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Investigations on the water intake of growing heifers

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Introduction

Water is one of the most important nutrients. The aim of this study was to investigate the relationship between the water intake of dairy heifers and factors such as ambient temperature, humidity, body weight, intake of dry matter (DM), Na and K as well as DM content and roughage portion in the diet.

Materials and methods

The diet was planned to cover the demand of energy and protein (GfE 2001).

Design of the experiment

Animals:	64 German Holstein heifers
Body weight:	175 kg – 500 kg
Housing:	non isolated stable, slatted floor, boxes (7 resp. 8 animals per box)
Water:	free access
Roughage:	grass silage ad libitum
Concentrates:	restricted (up to 2.0 kg/d)
Data registration:	feed and water intake individually through a computerized feeding system
Analyses:	DM, Na and K in silage and concentrate (twice or once a week, resp.)
Statistics:	multiple linear regression, stepwise procedure (SAS-software package)

Results

Table 1: Means and standard deviations (SD) for the variables (n = 19485)

Variables		Mean	SD
DM intake	kg/day	6.2	1.8
Body weight	kg	316	86
Average ambient temp.	°C	11.1	7.6
Relative humidity	%	73.2	14.4
DM content of the diet	%	39.3	7.6
K intake	g/day	165.2	59.1
Na intake	g/day	6.6	2.4
Roughage part in the diet	%	83.7	12.0
Water intake	kg/day	19.1	8.9

The data measured during the experiment comprised a large range of variation. The DM content of the diet ranged between 25 and 90%, the DM intake between 0.2 and 14.8 kg/d, the roughage portion of the ration between 10 and 99% and the average ambient temperature between - 5 and 28°C.

The results of the stepwise regression analysis are shown in Table 2.

Table 2: Results of the stepwise regression analysis

Variable	r^2	Increase in r^2
Body weight	0.1661	0.1661
Average ambient temp.	0.2840	0.1179
Roughage part of the diet	0.2996	0.0156
Relative humidity	0.3102	0.0106
Dry matter intake	0.3162	0.0060

The body weight caused the highest effect on r^2 (0.17). Average ambient temperature as additional variable increased r^2 by 0.12. The inclusion of the factors roughage part of the diet, relative humidity and dry matter intake increased r^2 by 0.02, 0.01 and 0.01, respectively.

The factors dry matter content of the diet, K intake and Na intake had only marginal effects on r^2.

The subjection of the data to multiple regression analysis results in the equation given in Table 3.

Table 3: Equation for estimating the water intake of growing heifers (n = 19485)

Water intake (kg/day) =
- 5.206
+ 0.038 * body weight (kg)
+ 0.610 * average ambient temp. (°C)
+ 0.098 * roughage part of the diet (%)
- 0.086 * relative humidity (%)
+ 0.530 * dry matter intake (kg/day)

Conclusions

The presented equation considers the most significant factors for predicting the water consumption of dairy heifers under housing and feeding conditions existing in Central Europe.