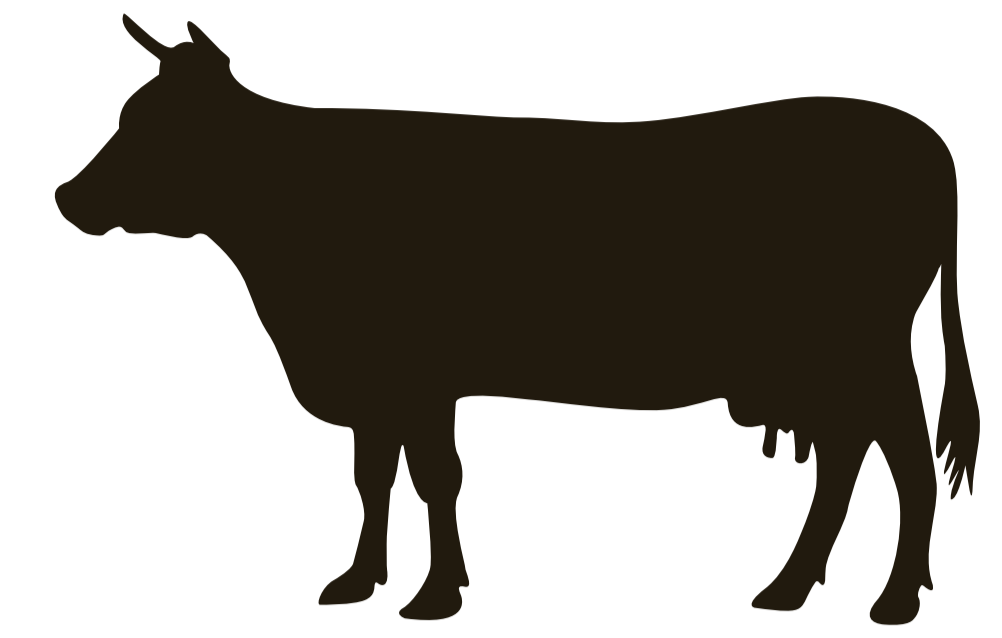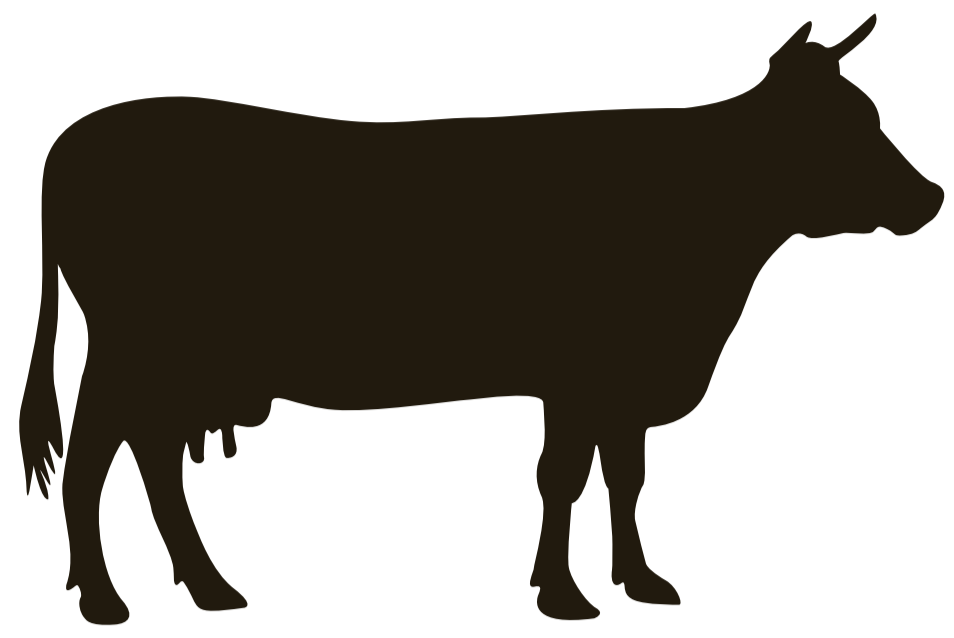# Using AI to identify mastitis causing pathogens in dairy production

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## Bacticam - an on-farm tool for analysing milk samples

The company Agricam (Linköping, Sweden) has developed a bacterial classifier, Bacticam, for automatic reading and classification of bacterial growth on SELMA PLUS multiple-agar plates. The bacterial classifier is based an artificial neural network doing automatic image analysis of the multiple-media agar plates.

Milk sample collected on the farm is spread on SELMA PLUS agar plates at the farms Bacticam station.

Samples are incubated at 37 degrees Celsius.
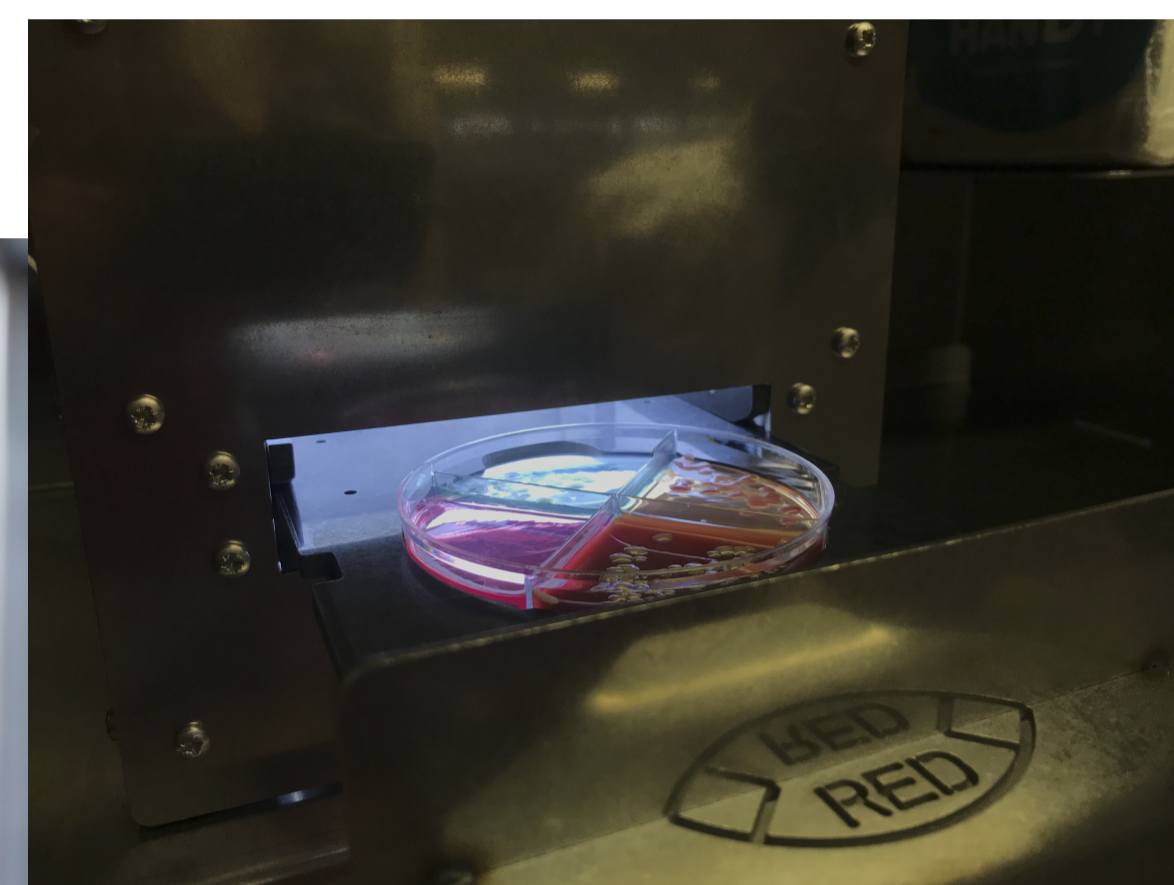
After 24 hours the plate is placed in the photo-studio.

The plate is photographed with a smart-phone camera. After image quality control the growth is classified.

Comparing the Bacticam system to veterinarians in clinical practice

Two versions of the classifier (generation 1 and generation 2) were used to analyse 621 pictures of samples collected and photographed on farms. Gold standard was either assessment by a bacteriologist or confirmation of sample using MALDI-TOF.

The samples included 7 bacterial species (25% *Escherichia coli*, 7% *Staphylococcus aureus*, 5% other staphylococci, 4% *Klebsiella spp.*, 42% *Streptococcus spp.*, 9% beta-haemolysing streptococci and 7% Trueperella pyogenes).

To gain insight into the performance of veterinarians in clinical practice, reports from the yearly assessment arranged by the Swedish veterinary agency (2019-2021) were consulted. Each year the participating clinics receive 5 samples of milk containing an unknown pathogens and analyse them according to their standard routines.

Participation:
2019: 131 veterinarians from 48 workplaces
Pathogens: Yeast*, *Klebsiella spp.*, beta-haemolysing streptococci, other staphylococci, *Trueperella pyogenes*
2020: 149 veterinarians from 54 workplaces
Pathogens: S. aureus, other staphylococci, Streptococcus spp, S. aureus, E. coli
2021: 91 veterinarians from 46 workplaces
Pathogens: S. aureus, Klebsiella spp, Pasteurella multocida*, other staphylococci, beta-haemolysing streptococci
*Not included in comparison

Sensitivity of Bacticam and veterinarians

Bacticam (1st generation) | **Bacticam (2nd generation)** | **Veterinarians**
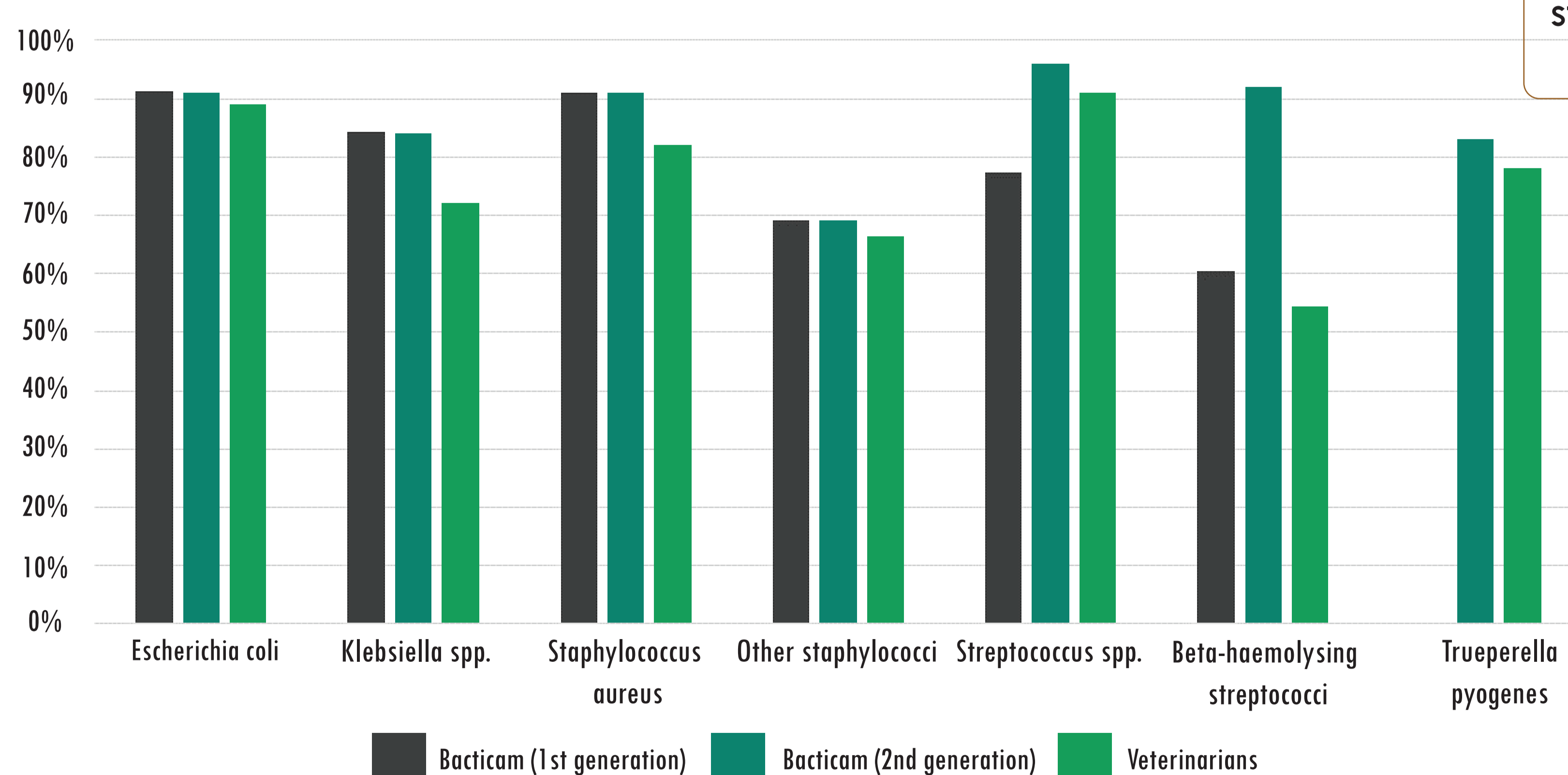
Conclusion

The sensitivity of the bacticam system appears to be comparable to practicing veterinarians.

However, since the AI and the veterinarians assessed two different sets of samples there is a high risk of bias in this comparison. For better comparability the samples used in the yearly assessment should be analysed using the Bacticam system.

In collaboration with:

agricam