

## Supporting Information

The Bugs codes for the simultaneous model (described in section 4, Eq. (6)) and the two step model (described in section 5, Eq. (10)) are respectively given in Appendix A and Appendix B.

### appendix A:

```
model {
  # Model 1
  for( i in 1 : n ) {
    Y[i] ~ dbin(p[i],N[i])
    logit(p[i]) <- gamma[lot[i]] + beta[lot[i]] *(log( d[i])/log(10) )
  }

  # Model 2
  for (i in 1:m) {
    Y2[i] ~ dbin(p2[i],N2[i])
    p2[i] <- exp(gamma[lot1[i]] + beta[lot1[i]] *d2[i] ) / (1+ exp(gamma[lot1[i]] + beta[lot1[i]] *d2[i] ))
    d2[i] <- log(d0[i])/log(10) - Z[i]
    Z[i] ~ dnorm(mu[i],tau[lot1[i]])
    mu[i] <- b[lot1[i]]*(log(UV[i]+1)/log(10))
  }

  # priors
  for (i in 1:5) {
    b[i] ~ dnorm(b1, taub)
    gamma[i] ~ dnorm(0,1.0E-6)
    beta[i] ~ dnorm(0,1.0E-6)
    tau[i] ~ dgamma(.0001,.0001)
    b1 ~ dnorm(0, 1.0E-4)
    taub ~ dgamma (.0001,.0001)
  }
}

data
list(n=80,m=51)

Y[]  d[]  N[]  lot[]
0    20   10   1
3    40   10   1
.
.

END;
```

Y2[] N2[] d0[] UV[] lot1[]

1 6 1000 4 1  
4 6 10000 4 1

.

.

.

END;

## **appendix B :**

```
model {  
    for( i in 1 : n0 ) {  
        W[i] ~ dnorm(mu[i],tau)  
        mu[i] <- b1*(log(UV[i]+1)/log(10)) }  
    for( i in 1 : n1 ) {  
        W1[i] ~ dnorm(mu1[i],tau)I( ,lb[i])  
        mu1[i] <- b1*(log(UV[i]+1)/log(10)) }  
    for( i in 1 : n2 ) {  
        W2[i] ~ dnorm(mu2[i],tau)I(ub[i],)  
        mu2[i] <- b1*(log(UV[i]+1)/log(10)) }  
  
# priors  
    b1 ~ dnorm(0, 1.0E-4)  
    tau ~ dgamma (.0001,.0001)  
}
```

### **data**

list(n0=26,n1=2,n2=4, lb= c(.5,.3), ub=c(4.9,4.9,4.9,4.9))

UV[] W[]

4 2  
2.9 2.5  
13.1 2.5

.

.

.

END;

UV[] W1[]

0.8 NA  
2.8 NA

END;

UV[] W2[]

120	NA
11.4	NA
59.3	NA
52.9	NA

END;