An update on the UK National Johne's Management Plan

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Introduction

In 2009 Dairy UK, milk processor body set up an industry initiative with stakeholders from the dairy industry called Action Johne's.) All UK dairy farms have a single supply contract with a designated buyer, who has control over the standards to which the milk is produced.) This has progressed over the years from a Johne's Disease (JD) education and engagement program to a more structured framework for the control and management of Johnes Disease in the UK dairy herd called the National Johne's Management Plan (NJMP).

In 2017 the scheme structure involved the training or more than 1000 vets to be Approved JD advisors through the British Cattle Vet Association and a campaign through the milk buyers to ensure their farmers had undertaken an annual risk assessment in conjunction with a trained and accredited Johnes Veterinary Adviser, and selected an appropriate control strategy from six possible options. The UK national farm assurance program (Red Tractor) incorporated the NJMP into the dairy farm standards in 2020, effectively making it mandatory to be part of the NJMP, resulting in 95% of all UK dairy farmers now being included in the scheme

Some individual retailers (supermarkets) who have direct supplier contracts with individual dairy farms have now become involved in setting more onerous requirements for their suppliers, creating some confusion about the rules and requirements of the national scheme.

The program has been phenomenally successful in terms of providing a framework for widespread engagement. The annual cost of managing the program centrally has been less than £30k per year with most of the funds utilised for maintaining websites, promotional materials and gathering of declarations and strategies. The main costs of implementing the programme have been born by the farmers and milk buyers, and indirectly by the milk market. There has not been any State involvement.

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Results and challenges

The level of engagement achieved with the milk buyers has increased in the last 3 years from 22 to 40: (Fig 1)

Percentage bracket	Year 1	Year 2	Year 3
Number of processors achieved 100%	10	10	11
Number of processors achieved 90-99%	6	2	7
Number of processors achieved 80-89%	1	6	7
Number of processors achieved 50-79%	4	4	3
Number of processors achieved <50%	1	0	5
Number of processors nil returns			4
Number of processors – no percentage calcs			3
Total Number of processors	**22**	**22**	**40**

Fig 1. Number of milk processors and % farmer engagement with NJMP 2018-2020

The NJMP requires farmers to opt for one of six control strategies to manage Johnes Disease on their farms. The ability to choose an appropriate control strategy to fit the farm has been crucial to the success of the program. The choice is driven by prevalence, farmer aspiration and resources. (Fig 2)

The main surveillance tool used to identify infection and to manage infected animals has been Elisa testing of individual cow milk samples. Approximately 70% of herds are using individual cow milk Elisa testing within their control programmes, with around 42% using quarterly milk testing to identify and manage infected cows within their herds.

Strategy	Number of declarations 2018	Number of declarations 2019	Number of declarations 2020
1. Biosecurity protect and monitor	304	324	549
2. Improved farm management	135	135	296
3. Improved farm management and strategic testing	1468	1727	2224
4. Improved farm management test and cull	803	1001	1480
5. Breed to terminal sire	204	256	638
6. Firebreak vaccination	9	9	17
Control strategy unknown by AGJ	3161	2031	11
Total number of declarations received	6084	5483	5215

Fig 2. Strategy Control Plan Selection 2018-2020

Measuring and managing progress

The success of the NJMP has been evident by the level of voluntary engagement in the programme, with over 95% of the UK milk supply now being derived from dairy farms that have engaged and complied with the requirements of the National Johnes Management Plan. However, there is no central system to determine the status of each of those farms, not measure progress towards the overall objectives of the programme to reduce the prevalence of Johnes Disease in the national herd and reduce the level of MAP in milk.

The Technical Group of the scheme has considered various options to use data that is already being collected to create reliable and relevant systems of measurement to determine progression towards the objectives.

Options considered to determine progress within the UK National Johnes Management Plan.

1) **Monitoring risks** – every dairy farms in the programme has an annual risk assessment conducted by a trained and accredited Johnes Veterinary Adviser: various systems are used to conduct the assessment, but these could be standardised and used to measure progress by measuring risk over time.
2) **Monitoring Johnes Status** – every farm is required to determine their Johnes status, but there is no standardised system to define status nor measure prevalence on farm. Systems could be introduced to conduct such assessments, but would require standardised testing and central management of results.

3) **Monitoring prevalence within a selected group of farms**. Data is already available from a group of farms that are using reliable and standardised surveillance systems to manage the disease, to track progress of these particular farms over time. As nearly half of all farms in the programme are using one of three milk recording organisations to perform quarterly testing on milk samples from lactating cows in their herds (as a single standard test is being used – Idexx Elisa), there is a plethora of data which can be used to give an indication of progress over time. The analysis of the available data has given an insight in to the successes and failures in those farms from which data can be extracted, and had led to the creating of a tool that can be used not only to measure and monitor progress, but to identify strengths and weaknesses in the control strategy.

Next Steps

Dairy UK and AHDB commissioned research by VEERU (Reading University) lead by Nick Taylor in combination with the Action Group Technical group based on identifying potential outcome and driver measures to track JD progress. This work was building on some preliminary work within the Park Vet Group by the author utilising spreadsheet analysis

The initial study included retrospective data from 39 herds over 652 test dates, 157,985 test results.

A wide range of parameters were examined, and the following were the most useful.

The final chosen OUTCOME measures were the Average Test Value (mean of all test results of a whole milking herd screen), % positive over 30, 60, 100 values. (30 = positive cut point, 60 indicates entry into progression, 100 = heavy shedding risk)

The ATV was strongly correlated to the % test positivity. (R=0.87)

This correlation exists (albeit weaker) when positive animals are removed. (R=0.45). The impact on test negative animals on the overall ATV was explored in more detail.

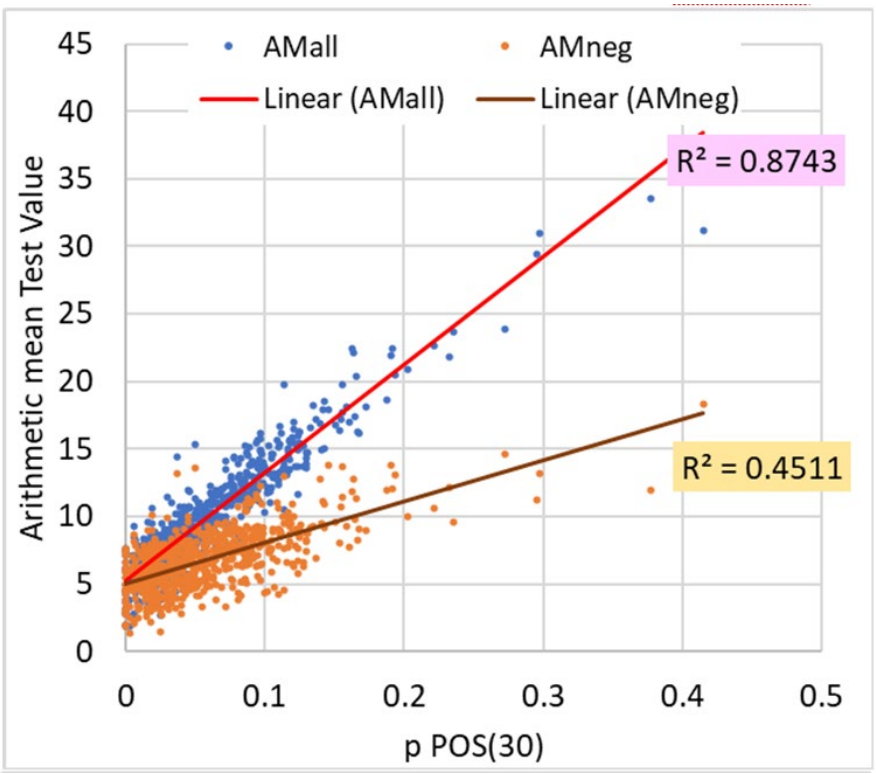

Fig 3. Correlation of Arithmetic Mean Test Value for all cows and cows testing negative

Herds that retain strongly positive animals and have the highest incidence of JD have the highest ATV. Herds that repeatedly test negative over several years have the lowest ATV. Herds that simply cull positive animals alone or are moving from higher to lower prevalence are more likely to have a low / intermediate level due to the level of inconclusive and test positive animals within the herd.

The DRIVERS to infection within the herd related to NEW DETECTIONS, PERSISTENCE, REMOVAL RATE AND DISEASE PRESSURE (breeding from known test positive JD cows) (Fig 4)

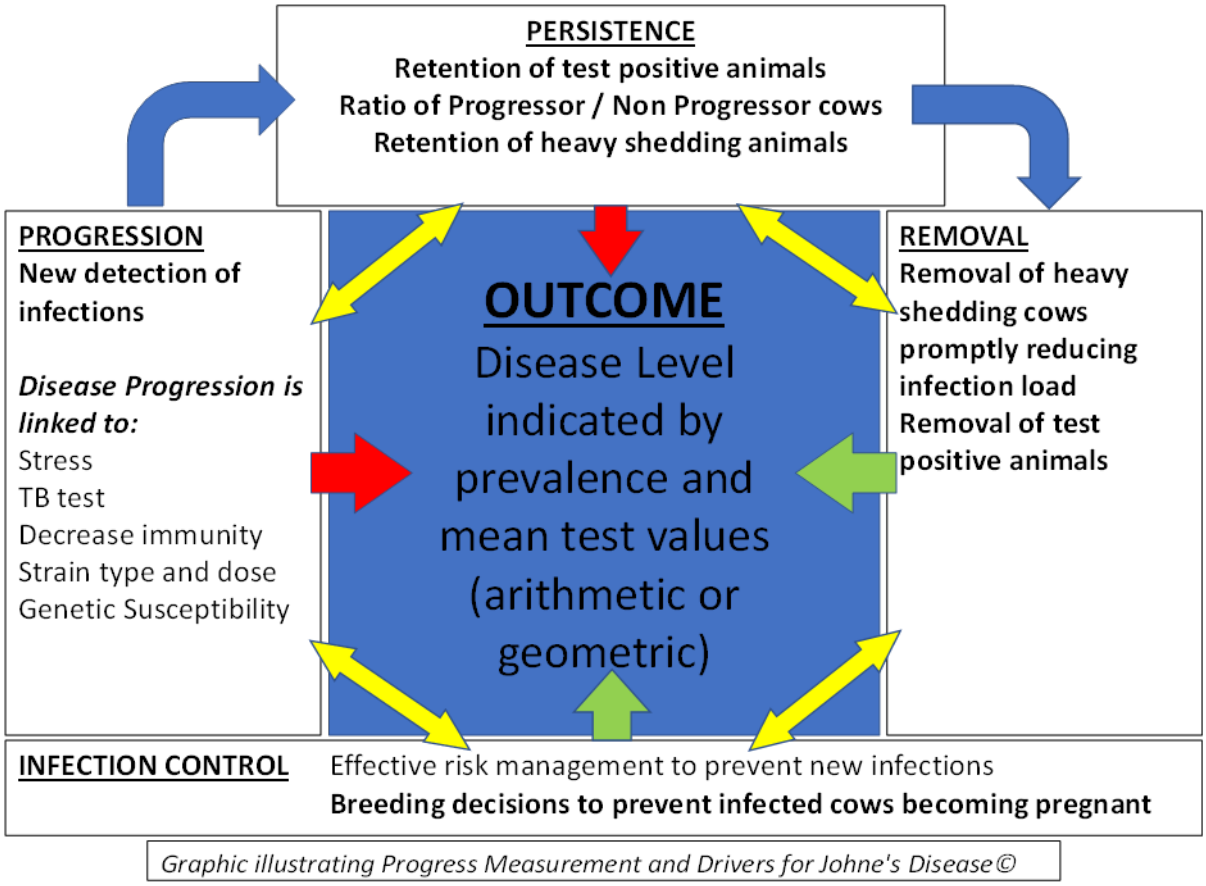

Fig 4. Graphic illustrating the progress measurement and drivers for JD within quarterly milk tested herds.

The four drivers defined that had the greatest influence on the ATV were 2 retrospective indicators (% of cows testing positive for the first time, NEW DETECTIONS J4%, and % of cows with 2 tests out of 4 consecutive tests which are positive, J5% PERSISTENCE) . These measures indicate the historic levels of infection in the herd 3-4 years earlier.

The contemporary drivers are the relative risk of removal of J5 cows from the herd compared to non-affected (negative) cows and the relative risk of serving J5 cows. These drivers appear to be reasonably good indicators for good management decisions to promote JD control. Farmers that commit to not serving JD cows and culling appropriately tend to have effective control programs. Those that cull however and do not control PERSISTENCE or NEW DETECTIONS are less effective at controlling the disease.

Development of quartile ranges

For each outcome and driver measure quartile ranges were established and these then allowed a way of conditionally formatting the data tables for ease of interpretation.

These quartile ranges were established by examination of data from 257 randomly selected herds with at least 7 quarterly testing dates in the two calendar years 2018/19 (in future the data can be reviewed and updated on an annual basis).

This data set is skewed towards farmers selecting this as a control program which requires an annual investment of circa £10 per cow for 4 milk tests. Caution must be taken with comparison with randomly selected surveillance used for example national surveillance purposes.

The key outcome measures of ATV and % positivity show similar trends. In the worst affected herds infection can progress out of control with the ATV exceeding 15 and test positivity greater than 12%.

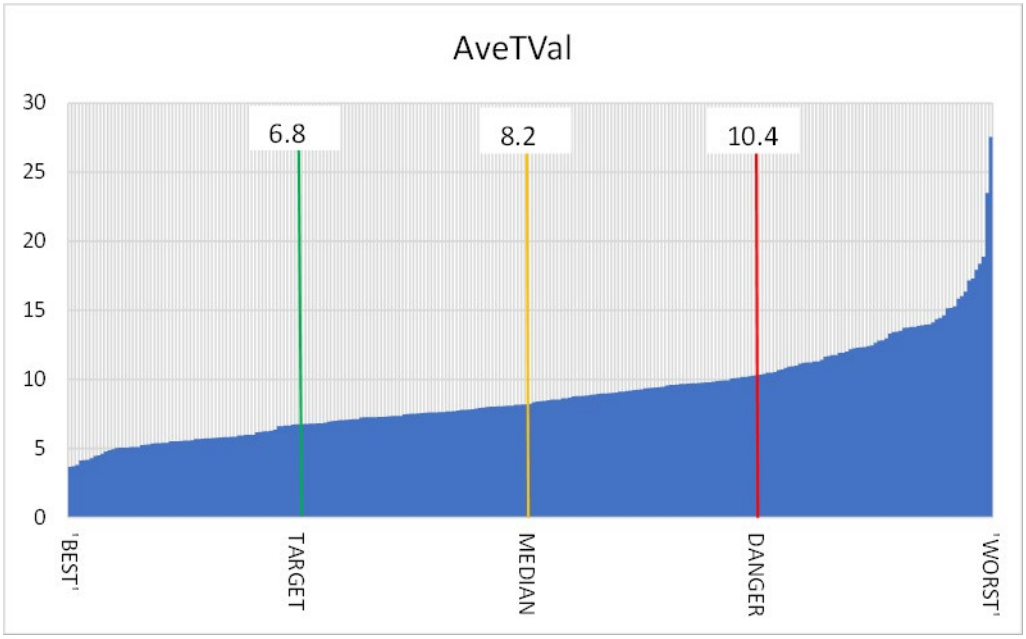

Fig 5 Average test value ranked into quartiles in 257 randomly selected quarterly milk testing herds

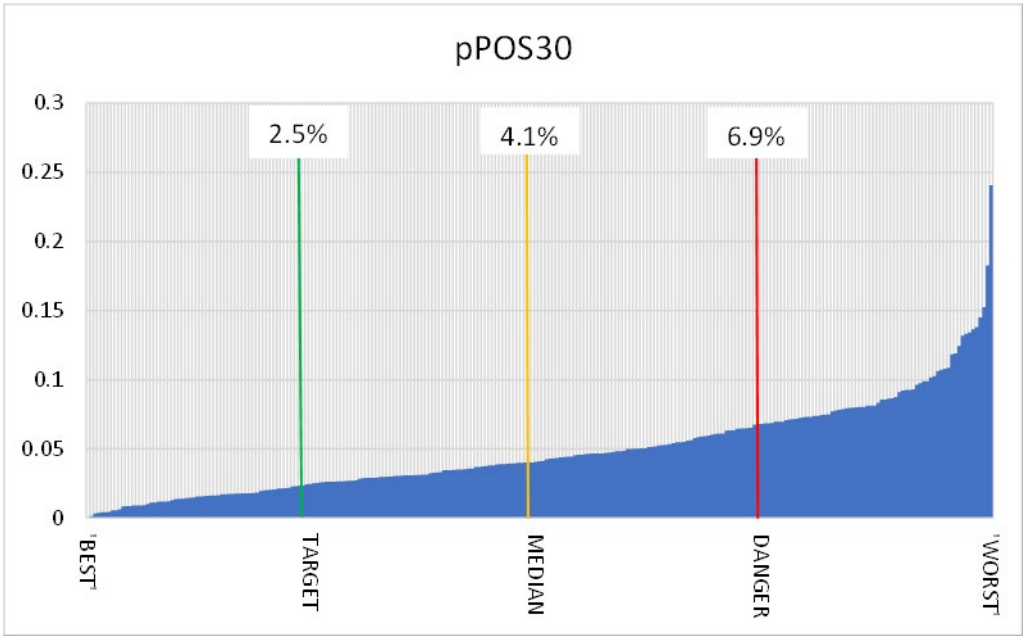

Fig 6. % Test positive ranked into quartiles in 257 randomly selected quarterly milk testing herds

The Johne's Tracker

The Johne's Tracker program will be launched in July 2021.

Interherd (PAN livestock Services) have already developed a fully working program that allows analysis of any herd irrespective of the milk recording agency. This work was driven by Dr James Hanks and Andrew James who worked through the coding to deliver a practical workable end product. The IH program has been used as the beta testing platform for the JD Tracker. The Milk Recording Organisations (NMR, CIS, QMMS) are developing the similar software for farmer and vet access.

The results are illustrated by colour coding the data according to quartiles.

The basis of the output grid for an individual herd is utilises conditional formatting. The aim is to use the colours to illustrate the above average (green, darkest green = best quartile) , amber 3rd quartile and pink the worst quartile.

The data is scanned to assess the OUTCOMES and then further analysed to assess the DRIVERS.

Johnes annual monitor: ALL_SELECTED

The table below is formatted to show the main JD KPIs to allow comparison with other herds. Dark green is top quartile, light green 2nd quartile, amber third quartile and red is lowest/ worst quartile. Review the outcome measures first (ATV and % positive at differing thresholds). Then evaluate how the JD drivers have changed over time.

Johnes annual monitor: ALL_SELECTED										
Year	Herd	Ave. test value	J5% (overall)	J4% (overall)	J4% (P1)	Pos >=30	Pos >=60	Pos >=100	J5 service (likelihood cf others)	J5 exit (likelihood cf others)
2021	ALL_SELECTED	7.0	1.5%	1.5%	1.1%	2.5%	1.3%	0.4%	0.0	0.0
2020	ALL_SELECTED	6.9	2.3%	1.0%	0.6%	3.0%	1.1%	0.6%	0.3	3.8
2019	ALL_SELECTED	9.4	5.6%	2.8%	2.5%	6.0%	2.0%	1.1%	0.2	6.5
2018	ALL_SELECTED	13.7	8.9%	4.7%	6.2%	10.7%	5.1%	2.6%	0.2	3.6
2017	ALL_SELECTED	14.2	12.2%	3.6%	5.1%	10.3%	5.7%	2.7%	0.5	3.5
2016	ALL_SELECTED	18.3	19.2%	3.5%	4.3%	15.3%	7.0%	4.1%	0.7	3.0
2015	ALL_SELECTED	28.5	19.7%	12.2%	11.4%	29.7%	13.9%	6.1%	0.7	2.6

Fig 7. Extract from Interherd + report illustrating annual trends demonstrating marked improvement within a single herd.

In the herd illustrated in Fig 7 the farmer with expert help from their vet adopted a robust control program involving the use of selective breeding with sexed semen to secure replacements in low risk stock, proactive culling and modifications to maternity and calf management to reduce risk of spread. A “green” calving and calf line was established blocking transmission to the next generation.

The table is further supported by graphs of specific parameters and more detailed analysis of individual milk recordings. More detailed analysis of other reproductive and health parameters for each JD category is possible within the program.

The same methodology can be utilised to examine progress at group level. Within the same veterinary practice consistent improvement was achieved in over 65% of herds with a halving of test positive rate. (Fig 8)

Johnes annual monitor: ALL_SELECTED										
Year	Herd	Ave. test value	J5% (all)	J4% (all)	J4% (P1)	Pos >=30	Pos >=60	Pos >=100	J5 service (likelihood cf others)	J5 exit (likelihood cf others)
2021	ALL_SELECTED	9.4	3.71%	2.00%	1.74%	5.1%	2.2%	1.0%	0.23	4.38
2020	ALL_SELECTED	8.4	3.36%	2.25%	1.90%	4.5%	1.3%	0.6%	0.26	2.34
2019	ALL_SELECTED	8.5	4.81%	2.14%	1.75%	5.1%	1.6%	0.6%	0.35	3.27
2018	ALL_SELECTED	8.4	5.06%	2.17%	2.38%	5.9%	2.3%	0.9%	0.50	1.50
2017	ALL_SELECTED	9.4	5.68%	2.30%	2.57%	6.0%	2.4%	1.0%	0.69	1.87
2016	ALL_SELECTED	11.2	7.57%	2.77%	4.41%	8.4%	2.8%	1.2%	0.79	1.65
2015	ALL_SELECTED	13.1	7.04%	4.54%	4.74%	11.3%	3.5%	1.2%	0.89	1.16

Fig 8. Demonstration of improvements in a single veterinary practice monitoring 27 dairy herds over a 7-year period.

Summary and Next Steps

The JD Tracker project has provided new insights into an old disease. The presentation of data in a more accessible way is allowing vets and farmers to have more focused discussions and learn from past mistakes. The reports provide a strong motivator for farmers by showing the success that has been achieved.

Early experiences show that the commonest mistake is an over reliance on culling without reducing the NEW DETECTION rate (J4%) in all cows or parity 1 cows.

Failure to cull effectively and promptly results in an increase in PERSISTENCE (J5%) and the herd biocontainment measures become overwhelmed by the level of MAP within the herd.

Over the next year the target is to educate the vets and farmers in the best use of the tool and to consider how best we can then extend this concept to annual testing herds.

A useful next step would be to assess the progress across all herds utilising quarterly milk testing over the last 7 years and to conduct further practical work on how the best herds control JD most effectively.

Individual retailer and farmer groups are already considering how best their success measures can be aligned to this program and avoid the challenges of simply culling cows to achieve a given herd prevalence target.

Further links to risk assessment databases (Myhealthyherd) would allow for work on prospective assessments and correlations to future prevalence's.

Acknowledgements

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