupae (0 dpi)
Normoxia				
## 49	GmmIV	22B	110	0 Pupae (0 dpi)
Normoxia				
## 50	GmmIV	4A	110	3 Adult (3 dpi)
Hypoxia				
## 51	GmmIV	4B	110	3 Adult (3 dpi)
Hypoxia				
## 52	GmmIV	7A	110	3 Adult (3 dpi)
Normoxia				
## 53	GmmIV	7B	110	3 Adult (3 dpi)
Normoxia				
## 54	GmmIV	3A	110	0 Pupae (0 dpi)
Hypoxia				
## 55	GmmIV	3B	110	0 Pupae (0 dpi)
Hypoxia				
## 56	GmmIV	20A	150	0 Pupae (0 dpi)
Hypoxia				
## 57	GmmIV	20B	150	0 Pupae (0 dpi)
Hypoxia				
## 58	GmmIV	23A	150	0 Pupae (0 dpi)
Normoxia				
## 59	GmmIV	23B	150	0 Pupae (0 dpi)
Normoxia				
## 60	GmmIV	5A	150	3 Adult (3 dpi)
Hypoxia				
## 61	GmmIV	5B	150	3 Adult (3 dpi)
Hypoxia				
## 62	GmmIV	8A	150	3 Adult (3 dpi)
Normoxia				
## 63	GmmIV	8B	150	3 Adult (3 dpi)
Normoxia				
## 64	GmmIV	16A	0	0 Pupae (0 dpi)
Hypoxia				
## 65	GmmIV	16B	0	0 Pupae (0 dpi)
Hypoxia				
## 66	GmmIV	17A	0	3 Adult (3 dpi)
Normoxia				
## 67	GmmIV	17B	0	3 Adult (3 dpi)
Normoxia				
## 68	GmmIV	4a	0	3 Adult (3 dpi)
Hypoxia				
## 69	GmmIV	4b	0	3 Adult (3 dpi)
Hypoxia				

## 70	GmmIV	10A	110	0 Pupae (0 dpi)
Hypoxia				
## 71	GmmIV	10B	110	0 Pupae (0 dpi)
Hypoxia				
## 72	GmmIV	13A	70	0 Pupae (0 dpi)
Normoxia				
## 73	GmmIV	13B	70	0 Pupae (0 dpi)
Normoxia				
## 74	GmmIV	19A	110	3 Adult (3 dpi)
Hypoxia				
## 75	GmmIV	19B	110	3 Adult (3 dpi)
Hypoxia				
## 76	GmmIV	22A	70	3 Adult (3 dpi)
Normoxia				
## 77	GmmIV	22B	70	3 Adult (3 dpi)
Normoxia				
## 78	GmmIV	11A	150	0 Pupae (0 dpi)
Hypoxia				
## 79	GmmIV	14A	110	0 Pupae (0 dpi)
Normoxia				
## 80	GmmIV	14B	110	0 Pupae (0 dpi)
Normoxia				
## 81	GmmIV	20A	150	3 Adult (3 dpi)
Hypoxia				
## 82	GmmIV	20B	150	3 Adult (3 dpi)
Hypoxia				
## 83	GmmIV	4A	110	3 Adult (3 dpi)
Normoxia				
## 84	GmmIV	4B	110	3 Adult (3 dpi)
Normoxia				
## 85	GmmIV	12A	190	0 Pupae (0 dpi)
Hypoxia				
## 86	GmmIV	12B	190	0 Pupae (0 dpi)
Hypoxia				
## 87	GmmIV	15A	150	0 Pupae (0 dpi)
Normoxia				
## 88	GmmIV	15B	150	0 Pupae (0 dpi)
Normoxia				
## 89	GmmIV	21A	190	3 Adult (3 dpi)
Hypoxia				
## 90	GmmIV	21B	190	3 Adult (3 dpi)
Hypoxia				
## 91	GmmIV	5A	150	3 Adult (3 dpi)
Normoxia				
## 92	GmmIV	5B	150	3 Adult (3 dpi)
Normoxia				
## 93	GmmNegV	17A	0	3 Adult (3 dpi)
Hypoxia				
## 94	GmmNegV	17B	0	3 Adult (3 dpi)
Hypoxia				

## 95	GmmNegV	18A	0	3 Adult (3 dpi)
	Normoxia			
## 96	GmmNegV	18B	0	3 Adult (3 dpi)
	Normoxia			
## 97	GmmNegV	8A	0	0 Pupae (0 dpi)
	Hypoxia			
## 98	GmmNegV	8B	0	0 Pupae (0 dpi)
	Hypoxia			
## 99	GmmNegV	9A	0	0 Pupae (0 dpi)
	Normoxia			
## 100	GmmNegV	9B	0	0 Pupae (0 dpi)
	Normoxia			
## 101	GmmNegV	16B	0	0 Pupae (0 dpi)
	Hypoxia			
## 102	GmmNegV	16B	0	0 Pupae (0 dpi)
	Hypoxia			
## 103	GmmNegV	17A	0	3 Adult (3 dpi)
	Normoxia			
## 104	GmmNegV	17B	0	3 Adult (3 dpi)
	Normoxia			
## 105	GmmNegV	6A	0	3 Adult (3 dpi)
	Normoxia			
## 106	GmmNegV	6B	0	3 Adult (3 dpi)
	Normoxia			
## 107	GmmNegV	1A	0	0 Pupae (0 dpi)
	Hypoxia			
## 108	GmmNegV	1B	0	0 Pupae (0 dpi)
	Hypoxia			
## 109	GmmNegV	2A	0	3 Adult (3 dpi)
	Hypoxia			
## 110	GmmNegV	2B	0	3 Adult (3 dpi)
	Hypoxia			
## 111	GmmNegV	3a	0	3 Adult (3 dpi)
	Normoxia			
## 112	GmmNegV	3b	0	3 Adult (3 dpi)
	Normoxia			
## 113	GmmNegV	4a	0	3 Adult (3 dpi)
	Hypoxia			
## 114	GmmNegV	4b	0	3 Adult (3 dpi)
	Hypoxia			
## 115	GmmNegV	11A	70	3 Adult (3 dpi)
	Hypoxia			
## 116	GmmNegV	11B	70	3 Adult (3 dpi)
	Hypoxia			
## 117	GmmNegV	14A	70	3 Adult (3 dpi)
	Normoxia			
## 118	GmmNegV	14B	70	3 Adult (3 dpi)
	Normoxia			
## 119	GmmNegV	21A	70	0 Pupae (0 dpi)
	Normoxia			

## 120 GmmNegV	21B	70	0 Pupae (0 dpi)
Normoxia			
## 121 GmmNegV	2A	70	0 Pupae (0 dpi)
Hypoxia			
## 122 GmmNegV	2B	70	0 Pupae (0 dpi)
Hypoxia			
## 123 GmmNegV	5A	70	0 Pupae (0 dpi)
Normoxia			
## 124 GmmNegV	5B	70	0 Pupae (0 dpi)
Normoxia			
## 125 GmmNegV	10A	110	0 Pupae (0 dpi)
Hypoxia			
## 126 GmmNegV	10B	110	0 Pupae (0 dpi)
Hypoxia			
## 127 GmmNegV	13A	70	0 Pupae (0 dpi)
Normoxia			
## 128 GmmNegV	13B	70	0 Pupae (0 dpi)
Normoxia			
## 129 GmmNegV	19A	110	3 Adult (3 dpi)
Hypoxia			
## 130 GmmNegV	19B	110	3 Adult (3 dpi)
Hypoxia			
## 131 GmmNegV	22A	70	3 Adult (3 dpi)
Normoxia			
## 132 GmmNegV	22B	70	3 Adult (3 dpi)
Normoxia			
## 133 GmmNegV	3A	70	3 Adult (3 dpi)
Hypoxia			
## 134 GmmNegV	3B	70	3 Adult (3 dpi)
Hypoxia			
## 135 GmmNegV	6A	70	3 Adult (3 dpi)
Normoxia			
## 136 GmmNegV	6B	70	3 Adult (3 dpi)
Normoxia			
## 137 GmmNegV	2A	70	0 Pupae (0 dpi)
Hypoxia			
## 138 GmmNegV	2B	70	0 Pupae (0 dpi)
Hypoxia			
## 139 GmmNegV	12A	110	3 Adult (3 dpi)
Hypoxia			
## 140 GmmNegV	12B	110	3 Adult (3 dpi)
Hypoxia			
## 141 GmmNegV	15A	110	3 Adult (3 dpi)
Normoxia			
## 142 GmmNegV	15B	110	3 Adult (3 dpi)
Normoxia			
## 143 GmmNegV	22A	110	0 Pupae (0 dpi)
Normoxia			
## 144 GmmNegV	22B	110	0 Pupae (0 dpi)
Normoxia			

## 145 GmmNegV	3A	110	0 Pupae (0 dpi)
Hypoxia			
## 146 GmmNegV	3B	110	0 Pupae (0 dpi)
Hypoxia			
## 147 GmmNegV	6A	110	0 Pupae (0 dpi)
Normoxia			
## 148 GmmNegV	6B	110	0 Pupae (0 dpi)
Normoxia			
## 149 GmmNegV	11A	150	0 Pupae (0 dpi)
Hypoxia			
## 150 GmmNegV	11B	150	0 Pupae (0 dpi)
Hypoxia			
## 151 GmmNegV	14A	110	0 Pupae (0 dpi)
Normoxia			
## 152 GmmNegV	14B	110	0 Pupae (0 dpi)
Normoxia			
## 153 GmmNegV	20A	150	3 Adult (3 dpi)
Hypoxia			
## 154 GmmNegV	20B	150	3 Adult (3 dpi)
Hypoxia			
## 155 GmmNegV	4A	110	3 Adult (3 dpi)
Hypoxia			
## 156 GmmNegV	4B	110	3 Adult (3 dpi)
Hypoxia			
## 157 GmmNegV	7A	110	3 Adult (3 dpi)
Normoxia			
## 158 GmmNegV	7B	110	3 Adult (3 dpi)
Normoxia			
## 159 GmmNegV	3A	110	0 Pupae (0 dpi)
Hypoxia			
## 160 GmmNegV	3B	110	0 Pupae (0 dpi)
Hypoxia			
## 161 GmmNegV	4A	110	3 Adult (3 dpi)
Normoxia			
## 162 GmmNegV	4B	110	3 Adult (3 dpi)
Normoxia			
## 163 GmmNegV	13A	150	3 Adult (3 dpi)
Hypoxia			
## 164 GmmNegV	13B	150	3 Adult (3 dpi)
Hypoxia			
## 165 GmmNegV	16A	150	3 Adult (3 dpi)
Normoxia			
## 166 GmmNegV	16B	150	3 Adult (3 dpi)
Normoxia			
## 167 GmmNegV	20A	150	0 Pupae (0 dpi)
Hypoxia			
## 168 GmmNegV	20B	150	0 Pupae (0 dpi)
Hypoxia			
## 169 GmmNegV	23A	150	0 Pupae (0 dpi)
Normoxia			

## 170 GmmNegV	23B	150	0 Pupae (0 dpi)
Normoxia			
## 171 GmmNegV	4A	150	0 Pupae (0 dpi)
Hypoxia			
## 172 GmmNegV	4B	150	0 Pupae (0 dpi)
Hypoxia			
## 173 GmmNegV	7A	150	0 Pupae (0 dpi)
Normoxia			
## 174 GmmNegV	7B	150	0 Pupae (0 dpi)
Normoxia			
## 175 GmmNegV	12A	190	0 Pupae (0 dpi)
Hypoxia			
## 176 GmmNegV	12B	190	0 Pupae (0 dpi)
Hypoxia			
## 177 GmmNegV	21A	190	3 Adult (3 dpi)
Hypoxia			
## 178 GmmNegV	21B	190	3 Adult (3 dpi)
Hypoxia			
## 179 GmmNegV	5A	150	3 Adult (3 dpi)
Hypoxia			
## 180 GmmNegV	5B	150	3 Adult (3 dpi)
Hypoxia			
## 181 GmmNegV	8A	150	3 Adult (3 dpi)
Normoxia			
## 182 GmmNegV	8B	150	3 Adult (3 dpi)
Normoxia			
## 183 GmmNegV	5A	150	3 Adult (3 dpi)
Normoxia			
## 184 GmmNegV	5B	150	3 Adult (3 dpi)
Normoxia			
## 185 GmmNegV	1A	0	0 Pupae (0 dpi)
Normoxia			
## 186 GmmNegV	1B	0	0 Pupae (0 dpi)
Normoxia			

##	Replicate	Expression	Mean.Cq	Normalized_expression	Transformed
## 1	1	0.1090300	22.03000	0.46045991	-0.80639449
## 2	1	0.1252000	22.18000	0.52874971	-0.65798208
## 3	1	0.1346500	21.74000	0.56865933	-0.58070931
## 4	1	0.1253500	21.86000	0.52938320	-0.65670601
## 5	1	1.0128188	20.06000	3.09645293	1.06872315
## 6	1	0.9783009	20.14000	2.99092264	1.03769990
## 7	1	4.2774600	20.65000	13.07731817	2.26699785
## 8	1	0.2131900	24.97000	0.65177780	-0.43734511
## 9	1	0.1312300	21.22000	0.55421585	-0.60796567
## 10	1	0.0281800	23.20000	0.11901092	-2.37204012
## 11	1	51.4884900	23.08000	217.44827590	4.16199580
## 12	1	35.4320700	23.73000	149.63815280	3.93967708
## 13	1	0.3535200	23.98000	1.08080345	0.07740358
## 14	1	0.5363300	23.34000	1.63970161	0.48248615
## 15	1	1.1104700	21.11000	3.39499832	1.15055481

## 16	1	0.7600200	21.47000	2.32358067	0.80854586
## 17	1	0.1811900	21.22000	0.76520895	-0.27121916
## 18	1	0.1300200	21.37000	0.54910573	-0.61779662
## 19	1	0.1700800	20.48000	0.71828874	-0.33641872
## 20	1	0.1377400	20.66000	0.58170915	-0.55672992
## 21	1	1.0421000	21.21000	3.18597328	1.09414157
## 22	1	0.8134100	21.31000	2.48680791	0.87073579
## 23	1	0.3025000	22.33000	0.92482191	-0.07846029
## 24	1	0.1771300	22.62000	0.54153291	-0.63255198
## 25	1	0.1016900	21.38000	0.42946133	-0.88197175
## 26	1	0.0811200	21.68000	0.34258927	-1.13070376
## 27	1	0.0890500	22.69000	0.37607957	-1.02737202
## 28	1	0.3971000	21.14000	1.21403895	0.19208399
## 29	1	0.2948100	21.36000	0.90131157	-0.10444596
## 30	1	3.0791500	19.95000	9.41376991	2.00858578
## 31	1	0.9467200	20.14000	2.89437158	1.00824280
## 32	2	41.6958900	18.76000	1.52845712	0.41538497
## 33	2	44.1936500	18.90000	1.62001816	0.47098498
## 34	2	4.9830300	20.88000	0.18266423	-1.85317370
## 35	2	4.0377800	21.10000	0.14801396	-2.10513769
## 36	2	2.4963200	21.57000	1.12002369	0.11270985
## 37	2	2.4351600	21.58000	1.09258304	0.08815380
## 38	2	2.4411800	21.48000	1.09528403	0.09060080
## 39	2	1.7750200	21.63000	0.79639808	-0.23026726
## 40	2	77.4999800	18.05000	2.84093700	0.99147185
## 41	2	89.1371500	18.02000	3.26752377	1.11662237
## 42	2	0.3540300	21.12000	0.15884261	-2.01996763
## 43	2	0.2905300	21.09000	0.13035207	-2.25993610
## 44	2	0.7990400	21.06000	0.35850521	-1.08027279
## 45	2	0.5569800	21.31000	0.24990017	-1.48744234
## 46	2	85.4123400	18.18000	3.13098244	1.07862208
## 47	2	51.9678200	18.22000	1.90499794	0.62415220
## 48	2	77.0431500	18.06000	2.82419086	0.98614442
## 49	2	70.0133600	18.17000	2.56649801	0.89948632
## 50	2	1.5843400	20.05000	0.71084570	-0.34719100
## 51	2	1.4308200	19.84000	0.64196589	-0.45318904
## 52	2	0.7566700	25.64000	0.33949507	-1.14080706
## 53	2	0.4437700	25.93000	0.19910625	-1.75145145
## 54	2	70.2479300	17.60000	2.57509671	0.90252972
## 55	2	54.1456100	17.67000	1.98482976	0.66256323
## 56	2	63.0303700	19.38000	2.31052073	0.80336367
## 57	2	55.6890600	19.66000	2.04140841	0.68877095
## 58	2	131.2552700	17.80000	4.81145869	1.45381433
## 59	2	103.3295600	18.06000	3.78777865	1.24690704
## 60	2	14.0394200	23.05000	6.29906542	1.68097579
## 61	2	8.8575800	23.14000	3.97412969	1.28884390
## 62	2	1.0936700	21.94000	0.49069683	-0.73788318
## 63	2	0.7212700	21.90000	0.32361215	-1.19431485
## 64	3	14.4368800	17.24000	1.32861836	0.28014077
## 65	3	13.5849800	17.28000	1.25021845	0.22084321

## 66	3	9.0625900	17.96000	75.16455171	3.50769831
## 67	3	8.3693500	18.03000	69.41486274	3.45582728
## 68	3	11.9261400	19.77000	98.91465539	3.68353730
## 69	3	3.4096000	21.27000	28.27900805	2.84097988
## 70	3	5.3506800	18.51000	0.49242022	-0.73411916
## 71	3	5.9361300	18.40000	0.54629887	-0.62323942
## 72	3	5.9905200	17.58000	0.55130436	-0.61355458
## 73	3	5.4069100	17.79000	0.49759504	-0.72290345
## 74	3	0.5584300	20.94000	4.63158331	1.42118995
## 75	3	0.4598800	21.13000	3.81421581	1.25299301
## 76	3	0.2825900	19.52000	2.34378369	0.81649964
## 77	3	0.2831800	19.69000	2.34867712	0.81841480
## 78	3	11.0635400	18.09000	1.01817168	0.01799234
## 79	3	15.4973400	18.25000	1.42621193	0.34879382
## 80	3	7.1197500	18.13000	0.65522679	-0.43183803
## 81	3	0.2620600	19.74000	2.17350917	0.74697251
## 82	3	0.2224400	20.03000	1.84490338	0.59405061
## 83	3	0.3690400	19.24000	3.06079456	1.05837233
## 84	3	0.2667800	19.50000	2.21265655	0.76347523
## 85	3	7.8034500	17.96000	0.71814734	-0.33662223
## 86	3	3.7812600	18.02000	0.34798734	-1.11331580
## 87	3	13.1375900	17.86000	1.20904539	0.18804067
## 88	3	13.0945400	17.75000	1.20508352	0.18481962
## 89	3	0.1813300	19.87000	1.50393962	0.39987341
## 90	3	0.1838700	20.09000	1.52500622	0.41321829
## 91	3	0.8061700	18.81000	6.68632330	1.73046170
## 92	3	0.4974200	19.22000	4.12557021	1.32136144
## 93	1	0.8102000	26.68000	5.20627169	1.52094764
## 94	1	0.7363400	26.76000	4.73165403	1.43950847
## 95	1	0.5395100	26.91000	3.46684231	1.16906697
## 96	1	0.4863700	27.07000	3.12536949	1.07702116
## 97	1	0.8843100	27.01000	0.26036264	-1.44042433
## 98	1	1.1734000	26.50000	0.34547786	-1.12136202
## 99	1	2.6828300	28.13000	0.78989122	-0.23866353
## 100	1	4.7126700	28.02000	1.38752611	0.32221692
## 101	3	10.7132300	24.32000	2.31479499	0.80506324
## 102	3	8.7765400	24.43000	1.89633666	0.61987867
## 103	3	1.0089800	27.78000	5.75491231	1.60547496
## 104	3	0.9038900	28.06000	5.15551119	1.51263603
## 105	3	0.6253100	25.68000	3.56657636	1.19407774
## 106	3	0.4556300	25.73000	2.59877371	0.91085245
## 107	2	1.4848600	26.97000	0.06325263	-3.17929376
## 108	2	1.4112400	26.96000	0.06011654	-3.24648346
## 109	2	1.8656500	26.34000	0.33823712	-1.14494355
## 110	2	1.6668200	26.47000	0.30218980	-1.27124838
## 111	2	1.1214100	26.94000	0.20330849	-1.72693311
## 112	2	1.0658700	26.71000	0.19323925	-1.78665215
## 113	3	5.4109400	25.25000	30.86234137	2.90328911
## 114	3	4.8051100	25.12000	27.40687295	2.81851841
## 115	1	0.2189000	27.03000	1.40663154	0.33544271

## 116	1	0.2003100	27.24000	1.28717389	0.24928915
## 117	1	118.9140500	28.95000	764.13089580	4.85147028
## 118	1	105.1212000	29.33000	675.49929310	4.78760271
## 119	2	42.6129100	26.04000	1.81524102	0.57879247
## 120	2	43.9302600	26.02000	1.87135800	0.60743277
## 121	1	1.1265200	29.92000	0.33167523	-1.16679892
## 122	1	0.9836700	29.74000	0.28961667	-1.31924979
## 123	1	11.2072300	25.01000	3.29968452	1.12531886
## 124	1	7.8449400	25.13000	2.30974354	0.80305427
## 125	3	2.4951400	27.69000	0.53912196	-0.63729731
## 126	3	0.6102700	27.92000	0.13186032	-2.24584019
## 127	3	9.2634100	23.79000	2.00153409	0.67038546
## 128	3	4.9444100	24.38000	1.06833285	0.06588137
## 129	3	11.9216400	25.73000	67.99737630	3.44231148
## 130	3	1.8955200	25.77000	10.81146442	2.11845159
## 131	3	0.2362600	26.01000	1.34755454	0.29388652
## 132	3	0.1822200	26.73000	1.03932696	0.03849905
## 133	2	1.0139200	25.99000	0.18382086	-1.84569432
## 134	2	0.9682700	25.82000	0.17554464	-1.90039133
## 135	2	2.0803000	26.05000	0.37715256	-1.02423071
## 136	2	1.8040700	26.21000	0.32707284	-1.18241362
## 137	2	118.9116100	24.16000	5.06544219	1.49766400
## 138	2	68.6617600	24.27000	2.92487988	1.01766607
## 139	1	0.7697600	26.10000	4.94640792	1.47742156
## 140	1	0.6476200	26.37000	4.16154736	1.32889359
## 141	1	0.2797500	26.65000	1.79764812	0.56961265
## 142	1	0.2673800	26.72000	1.71815962	0.52686668
## 143	2	54.4506800	25.55000	2.31951087	0.80693441
## 144	2	48.5452000	25.79000	2.06794697	0.70078990
## 145	1	11.1907100	25.10000	3.29482063	1.12400963
## 146	1	13.0064500	24.81000	3.82941920	1.25647192
## 147	1	1.2239900	26.97000	0.36037280	-1.07451714
## 148	1	1.0268300	27.19000	0.30232404	-1.27074779
## 149	3	17.6618300	24.45000	3.81617081	1.25344121
## 150	3	11.8749900	24.66000	2.56581510	0.89924413
## 151	3	0.3052100	29.31000	0.06594637	-3.12444399
## 152	3	0.8055700	28.08000	0.17405856	-1.91051283
## 153	3	1.2146200	25.03000	6.92781976	1.75975087
## 154	3	0.4163500	25.54000	2.37473264	0.82853891
## 155	2	2.0482300	25.96000	0.37133836	-1.04137139
## 156	2	2.1100900	25.84000	0.38255341	-1.00856706
## 157	2	0.2268300	33.84000	0.04112364	-3.75912578
## 158	2	0.1342400	33.91000	0.02433734	-4.50015672
## 159	2	35.6770200	25.03000	1.51978333	0.40992878
## 160	2	25.7247600	25.20000	1.09583315	0.09109747
## 161	3	0.2381900	26.33000	1.35856267	0.30177999
## 162	3	0.1865100	26.48000	1.06379581	0.06165263
## 163	1	0.5453500	25.99000	3.50436962	1.17856965
## 164	1	0.4553800	26.18000	2.92623056	1.01808076
## 165	1	0.6008200	27.23000	3.86081480	1.26360819

```

## 166      1  0.5227800 27.15000      3.35933685  1.14120515
## 167      2 106.8144500 26.32000      4.55012275  1.40595371
## 168      2  74.9821900 26.55000      3.19411998  1.09641565
## 169      2 101.2498400 25.20000      4.31307937  1.35985054
## 170      2 111.2807100 25.17000      4.74037820  1.44108525
## 171      1  0.6616200 27.27000      0.19479722 -1.77719115
## 172      1  0.5530500 26.96000      0.16283154 -1.99019225
## 173      1  3.0770200 25.60000      0.90595047 -0.09926004
## 174      1  2.6007700 25.51000      0.76573074 -0.27051903
## 175      3  6.3921000 25.01000      1.38113352  0.31774685
## 176      3  4.6987000 25.00000      1.01524258  0.01511614
## 177      3  0.2544100 25.98000      1.45107657  0.36546038
## 178      3  0.3049500 26.03000      1.73934122  0.53846673
## 179      2 31.8433400 28.23000      5.77310837  1.60812456
## 180      2 19.2974000 28.22000      3.49856458  1.17710704
## 181      2  5.6814612 26.98748      1.03003300  0.02954710
## 182      2  6.5011374 27.14410      1.17863801  0.16301621
## 183      3  1.1308500 24.78000      6.45002139  1.70065374
## 184      3  0.7980400 25.00000      4.55177527  1.40626577
## 185      2 37.9748200 25.58000      1.61766589  0.46960025
## 186      2 35.9224600 25.59000      1.53023867  0.41650142

```

```

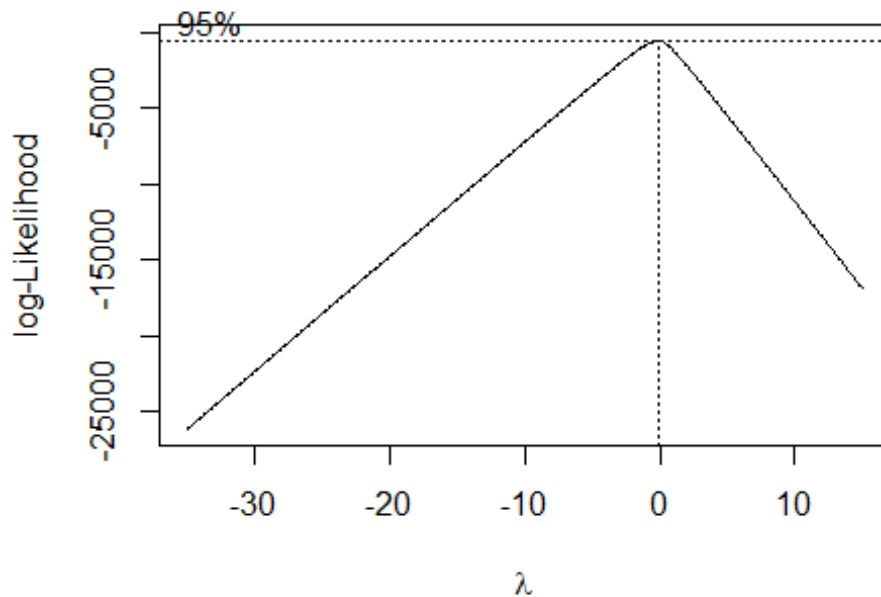
# check for normality of the data

```

```

Box=boxcox(Normalized_expression~1, lambda = seq(-35,15,0.1))

```



```

Cox = data.frame(Box$x, Box$y)
Cox2 = Cox[with(Cox, order(-Cox$Box.y)),]
Cox2[1,]

##      Box.x      Box.y
## 350   -0.1 -565.2725

lambda = Cox2[1, "Box.x"]
lambda

## [1] -0.1

Transformed = (Normalized_expression ^ lambda - 1)/lambda
Transformed

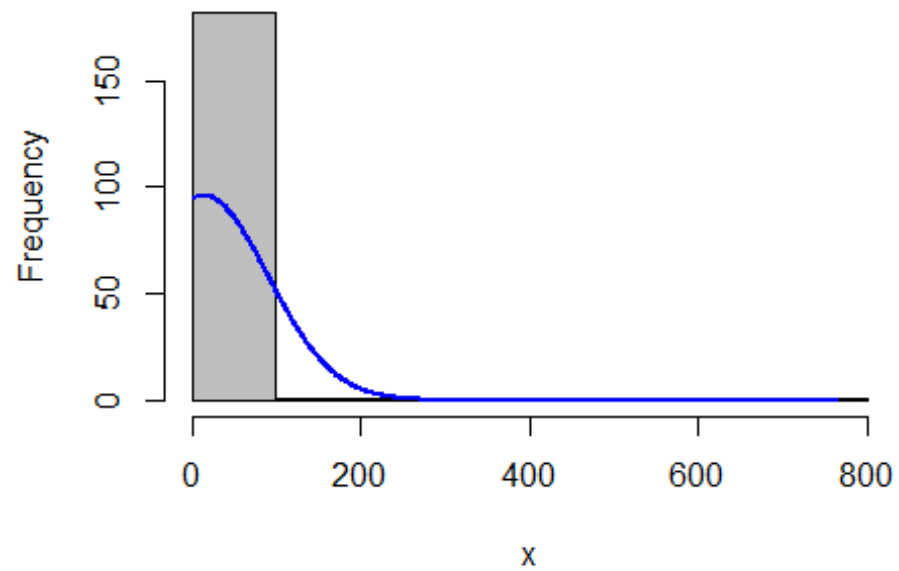
##   [1] -0.80639449 -0.65798208 -0.58070931 -0.65670601  1.06872315
##      1.03769990
##   [7]  2.26699785 -0.43734511 -0.60796568 -2.37204013  4.16199580
##      3.93967708
##  [13]  0.07740358  0.48248615  1.15055481  0.80854586 -0.27121916 -
##      0.61779662
##  [19] -0.33641872 -0.55672992  1.09414157  0.87073579 -0.07846029 -
##      0.63255198
##  [25] -0.88197175 -1.13070376 -1.02737202  0.19208399 -0.10444596
##      2.00858578
##  [31]  1.00824280  0.41538497  0.47098498 -1.85317370 -2.10513769
##      0.11270985
##  [37]  0.08815380  0.09060080 -0.23026726  0.99147185  1.11662237 -
##      2.01996763
##  [43] -2.25993610 -1.08027279 -1.48744234  1.07862208  0.62415220
##      0.98614442
##  [49]  0.89948632 -0.34719100 -0.45318904 -1.14080706 -1.75145145
##      0.90252972
##  [55]  0.66256323  0.80336367  0.68877095  1.45381433  1.24690704
##      1.68097579
##  [61]  1.28884390 -0.73788318 -1.19431485  0.28014077  0.22084321
##      3.50769831
##  [67]  3.45582728  3.68353730  2.84097988 -0.73411916 -0.62323942 -
##      0.61355458
##  [73] -0.72290345  1.42118995  1.25299301  0.81649964  0.81841480
##      0.01799234
##  [79]  0.34879382 -0.43183803  0.74697251  0.59405061  1.05837233
##      0.76347523
##  [85] -0.33662223 -1.11331580  0.18804067  0.18481962  0.39987341
##      0.41321829
##  [91]  1.73046170  1.32136144  1.52094764  1.43950847  1.16906697
##      1.07702116
##  [97] -1.44042433 -1.12136202 -0.23866353  0.32221692  0.80506324
##      0.61987867
## [103]  1.60547496  1.51263603  1.19407774  0.91085245 -3.17929376 -
##      3.24648346

```

```
## [109] -1.14494355 -1.27124838 -1.72693311 -1.78665215 2.90328911
2.81851841
## [115] 0.33544271 0.24928915 4.85147028 4.78760271 0.57879247
0.60743277
## [121] -1.16679892 -1.31924979 1.12531886 0.80305427 -0.63729731 -
2.24584019
## [127] 0.67038546 0.06588137 3.44231148 2.11845159 0.29388652
0.03849905
## [133] -1.84569432 -1.90039133 -1.02423071 -1.18241362 1.49766400
1.01766607
## [139] 1.47742156 1.32889359 0.56961265 0.52686668 0.80693441
0.70078990
## [145] 1.12400963 1.25647192 -1.07451714 -1.27074779 1.25344121
0.89924413
## [151] -3.12444399 -1.91051283 1.75975087 0.82853891 -1.04137139 -
1.00856706
## [157] -3.75912578 -4.50015672 0.40992878 0.09109747 0.30177999
0.06165263
## [163] 1.17856965 1.01808076 1.26360819 1.14120515 1.40595371
1.09641565
## [169] 1.35985054 1.44108525 -1.77719115 -1.99019225 -0.09926004 -
0.27051903
## [175] 0.31774685 0.01511614 0.36546038 0.53846673 1.60812456
1.17710704
## [181] 0.02954710 0.16301621 1.70065374 1.40626577 0.46960025
0.41650142
```

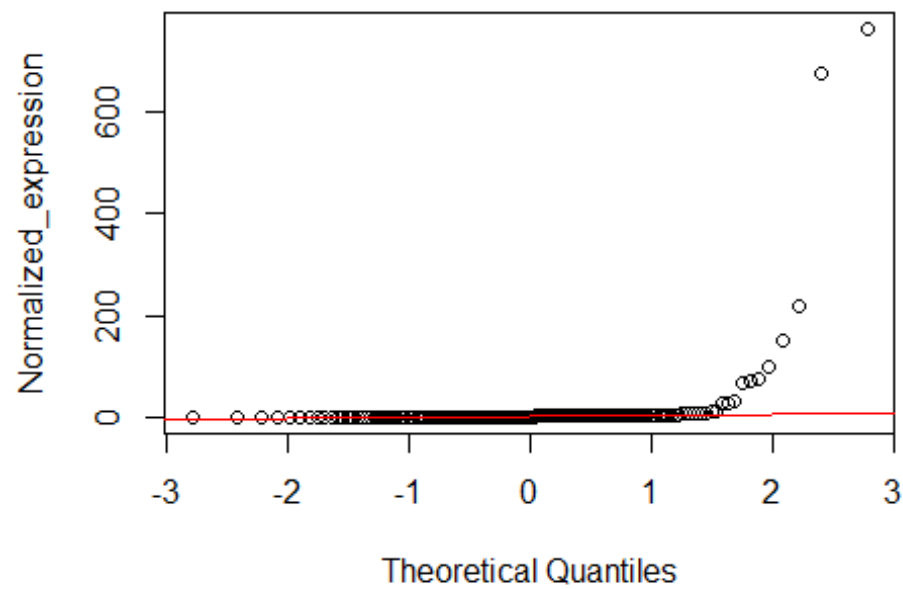
```
expression <- with(qpcr,Normalized_expression)
trans <- with(qpcr,Transformed)
library(rcompanion)
```

```
plotNormalHistogram(Normalized_expression)
```

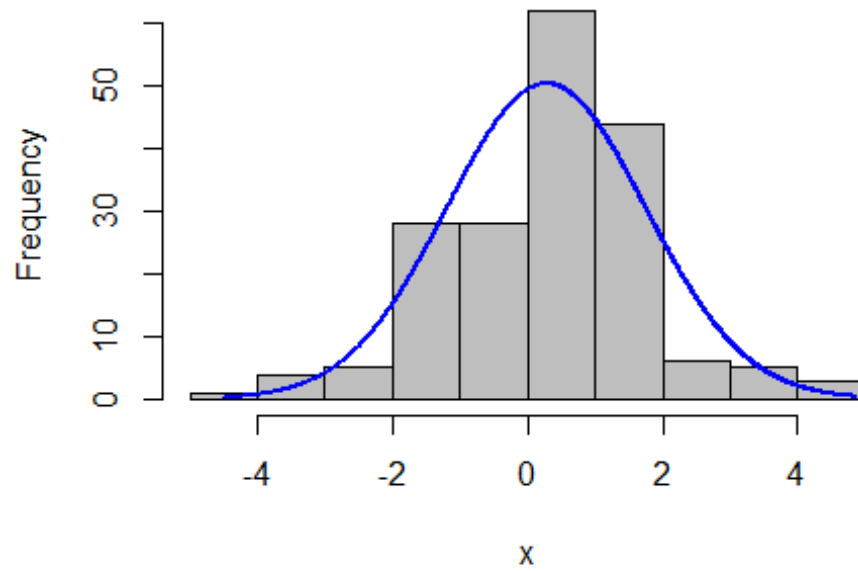



```
qqnorm(Normalized_expression,ylab="Normalized_expression")
qqline(Normalized_expression,
       col="red")
```

Normal Q-Q Plot

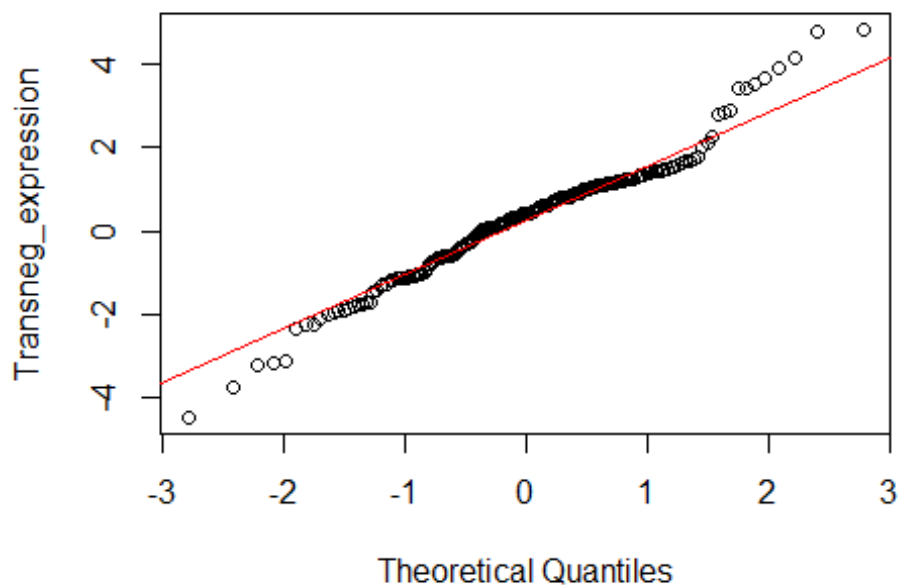


```
plotNormalHistogram(Transformed)
```



```
qqnorm(Transformed,ylab="Transneg_expression")  
qqline(Transformed,  
        col="red")
```

Normal Q-Q Plot



```
#-----
#=====
=====

ifla<-subset(qpcr, Target=="GmmIV")
ifla

##      Target Sample Irradiation_dose Dpi    Life_stage
Irradiation_conditions
## 1   GmmIV    17A                0   3 Adult (3 dpi)
Hypoxia
## 2   GmmIV    17B                0   3 Adult (3 dpi)
Hypoxia
## 3   GmmIV    18A                0   3 Adult (3 dpi)
Normoxia
## 4   GmmIV    18B                0   3 Adult (3 dpi)
Normoxia
## 5   GmmIV     8A                0   0 Pupae (0 dpi)
Hypoxia
## 6   GmmIV     8B                0   0 Pupae (0 dpi)
Hypoxia
## 7   GmmIV     9A                0   0 Pupae (0 dpi)
Normoxia
## 8   GmmIV     9B                0   0 Pupae (0 dpi)
Normoxia
## 9   GmmIV    11A               70   3 Adult (3 dpi)
```

Hypoxia					
## 10	GmmIV	11B	70	3 Adult (3 dpi)	
Hypoxia					
## 11	GmmIV	14A	70	3 Adult (3 dpi)	
Normoxia					
## 12	GmmIV	14B	70	3 Adult (3 dpi)	
Normoxia					
## 13	GmmIV	2A	70	0 Pupae (0 dpi)	
Hypoxia					
## 14	GmmIV	2B	70	0 Pupae (0 dpi)	
Hypoxia					
## 15	GmmIV	5A	70	0 Pupae (0 dpi)	
Normoxia					
## 16	GmmIV	5B	70	0 Pupae (0 dpi)	
Normoxia					
## 17	GmmIV	12A	110	3 Adult (3 dpi)	
Hypoxia					
## 18	GmmIV	12B	110	3 Adult (3 dpi)	
Hypoxia					
## 19	GmmIV	15A	110	3 Adult (3 dpi)	
Normoxia					
## 20	GmmIV	15B	110	3 Adult (3 dpi)	
Normoxia					
## 21	GmmIV	3A	110	0 Pupae (0 dpi)	
Hypoxia					
## 22	GmmIV	3B	110	0 Pupae (0 dpi)	
Hypoxia					
## 23	GmmIV	6A	110	0 Pupae (0 dpi)	
Normoxia					
## 24	GmmIV	6B	110	0 Pupae (0 dpi)	
Normoxia					
## 25	GmmIV	13A	150	3 Adult (3 dpi)	
Hypoxia					
## 26	GmmIV	13B	150	3 Adult (3 dpi)	
Hypoxia					
## 27	GmmIV	16B	150	3 Adult (3 dpi)	
Normoxia					
## 28	GmmIV	4A	150	0 Pupae (0 dpi)	
Hypoxia					
## 29	GmmIV	4B	150	0 Pupae (0 dpi)	
Hypoxia					
## 30	GmmIV	7A	150	0 Pupae (0 dpi)	
Normoxia					
## 31	GmmIV	7B	150	0 Pupae (0 dpi)	
Normoxia					
## 32	GmmIV	1A	0	0 Pupae (0 dpi)	
Normoxia					
## 33	GmmIV	1B	0	0 Pupae (0 dpi)	
Normoxia					
## 34	GmmIV	1A	0	0 Pupae (0 dpi)	

Hypoxia				
## 35	GmmIV	1b	0	0 Pupae (0 dpi)
Hypoxia				
## 36	GmmIV	2a	0	3 Adult (3 dpi)
Hypoxia				
## 37	GmmIV	2b	0	3 Adult (3 dpi)
Hypoxia				
## 38	GmmIV	3a	0	3 Adult (3 dpi)
Normoxia				
## 39	GmmIV	3b	0	3 Adult (3 dpi)
Normoxia				
## 40	GmmIV	21A	70	0 Pupae (0 dpi)
Normoxia				
## 41	GmmIV	21B	70	0 Pupae (0 dpi)
Normoxia				
## 42	GmmIV	3A	70	3 Adult (3 dpi)
Hypoxia				
## 43	GmmIV	3B	70	3 Adult (3 dpi)
Hypoxia				
## 44	GmmIV	6A	70	3 Adult (3 dpi)
Normoxia				
## 45	GmmIV	6B	70	3 Adult (3 dpi)
Normoxia				
## 46	GmmIV	2A	70	0 Pupae (0 dpi)
Hypoxia				
## 47	GmmIV	2B	70	0 Pupae (0 dpi)
Hypoxia				
## 48	GmmIV	22A	110	0 Pupae (0 dpi)
Normoxia				
## 49	GmmIV	22B	110	0 Pupae (0 dpi)
Normoxia				
## 50	GmmIV	4A	110	3 Adult (3 dpi)
Hypoxia				
## 51	GmmIV	4B	110	3 Adult (3 dpi)
Hypoxia				
## 52	GmmIV	7A	110	3 Adult (3 dpi)
Normoxia				
## 53	GmmIV	7B	110	3 Adult (3 dpi)
Normoxia				
## 54	GmmIV	3A	110	0 Pupae (0 dpi)
Hypoxia				
## 55	GmmIV	3B	110	0 Pupae (0 dpi)
Hypoxia				
## 56	GmmIV	20A	150	0 Pupae (0 dpi)
Hypoxia				
## 57	GmmIV	20B	150	0 Pupae (0 dpi)
Hypoxia				
## 58	GmmIV	23A	150	0 Pupae (0 dpi)
Normoxia				
## 59	GmmIV	23B	150	0 Pupae (0 dpi)

Normoxia				
## 60	GmmIV	5A	150	3 Adult (3 dpi)
Hypoxia				
## 61	GmmIV	5B	150	3 Adult (3 dpi)
Hypoxia				
## 62	GmmIV	8A	150	3 Adult (3 dpi)
Normoxia				
## 63	GmmIV	8B	150	3 Adult (3 dpi)
Normoxia				
## 64	GmmIV	16A	0	0 Pupae (0 dpi)
Hypoxia				
## 65	GmmIV	16B	0	0 Pupae (0 dpi)
Hypoxia				
## 66	GmmIV	17A	0	3 Adult (3 dpi)
Normoxia				
## 67	GmmIV	17B	0	3 Adult (3 dpi)
Normoxia				
## 68	GmmIV	4a	0	3 Adult (3 dpi)
Hypoxia				
## 69	GmmIV	4b	0	3 Adult (3 dpi)
Hypoxia				
## 70	GmmIV	10A	110	0 Pupae (0 dpi)
Hypoxia				
## 71	GmmIV	10B	110	0 Pupae (0 dpi)
Hypoxia				
## 72	GmmIV	13A	70	0 Pupae (0 dpi)
Normoxia				
## 73	GmmIV	13B	70	0 Pupae (0 dpi)
Normoxia				
## 74	GmmIV	19A	110	3 Adult (3 dpi)
Hypoxia				
## 75	GmmIV	19B	110	3 Adult (3 dpi)
Hypoxia				
## 76	GmmIV	22A	70	3 Adult (3 dpi)
Normoxia				
## 77	GmmIV	22B	70	3 Adult (3 dpi)
Normoxia				
## 78	GmmIV	11A	150	0 Pupae (0 dpi)
Hypoxia				
## 79	GmmIV	14A	110	0 Pupae (0 dpi)
Normoxia				
## 80	GmmIV	14B	110	0 Pupae (0 dpi)
Normoxia				
## 81	GmmIV	20A	150	3 Adult (3 dpi)
Hypoxia				
## 82	GmmIV	20B	150	3 Adult (3 dpi)
Hypoxia				
## 83	GmmIV	4A	110	3 Adult (3 dpi)
Normoxia				
## 84	GmmIV	4B	110	3 Adult (3 dpi)

Normoxia						
## 85	GmmIV	12A	190	0 Pupae (0 dpi)		
Hypoxia						
## 86	GmmIV	12B	190	0 Pupae (0 dpi)		
Hypoxia						
## 87	GmmIV	15A	150	0 Pupae (0 dpi)		
Normoxia						
## 88	GmmIV	15B	150	0 Pupae (0 dpi)		
Normoxia						
## 89	GmmIV	21A	190	3 Adult (3 dpi)		
Hypoxia						
## 90	GmmIV	21B	190	3 Adult (3 dpi)		
Hypoxia						
## 91	GmmIV	5A	150	3 Adult (3 dpi)		
Normoxia						
## 92	GmmIV	5B	150	3 Adult (3 dpi)		
Normoxia						
##	Replicate	Expression	Mean.Cq	Normalized_expression	Transformed	
## 1	1	0.1090300	22.03	0.4604599	-0.80639449	
## 2	1	0.1252000	22.18	0.5287497	-0.65798208	
## 3	1	0.1346500	21.74	0.5686593	-0.58070931	
## 4	1	0.1253500	21.86	0.5293832	-0.65670601	
## 5	1	1.0128188	20.06	3.0964529	1.06872315	
## 6	1	0.9783009	20.14	2.9909226	1.03769990	
## 7	1	4.2774600	20.65	13.0773182	2.26699785	
## 8	1	0.2131900	24.97	0.6517778	-0.43734511	
## 9	1	0.1312300	21.22	0.5542158	-0.60796567	
## 10	1	0.0281800	23.20	0.1190109	-2.37204012	
## 11	1	51.4884900	23.08	217.4482759	4.16199580	
## 12	1	35.4320700	23.73	149.6381528	3.93967708	
## 13	1	0.3535200	23.98	1.0808034	0.07740358	
## 14	1	0.5363300	23.34	1.6397016	0.48248615	
## 15	1	1.1104700	21.11	3.3949983	1.15055481	
## 16	1	0.7600200	21.47	2.3235807	0.80854586	
## 17	1	0.1811900	21.22	0.7652089	-0.27121916	
## 18	1	0.1300200	21.37	0.5491057	-0.61779662	
## 19	1	0.1700800	20.48	0.7182887	-0.33641872	
## 20	1	0.1377400	20.66	0.5817091	-0.55672992	
## 21	1	1.0421000	21.21	3.1859733	1.09414157	
## 22	1	0.8134100	21.31	2.4868079	0.87073579	
## 23	1	0.3025000	22.33	0.9248219	-0.07846029	
## 24	1	0.1771300	22.62	0.5415329	-0.63255198	
## 25	1	0.1016900	21.38	0.4294613	-0.88197175	
## 26	1	0.0811200	21.68	0.3425893	-1.13070376	
## 27	1	0.0890500	22.69	0.3760796	-1.02737202	
## 28	1	0.3971000	21.14	1.2140389	0.19208399	
## 29	1	0.2948100	21.36	0.9013116	-0.10444596	
## 30	1	3.0791500	19.95	9.4137699	2.00858578	
## 31	1	0.9467200	20.14	2.8943716	1.00824280	
## 32	2	41.6958900	18.76	1.5284571	0.41538497	

## 33	2	44.1936500	18.90	1.6200182	0.47098498
## 34	2	4.9830300	20.88	0.1826642	-1.85317370
## 35	2	4.0377800	21.10	0.1480140	-2.10513769
## 36	2	2.4963200	21.57	1.1200237	0.11270985
## 37	2	2.4351600	21.58	1.0925830	0.08815380
## 38	2	2.4411800	21.48	1.0952840	0.09060080
## 39	2	1.7750200	21.63	0.7963981	-0.23026726
## 40	2	77.4999800	18.05	2.8409370	0.99147185
## 41	2	89.1371500	18.02	3.2675238	1.11662237
## 42	2	0.3540300	21.12	0.1588426	-2.01996763
## 43	2	0.2905300	21.09	0.1303521	-2.25993610
## 44	2	0.7990400	21.06	0.3585052	-1.08027279
## 45	2	0.5569800	21.31	0.2499002	-1.48744234
## 46	2	85.4123400	18.18	3.1309824	1.07862208
## 47	2	51.9678200	18.22	1.9049979	0.62415220
## 48	2	77.0431500	18.06	2.8241909	0.98614442
## 49	2	70.0133600	18.17	2.5664980	0.89948632
## 50	2	1.5843400	20.05	0.7108457	-0.34719100
## 51	2	1.4308200	19.84	0.6419659	-0.45318904
## 52	2	0.7566700	25.64	0.3394951	-1.14080706
## 53	2	0.4437700	25.93	0.1991063	-1.75145145
## 54	2	70.2479300	17.60	2.5750967	0.90252972
## 55	2	54.1456100	17.67	1.9848298	0.66256323
## 56	2	63.0303700	19.38	2.3105207	0.80336367
## 57	2	55.6890600	19.66	2.0414084	0.68877095
## 58	2	131.2552700	17.80	4.8114587	1.45381433
## 59	2	103.3295600	18.06	3.7877787	1.24690704
## 60	2	14.0394200	23.05	6.2990654	1.68097579
## 61	2	8.8575800	23.14	3.9741297	1.28884390
## 62	2	1.0936700	21.94	0.4906968	-0.73788318
## 63	2	0.7212700	21.90	0.3236122	-1.19431485
## 64	3	14.4368800	17.24	1.3286184	0.28014077
## 65	3	13.5849800	17.28	1.2502185	0.22084321
## 66	3	9.0625900	17.96	75.1645517	3.50769831
## 67	3	8.3693500	18.03	69.4148627	3.45582728
## 68	3	11.9261400	19.77	98.9146554	3.68353730
## 69	3	3.4096000	21.27	28.2790081	2.84097988
## 70	3	5.3506800	18.51	0.4924202	-0.73411916
## 71	3	5.9361300	18.40	0.5462989	-0.62323942
## 72	3	5.9905200	17.58	0.5513044	-0.61355458
## 73	3	5.4069100	17.79	0.4975950	-0.72290345
## 74	3	0.5584300	20.94	4.6315833	1.42118995
## 75	3	0.4598800	21.13	3.8142158	1.25299301
## 76	3	0.2825900	19.52	2.3437837	0.81649964
## 77	3	0.2831800	19.69	2.3486771	0.81841480
## 78	3	11.0635400	18.09	1.0181717	0.01799234
## 79	3	15.4973400	18.25	1.4262119	0.34879382
## 80	3	7.1197500	18.13	0.6552268	-0.43183803
## 81	3	0.2620600	19.74	2.1735092	0.74697251
## 82	3	0.2224400	20.03	1.8449034	0.59405061

## 83	3	0.3690400	19.24	3.0607946	1.05837233
## 84	3	0.2667800	19.50	2.2126565	0.76347523
## 85	3	7.8034500	17.96	0.7181473	-0.33662223
## 86	3	3.7812600	18.02	0.3479873	-1.11331580
## 87	3	13.1375900	17.86	1.2090454	0.18804067
## 88	3	13.0945400	17.75	1.2050835	0.18481962
## 89	3	0.1813300	19.87	1.5039396	0.39987341
## 90	3	0.1838700	20.09	1.5250062	0.41321829
## 91	3	0.8061700	18.81	6.6863233	1.73046170
## 92	3	0.4974200	19.22	4.1255702	1.32136144

#select the model

```
anova(with(ifla,lm(Transformed ~ Irradiation_dose)))
```

Analysis of Variance Table

##

Response: Transformed

##		Df	Sum Sq	Mean Sq	F value	Pr(>F)
## Irradiation_dose	4	3.875	0.96881	0.5443	0.7036	
## Residuals	87	154.840	1.77977			

```
anova(with(ifla,lm(Transformed ~ Life_stage)))
```

Analysis of Variance Table

##

Response: Transformed

##		Df	Sum Sq	Mean Sq	F value	Pr(>F)
## Life_stage	1	0.134	0.13373	0.0759	0.7836	
## Residuals	90	158.582	1.76202			

```
anova(with(ifla,lm(Transformed ~ Irradiation_conditions)))
```

Analysis of Variance Table

##

Response: Transformed

##		Df	Sum Sq	Mean Sq	F value	Pr(>F)
## Irradiation_conditions	1	3.848	3.8478	2.2361	0.1383	
## Residuals	90	154.867	1.7207			

```
anova(with(ifla,lm(Transformed ~ Irradiation_dose +Life_stage)))
```

Analysis of Variance Table

##

Response: Transformed

##		Df	Sum Sq	Mean Sq	F value	Pr(>F)
## Irradiation_dose	4	3.875	0.96881	0.5387	0.7077	
## Life_stage	1	0.173	0.17339	0.0964	0.7569	
## Residuals	86	154.667	1.79845			

```
anova(with(ifla,lm(Transformed ~
Irradiation_dose+Irradiation_conditions)))
```

```
## Analysis of Variance Table
##
## Response: Transformed
##              Df Sum Sq Mean Sq F value Pr(>F)
## Irradiation_dose      4   3.875   0.9688   0.5509 0.6989
## Irradiation_conditions 1   3.591   3.5907   2.0416 0.1567
## Residuals            86 151.249   1.7587

anova(with(ifla,lm(Transformed ~ Irradiation_dose *Life_stage)))

## Analysis of Variance Table
##
## Response: Transformed
##              Df Sum Sq Mean Sq F value Pr(>F)
## Irradiation_dose      4   3.875   0.96881   0.5403 0.7065
## Life_stage            1   0.173   0.17339   0.0967 0.7566
## Irradiation_dose:Life_stage 4   7.638   1.90948   1.0649 0.3792
## Residuals            82 147.029   1.79303

anova(with(ifla,lm(Transformed ~ Irradiation_dose
*Irradiation_conditions)))

## Analysis of Variance Table
##
## Response: Transformed
##              Df Sum Sq Mean Sq F value
Pr(>F)
## Irradiation_dose      4   3.875   0.9688   0.5645
0.6891
## Irradiation_conditions 1   3.591   3.5907   2.0921
0.1518
## Irradiation_dose:Irradiation_conditions 3   8.798   2.9327   1.7087
0.1715
## Residuals            83 142.451   1.7163

#-----
-----

mod1 <- lm(Transformed ~ Irradiation_dose + Irradiation_conditions,
data = ifla)
mod2 <- lm(Transformed ~ Irradiation_dose * Irradiation_conditions,
data = ifla)
mod3 <- lm(Transformed ~ Irradiation_dose + Life_stage +
Irradiation_conditions, data = ifla)
mod4 <- lm(Transformed ~ Irradiation_dose * Life_stage *
Irradiation_conditions, data = ifla)
mod5 <- lm(Transformed ~ Irradiation_dose + Life_stage, data = ifla)
mod6 <- lm(Transformed ~ Irradiation_dose*Life_stage, data = ifla)
mod7 <- lm(Transformed ~ Irradiation_dose, data = ifla)
mod8 <- lm(Transformed ~ Irradiation_conditions, data = ifla)
```

```

mod9 <- lm(Transformed ~ Life_stage, data = ifla)
mod10<- lm(Transformed ~ Irradiation_dose*Life_stage, data = ifla)

AICc(mod1,mod2,mod3,mod4,mod5,mod6,mod7,mod8,mod9,mod10)

##          df      AICc
## mod1      7 322.1550
## mod2     10 324.0242
## mod3      8 324.4492
## mod4     19 334.6839
## mod5      7 324.2105
## mod6     11 329.5179
## mod7      6 321.9685
## mod8      3 315.2693
## mod9      3 317.4496
## mod10    11 329.5179

anova(mod8, mod9)

## Analysis of Variance Table
##
## Model 1: Transformed ~ Irradiation_conditions
## Model 2: Transformed ~ Life_stage
##   Res.Df    RSS Df Sum of Sq F Pr(>F)
## 1      90 154.87
## 2      90 158.58  0    -3.7141

##no difference, choose either model but went for the Lowest

summary(mod8)

##
## Call:
## lm(formula = Transformed ~ Irradiation_conditions, data = ifla)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -2.4854 -0.9284 -0.0130  0.6477  3.6395
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    0.1134     0.1913   0.593   0.555
## Irradiation_conditionsNormoxia  0.4091     0.2736   1.495   0.138
##
## Residual standard error: 1.312 on 90 degrees of freedom
## Multiple R-squared:  0.02424,    Adjusted R-squared:  0.0134
## F-statistic: 2.236 on 1 and 90 DF,  p-value: 0.1383

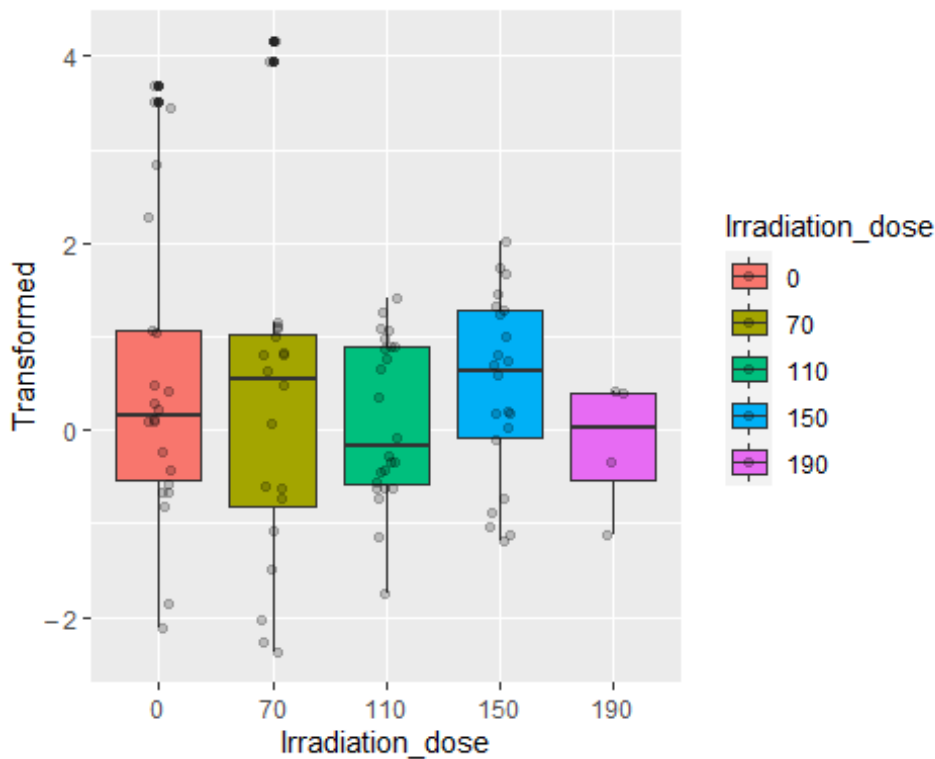
#-----
-----

```

```
#####
#####
###Irradiation dose

ifla$Irradiation_dose=as.factor(ifla$Irradiation_dose)
label_parse <- function(breaks) {parse(text = breaks)}

Fig1a<-ggplot(ifla,aes(x=Irradiation_dose,y=Transformed,
fill=Irradiation_dose)) +
  geom_boxplot()+
  geom_jitter(width=0.1,alpha=0.2)+scale_y_continuous(labels =
label_parse)
Fig1a
```



```
tiff("Fig 1a.tiff", width = 4, height = 4, units = 'in', res = 300)
plot(Fig1a+theme_tufte() + theme(axis.line = element_line(size = 1,
colour = "black")) + theme(axis.text.x = element_blank())
+theme(legend.title = element_text(face = "bold")) + theme(legend.text
= element_text(face = "plain"))) + xlab(expression(bold("Irradiation
doses (Gy)")))) + ylab(expression (bold("Transformed relative GmmIV
density"))))
dev.off()

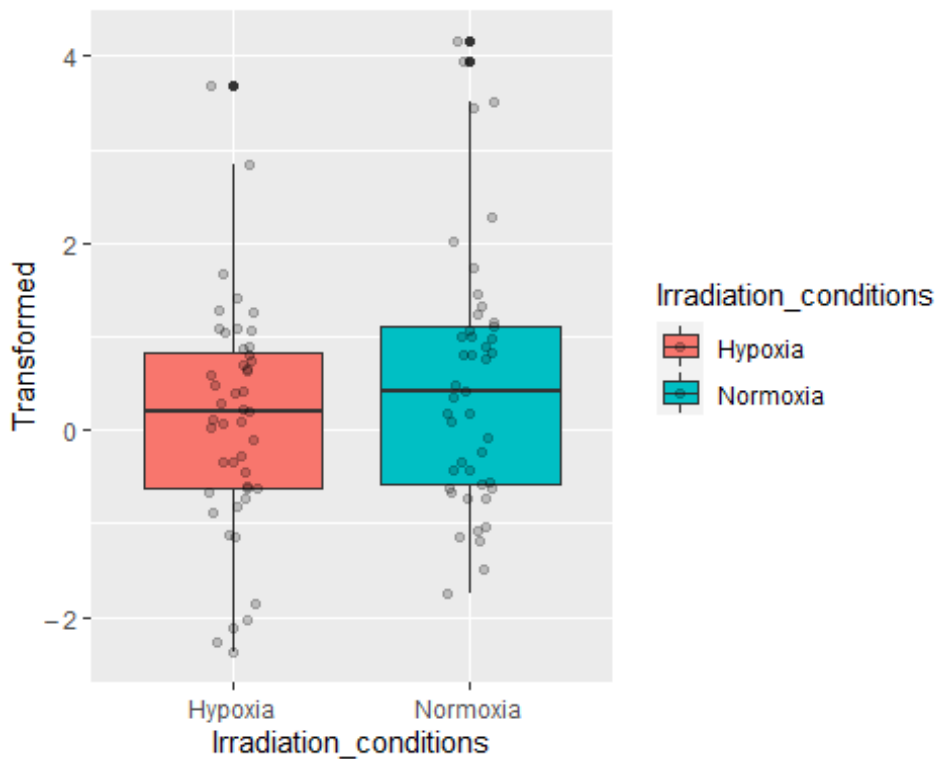
## png
## 2
```

###Irradiation status

```
#ifla$Irradiation_conditions=as.factor(ifla$Irradiation_conditions)
```

```
label_parse <- function(breaks) {parse(text = breaks)}
```

```
Fig1b<-ggplot(ifla,aes(x=Irradiation_conditions,y=Transformed,
fill=Irradiation_conditions)) +
  geom_boxplot() + geom_jitter(width=0.1,alpha=0.2)+
  scale_y_continuous(labels = label_parse)
Fig1b
```



```
tiff("Fig 1b.tiff", width = 4, height = 4, units = 'in', res = 300)
plot(Fig1b+theme_tufte() + theme(axis.line = element_line(size = 1,
colour = "black")) + theme(axis.text.x = element_blank())
+theme(legend.title = element_text(face = "bold")) + theme(legend.text
= element_text(face = "plain"))) + xlab(expression(bold("Irradiation
status "))) + ylab(expression (bold("Transformed relative GmmIV
density"))))
dev.off()
```

```
## png
```

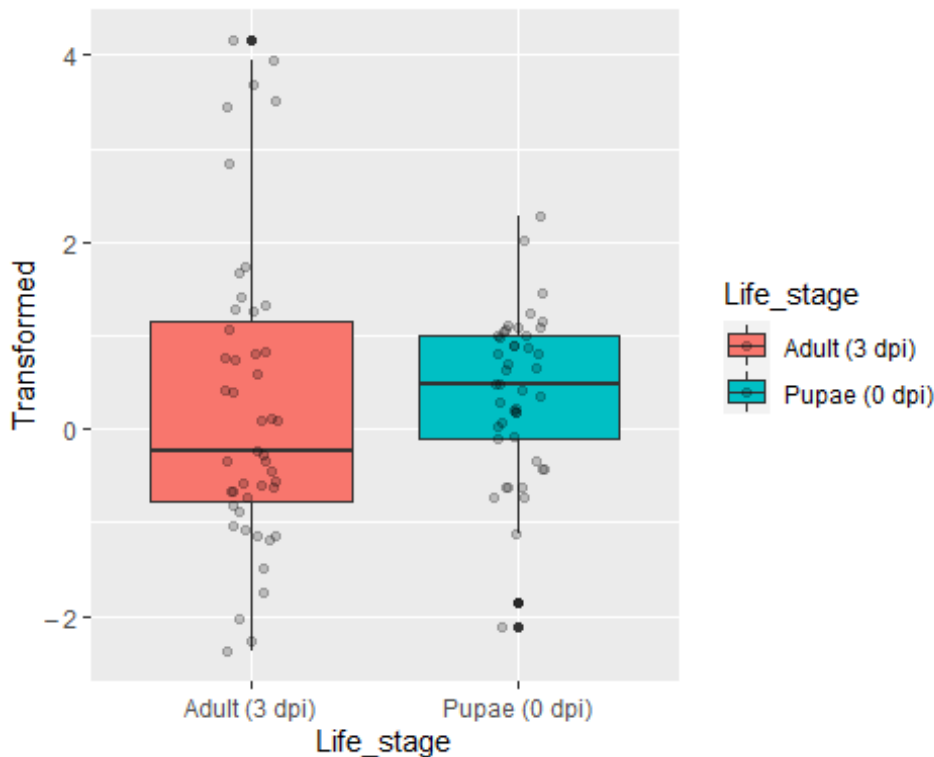
```
## 2
```

###Days_post.irradiation

```
#ifla$Life_stage=as.factor(ifla$Life_stage)
```

```
label_parse <- function(breaks) {parse(text = breaks)}
```

```
Fig1c<-ggplot(ifla,aes(x=Life_stage,y=Transformed, fill=Life_stage)) +
  geom_boxplot() + geom_jitter(width=0.1,alpha=0.2)+
  scale_y_continuous(labels = label_parse)
Fig1c
```



```
tiff("Fig 1c.tiff", width = 4, height = 4, units = 'in', res = 300)
plot(Fig1c+theme_tufte() + theme(axis.line = element_line(size = 1,
colour = "black")) + theme(axis.text.x = element_blank())
+theme(legend.title = element_text(face = "bold")) + theme(legend.text
= element_text(face = "plain")))) + xlab(expression(bold("Days post
irradiation")))) + ylab(expression (bold("Transformed relative GmmIV
density"))))
dev.off()
```

```
## png
## 2
```

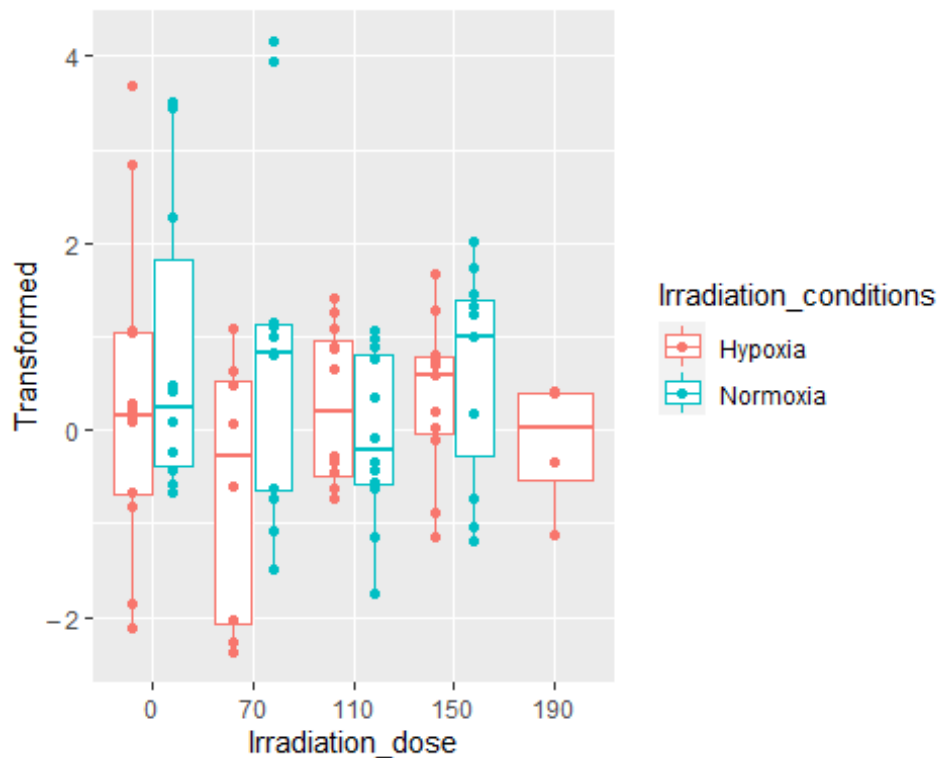
###Irradiation dose according to air status

```
label_parse <- function(breaks) {parse(text = breaks)}
```

```
Fig2a<-ggplot(ifla, aes(x=Irradiation_dose,y=Transformed,
colour=Irradiation_conditions)) +
  geom_boxplot(position=position_dodge(0.8))+
  geom_jitter(position=position_dodge(0.8))+ scale_y_continuous(labels
```

```
= label_parse)
```

Fig2a



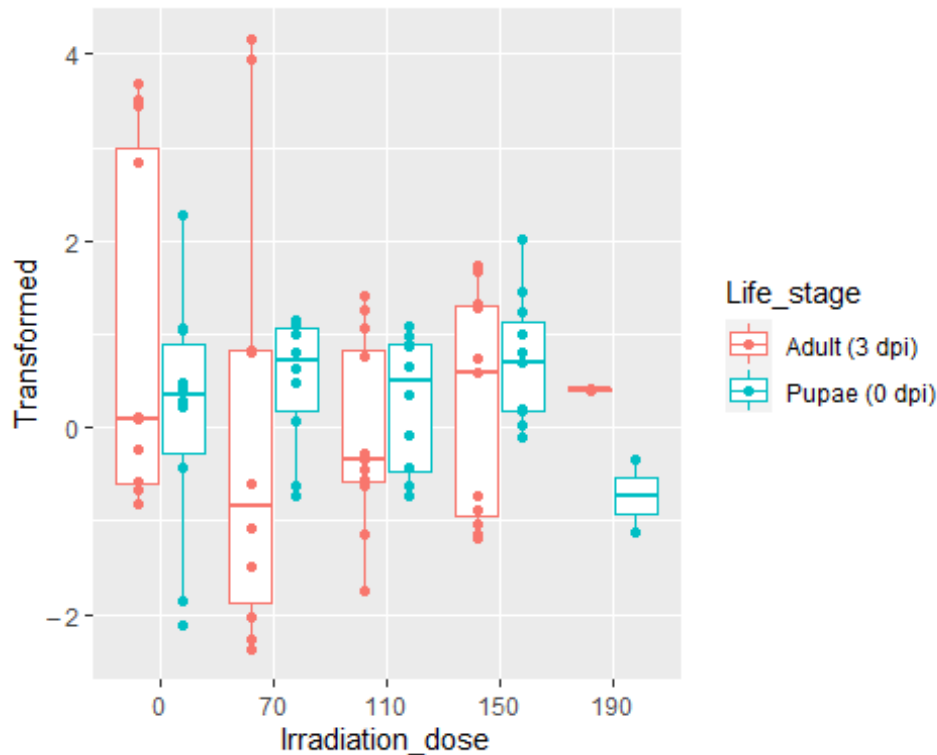
```
tiff("Fig 2a.tiff", width = 7, height = 4, units = 'in',compression =
'lwz',res = 300)
plot(Fig2a+theme_tufte() + theme(axis.line = element_line(size = 1,
colour = "black")) + theme(legend.title= element_text(face = "bold")) +
theme(legend.text = element_text(face = "plain"))) + theme(axis.text.x
= element_text(colour = "black")) + theme(axis.text.y =
element_text(colour = "black")) + xlab(expression(bold("Irradiation
dose (Gy)")))) + ylab(expression(bold("GmmIV_ ")~bold("Transformed
normalized density"))))
dev.off()
```

```
## png
## 2
```

```
###Irradiation dose according to pupae stage/ days post irradiation
label_parse <- function(breaks) {parse(text = breaks)}
```

```
Fig2b<-ggplot(ifla, aes(x=Irradiation_dose,y=Transformed,
colour=Life_stage)) +
  geom_boxplot(position=position_dodge(0.8))+
  geom_jitter(position=position_dodge(0.8))+ scale_y_continuous(labels
= label_parse)
```

Fig2b



```
tiff("Fig 2b.tiff", width = 7, height = 4, units = 'in',compression =
'lzw',res = 300)
plot(Fig2b+theme_tufte() + theme(axis.line = element_line(size = 1,
colour = "black")) + theme(legend.title= element_text(face = "bold")) +
theme(legend.text = element_text(face = "plain"))) + theme(axis.text.x
= element_text(colour = "black")) + theme(axis.text.y =
element_text(colour = "black")) + xlab(expression(bold("Irradiation
dose (Gy)")))) + ylab(expression(bold("GmmIV_ ")~bold("Transformed
normalized density"))))
dev.off()
```

```
## png
## 2
```

```
# #Statistics iflaevirus for subsets
```

```
#-----
```

```
#iflaevirus-Normoxia
```

```
#-----
```

```
#iflaNorm<- read.csv("iflaevirus_alldata_normalized.csv")
iflaNorm<- subset(ifla, Irradiation_conditions=="Normoxia")
iflaNorm
```

```
## Target Sample Irradiation_dose Dpi Life_stage
Irradiation_conditions
```


## 3	GmmIV	18A	0	3 Adult (3 dpi)
	Normoxia			
## 4	GmmIV	18B	0	3 Adult (3 dpi)
	Normoxia			
## 7	GmmIV	9A	0	0 Pupae (0 dpi)
	Normoxia			
## 8	GmmIV	9B	0	0 Pupae (0 dpi)
	Normoxia			
## 11	GmmIV	14A	70	3 Adult (3 dpi)
	Normoxia			
## 12	GmmIV	14B	70	3 Adult (3 dpi)
	Normoxia			
## 15	GmmIV	5A	70	0 Pupae (0 dpi)
	Normoxia			
## 16	GmmIV	5B	70	0 Pupae (0 dpi)
	Normoxia			
## 19	GmmIV	15A	110	3 Adult (3 dpi)
	Normoxia			
## 20	GmmIV	15B	110	3 Adult (3 dpi)
	Normoxia			
## 23	GmmIV	6A	110	0 Pupae (0 dpi)
	Normoxia			
## 24	GmmIV	6B	110	0 Pupae (0 dpi)
	Normoxia			
## 27	GmmIV	16B	150	3 Adult (3 dpi)
	Normoxia			
## 30	GmmIV	7A	150	0 Pupae (0 dpi)
	Normoxia			
## 31	GmmIV	7B	150	0 Pupae (0 dpi)
	Normoxia			
## 32	GmmIV	1A	0	0 Pupae (0 dpi)
	Normoxia			
## 33	GmmIV	1B	0	0 Pupae (0 dpi)
	Normoxia			
## 38	GmmIV	3a	0	3 Adult (3 dpi)
	Normoxia			
## 39	GmmIV	3b	0	3 Adult (3 dpi)
	Normoxia			
## 40	GmmIV	21A	70	0 Pupae (0 dpi)
	Normoxia			
## 41	GmmIV	21B	70	0 Pupae (0 dpi)
	Normoxia			
## 44	GmmIV	6A	70	3 Adult (3 dpi)
	Normoxia			
## 45	GmmIV	6B	70	3 Adult (3 dpi)
	Normoxia			
## 48	GmmIV	22A	110	0 Pupae (0 dpi)
	Normoxia			
## 49	GmmIV	22B	110	0 Pupae (0 dpi)
	Normoxia			

## 52	GmmIV	7A	110	3 Adult (3 dpi)
Normoxia				
## 53	GmmIV	7B	110	3 Adult (3 dpi)
Normoxia				
## 58	GmmIV	23A	150	0 Pupae (0 dpi)
Normoxia				
## 59	GmmIV	23B	150	0 Pupae (0 dpi)
Normoxia				
## 62	GmmIV	8A	150	3 Adult (3 dpi)
Normoxia				
## 63	GmmIV	8B	150	3 Adult (3 dpi)
Normoxia				
## 66	GmmIV	17A	0	3 Adult (3 dpi)
Normoxia				
## 67	GmmIV	17B	0	3 Adult (3 dpi)
Normoxia				
## 72	GmmIV	13A	70	0 Pupae (0 dpi)
Normoxia				
## 73	GmmIV	13B	70	0 Pupae (0 dpi)
Normoxia				
## 76	GmmIV	22A	70	3 Adult (3 dpi)
Normoxia				
## 77	GmmIV	22B	70	3 Adult (3 dpi)
Normoxia				
## 79	GmmIV	14A	110	0 Pupae (0 dpi)
Normoxia				
## 80	GmmIV	14B	110	0 Pupae (0 dpi)
Normoxia				
## 83	GmmIV	4A	110	3 Adult (3 dpi)
Normoxia				
## 84	GmmIV	4B	110	3 Adult (3 dpi)
Normoxia				
## 87	GmmIV	15A	150	0 Pupae (0 dpi)
Normoxia				
## 88	GmmIV	15B	150	0 Pupae (0 dpi)
Normoxia				
## 91	GmmIV	5A	150	3 Adult (3 dpi)
Normoxia				
## 92	GmmIV	5B	150	3 Adult (3 dpi)
Normoxia				

##	Replicate	Expression	Mean.Cq	Normalized_expression	Transformed
## 3	1	0.13465	21.74	0.5686593	-0.58070931
## 4	1	0.12535	21.86	0.5293832	-0.65670601
## 7	1	4.27746	20.65	13.0773182	2.26699785
## 8	1	0.21319	24.97	0.6517778	-0.43734511
## 11	1	51.48849	23.08	217.4482759	4.16199580
## 12	1	35.43207	23.73	149.6381528	3.93967708
## 15	1	1.11047	21.11	3.3949983	1.15055481
## 16	1	0.76002	21.47	2.3235807	0.80854586
## 19	1	0.17008	20.48	0.7182887	-0.33641872

```
## 20      1      0.13774      20.66      0.5817091 -0.55672992
## 23      1      0.30250      22.33      0.9248219 -0.07846029
## 24      1      0.17713      22.62      0.5415329 -0.63255198
## 27      1      0.08905      22.69      0.3760796 -1.02737202
## 30      1      3.07915      19.95      9.4137699  2.00858578
## 31      1      0.94672      20.14      2.8943716  1.00824280
## 32      2     41.69589      18.76      1.5284571  0.41538497
## 33      2     44.19365      18.90      1.6200182  0.47098498
## 38      2      2.44118      21.48      1.0952840  0.09060080
## 39      2      1.77502      21.63      0.7963981 -0.23026726
## 40      2     77.49998      18.05      2.8409370  0.99147185
## 41      2     89.13715      18.02      3.2675238  1.11662237
## 44      2      0.79904      21.06      0.3585052 -1.08027279
## 45      2      0.55698      21.31      0.2499002 -1.48744234
## 48      2     77.04315      18.06      2.8241909  0.98614442
## 49      2     70.01336      18.17      2.5664980  0.89948632
## 52      2      0.75667      25.64      0.3394951 -1.14080706
## 53      2      0.44377      25.93      0.1991063 -1.75145145
## 58      2    131.25527      17.80      4.8114587  1.45381433
## 59      2   103.32956      18.06      3.7877787  1.24690704
## 62      2      1.09367      21.94      0.4906968 -0.73788318
## 63      2      0.72127      21.90      0.3236122 -1.19431485
## 66      3      9.06259      17.96     75.1645517  3.50769831
## 67      3      8.36935      18.03     69.4148627  3.45582728
## 72      3      5.99052      17.58      0.5513044 -0.61355458
## 73      3      5.40691      17.79      0.4975950 -0.72290345
## 76      3      0.28259      19.52      2.3437837  0.81649964
## 77      3      0.28318      19.69      2.3486771  0.81841480
## 79      3     15.49734      18.25      1.4262119  0.34879382
## 80      3      7.11975      18.13      0.6552268 -0.43183803
## 83      3      0.36904      19.24      3.0607946  1.05837233
## 84      3      0.26678      19.50      2.2126565  0.76347523
## 87      3     13.13759      17.86      1.2090454  0.18804067
## 88      3     13.09454      17.75      1.2050835  0.18481962
## 91      3      0.80617      18.81      6.6863233  1.73046170
## 92      3      0.49742      19.22      4.1255702  1.32136144
```

```
#-----
anova(with(iflaNorm,lm(Transformed~ Life_stage*Irradiation_dose)))

## Analysis of Variance Table
##
## Response: Transformed
##
##              Df Sum Sq Mean Sq F value Pr(>F)
## Life_stage      1  0.114  0.11429   0.0563 0.8138
## Irradiation_dose  3  6.380  2.12671   1.0473 0.3831
## Life_stage:Irradiation_dose  3  5.099  1.69966   0.8370 0.4822
## Residuals      37 75.135  2.03067

anova(with(iflaNorm,lm(Transformed~ Life_stage +Irradiation_dose)))
```

```

## Analysis of Variance Table
##
## Response: Transformed
##           Df Sum Sq Mean Sq F value Pr(>F)
## Life_stage      1  0.114  0.11429   0.0570 0.8126
## Irradiation_dose 3  6.380  2.12671   1.0603 0.3767
## Residuals      40 80.234  2.00585

anova(with(iflaNorm,lm(Transformed~ Life_stage)))

## Analysis of Variance Table
##
## Response: Transformed
##           Df Sum Sq Mean Sq F value Pr(>F)
## Life_stage      1  0.114  0.11429   0.0567 0.8129
## Residuals      43 86.614  2.01428

anova(with(iflaNorm,lm(Transformed~ Irradiation_dose)))

## Analysis of Variance Table
##
## Response: Transformed
##           Df Sum Sq Mean Sq F value Pr(>F)
## Irradiation_dose 3  6.313   2.1043   1.0729 0.3712
## Residuals      41 80.415   1.9613

mod1 <- lm(Transformed ~ Irradiation_dose, data = iflaNorm)
mod5 <- lm(Transformed~ Irradiation_dose+Life_stage, data = iflaNorm)
mod6 <- lm(Transformed ~ Irradiation_dose*Life_stage, data = iflaNorm)
mod11 <- lm(Transformed ~Life_stage, data = iflaNorm)

AICc(mod1, mod5, mod6, mod11)

##           df           AICc
## mod1         5 165.3674
## mod5         6 167.9377
## mod6         9 173.9153
## mod11        3 163.7558

anova(mod11, mod1)

## Analysis of Variance Table
##
## Model 1: Transformed ~ Life_stage
## Model 2: Transformed ~ Irradiation_dose
##   Res.Df    RSS Df Sum of Sq      F Pr(>F)
## 1         43 86.614
## 2         41 80.415  2      6.1985 1.5802 0.2182

summary(mod11)

```

```
##
## Call:
## lm(formula = Transformed ~ Life_stage, data = iflaNorm)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -2.2247 -1.0539 -0.1586  0.5765  3.6888
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)      0.4732     0.2959   1.599   0.117
## Life_stagePupae (0 dpi)  0.1008     0.4232   0.238   0.813
##
## Residual standard error: 1.419 on 43 degrees of freedom
## Multiple R-squared:  0.001318,    Adjusted R-squared:  -0.02191
## F-statistic: 0.05674 on 1 and 43 DF,  p-value: 0.8129

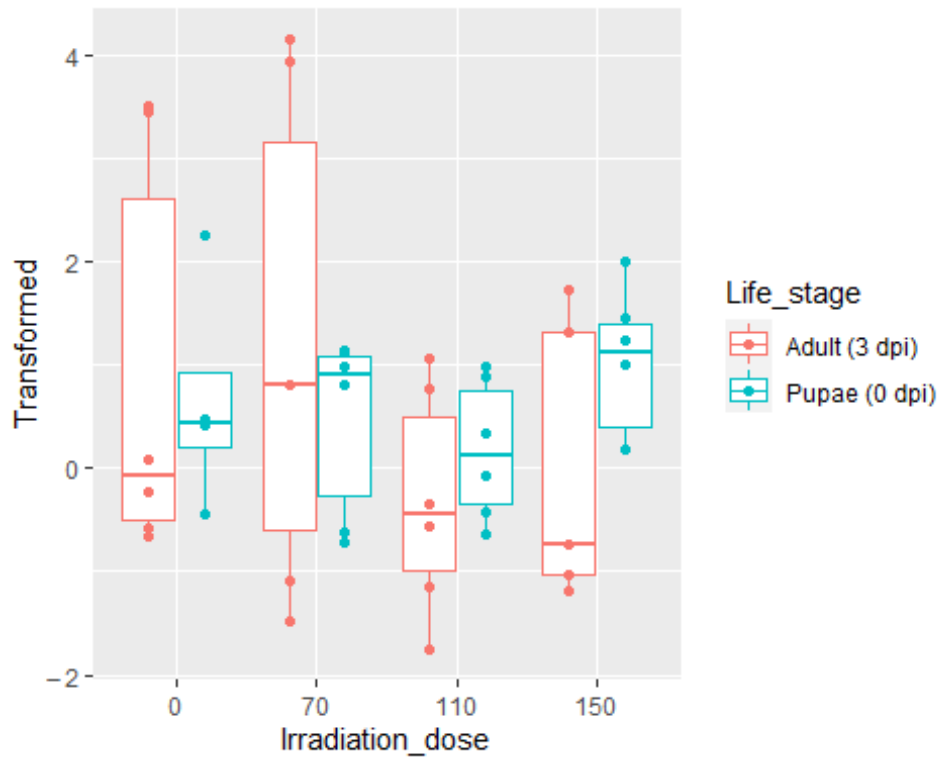
#-----

#FIGURE_normoxia
#iflaNorm$Life_stage=as.factor(iflaNorm$Life_stage)

label_parse <- function(breaks) {parse(text = breaks)}

FigS2A<-ggplot(iflaNorm, aes(x=Irradiation_dose,y=Transformed, colour=
Life_stage
)) +geom_boxplot(position=position_dodge(0.8))+
  geom_jitter(position=position_dodge(0.8))+
  scale_y_continuous(labels = label_parse)

FigS2A
```



```
tiff("Fig S2A.tiff", width = 7, height = 4, units = 'in',compression =
'lzw',res = 300)
plot(FigS2A+theme_tufte() + theme(axis.line = element_line(size = 1,
colour = "black")) + theme(legend.title= element_text(face = "bold")) +
theme(legend.text = element_text(face = "plain"))) + theme(axis.text.x
= element_text(colour = "black")) + theme(axis.text.y =
element_text(colour = "black")) + xlab(expression(bold("Irradiation
dose (Gy)")))) + ylab(expression(bold("GmmIV_ ")~bold("Normoxia
transformed relative density"))))
dev.off()

## png
## 2

#-----
#iflaevirus-Hypoxia
#-----
#iflaHypox <- read.csv("iflaevirus_allldata_normalized.csv")
iflaHypox <- subset(ifla , Irradiation_conditions=="Hypoxia")

#-----
---
anova(with(iflaHypox,lm(Transformed~ Life_stage+Irradiation_dose)))

## Analysis of Variance Table
##
## Response: Transformed
```

```

##              Df Sum Sq Mean Sq F value Pr(>F)
## Life_stage      1  0.033  0.03318   0.0219 0.8830
## Irradiation_dose 4   6.117  1.52936   1.0115 0.4127
## Residuals      41 61.989  1.51192

anova(with(iflaHypox,lm(Transformed~ Life_stage*Irradiation_dose)))

## Analysis of Variance Table
##
## Response: Transformed
##              Df Sum Sq Mean Sq F value  Pr(>F)
## Life_stage      1  0.033  0.0332   0.0269 0.87064
## Irradiation_dose 4   6.117  1.5294   1.2396 0.31107
## Life_stage:Irradiation_dose 4 16.340  4.0849   3.3110 0.02046 *
## Residuals      37 45.649  1.2338
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

anova(with(iflaHypox,lm(Transformed~ Life_stage)))

## Analysis of Variance Table
##
## Response: Transformed
##              Df Sum Sq Mean Sq F value Pr(>F)
## Life_stage      1  0.033  0.03318   0.0219  0.883
## Residuals      45 68.106  1.51347

anova(with(iflaHypox,lm(Transformed~ Irradiation_dose)))

## Analysis of Variance Table
##
## Response: Transformed
##              Df Sum Sq Mean Sq F value Pr(>F)
## Irradiation_dose 4   6.103  1.5258   1.033 0.4015
## Residuals      42 62.036  1.4770

mod1 <- lm(Transformed ~ Irradiation_dose, data = iflaHypox)
mod5 <- lm(Transformed~ Irradiation_dose+Life_stage, data = iflaHypox)
mod6 <- lm(Transformed ~ Irradiation_dose*Life_stage, data = iflaHypox)
mod11 <- lm(Transformed ~Life_stage, data = iflaHypox)

AICc(mod1, mod5, mod6, mod11)

##      df      AICc
## mod1    6 160.5258
## mod5    7 163.2617
## mod6   11 161.5522
## mod11    3 157.3715

anova(mod11, mod6)

```

```
## Analysis of Variance Table
##
## Model 1: Transformed ~ Life_stage
## Model 2: Transformed ~ Irradiation_dose * Life_stage
##   Res.Df    RSS Df Sum of Sq      F Pr(>F)
## 1      45 68.106
## 2      37 45.649  8    22.457 2.2753 0.04327 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

summary(mod11)

##
## Call:
## lm(formula = Transformed ~ Life_stage, data = iflaHypox)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -2.4594 -0.7253  0.0516  0.6965  3.5962
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)      0.08738    0.25112   0.348   0.729
## Life_stagePupae (0 dpi) 0.05315    0.35898   0.148   0.883
##
## Residual standard error: 1.23 on 45 degrees of freedom
## Multiple R-squared:  0.0004869, Adjusted R-squared: -0.02172
## F-statistic: 0.02192 on 1 and 45 DF, p-value: 0.883

summary(mod6)

##
## Call:
## lm(formula = Transformed ~ Irradiation_dose * Life_stage, data =
iflaHypox)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1.87999 -0.58719 -0.00667  0.51079  2.80670
##
## Coefficients:
##              Estimate Std. Error t
value      Estimate Std. Error t
## (Intercept)      0.87683    0.45346
1.934
## Irradiation_dose70      -2.69181    0.71698  -
3.754
## Irradiation_dose110     -0.71270    0.64129  -
1.111
## Irradiation_dose150     -0.49381    0.64129  -
0.770
```



```

## Irradiation_dose190                -0.47029    0.90692  -
0.519
## Life_stagePupae (0 dpi)            -1.10198    0.64129  -
1.718
## Irradiation_dose70:Life_stagePupae (0 dpi)  3.48263    1.01397
3.435
## Irradiation_dose110:Life_stagePupae (0 dpi)  1.29996    0.90692
1.433
## Irradiation_dose150:Life_stagePupae (0 dpi)  1.03851    0.92932
1.117
## Irradiation_dose190:Life_stagePupae (0 dpi) -0.02953    1.28258  -
0.023
##                                     Pr(>|t|)
## (Intercept)                        0.060834 .
## Irradiation_dose70                 0.000597 ***
## Irradiation_dose110                0.273583
## Irradiation_dose150                0.446176
## Irradiation_dose190                0.607158
## Life_stagePupae (0 dpi)            0.094084 .
## Irradiation_dose70:Life_stagePupae (0 dpi)  0.001478 **
## Irradiation_dose110:Life_stagePupae (0 dpi) 0.160148
## Irradiation_dose150:Life_stagePupae (0 dpi) 0.270985
## Irradiation_dose190:Life_stagePupae (0 dpi) 0.981755
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.111 on 37 degrees of freedom
## Multiple R-squared:  0.3301, Adjusted R-squared:  0.1671
## F-statistic: 2.025 on 9 and 37 DF,  p-value: 0.06392

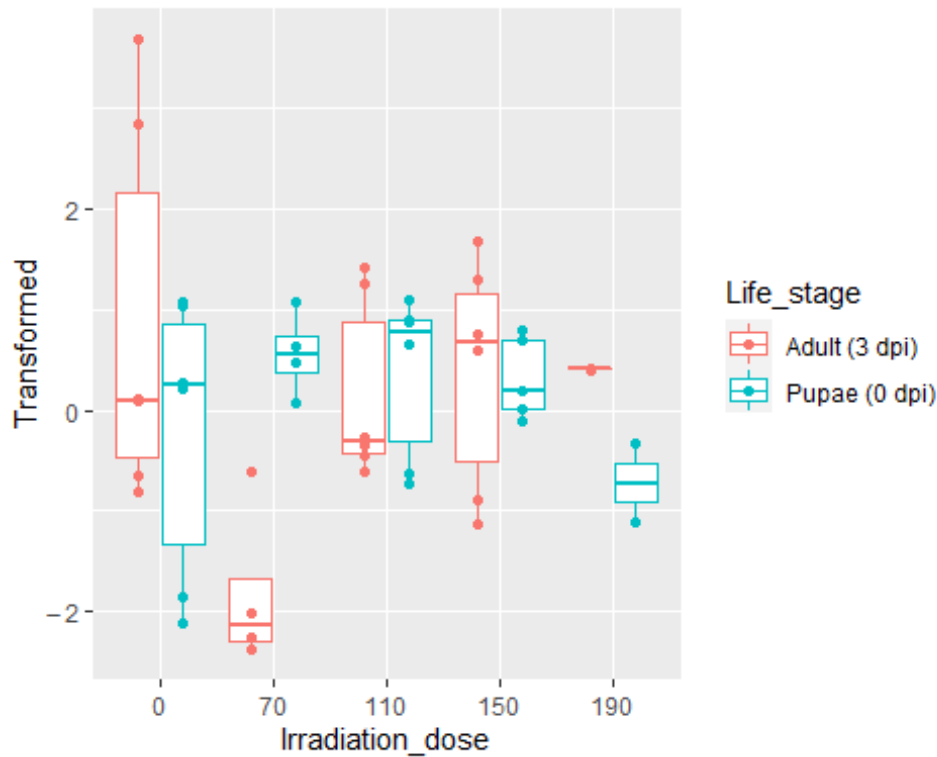
#-----

###Figure hypoxia
label_parse <- function(breaks) {parse(text = breaks)}

FigS2B<-ggplot(iflaHypox, aes(x=Irradiation_dose,y=Transformed, colour=
Life_stage)) +
  geom_boxplot(position=position_dodge(0.8))+
  geom_jitter(position=position_dodge(0.8)) + scale_y_continuous(labels
= label_parse)

FigS2B

```



```
tiff("Fig S2B.tiff", width = 7, height = 4, units = 'in',compression =
'lzw',res = 300)
plot(FigS2B+theme_tufte() + theme(axis.line = element_line(size = 1,
colour = "black")) + theme(legend.title= element_text(face = "bold")) +
theme(legend.text = element_text(face = "plain"))) + theme(axis.text.x
= element_text(colour = "black")) + theme(axis.text.y =
element_text(colour = "black")) + xlab(expression(bold("Irradiation
dose (Gy)")))) + ylab(expression(bold("GmmIV_ ")~bold("Hypoxia
Transformed relative density")))+ scale_y_continuous(labels =
label_parse)
```

```
## Scale for 'y' is already present. Adding another scale for 'y',
which will
## replace the existing scale.
```

```
dev.off()
```

```
## png
## 2
```

```
#
#work with GmmNegV data
```

```
neg<-subset(qpcr, Target=="GmmNegV")
neg
```

```
##      Target Sample Irradiation_dose Dpi      Life_stage
Irradiation_conditions
```

## 93 GmmNegV	17A	0	3 Adult (3 dpi)
Hypoxia			
## 94 GmmNegV	17B	0	3 Adult (3 dpi)
Hypoxia			
## 95 GmmNegV	18A	0	3 Adult (3 dpi)
Normoxia			
## 96 GmmNegV	18B	0	3 Adult (3 dpi)
Normoxia			
## 97 GmmNegV	8A	0	0 Pupae (0 dpi)
Hypoxia			
## 98 GmmNegV	8B	0	0 Pupae (0 dpi)
Hypoxia			
## 99 GmmNegV	9A	0	0 Pupae (0 dpi)
Normoxia			
## 100 GmmNegV	9B	0	0 Pupae (0 dpi)
Normoxia			
## 101 GmmNegV	16B	0	0 Pupae (0 dpi)
Hypoxia			
## 102 GmmNegV	16B	0	0 Pupae (0 dpi)
Hypoxia			
## 103 GmmNegV	17A	0	3 Adult (3 dpi)
Normoxia			
## 104 GmmNegV	17B	0	3 Adult (3 dpi)
Normoxia			
## 105 GmmNegV	6A	0	3 Adult (3 dpi)
Normoxia			
## 106 GmmNegV	6B	0	3 Adult (3 dpi)
Normoxia			
## 107 GmmNegV	1A	0	0 Pupae (0 dpi)
Hypoxia			
## 108 GmmNegV	1B	0	0 Pupae (0 dpi)
Hypoxia			
## 109 GmmNegV	2A	0	3 Adult (3 dpi)
Hypoxia			
## 110 GmmNegV	2B	0	3 Adult (3 dpi)
Hypoxia			
## 111 GmmNegV	3a	0	3 Adult (3 dpi)
Normoxia			
## 112 GmmNegV	3b	0	3 Adult (3 dpi)
Normoxia			
## 113 GmmNegV	4a	0	3 Adult (3 dpi)
Hypoxia			
## 114 GmmNegV	4b	0	3 Adult (3 dpi)
Hypoxia			
## 115 GmmNegV	11A	70	3 Adult (3 dpi)
Hypoxia			
## 116 GmmNegV	11B	70	3 Adult (3 dpi)
Hypoxia			
## 117 GmmNegV	14A	70	3 Adult (3 dpi)
Normoxia			

## 118 GmmNegV	14B	70	3 Adult (3 dpi)
Normoxia			
## 119 GmmNegV	21A	70	0 Pupae (0 dpi)
Normoxia			
## 120 GmmNegV	21B	70	0 Pupae (0 dpi)
Normoxia			
## 121 GmmNegV	2A	70	0 Pupae (0 dpi)
Hypoxia			
## 122 GmmNegV	2B	70	0 Pupae (0 dpi)
Hypoxia			
## 123 GmmNegV	5A	70	0 Pupae (0 dpi)
Normoxia			
## 124 GmmNegV	5B	70	0 Pupae (0 dpi)
Normoxia			
## 125 GmmNegV	10A	110	0 Pupae (0 dpi)
Hypoxia			
## 126 GmmNegV	10B	110	0 Pupae (0 dpi)
Hypoxia			
## 127 GmmNegV	13A	70	0 Pupae (0 dpi)
Normoxia			
## 128 GmmNegV	13B	70	0 Pupae (0 dpi)
Normoxia			
## 129 GmmNegV	19A	110	3 Adult (3 dpi)
Hypoxia			
## 130 GmmNegV	19B	110	3 Adult (3 dpi)
Hypoxia			
## 131 GmmNegV	22A	70	3 Adult (3 dpi)
Normoxia			
## 132 GmmNegV	22B	70	3 Adult (3 dpi)
Normoxia			
## 133 GmmNegV	3A	70	3 Adult (3 dpi)
Hypoxia			
## 134 GmmNegV	3B	70	3 Adult (3 dpi)
Hypoxia			
## 135 GmmNegV	6A	70	3 Adult (3 dpi)
Normoxia			
## 136 GmmNegV	6B	70	3 Adult (3 dpi)
Normoxia			
## 137 GmmNegV	2A	70	0 Pupae (0 dpi)
Hypoxia			
## 138 GmmNegV	2B	70	0 Pupae (0 dpi)
Hypoxia			
## 139 GmmNegV	12A	110	3 Adult (3 dpi)
Hypoxia			
## 140 GmmNegV	12B	110	3 Adult (3 dpi)
Hypoxia			
## 141 GmmNegV	15A	110	3 Adult (3 dpi)
Normoxia			
## 142 GmmNegV	15B	110	3 Adult (3 dpi)
Normoxia			

## 143 GmmNegV	22A	110	0 Pupae (0 dpi)
Normoxia			
## 144 GmmNegV	22B	110	0 Pupae (0 dpi)
Normoxia			
## 145 GmmNegV	3A	110	0 Pupae (0 dpi)
Hypoxia			
## 146 GmmNegV	3B	110	0 Pupae (0 dpi)
Hypoxia			
## 147 GmmNegV	6A	110	0 Pupae (0 dpi)
Normoxia			
## 148 GmmNegV	6B	110	0 Pupae (0 dpi)
Normoxia			
## 149 GmmNegV	11A	150	0 Pupae (0 dpi)
Hypoxia			
## 150 GmmNegV	11B	150	0 Pupae (0 dpi)
Hypoxia			
## 151 GmmNegV	14A	110	0 Pupae (0 dpi)
Normoxia			
## 152 GmmNegV	14B	110	0 Pupae (0 dpi)
Normoxia			
## 153 GmmNegV	20A	150	3 Adult (3 dpi)
Hypoxia			
## 154 GmmNegV	20B	150	3 Adult (3 dpi)
Hypoxia			
## 155 GmmNegV	4A	110	3 Adult (3 dpi)
Hypoxia			
## 156 GmmNegV	4B	110	3 Adult (3 dpi)
Hypoxia			
## 157 GmmNegV	7A	110	3 Adult (3 dpi)
Normoxia			
## 158 GmmNegV	7B	110	3 Adult (3 dpi)
Normoxia			
## 159 GmmNegV	3A	110	0 Pupae (0 dpi)
Hypoxia			
## 160 GmmNegV	3B	110	0 Pupae (0 dpi)
Hypoxia			
## 161 GmmNegV	4A	110	3 Adult (3 dpi)
Normoxia			
## 162 GmmNegV	4B	110	3 Adult (3 dpi)
Normoxia			
## 163 GmmNegV	13A	150	3 Adult (3 dpi)
Hypoxia			
## 164 GmmNegV	13B	150	3 Adult (3 dpi)
Hypoxia			
## 165 GmmNegV	16A	150	3 Adult (3 dpi)
Normoxia			
## 166 GmmNegV	16B	150	3 Adult (3 dpi)
Normoxia			
## 167 GmmNegV	20A	150	0 Pupae (0 dpi)
Hypoxia			

## 168 GmmNegV	20B	150	0 Pupae (0 dpi)
Hypoxia			
## 169 GmmNegV	23A	150	0 Pupae (0 dpi)
Normoxia			
## 170 GmmNegV	23B	150	0 Pupae (0 dpi)
Normoxia			
## 171 GmmNegV	4A	150	0 Pupae (0 dpi)
Hypoxia			
## 172 GmmNegV	4B	150	0 Pupae (0 dpi)
Hypoxia			
## 173 GmmNegV	7A	150	0 Pupae (0 dpi)
Normoxia			
## 174 GmmNegV	7B	150	0 Pupae (0 dpi)
Normoxia			
## 175 GmmNegV	12A	190	0 Pupae (0 dpi)
Hypoxia			
## 176 GmmNegV	12B	190	0 Pupae (0 dpi)
Hypoxia			
## 177 GmmNegV	21A	190	3 Adult (3 dpi)
Hypoxia			
## 178 GmmNegV	21B	190	3 Adult (3 dpi)
Hypoxia			
## 179 GmmNegV	5A	150	3 Adult (3 dpi)
Hypoxia			
## 180 GmmNegV	5B	150	3 Adult (3 dpi)
Hypoxia			
## 181 GmmNegV	8A	150	3 Adult (3 dpi)
Normoxia			
## 182 GmmNegV	8B	150	3 Adult (3 dpi)
Normoxia			
## 183 GmmNegV	5A	150	3 Adult (3 dpi)
Normoxia			
## 184 GmmNegV	5B	150	3 Adult (3 dpi)
Normoxia			
## 185 GmmNegV	1A	0	0 Pupae (0 dpi)
Normoxia			
## 186 GmmNegV	1B	0	0 Pupae (0 dpi)
Normoxia			

##	Replicate	Expression	Mean.Cq	Normalized_expression	Transformed
## 93	1	0.810200	26.68000	5.20627169	1.52094764
## 94	1	0.736340	26.76000	4.73165403	1.43950847
## 95	1	0.539510	26.91000	3.46684231	1.16906697
## 96	1	0.486370	27.07000	3.12536949	1.07702116
## 97	1	0.884310	27.01000	0.26036264	-1.44042433
## 98	1	1.173400	26.50000	0.34547786	-1.12136202
## 99	1	2.682830	28.13000	0.78989122	-0.23866353
## 100	1	4.712670	28.02000	1.38752611	0.32221692
## 101	3	10.713230	24.32000	2.31479499	0.80506324
## 102	3	8.776540	24.43000	1.89633666	0.61987867
## 103	3	1.008980	27.78000	5.75491231	1.60547496

## 104	3	0.903890	28.06000	5.15551119	1.51263603
## 105	3	0.625310	25.68000	3.56657636	1.19407774
## 106	3	0.455630	25.73000	2.59877371	0.91085245
## 107	2	1.484860	26.97000	0.06325263	-3.17929376
## 108	2	1.411240	26.96000	0.06011654	-3.24648346
## 109	2	1.865650	26.34000	0.33823712	-1.14494355
## 110	2	1.666820	26.47000	0.30218980	-1.27124838
## 111	2	1.121410	26.94000	0.20330849	-1.72693311
## 112	2	1.065870	26.71000	0.19323925	-1.78665215
## 113	3	5.410940	25.25000	30.86234137	2.90328911
## 114	3	4.805110	25.12000	27.40687295	2.81851841
## 115	1	0.218900	27.03000	1.40663154	0.33544271
## 116	1	0.200310	27.24000	1.28717389	0.24928915
## 117	1	118.914050	28.95000	764.13089580	4.85147028
## 118	1	105.121200	29.33000	675.49929310	4.78760271
## 119	2	42.612910	26.04000	1.81524102	0.57879247
## 120	2	43.930260	26.02000	1.87135800	0.60743277
## 121	1	1.126520	29.92000	0.33167523	-1.16679892
## 122	1	0.983670	29.74000	0.28961667	-1.31924979
## 123	1	11.207230	25.01000	3.29968452	1.12531886
## 124	1	7.844940	25.13000	2.30974354	0.80305427
## 125	3	2.495140	27.69000	0.53912196	-0.63729731
## 126	3	0.610270	27.92000	0.13186032	-2.24584019
## 127	3	9.263410	23.79000	2.00153409	0.67038546
## 128	3	4.944410	24.38000	1.06833285	0.06588137
## 129	3	11.921640	25.73000	67.99737630	3.44231148
## 130	3	1.895520	25.77000	10.81146442	2.11845159
## 131	3	0.236260	26.01000	1.34755454	0.29388652
## 132	3	0.182220	26.73000	1.03932696	0.03849905
## 133	2	1.013920	25.99000	0.18382086	-1.84569432
## 134	2	0.968270	25.82000	0.17554464	-1.90039133
## 135	2	2.080300	26.05000	0.37715256	-1.02423071
## 136	2	1.804070	26.21000	0.32707284	-1.18241362
## 137	2	118.911610	24.16000	5.06544219	1.49766400
## 138	2	68.661760	24.27000	2.92487988	1.01766607
## 139	1	0.769760	26.10000	4.94640792	1.47742156
## 140	1	0.647620	26.37000	4.16154736	1.32889359
## 141	1	0.279750	26.65000	1.79764812	0.56961265
## 142	1	0.267380	26.72000	1.71815962	0.52686668
## 143	2	54.450680	25.55000	2.31951087	0.80693441
## 144	2	48.545200	25.79000	2.06794697	0.70078990
## 145	1	11.190710	25.10000	3.29482063	1.12400963
## 146	1	13.006450	24.81000	3.82941920	1.25647192
## 147	1	1.223990	26.97000	0.36037280	-1.07451714
## 148	1	1.026830	27.19000	0.30232404	-1.27074779
## 149	3	17.661830	24.45000	3.81617081	1.25344121
## 150	3	11.874990	24.66000	2.56581510	0.89924413
## 151	3	0.305210	29.31000	0.06594637	-3.12444399
## 152	3	0.805570	28.08000	0.17405856	-1.91051283
## 153	3	1.214620	25.03000	6.92781976	1.75975087

## 154	3	0.416350	25.54000	2.37473264	0.82853891
## 155	2	2.048230	25.96000	0.37133836	-1.04137139
## 156	2	2.110090	25.84000	0.38255341	-1.00856706
## 157	2	0.226830	33.84000	0.04112364	-3.75912578
## 158	2	0.134240	33.91000	0.02433734	-4.50015672
## 159	2	35.677020	25.03000	1.51978333	0.40992878
## 160	2	25.724760	25.20000	1.09583315	0.09109747
## 161	3	0.238190	26.33000	1.35856267	0.30177999
## 162	3	0.186510	26.48000	1.06379581	0.06165263
## 163	1	0.545350	25.99000	3.50436962	1.17856965
## 164	1	0.455380	26.18000	2.92623056	1.01808076
## 165	1	0.600820	27.23000	3.86081480	1.26360819
## 166	1	0.522780	27.15000	3.35933685	1.14120515
## 167	2	106.814450	26.32000	4.55012275	1.40595371
## 168	2	74.982190	26.55000	3.19411998	1.09641565
## 169	2	101.249840	25.20000	4.31307937	1.35985054
## 170	2	111.280710	25.17000	4.74037820	1.44108525
## 171	1	0.661620	27.27000	0.19479722	-1.77719115
## 172	1	0.553050	26.96000	0.16283154	-1.99019225
## 173	1	3.077020	25.60000	0.90595047	-0.09926004
## 174	1	2.600770	25.51000	0.76573074	-0.27051903
## 175	3	6.392100	25.01000	1.38113352	0.31774685
## 176	3	4.698700	25.00000	1.01524258	0.01511614
## 177	3	0.254410	25.98000	1.45107657	0.36546038
## 178	3	0.304950	26.03000	1.73934122	0.53846673
## 179	2	31.843340	28.23000	5.77310837	1.60812456
## 180	2	19.297400	28.22000	3.49856458	1.17710704
## 181	2	5.681461	26.98748	1.03003300	0.02954710
## 182	2	6.501137	27.14410	1.17863801	0.16301621
## 183	3	1.130850	24.78000	6.45002139	1.70065374
## 184	3	0.798040	25.00000	4.55177527	1.40626577
## 185	2	37.974820	25.58000	1.61766589	0.46960025
## 186	2	35.922460	25.59000	1.53023867	0.41650142

```
#neg$Life_stage=as.factor(neg$Life_stage)
```

```
neg$Irradiation_dose=as.factor(neg$Irradiation_dose)
```

```
#select the model
```

```
anova(with(neg,lm(Transformed ~ Irradiation_dose)))
```

```
## Analysis of Variance Table
```

```
##
```

```
## Response: Transformed
```

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

```
## Irradiation_dose  4  12.81   3.2026   1.237  0.301
```

```
## Residuals      89 230.43   2.5891
```

```
anova(with(neg,lm(Transformed ~ Life_stage)))
```

```
## Analysis of Variance Table
```

```
##
```



```
## Response: Transformed
##           Df Sum Sq Mean Sq F value Pr(>F)
## Life_stage 1  10.905 10.9047  4.3181 0.0405 *
## Residuals 92 232.335  2.5254
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

anova(with(neg,lm(Transformed ~ Irradiation_conditions)))

## Analysis of Variance Table
##
## Response: Transformed
##           Df Sum Sq Mean Sq F value Pr(>F)
## Irradiation_conditions 1  0.009  0.0091  0.0034 0.9533
## Residuals              92 243.230  2.6438

anova(with(neg,lm(Transformed ~ Irradiation_dose +
Irradiation_conditions)))

## Analysis of Variance Table
##
## Response: Transformed
##           Df Sum Sq Mean Sq F value Pr(>F)
## Irradiation_dose      4  12.810  3.2026  1.2232 0.3068
## Irradiation_conditions 1  0.024  0.0243  0.0093 0.9234
## Residuals             88 230.405  2.6182

anova(with(neg,lm(Transformed ~ Irradiation_dose+Life_stage)))

## Analysis of Variance Table
##
## Response: Transformed
##           Df Sum Sq Mean Sq F value Pr(>F)
## Irradiation_dose      4  12.810  3.2026  1.2817 0.2833
## Life_stage            1  10.546 10.5462  4.2207 0.0429 *
## Residuals             88 219.883  2.4987
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

anova(with(neg,lm(Transformed ~
Irradiation_dose*Irradiation_conditions)))

## Analysis of Variance Table
##
## Response: Transformed
##           Df Sum Sq Mean Sq F value
Pr(>F)
## Irradiation_dose      4  12.810  3.2026  1.3288
0.26587
## Irradiation_conditions 1  0.024  0.0243  0.0101
0.92021
## Irradiation_dose:Irradiation_conditions 3  25.546  8.5154  3.5332
```

```

0.01817 *
## Residuals                                85 204.859  2.4101
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

anova(with(neg,lm(Transformed ~ Irradiation_dose*Life_stage)))

## Analysis of Variance Table
##
## Response: Transformed
##              Df  Sum Sq Mean Sq F value  Pr(>F)
## Irradiation_dose      4  12.810   3.2026   1.2537 0.29475
## Life_stage            1   10.546  10.5462   4.1285 0.04533 *
## Irradiation_dose:Life_stage  4   5.304   1.3261   0.5191 0.72189
## Residuals            84 214.578   2.5545
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

#-----
-----

mod1 <- lm(Transformed ~ Irradiation_dose + Irradiation_conditions,
data = neg)
mod2 <- lm(Transformed ~ Irradiation_dose * Irradiation_conditions,
data = neg)
mod3 <- lm(Transformed ~ Irradiation_dose + Life_stage +
Irradiation_conditions, data = neg)
mod4 <- lm(Transformed ~ Irradiation_dose * Life_stage *
Irradiation_conditions, data = neg)
mod5 <- lm(Transformed ~ Irradiation_dose + Life_stage, data = neg)
mod6 <- lm(Transformed ~ Irradiation_dose*Life_stage, data = neg)
mod7 <- lm(Transformed ~ Irradiation_dose, data = neg)
mod8 <- lm(Transformed ~ Irradiation_conditions, data = neg)
mod9 <- lm(Transformed ~ Life_stage, data = neg)
mod10<- lm(Transformed ~ Irradiation_dose+Life_stage, data = neg)

AICc(mod1,mod2,mod3,mod4,mod5,mod6,mod7,mod8,mod9, mod10)

##      df      AICc
## mod1   7 366.3377
## mod2  10 362.6394
## mod3   8 364.3339
## mod4  19 375.4282
## mod5   7 361.9439
## mod6  11 369.5657
## mod7   6 364.0109
## mod8   3 362.3942
## mod9   3 358.0862
## mod10  7 361.9439

```

```
anova(mod8, mod9)
```

```
## Analysis of Variance Table
```

```
##
```

```
## Model 1: Transformed ~ Irradiation_conditions
```

```
## Model 2: Transformed ~ Life_stage
```

```
##   Res.Df    RSS Df Sum of Sq F Pr(>F)
```

```
## 1      92 243.23
```

```
## 2      92 232.34  0    10.896
```

##no difference, choose either model but went for the lowest

```
summary(mod8)
```

```
##
```

```
## Call:
```

```
## lm(formula = Transformed ~ Irradiation_conditions, data = neg)
```

```
##
```

```
## Residuals:
```

```
##      Min       1Q   Median       3Q      Max
```

```
## -4.7611 -1.2745  0.2815  0.9369  4.5905
```

```
##
```

```
## Coefficients:
```

```
##              Estimate Std. Error t value Pr(>|t|)
```

```
## (Intercept)      0.24128    0.23469   1.028   0.307
```

```
## Irradiation_conditionsNormoxia  0.01968    0.33549   0.059   0.953
```

```
##
```

```
## Residual standard error: 1.626 on 92 degrees of freedom
```

```
## Multiple R-squared:  3.742e-05, Adjusted R-squared:  -0.01083
```

```
## F-statistic: 0.003443 on 1 and 92 DF, p-value: 0.9533
```

```
summary(mod9)
```

```
##
```

```
## Call:
```

```
## lm(formula = Transformed ~ Life_stage, data = neg)
```

```
##
```

```
## Residuals:
```

```
##      Min       1Q   Median       3Q      Max
```

```
## -5.0706 -0.9975  0.4321  0.9186  4.2810
```

```
##
```

```
## Coefficients:
```

```
##              Estimate Std. Error t value Pr(>|t|)
```

```
## (Intercept)      0.5704    0.2247   2.538  0.0128 *
```

```
## Life_stagePupae (0 dpi) -0.6826    0.3285  -2.078  0.0405 *
```

```
## ---
```

```
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
##
```

```
## Residual standard error: 1.589 on 92 degrees of freedom
```

```
## Multiple R-squared:  0.04483, Adjusted R-squared:  0.03445
```

```
## F-statistic: 4.318 on 1 and 92 DF, p-value: 0.0405
```

```

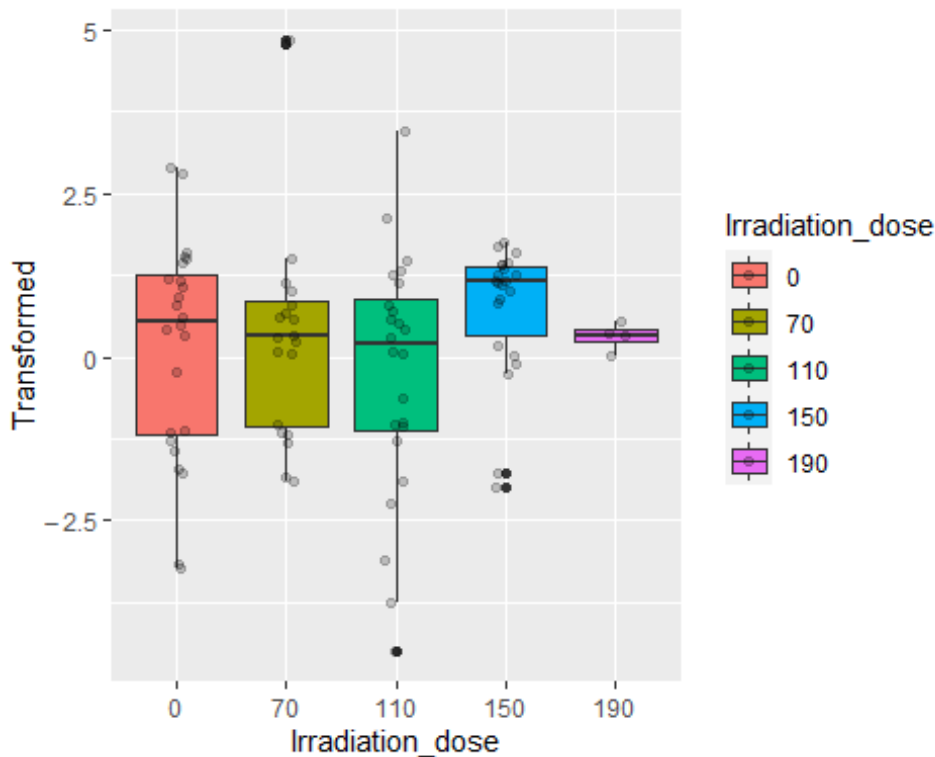
#-----
#=====

neg$Irradiation_dose=as.factor(neg$Irradiation_dose)

label_parse <- function(breaks) {parse(text = breaks)}

Fig3a<-ggplot(neg,aes(x=Irradiation_dose,y=Transformed,
fill=Irradiation_dose)) +
  geom_boxplot() + geom_jitter(width=0.1,alpha=0.2)+
  scale_y_continuous(labels = label_parse)
Fig3a

```



```

tiff("Fig 3a.tiff", width = 4, height = 4, units = 'in', res = 300)
plot(Fig3a+theme_tufte() + theme(axis.line = element_line(size = 1,
colour = "black")) + theme(axis.text.x = element_blank()))
+theme(legend.title = element_text(face = "bold")) + theme(legend.text
= element_text(face = "plain"))) + xlab(expression(bold("Irradiation
doses (Gy)"))) + ylab(expression (bold("Transformed relative GmmNegeV
density"))))
dev.off()

## png
## 2

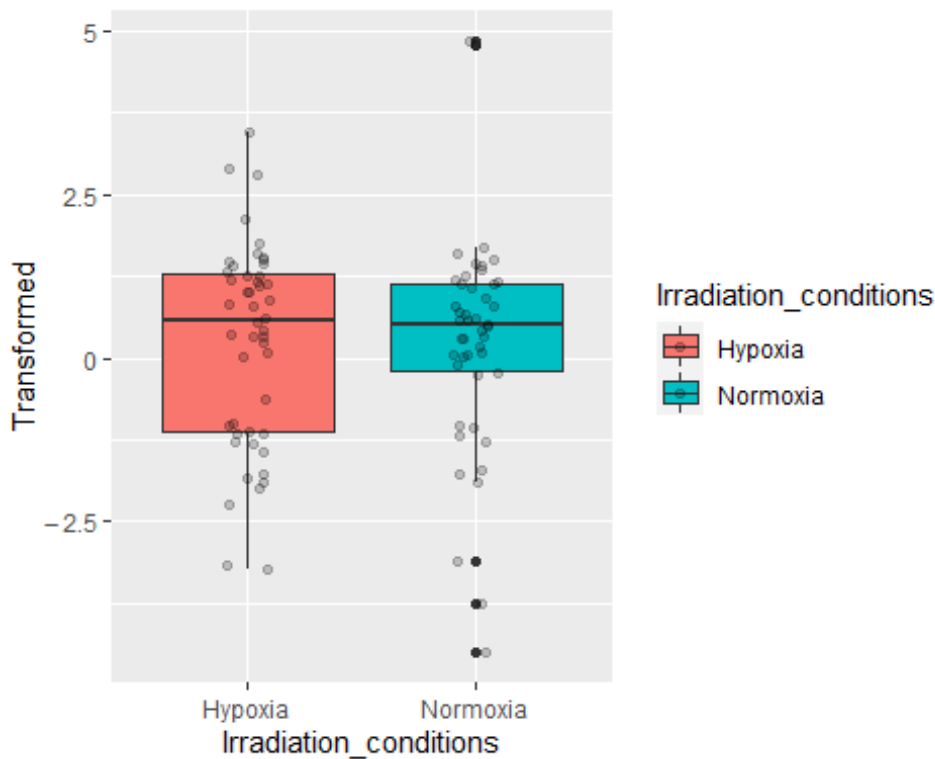
```

```
###Irradiation_conditions
```

```
#neg$Irradiation_conditions=as.factor(neg$Irradiation_conditions)
```

```
label_parse <- function(breaks) {parse(text = breaks)}
```

```
Fig3b<-ggplot(neg,aes(x=Irradiation_conditions,y=Transformed,  
fill=Irradiation_conditions)) +  
  geom_boxplot() + geom_jitter(width=0.1,alpha=0.2)+  
  scale_y_continuous(labels = label_parse)  
Fig3b
```



```
tiff("Fig 3b.tiff", width = 4, height = 4, units = 'in', res = 300)  
plot(Fig3b+theme_tufte() + theme(axis.line = element_line(size = 1,  
colour = "black")) + theme(axis.text.x = element_blank())  
+theme(legend.title = element_text(face = "bold")) + theme(legend.text  
= element_text(face = "plain"))) + xlab(expression(bold("Irradiation  
status")))) + ylab(expression (bold("Transformed relative GmmNegeV  
density"))))  
dev.off()
```

```
## png
```

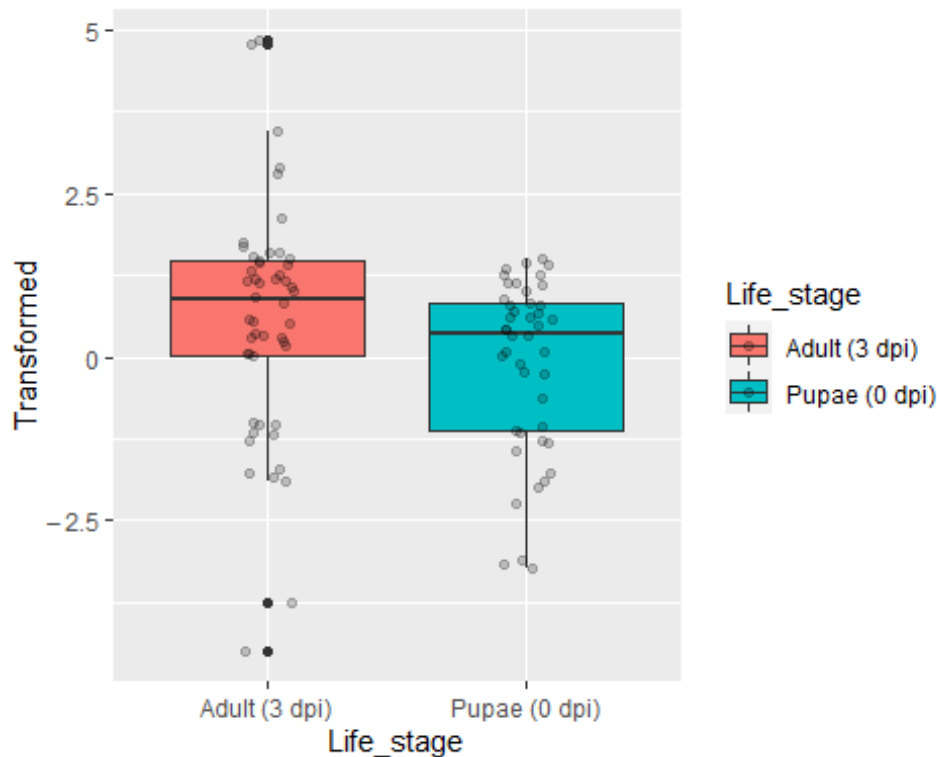
```
## 2
```

```
###Days_post.irradiation
```

```
###neg$Life_stage=as.factor(neg$Life_stage)
```

```
label_parse <- function(breaks) {parse(text = breaks)}
```

```
Fig3c<-ggplot(neg,aes(x=Life_stage,y=Transformed, fill=Life_stage)) +
  geom_boxplot() + geom_jitter(width=0.1,alpha=0.2)+
  scale_y_continuous(labels = label_parse)
Fig3c
```



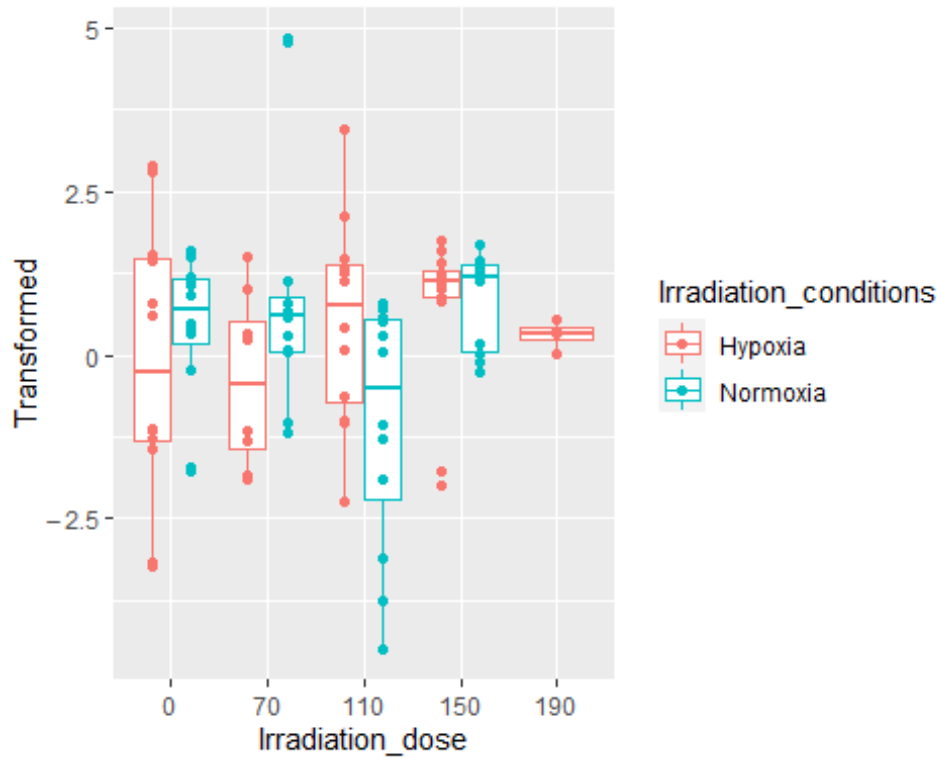
```
tiff("Fig 3c.tiff", width = 4, height = 4, units = 'in', res = 300)
plot(Fig3c+theme_tufte() + theme(axis.line = element_line(size = 1,
colour = "black")) + theme(axis.text.x = element_blank())
+theme(legend.title = element_text(face = "bold")) + theme(legend.text
= element_text(face = "plain")))) + xlab(expression(bold("Days post
irradiation")))) + ylab(expression (bold("Transformed relative GmmNegeV
density"))))
dev.off()
```

```
## png
## 2
```

```
###Irradiation dose according to irradiation status
label_parse <- function(breaks) {parse(text = breaks)}
```

```
Fig4a<-ggplot(neg, aes(x=Irradiation_dose,y=Transformed,
colour=Irradiation_conditions)) +
  geom_boxplot(position=position_dodge(0.8))+
  geom_jitter(position=position_dodge(0.8))+ scale_y_continuous(labels
= label_parse)
```

Fig4a



```
tiff("Fig 4a.tiff", width = 7, height = 4, units = 'in',compression =
'lwz',res = 300)
plot(Fig4a+theme_tufte() + theme(axis.line = element_line(size = 1,
colour = "black")) + theme(legend.title= element_text(face = "bold")) +
theme(legend.text = element_text(face = "plain"))) + theme(axis.text.x
= element_text(colour = "black")) + theme(axis.text.y =
element_text(colour = "black")) + xlab(expression(bold("Irradiation
dose (Gy)")))) + ylab(expression(bold("GmmNegeV_ ")~bold("Transformed
normalized density"))))
dev.off()
```

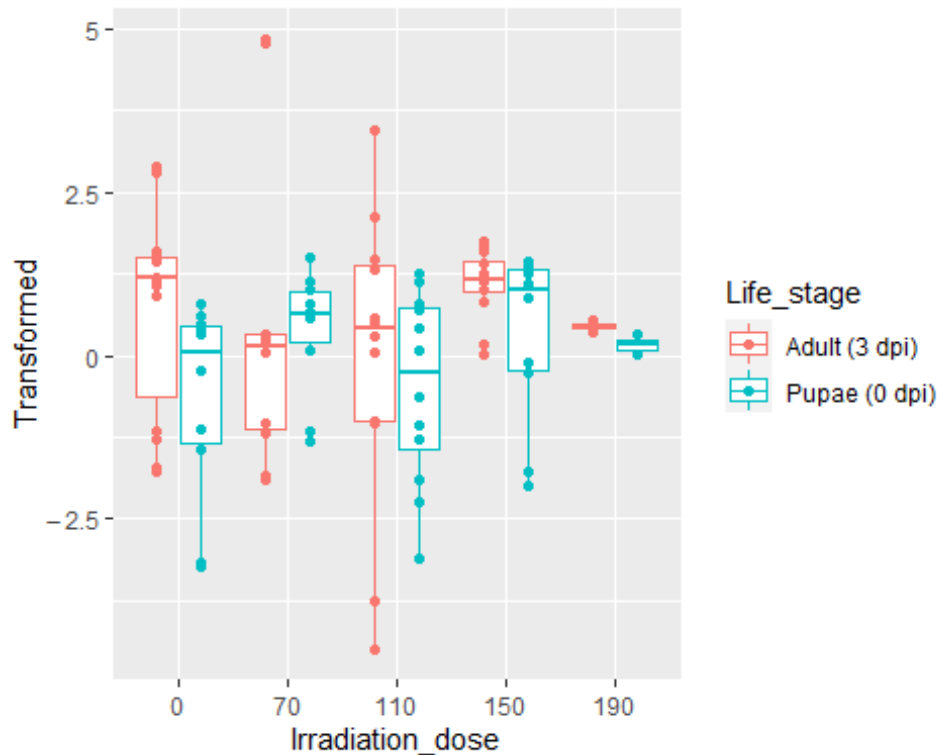
```
## png
## 2
```

###Irradiation dose according to days post irradiation

```
label_parse <- function(breaks) {parse(text = breaks)}
```

```
Fig4b<-ggplot(neg, aes(x=Irradiation_dose,y=Transformed,
colour=Life_stage)) +
  geom_boxplot(position=position_dodge(0.8))+
  geom_jitter(position=position_dodge(0.8))+ scale_y_continuous(labels
= label_parse)
```

Fig4b



```
tiff("Fig 4b.tiff", width = 7, height = 4, units = 'in',compression =
'lzw',res = 300)
plot(Fig4b+theme_tufte() + theme(axis.line = element_line(size = 1,
colour = "black")) + theme(legend.title= element_text(face = "bold")) +
theme(legend.text = element_text(face = "plain"))) + theme(axis.text.x
= element_text(colour = "black")) + theme(axis.text.y =
element_text(colour = "black")) + xlab(expression(bold("Irradiation
dose (Gy)")))) + ylab(expression(bold ("GmmNegV_ ")~bold("Transformed
normalized density"))))
dev.off()
```

```
## png
## 2
```

```
#-----
```

```
#GmmNegV-Normoxia
```

```
#-----
```

```
#NegNorm<- read.csv("GmmNegV_alldata_normalized.csv")
```

```
NegNorm<- subset(neg, Irradiation_conditions=="Normoxia")
```

```
NegNorm
```

```
##      Target Sample Irradiation_dose Dpi    Life_stage
Irradiation_conditions
## 95  GmmNegV    18A                0    3 Adult (3 dpi)
Normoxia
## 96  GmmNegV    18B                0    3 Adult (3 dpi)
```


Normoxia				
## 99 GmmNegV	9A	0	0	Pupae (0 dpi)
Normoxia				
## 100 GmmNegV	9B	0	0	Pupae (0 dpi)
Normoxia				
## 103 GmmNegV	17A	0	3	Adult (3 dpi)
Normoxia				
## 104 GmmNegV	17B	0	3	Adult (3 dpi)
Normoxia				
## 105 GmmNegV	6A	0	3	Adult (3 dpi)
Normoxia				
## 106 GmmNegV	6B	0	3	Adult (3 dpi)
Normoxia				
## 111 GmmNegV	3a	0	3	Adult (3 dpi)
Normoxia				
## 112 GmmNegV	3b	0	3	Adult (3 dpi)
Normoxia				
## 117 GmmNegV	14A	70	3	Adult (3 dpi)
Normoxia				
## 118 GmmNegV	14B	70	3	Adult (3 dpi)
Normoxia				
## 119 GmmNegV	21A	70	0	Pupae (0 dpi)
Normoxia				
## 120 GmmNegV	21B	70	0	Pupae (0 dpi)
Normoxia				
## 123 GmmNegV	5A	70	0	Pupae (0 dpi)
Normoxia				
## 124 GmmNegV	5B	70	0	Pupae (0 dpi)
Normoxia				
## 127 GmmNegV	13A	70	0	Pupae (0 dpi)
Normoxia				
## 128 GmmNegV	13B	70	0	Pupae (0 dpi)
Normoxia				
## 131 GmmNegV	22A	70	3	Adult (3 dpi)
Normoxia				
## 132 GmmNegV	22B	70	3	Adult (3 dpi)
Normoxia				
## 135 GmmNegV	6A	70	3	Adult (3 dpi)
Normoxia				
## 136 GmmNegV	6B	70	3	Adult (3 dpi)
Normoxia				
## 141 GmmNegV	15A	110	3	Adult (3 dpi)
Normoxia				
## 142 GmmNegV	15B	110	3	Adult (3 dpi)
Normoxia				
## 143 GmmNegV	22A	110	0	Pupae (0 dpi)
Normoxia				
## 144 GmmNegV	22B	110	0	Pupae (0 dpi)
Normoxia				
## 147 GmmNegV	6A	110	0	Pupae (0 dpi)

Normoxia					
## 148 GmmNegV	6B		110	0 Pupae (0 dpi)	
Normoxia					
## 151 GmmNegV	14A		110	0 Pupae (0 dpi)	
Normoxia					
## 152 GmmNegV	14B		110	0 Pupae (0 dpi)	
Normoxia					
## 157 GmmNegV	7A		110	3 Adult (3 dpi)	
Normoxia					
## 158 GmmNegV	7B		110	3 Adult (3 dpi)	
Normoxia					
## 161 GmmNegV	4A		110	3 Adult (3 dpi)	
Normoxia					
## 162 GmmNegV	4B		110	3 Adult (3 dpi)	
Normoxia					
## 165 GmmNegV	16A		150	3 Adult (3 dpi)	
Normoxia					
## 166 GmmNegV	16B		150	3 Adult (3 dpi)	
Normoxia					
## 169 GmmNegV	23A		150	0 Pupae (0 dpi)	
Normoxia					
## 170 GmmNegV	23B		150	0 Pupae (0 dpi)	
Normoxia					
## 173 GmmNegV	7A		150	0 Pupae (0 dpi)	
Normoxia					
## 174 GmmNegV	7B		150	0 Pupae (0 dpi)	
Normoxia					
## 181 GmmNegV	8A		150	3 Adult (3 dpi)	
Normoxia					
## 182 GmmNegV	8B		150	3 Adult (3 dpi)	
Normoxia					
## 183 GmmNegV	5A		150	3 Adult (3 dpi)	
Normoxia					
## 184 GmmNegV	5B		150	3 Adult (3 dpi)	
Normoxia					
## 185 GmmNegV	1A		0	0 Pupae (0 dpi)	
Normoxia					
## 186 GmmNegV	1B		0	0 Pupae (0 dpi)	
Normoxia					
##	Replicate	Expression	Mean.Cq	Normalized_expression	Transformed
## 95	1	0.539510	26.91000	3.46684231	1.16906697
## 96	1	0.486370	27.07000	3.12536949	1.07702116
## 99	1	2.682830	28.13000	0.78989122	-0.23866353
## 100	1	4.712670	28.02000	1.38752611	0.32221692
## 103	3	1.008980	27.78000	5.75491231	1.60547496
## 104	3	0.903890	28.06000	5.15551119	1.51263603
## 105	3	0.625310	25.68000	3.56657636	1.19407774
## 106	3	0.455630	25.73000	2.59877371	0.91085245
## 111	2	1.121410	26.94000	0.20330849	-1.72693311
## 112	2	1.065870	26.71000	0.19323925	-1.78665215

```
## 117      1 118.914050 28.95000      764.13089580  4.85147028
## 118      1 105.121200 29.33000      675.49929310  4.78760271
## 119      2  42.612910 26.04000        1.81524102  0.57879247
## 120      2  43.930260 26.02000        1.87135800  0.60743277
## 123      1  11.207230 25.01000        3.29968452  1.12531886
## 124      1   7.844940 25.13000        2.30974354  0.80305427
## 127      3   9.263410 23.79000        2.00153409  0.67038546
## 128      3   4.944410 24.38000        1.06833285  0.06588137
## 131      3   0.236260 26.01000        1.34755454  0.29388652
## 132      3   0.182220 26.73000        1.03932696  0.03849905
## 135      2   2.080300 26.05000        0.37715256 -1.02423071
## 136      2   1.804070 26.21000        0.32707284 -1.18241362
## 141      1   0.279750 26.65000        1.79764812  0.56961265
## 142      1   0.267380 26.72000        1.71815962  0.52686668
## 143      2  54.450680 25.55000        2.31951087  0.80693441
## 144      2  48.545200 25.79000        2.06794697  0.70078990
## 147      1   1.223990 26.97000        0.36037280 -1.07451714
## 148      1   1.026830 27.19000        0.30232404 -1.27074779
## 151      3   0.305210 29.31000        0.06594637 -3.12444399
## 152      3   0.805570 28.08000        0.17405856 -1.91051283
## 157      2   0.226830 33.84000        0.04112364 -3.75912578
## 158      2   0.134240 33.91000        0.02433734 -4.50015672
## 161      3   0.238190 26.33000        1.35856267  0.30177999
## 162      3   0.186510 26.48000        1.06379581  0.06165263
## 165      1   0.600820 27.23000        3.86081480  1.26360819
## 166      1   0.522780 27.15000        3.35933685  1.14120515
## 169      2 101.249840 25.20000        4.31307937  1.35985054
## 170      2 111.280710 25.17000        4.74037820  1.44108525
## 173      1   3.077020 25.60000        0.90595047 -0.09926004
## 174      1   2.600770 25.51000        0.76573074 -0.27051903
## 181      2   5.681461 26.98748        1.03003300  0.02954710
## 182      2   6.501137 27.14410        1.17863801  0.16301621
## 183      3   1.130850 24.78000        6.45002139  1.70065374
## 184      3   0.798040 25.00000        4.55177527  1.40626577
## 185      2  37.974820 25.58000        1.61766589  0.46960025
## 186      2  35.922460 25.59000        1.53023867  0.41650142
```

```
#-----
anova(with(NegNorm,lm(Transformed~ Life_stage*Irradiation_dose)))

## Analysis of Variance Table
##
## Response: Transformed
##
##              Df Sum Sq Mean Sq F value Pr(>F)
## Life_stage      1  1.305   1.3045   0.5080  0.4804
## Irradiation_dose  3 29.635   9.8783   3.8467  0.0169 *
## Life_stage:Irradiation_dose  3  0.993   0.3309   0.1289  0.9424
## Residuals      38 97.582   2.5680
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```

anova(with(NegNorm,lm(Transformed~ Life_stage +Irradiation_dose)))

## Analysis of Variance Table
##
## Response: Transformed
##              Df Sum Sq Mean Sq F value    Pr(>F)
## Life_stage      1  1.305   1.3045    0.5426  0.46556
## Irradiation_dose 3 29.635   9.8783    4.1086  0.01226 *
## Residuals      41 98.575    2.4043
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

anova(with(NegNorm,lm(Transformed~ Life_stage)))

## Analysis of Variance Table
##
## Response: Transformed
##              Df Sum Sq Mean Sq F value    Pr(>F)
## Life_stage      1  1.305   1.3045    0.4477  0.5069
## Residuals      44 128.210    2.9139

anova(with(NegNorm,lm(Transformed~ Irradiation_dose)))

## Analysis of Variance Table
##
## Response: Transformed
##              Df Sum Sq Mean Sq F value    Pr(>F)
## Irradiation_dose 3 30.132  10.0441    4.2447  0.01045 *
## Residuals      42 99.382    2.3662
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

mod1 <- lm(Transformed ~ Irradiation_dose, data = NegNorm)
mod5 <- lm(Transformed~ Irradiation_dose+Life_stage, data = NegNorm)
mod6 <- lm(Transformed ~ Irradiation_dose*Life_stage, data = NegNorm)
mod11 <- lm(Transformed ~Life_stage, data = NegNorm)

AICc(mod1, mod5, mod6, mod11)

##           df      AICc
## mod1      5 177.4776
## mod5      6 179.7564
## mod6      9 188.1370
## mod11     3 184.2651

anova(mod1, mod5)

## Analysis of Variance Table
##
## Model 1: Transformed ~ Irradiation_dose
## Model 2: Transformed ~ Irradiation_dose + Life_stage

```

```
##   Res.Df    RSS Df Sum of Sq      F Pr(>F)
## 1      42 99.382
## 2      41 98.575   1   0.80711 0.3357 0.5655

summary(mod1)

##
## Call:
## lm(formula = Transformed ~ Irradiation_dose, data = NegNorm)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -3.4442 -0.8369 -0.0062  0.7774  3.8835
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)      0.4104      0.4441   0.924   0.3606
## Irradiation_dose70  0.5575      0.6280   0.888   0.3797
## Irradiation_dose110 -1.4664      0.6280  -2.335   0.0244 *
## Irradiation_dose150  0.4031      0.6586   0.612   0.5438
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.538 on 42 degrees of freedom
## Multiple R-squared:  0.2327, Adjusted R-squared:  0.1778
## F-statistic: 4.245 on 3 and 42 DF,  p-value: 0.01045

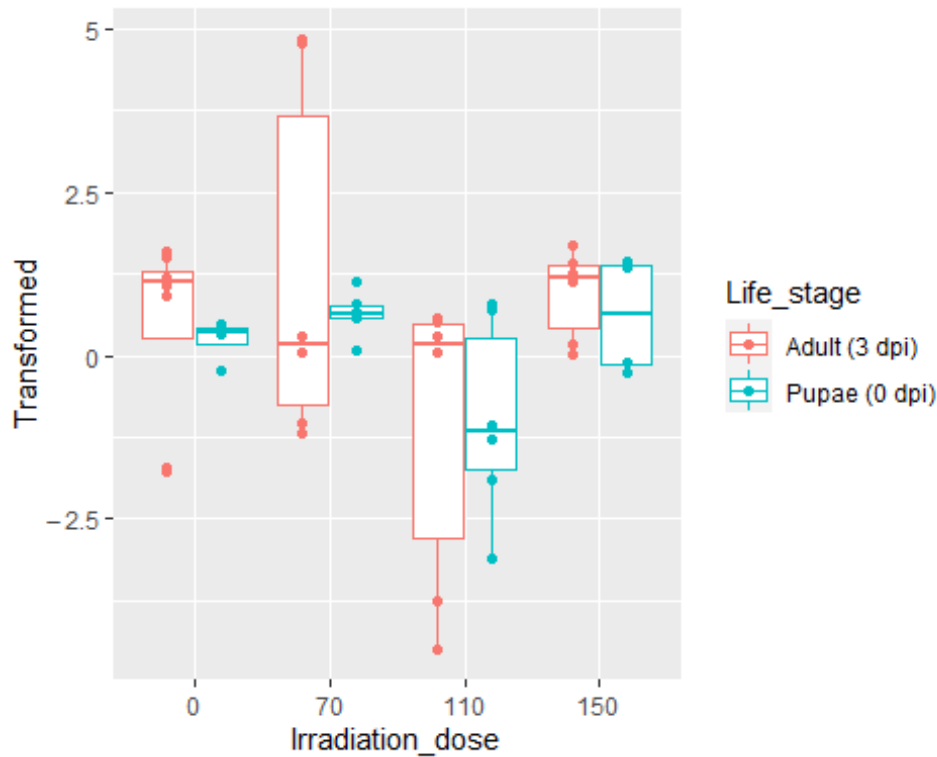
#-----

#FIGURE_normoxia
####NegNorm$Life_stage=as.factor(NegNorm$Life_stage)

label_parse <- function(breaks) {parse(text = breaks)}

FigsS3A<-ggplot(NegNorm, aes(x=Irradiation_dose,y=Transformed, colour=
Life_stage
)) +geom_boxplot(position=position_dodge(0.8))+
  geom_jitter(position=position_dodge(0.8))+ scale_y_continuous(labels
= label_parse)

FigsS3A
```



```
tiff("Fig S3A.tiff", width = 7, height = 4, units = 'in',compression =
'lzw',res = 300)
plot(FigsS3A+theme_tufte() + theme(axis.line = element_line(size = 1,
colour = "black")) + theme(legend.title= element_text(face = "bold")) +
theme(legend.text = element_text(face = "plain"))) + theme(axis.text.x
= element_text(colour = "black")) + theme(axis.text.y =
element_text(colour = "black")) + xlab(expression(bold("Irradiation
dose (Gy)")))) + ylab(expression(bold("GmmNegeV_ ")~bold("Normoxia
transformed relative density"))))
dev.off()

## png
## 2

#-----
#NegHypox <- read.csv("GmmNegV_alldata_normalized.csv")
NegHypox <- subset(neg , Irradiation_conditions=="Hypoxia")

#-----
---
anova(with(NegHypox,lm(Transformed~ Life_stage+Irradiation_dose)))

## Analysis of Variance Table
##
## Response: Transformed
##
##           Df Sum Sq Mean Sq F value    Pr(>F)
## Life_stage  1 12.211  12.2113    5.4991 0.02383 *
```

```

## Irradiation_dose 4 8.239 2.0598 0.9276 0.45711
## Residuals      42 93.265 2.2206
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

anova(with(NegHypox,lm(Transformed~ Life_stage*Irradiation_dose)))

## Analysis of Variance Table
##
## Response: Transformed
##              Df Sum Sq Mean Sq F value Pr(>F)
## Life_stage      1 12.211 12.2113   5.7190 0.02184 *
## Irradiation_dose 4  8.239  2.0598   0.9647 0.43804
## Life_stage:Irradiation_dose 4 12.127  3.0318   1.4199 0.24602
## Residuals      38 81.138  2.1352
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

anova(with(NegHypox,lm(Transformed~ Life_stage)))

## Analysis of Variance Table
##
## Response: Transformed
##              Df Sum Sq Mean Sq F value Pr(>F)
## Life_stage      1 12.211 12.2113   5.534 0.02299 *
## Residuals      46 101.504  2.2066
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

anova(with(NegHypox,lm(Transformed~ Irradiation_dose)))

## Analysis of Variance Table
##
## Response: Transformed
##              Df Sum Sq Mean Sq F value Pr(>F)
## Irradiation_dose 4  8.239  2.0598   0.8397 0.5076
## Residuals      43 105.476  2.4529

mod1 <- lm(Transformed ~ Irradiation_dose, data = NegHypox)
mod5 <- lm(Transformed~ Irradiation_dose+Life_stage, data = NegHypox)
mod6 <- lm(Transformed ~ Irradiation_dose*Life_stage, data = NegHypox)
mod11 <- lm(Transformed ~Life_stage, data = NegHypox)

AICc(mod1, mod5, mod6, mod11)

##          df      AICc
## mod1      6 188.0566
## mod5      7 184.9018
## mod6     11 190.7488
## mod11     3 178.7108

anova(mod11,mod5)

```

```

## Analysis of Variance Table
##
## Model 1: Transformed ~ Life_stage
## Model 2: Transformed ~ Irradiation_dose + Life_stage
##   Res.Df    RSS Df Sum of Sq    F Pr(>F)
## 1      46 101.504
## 2      42  93.265  4    8.2394 0.9276 0.4571

summary(mod11)

##
## Call:
## lm(formula = Transformed ~ Life_stage, data = NegHypox)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -2.9834 -1.0864  0.3928  1.0917  2.6966
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)      0.7457     0.3032   2.459   0.0177 *
## Life_stagePupae (0 dpi) -1.0088     0.4288  -2.352   0.0230 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.485 on 46 degrees of freedom
## Multiple R-squared:  0.1074, Adjusted R-squared:  0.08798
## F-statistic: 5.534 on 1 and 46 DF,  p-value: 0.02299

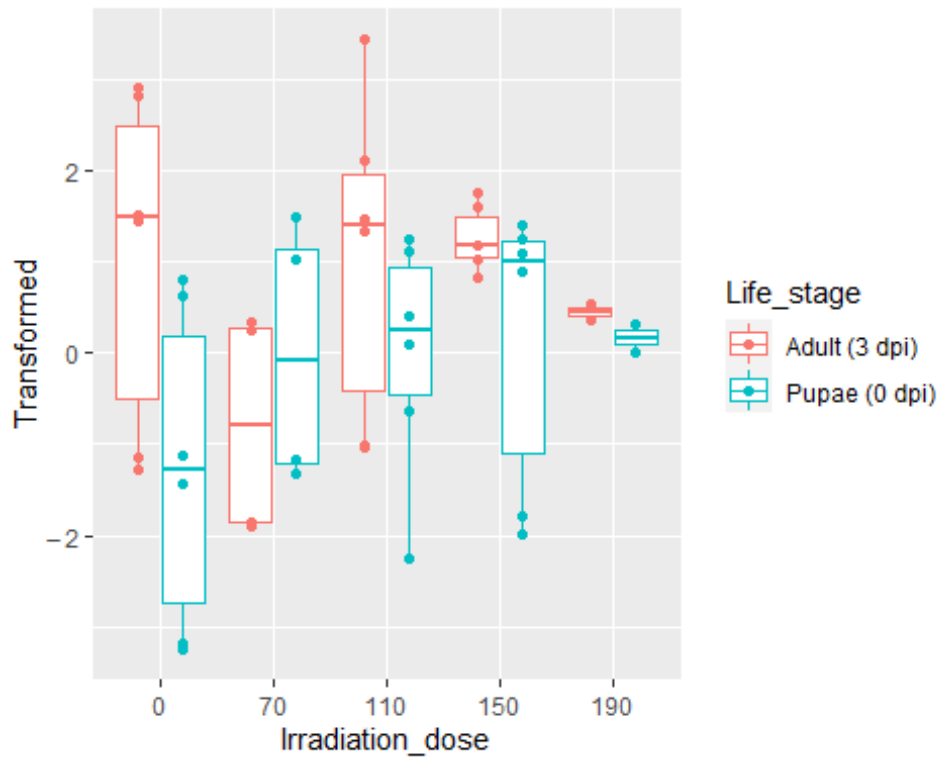
#-----

###Figure hypoxia
label_parse <- function(breaks) {parse(text = breaks)}

FigS3B<-ggplot(NegHypox, aes(x=Irradiation_dose,y=Transformed, colour=
Life_stage)) +
  geom_boxplot(position=position_dodge(0.8))+
  geom_jitter(position=position_dodge(0.8))+ scale_y_continuous(labels
= label_parse)

FigS3B

```

```
tiff("Fig S3B.tiff", width = 7, height = 4, units = 'in',compression =
'lzw',res = 300)
plot(FigS3B+theme_tufte() + theme(axis.line = element_line(size = 1,
colour = "black")) + theme(legend.title= element_text(face = "bold")) +
theme(legend.text = element_text(face = "plain"))) + theme(axis.text.x
= element_text(colour = "black")) + theme(axis.text.y =
element_text(colour = "black")) + xlab(expression(bold("Irradiation
dose (Gy)")))) + ylab(expression(bold("GmmNegeV_ ")~bold("Hypoxia
Transformed relative density"))))
dev.off()

## png
## 2
```