Bacteria to modulate the microbiota of ruminants' feet

Nolivade designs and offers patented biocontrol solutions containing live bacteria for animal productions.

The mode of action of these bacteria, which are often referred to as 'barrier flora', is based on the many interactions they will have with the microbiota of the environment to which they are applied.

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The aim is to stabilise a 'healthy' microbiota or positively modulate a microbiota during its development.

This paper presents the results obtained with a protocol using barrier flora on the prevalence of lameness in more than 150 dairy farms, monitored for a two year period.

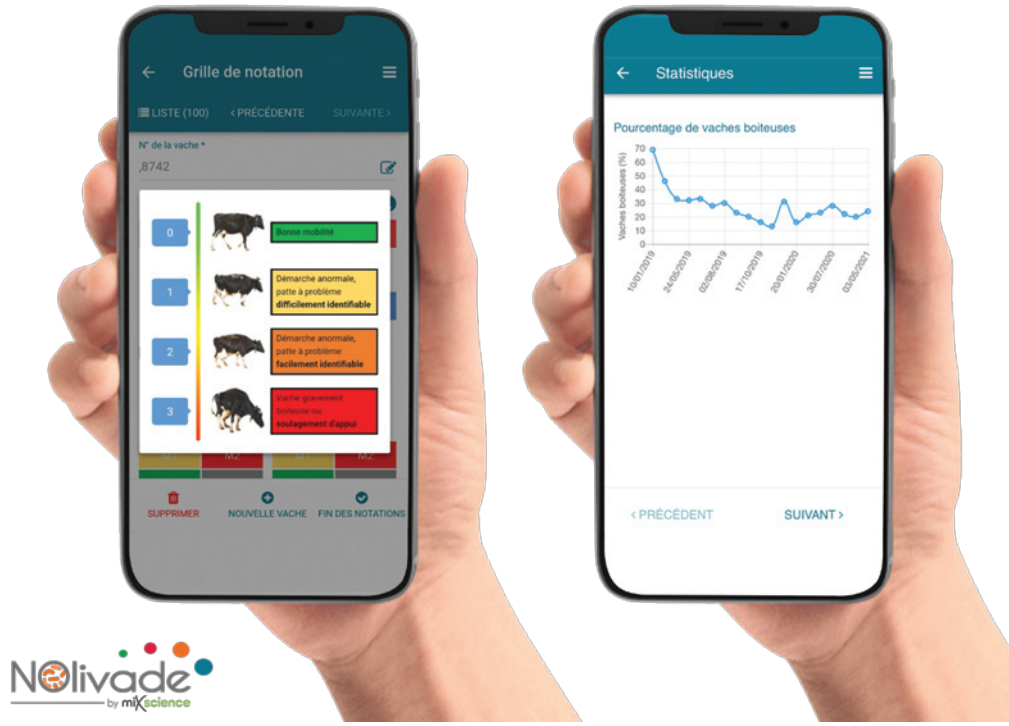

Fig. 1. Screenshot of the Noliscore application: Cow rating interface (left) and a graph of the evolution of the percentage of lame cows in a farm (right).

Equipment and method

The bacteria used, which are marketed under the brand name Nolifeet, are composed of a combination of several strains of *Bacillus subtilis* and *Lactococcus lactis*.

They are suspended in a volume of water containing no active biocide and applied by spraying. To guarantee a homogeneous application, dedicated equipment is used: an electric sprayer combined with a flat fan nozzle.

The protocol is to spray the heel area of the rear feet of all lactating cows once a week as well as on dry cows and heifers from three weeks before calving. Approximately 20ml of the solution is applied per foot, the aim being to deposit a bacterial film on the most frequently affected areas.

The dairy farmers did not change their practices apart from ending the use of collectively applied biocidal solutions.

The sample is represented by all the dairy farms that started this solution over the analysed period of two years.

Nolivade technicians put the monitoring in place with the farmer and the lameness of all cows was rated according to the 'DairyCo Mobility Score' scoring grid. This rating is repeated at intervals of 1 to 3 months using an application developed for this purpose, Noliscore (Fig. 1). Dairy farmers also have access to their farm's results. The results were processed in the R software using mixed linear models.

Results

In the following analysis, a cow is considered to be lame if its score is at least equal to 1.

This includes animals with lesions that do not lead to frank lameness and allows most active lesions to be taken into account.

The percentage of lame cows in the 154 farms decreased on average from 51% at the start of the application to 27% one year later (Fig. 2).

The statistical analysis of this evolution via a linear regression with a mixed model 'dairy farm' random effect shows a significant reduction (p-value <2.2e-16). In order to better characterise the decrease in the percentage of lame cows based on the initial health status of the herds, the farms were divided into three classes of equal numbers based on the initial prevalence of lameness (Fig. 3).

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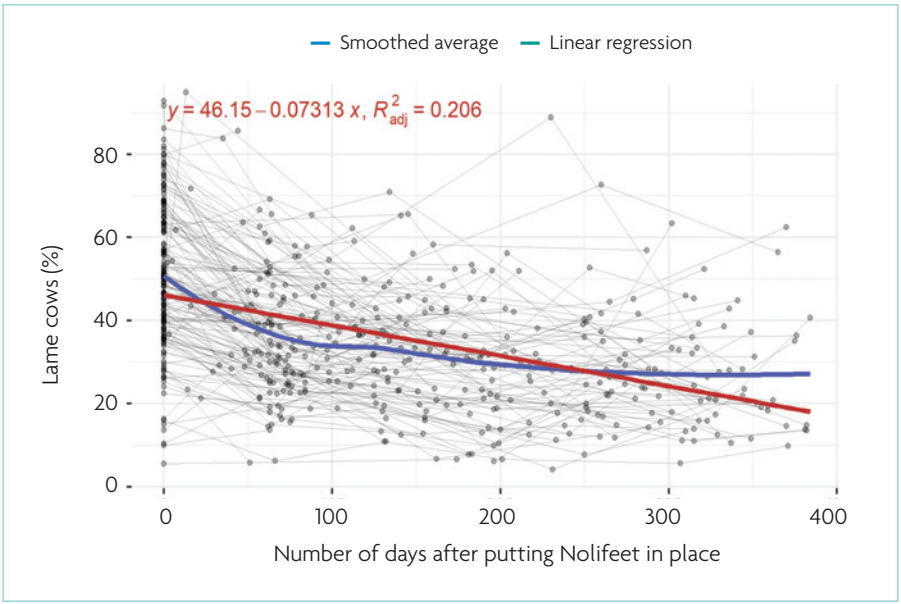

Fig. 2. Percentage of lame cows per farm.

barrier flora have had an impact on the decrease in the prevalence of lameness, considering that the high number of farms and the spread of the implementation at least partially mitigate environmental and seasonal effects.

The dairy farmers acknowledge this decrease in prevalence compared to the previous period. In the farms considered, the main cause of lameness is infectious lameness (see trimming reports and observations made in the farms).

On the other hand, it was proven that, on some dairy farms, 80% of first-calf heifers whose lactation began after the start of the solution were still healthy after a year.

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The 'Lower T0' class includes farms with an initial percentage of lame cows that is less than 41.4%: for this group, the prevalence of lameness decreased from 31% to 20.8% in one year.

The 'Intermediate T0' class includes farms with an initial percentage of lame cows that is between 41.4% and 61.1%: for this group, the prevalence of lameness decreased from 49.5% to 29.1% in one year.

The 'Upper T0' class includes farms with an initial percentage of lame cows that is greater than 61.1%: for this group, the prevalence of lameness decreased from 70.8% to 24.8% in one year.

We see that in all cases the evolution over one year is positive and significant. By applying a global mixed linear model and taking into account the 'class' effect over the entire period, we obtain a significant effect of the class variable (p value=0.023).

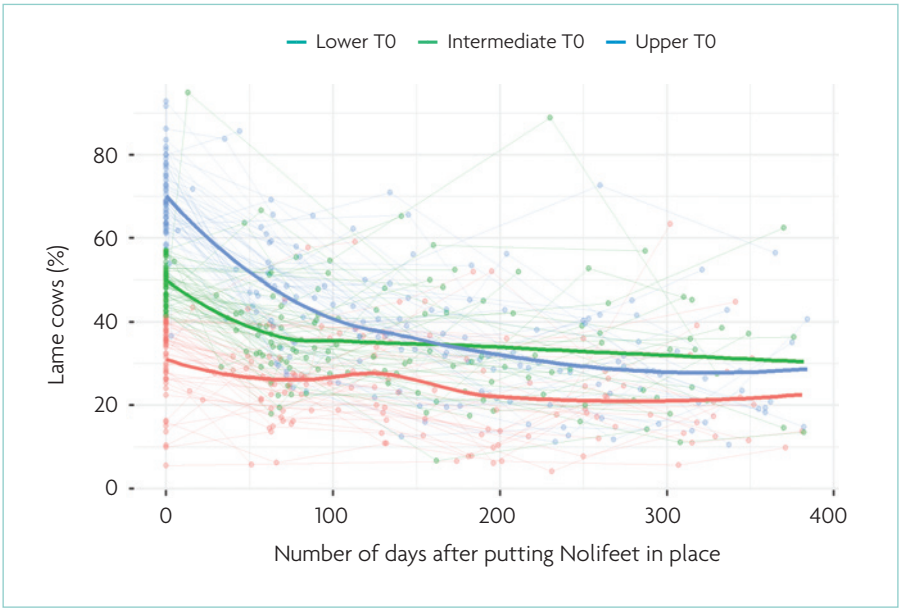

Fig. 3. Evolution of the percentage of lame cows in each of the three dairy farm classes.

Discussion

The initial percentage of lame cows may seem high: the dairy farms included in this analysis are not the result of sampling and are therefore not representative of the total population.

Indeed, the dairy farmers in this study are looking for solutions to the lameness evident in their herds.

On the other hand, the percentage of lame cows includes 1 scores, which are not always taken into account in other studies.

This is a descriptive analysis of the evolution of the prevalence of lameness over one year from the implementation of a solution.

This analysis suggests that the applied barrier flora have had an impact on the decrease in the prevalence of lameness, considering that the high number of farms and the spread of the implementation at least partially mitigate environmental and seasonal effects.

This may suggest a mode of action combining an increase in the skin resilience of healthy cows associated with a reduction in new infections and a reduction of active forms by spontaneous healing or after an intervention or after the culling of the cows in question. ■

CONCLUSION

Dairy farmers faced with lameness in their herds are looking for support to help them manage this problem. Some are also looking for more sustainable solutions. The results obtained show that Nolifeet can meet these expectations when it is part of a programme that takes a comprehensive approach and includes monitoring.