

KEVLAR NO SPOOLS LOGNORMAL PRIOR I

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#####
##### This program represents the collaborative efforts of Avery Ashby, #####
##### Ramon Leon, and Jayanth Thyagarajan. This is an inclusive odc file #####
##### containing the model, data, and initial values. March 20, 2002. #####
#####
```

```
#####
##### MODEL #####
#####
```

```
model KevlarNoSpoolsLognormalPrior1to2;
{
```

```
##### Generation of prior values #####
```

```
intercept ~ dnorm(0,0.001) # Intecept prior
beta.stress ~ dnorm(0,0.001) # Fixed stress effect
```

```
##### Creates a lognormal prior for the shape parameter of the Weibull #####
##### where most certainly r (Beta) is between 1 and 5 #####
```

```
anot <- -0.80472
mu <- anot * -1
bnot <- 0.31241
tau <- pow(bnot,-2) # tau = 1/(bnot^2)
r ~ dlnorm(mu,tau) # Weibull shape parameter
```

```
##### This loop reads in the data and calculates Weibull scale parameter #####
```

```
for(j in 1:M ) { # M is the number of rows in the data (108)
  log(eta[j]) <- intercept + beta.stress * log(stress[j]) # This is the function for mu in the Weibull
  lambda[j] <- pow(eta[j],-r) # Rescale into lambda parameterization
} # for use in winBUGS 1.4
```

```
##### End of loop #####
#####
```

```
##### This loop gives failure times as exact or censored #####
```

```
for(j in 1:M ) {
  t[j] ~ dweib(r,lambda[j])(cen[j],) # Failure times are Weibull or censored
}
```

```
##### End of loop #####
#####
```

```
##### Calculates specified failure quantiles for a given spool #####
```

```
eta234 <- exp(intercept + beta.stress * log(23.4)) # Eta values at 23.4 MPa stress level
quan234 <- eta234 * pow((-log(1 - 0.01)),(1/r)) # 1st percentile at 23.4 MPa stress
lambda234 <- pow(eta234,-r) # Rescale into lambda parameterization
y.234new ~ dweib(r,lambda234) # Predicted distribution for 23.4 MPa stress
probability234 <- 1 - exp(-(pow((1000/eta234),r))) # Prob of failure at 1000 hours for each spool
```

```
eta225 <- exp(intercept + beta.stress * log(22.5)) # Eta values at 22.5 MPa stress
quan225 <- (eta225 * pow((-log(1 - 0.5)),(1/r))) / 1000 # 50th percentile at 22.5 MPa stress (/ 1000)
```



```
list(intercept = 84.1, beta.stress = -23.1, r = 1.21)      # initial values based on Crowder et al. (1991)
list(intercept = 1, beta.stress = -1,r = 1)
#####                               End of initial values                               #####
#####
```