ZOOTECNIA BRASIL
Centro de Convenções da PUC-GO | Goiânia-GO
27 a 30 de agosto de 2018

55ª REUNIÃO ANUAL DA SOCIEDADE BRASILEIRA DE ZOOTECNIA

ZOOTEC 28º CONGRESSO BRASILEIRO DE ZOOTECNIA

CONSTRUINDO SABERES, FORMANDO PESSOAS E TRANSFORMANDO A PRODUÇÃO ANIMAL

# GOMPERTZ MODEL APPLIED TO DOG GROWTH CURVE

Gabriela Soares Carvalho Pamplona CORTE REAL*[1], Humberto Pena COUTO[2], Ricardo Augusto Mendonça VIEIRA[2]

*corresponding author: gabrielapamplona@yahoo.com.br
[1]Zootechnist, Doctor Animal Science, autonomous, Campos dos Goytacazes, RJ, Brasil
[2] Associate professor, Universidade Estadual Norte Fluminense – UENF/CCTA/LZO, Campos dos Goytacazes, Rio de Janeiro, Brasil

We used the Gompertz model to describe the growth of different sex, breeds e size categories of dogs. The parameterization of the model was $M_t = M_0 \exp(\mu_0(1 - \exp(-kt))/k) + e_t$, in which $M_t$ (kg) is the mass of the dog at time $t$ (months), $M_0$ is the birth mass (kg), $\mu_0$ $(\text{months}^{-1})$ is the specific growth rate at birth, $k$ $(\text{months}^{-1})$ is the decay fractional rate of $\mu_0$, and $e_t$ is the random error. We fitted this model as a nonlinear mixed effects model by introducing to each parameter the fixed effects of sex, size, breed, and their interactions, as well as the random effect of animal, by using nlme function of R. We choose of the most suited version of the model based on the corrected Akaike Information Criterion and derived measures according to the information theoretic approach. The version chosen was the one that presented the largest model probability $(w_r) \cong 1.000$, i.e., the solution included the effects of breed and sex, heterogeneous variances for Breed×Sex that scales to the body mass, and a continuous auto regressive variance function for repeated time mass measurements. We estimated 27 Breed×Sex estimates for $M_0$, $\mu_0$ and $k$, which also yield the same number of estimates for mature body size, computed as $M_0 \exp(\mu_0/k)$. The correlation between repeated measurements was 0.883, with a 95% confidence interval (0.838, 0.916); the variance power was $-0.364$ (–0.447, –0.281), and the standard deviation range for each Breed×Sex interacting categories ranged from 0.07 kg for as Chiuaua male and female, whereas the largest variability recorded was 10.40 kg for Bulldog female. The estimates of $M_0$ ranged from 0.043 to 3.987 kg for Yorkshire male and Bulldog female, respectively. However, it is well known that the Gompertz model overestimates the birth mass. The body mass at maturity ranged from 1.6 to 89.6 in the Chiuaua female and German Shepherd male. The specific growth rate at r Bulldog female was maximum among all breeds $(\hat{\mu}_0 = 3.317\ \text{months}^{-1})$, and presented the highest reduction rate, i.e., $\hat{k} = 0.561\ \text{month}^{-1}$; curiously, it appears that this breed is a medium-sized shape with maturity mass equal to 34.7 kg. On the other hand, the maximum $\hat{k}$ was 0.589 $\text{months}^{-1}$, whereas the minimum $\hat{k}$ was 0.265 $\text{months}^{-1}$ for the Bulldog female and Cocker female, respectively. The random effect of dogs over the fixed parameters was negligible and there were no evidence that its inclusion improved the model fit, according to the information theoretic approach.

**Keywords:** age, body mass, breed, pet, sex