# The Meal Criterion Estimated in Grazing Dairy Cattle: Evaluation of Different Methods

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# The meal criterion estimated in grazing dairy cattle: evaluation of different methods

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**Introduction** The meal criterion (MC) has been found a useful tool to pre-treat intake behaviour data in dairy cows. It was defined as the longest interval between bouts that belong to the same meal (Tolkamp & Kyriazakis, 1999*)*, necessary to cluster bouts to meals. The method of Yeates *et al.* (2001) calculating the $\log_e$-transformed intervals between bouts and using the Gaussian-Gaussian-Weibull (GGW) model to calculate the MC was found to provide the best estimation of the MC in biological as well as statistical terms. However, in grazing dairy cattle the MC-estimation has only been carried out by Rook & Huckle (1997) using a broken stick method. The aim of this study was to estimate the MC in grazing dairy cattle with the recently developed estimation methods.

**Materials and methods** Eight Holstein-Friesian dairy cows were allocated to two treatments: 1 day grazing in a plot of 0.125 ha (A) or 4 days grazing (B) in a plot of 0.5 ha. Four cows of group A were observed continuously, four cows in group B were observed during one day in each subperiod of 4 days. Four repetitions of a 4-day period were carried out in each of two periods after adapting the cows to grazing during 2.5 weeks.
A total number of 146 grazing behaviour recordings over 24h were collected using IGER Behaviour Recorders. Recordings were analysed using Graze-software version 8.0 (Rutter, 2000). Intervals between grazing bouts were calculated and Gaussian-Gaussian- (GG), Gaussian-Weibull- (GW), and Weibull-Weibull-populations (WW) were fitted to the frequency distribution of $\log_e$-transformed intervals between bouts using SAS. The quality of the fit of these models was calculated using the Minimal Function Value (MFV). The MC was calculated at the point where the two populations crossed.

**Table 1** MFV values and MC-estimation of different subsets

| | MFV | | | Meal Criterion WW |
|---|---|---|---|---|
| | GG | GW | WW | Minutes |
| Total dataset | 34237 | 34188 | 33860 | 2.1 |
| Group A[1] | 26426 | 26388 | 26158 | 2.1 |
| Group B[2] | 7738 | 7714 | 7650 | 1.8 |
| Period 1 | 16388 | 16364 | 16171 | 2.3 |
| Period 2 | 17814 | 17788 | 17655 | 1.9 |
| Period 1 A[1] | 12021 | 12004 | 11872 | 2.3 |
| Period 2 A[1] | 14383 | 14362 | 14262 | 2.0 |
| Period 1 B[2] | 4323 | 4300 | 4267 | 2.5 |
| Period 2 B[2] | 3405 | 3399 | 3373 | 1.5 |

[1]Stripgrazing group; [2] 4-day grazing group

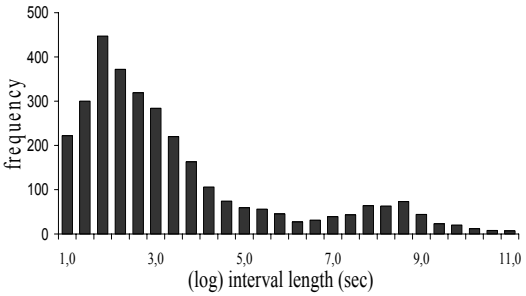


**Figure 1** Frequency distribution of the $\log_e$-transformed interval between bouts

**Results** The MFV-values for the different models in Table 1 indicate that the WW-model gives the best fit to all different datasets.

**Conclusions** WW-model of the $\log_e$-transformed inter-bout intervals fits the frequency distribution better than the other models tested. The WW-model is superior to the broken stick model used by Rook and Huckle (1997) in biological as well as statistical perspective. The MC is estimated between 1.5 and 2.5 minutes and seems to differ between different subsets. Further analysis to test whether these are significant differences is necessary.

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