BLUP - Animal Model:

- Linear Mixed Effects Model (LME)
- Data set ⇒ Observations on a response variable (y); trait of interest
  - ⇒ Information about known environment (Herd, sex, age, ...)
  - ⇒ Pedigree: ancestral information
- Goal: . Estimates ($\hat{\beta}$) for fixed effects
  . Predictions of breeding values
- Given: Variance components: σ_e^2; σ_u^2; σ_p^2; h^2

$$\sigma_p^2 = \sigma_u^2 + \sigma_e^2 \quad ; \quad h^2 = \sigma_u^2 / \sigma_p^2$$

(In MME: $\lambda = \sigma_e^2 / \sigma_u^2$)

Solutions are obtained via Mixed Model Equations (MME)

$$\begin{bmatrix} X^TX & X^TZ \\ Z^TX & Z^TZ + \lambda G^{-1} \end{bmatrix} \begin{bmatrix} \hat{\beta} \\ \hat{u} \end{bmatrix} = \begin{bmatrix} X^Ty \\ Z^Ty \end{bmatrix} \quad ; \text{ if } R = I \cdot \sigma_e^2 \text{ = rank}$$

$$G = A \cdot \sigma_u^2$$

↳ numerator relationship matrix