Additional file 2: R code

```
#Reference group conversion
library(readxl)
library(openxlsx)
library(dosresmeta)
library(epitools)
steel<-read_excel("file path")
steel$logrr=log(steel$rr)
steel$lnLL=log(steel$ll)
steel$lnUL=log(steel$ul)
steel$se=(steel$lnUL-steel$lnLL)/3.92 steel
csteel<-hamling(logrr,se,cases,n=people,type=type,data=steel) csteel
dsteel<- csteel[, 1:ncol(csteel)]*10 dsteel
epitab(dsteel,method="rateratio",verbose=TRUE)

#Meta-analysis of maximum and minimum dose groups
library(readxl)
library(openxlsx)
library(dosresmeta)
library(meta)
filename <-read_excel("file path")
filename
      meta1 <- metabin(Events.E, Total.E, Events.C, Total.C,data = filename ,
                       sm=      "RR",      studlab      =      paste(filename
$study, filename$year, sep = ","),
                       byvar = tool, method = "MH")
meta1
forest(meta1, label.e = 'The highest ', label.c = 'The lowest ')
metainf(meta1,pooled = "random")
forest(metainf(meta1,pooled = "random"))

#dose-response meta analysis
library(readxl)
library(openxlsx)
library(dosresmeta)
library(rms)
filename2<-read_excel("file path")
filename2
knots<- quantile(filename$DIP,c(.05, ~.35, .65, .95))
quadr<- dosresmeta(formula = logrr      rcs(DIP,knots), type = type, id = id,
                                    se = se, cases = cases, n = n, data = filename2,
method = "reml")
summary(quadr)
waldtest(b = coef(quadr),Sigma =~vcov(quadr), Terms = 1:2)
lin <- dosresmeta(formula = logrr      DIP, type = type, id =
                                    se = se, cases = cases,   n =   n, data = filename2,
method = "reml")
summary(lin)
pred<- predict(lin,data.frame(DIP= seq(0,5, 1)), xref = 0)
print(exp(pred),digits = 3)
predict(lin, delta =  1, expo = TRUE)
with(predict(lin, expo = TRUE, order = TRUE), {
   plot(DIP, pred, log = "y", type = "l",      xlim
        = c(-7, 4), ylim = c(0.8, 3))
   lines(DIP, ci.lb, lty = 2)
   lines(DIP, ci.ub, lty = 2)
   rug(DIP, quiet = TRUE) })
```