

$$\pi(\tau|y) \propto \pi(y|\tau) \pi(\tau)$$

$$\propto \tau^{\frac{1}{2}} \exp\left(-\frac{1}{2}(\gamma - \mu)^2 \tau\right) \exp(-\beta \tau)$$

$$= \tau^{\alpha + 1/2 - 1} \exp\left(-\left(\beta + \frac{1}{2}(\gamma - \mu)^2\right) \tau\right)$$

$$\propto \tau \text{ GAMMA}(\tau; \alpha + 1/2, \beta + \frac{1}{2}(\gamma - \mu)^2)$$