**Evaluation of three methods to assess the degree of milk-out in dairy cows**

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**Supplementary material for *animal* journal**

**Supplementary Figure S1** Randomised temporal organisation of the three evaluators when assessing completeness of milk-out in German Holstein dairy cow herd 1 to 6. All dairy herds were visited once by each evaluator

**Supplementary Table S1** Characteristics of six German Holstein dairy cow herds, parlours and parlour settings at the six dairy farms included in the evaluation of completeness of milk-out

|  |  |
| --- | --- |
|  | Farm |
|  | A | B | C | D | E | F |
| Herd characteristics |  |  |  |  |  |  |
| Herd size | 198 | 81 | 390 | 194 | 140 | 303 |
| Mean lactation number | 2.3 | 2.2 | 2.6 | 1.3 | 1.6 | 2.1 |
| Parlour types and technical settings |  |  |  |  |  |  |
| Milking parlour type | parallel | auto-tandem | parallel | herringbone | herringbone | herringbone |
| Size of milking parlour | 2x12 | 2x4 | 2x20 | 2x12 | 2x8 | 2x8 |
| Operating vacuum setting (kPa) | 42 | 37 | 44 | 43 | 37 | 43 |
| Pulsation ratio | 60:40 | 60:40 | 60:40 | 65:35 | 60:40 | 60:40 |
| Pulsation rate (cycles/min) | 60 | 60 | 60 | 60 | 60 | 58 |
| Automatic cluster remover setting (ml/min) | 300 | 300 | 480 | 300 | 250 | 750 |
| Delay times (s) | 25 |  | 25 | 30 | 30 | 20 |
| Mean vacuum level at the teat end during ongoing milk flow (kPa) 1 | - | 34.4(n = 32) | 35.1(n = 44) | 37.6(n = 32) | 36.7(n = 28) | - |

1 Vacuum measurements conducted in July and August 2017

**Supplementary Material S1** Logistic and linear regression model description

A logistic regression model was fitted to analyse the relationship between the outcome of the visual scoring of the degree of quarter filling (**VISUAL)** (target) and the herd, the evaluators and the strip yield in 60 s (**SY60**) (predictors). A linear regression model was introduced to analyse the relationship between the outcome of the precisely defined hand milking method **(DEFINED)** (target) and the method of quantitative assessment of number of easy strips (**EASYSTRIPS**) (target) and the herd, the evaluators and SY60 (predictors). The models were defined as

 $Yi= β0+ β1xi + β2xi +β3xi + εi$

Where

$Y\_{i }$is the outcome of the assessment of the cow’s quarters with the VISUAL, the DEFINED or the EASYSTRIPS method

$β0$ is the intercept

$β\_{1}xi$ is the effect of the herd

$β\_{2}xi$ is the effect of the evaluator

$β\_{3}xi$ is the effect of SY60

$ε\_{i}$ is the random error for the model

**Supplementary Material S2** Exemplary R Code of the linear regression model for the method of quantitative assessment of number of easy strips (**EASYSTRIPS**)

lmEASYSTRIPS <- lme(EASYSTRIPS ~ SY60 + herd + evaluator, data=data1, random=~1|ID, na.action=na.exclude, weights=varIdent(form=~1|herd\*evaluator), method="ML", control=list(maxIter=255,msMaxIter=255,opt="nlminb"))

anova(lmEASYSTRIPS)

summary(lmEASYSTRIPS)