HERD HEALTH AND PRODUCTION MEDICINE

Can an ATP bioluminescence meter be used as an on-farm tool for assessing the microbiological quality of drinking water?

P.A.A. Penterman[1], G. Hoflack[1], N. Botteldoorn[2], G. Vertenten[3] and B. Sustronck[1].

INTRODUCTION

- Water is one of the most important nutrients for cattle to sustain life and optimize growth and productivity.
- One aspect of water quality is the degree of microbiological contamination which is usually evaluated using laboratory procedures.
- The adenosine triphosphate (ATP) bioluminescence meter has been advocated as a simple and useful tool for the evaluation of the degree of microbiological contamination of surfaces and liquids.

OBJECTIVE

The objective of the present study was to examine whether an ATP bioluminescence meter can be used as an on-farm tool to assess the degree of microbiological contamination of drinking water.

MATERIALS AND METHODS

- A total of 153 drinking water samples from different cattle farms in Belgium that were submitted to the reference laboratory (DGZ, Torhout, Belgium) were included in the study.
- The total bacterial cell count (TBCC) was determined at 22°C using an ISO 6222 standard method.
- The ATP bioluminescence, expressed as the number of relative light units (RLU) for each water sample, was obtained using AquaSnap™ Total swabs and a SystemSURE Plus meter (Hygiena™, California, USA).
- Correlation between TBCC and ATP bioluminescence and optimal cut-off points for the ATP bioluminescence method to classify drinking water as 'microbiologically suitable' (TBCC < 100.000 cfu/ml) or 'microbiologically unsuitable' (TBCC ≥ 100.000 cfu/ml) as drinking water were determined.
- Statistical analysis was performed in R (R Core Team 2022).

ATP bioluminescence measurements can be used as an on-farm screening tool to evaluate the microbiological quality of drinking water.

Water samples with an RLU of less than 8 can be considered as 'microbiologically suitable' whereas, water sample with an RLU of more than 650 should be considered as 'microbiologically unsuitable' as drinking water.

Water samples with an RLU between 8 and 650 should be submitted to an appropriate laboratory for microbiological quality assessment.

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RESULTS

- The correlation between the TBCC and the ATP value of the drinking water samples is reflected in **Fig 1.**
- The optimal cut-point for the ATP bioluminescence method was 8 RLU (sensitivity 100%, no false negative samples) to classify drinking water samples as 'microbiologically suitable'. The optimal cut-point for the ATP bioluminescence method was 650 RLU (specificity 99%, 1% false positive samples) to classify drinking water samples as 'microbiologically unsuitable'.
- When applying a single cut-off value of 15 RLU to classify drinking water as microbiologically suitable or not the ATP bioluminescence method resulted in a sensitivity of 80.0% and a specificity of 70.3% **(Table 1).**

FIGURE 1. Relationship between the total bacterial cell count (TBCC) and the ATP bioluminescence value of dinking water.

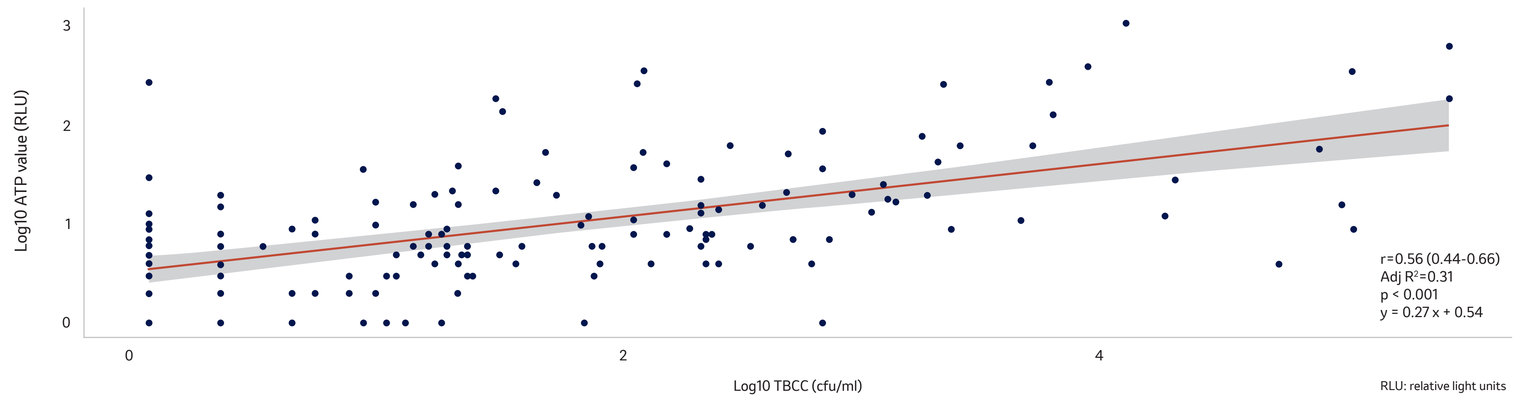

TABLE 1. Optimal cut-off points for drinking water ATP bioluminescence value using total bacterial cell count (TBCC) as reference.

	TBCC	ATP value	Sensitivity	Specificity
Two cut-off values	**<100.000 cfu/ml**	**<8 RLU**	**100%**	56.8%
	≥100.000 cfu/ml	**>650 RLU**	20.0%	**99.3%**
Single cut-off value	**<100.000 cfu/ml**	**<15 RLU**	**80.0%**	**70.3%**

AUTHORS' AFFILIATION

1. MSD Animal Health Benelux, Ruminant Business Unit, The Netherlands/Belgium
2. Dierengezondheidszorg Vlaanderen, Belgium
3. MSD Animal Health, Global Ruminant Biologicals, The Netherlands

Abstract number: 1047.