

# RSPCA Hugh Wirth Scholarship: Annual Progress Report 2021

*Addressing the consequences of social deprivation experienced by artificially-reared dairy heifers: providing older social models for improved welfare, social and cognitive outcomes.*

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This research explores the potential for enriched social environments to improve heifer development and welfare, primarily through an experiment investigating the effects of rearing dairy heifers with adult dry cows as social models on calves' development. Forty dairy heifers were mixed into groups of 10 at 2 weeks of age, and one of two treatments were applied until 13 weeks: 1. Hand-reared, group-housed calves (-S), or 2. Hand-reared, group-housed calves housed with 3 non-familial dry cows (+S). All groups were housed on pasture and fed 3L whole milk twice/day. The experimental farm is in the North-West of Tasmania. Calves were successfully reared within these treatments from August to November 2019, when initial testing was undertaken and the heifers were weaned and returned to the research farm. 3 heifers were sold by the farm after this period. Between October and December 2020, the 37 remaining heifers underwent a breeding program; of these, 33 successfully fell pregnant. 17 heifers reared by the farm commercially were added to the experimental group at this time, to form a 'commercial control' for the ongoing proportion of the study, with a resulting total of 50 experimental heifers across 3 treatment groups.

The initial stages of this project (including the treatment period and initial behavioural testing) were funded through alternative sources, while the funding provided by RSPCA Australia is intended to support long-term behavioural and physiological testing and behavioural data analysis of videos. This included cognitive and social testing that was originally scheduled for March-April 2020 and then September 2020, but which was delayed due to the global pandemic, along with observation of behavioural responses to insemination and other management procedures also scheduled to be conducted toward the second half of September 2020. Tasmania's border remained closed to the mainland until December 2020, and funding could not cover casual staff to complete testing without the PhD researcher. Cognitive testing was therefore cancelled, while behavioural responses to social isolation and novel objects were tested in late January to early February 2021.

In May 2021, heifers were fitted with RumiWatch pedometers and MooMonitor collars, to continuously capture their baseline rumination, activity, oestrus and lying behaviour, continuing through to integration testing and their first month in the milking herd. In June and July 2021, integration testing (funded by RSPCA Australia) was successfully conducted and data has been fully recorded, but not yet analysed. Heifers were split into two cohorts according to their anticipated calving date, before being randomly allocated (but balanced for treatment) to one of three testing groups (total n= 6 testing groups). Live observational data was collected when these small groups of heifers first mixed with small groups of cows from the main herd, and again the next day when the new, mixed group was moved to a fresh allocation of grass and silage. Behaviours recorded included agonistic interactions and escalations of these, behaviours facilitating social bonds, and the synchronicity of standing and lying behaviours between heifers and cows, as well as each heifer's nearest neighbour at 20-minute intervals across three 3-hour periods over their testing weekend.

Heifers began calving on July 8<sup>th</sup>, and calving was completed on September 8<sup>th</sup>. The pedometers and collars continued to collect behavioural data, while the dairy's Delpro system collected data on milk yield, health, weight fluctuations, body condition scores and milking order. Accelerometers were fitted

to milking clusters; similar devices have previously been validated to measure movement while milking which can indicate stress or a negative affective state in the animal. These will be validated and then used to assess reactivity to milking during the first two weeks in the milking herd. Milk samples to be analysed for cortisol concentration were also collected on days 7, 14 and 28 in milk; the final sample is scheduled to be collected on October 5. RSPCA funding will allow these 150 samples to be analysed, and results will provide insight into the levels and fluctuations of chronic stress each individual heifer may have experienced physiologically during her first month of lactation, and potentially treatment effects between experimental groups. All the aforementioned data collection will cease at the time the final milk sample is taken; the PhD researcher will then begin to organise the data ready for analysis. Given the large amount of data, including continuously recorded data from May-October 2021, this will be a large task but will provide a rich and varied account of the individual experiences of the experimental heifers in the period leading up to calving, and following their entry into the milking herd.

The structure of this study did have to change due to the global pandemic, however most of the data collection for which the RSPCA Hugh Wirth Scholarship was earmarked to fund was able to be successfully completed, albeit in a slightly amended format. Hurdles aside, the initial stages of the experiment and treatment period, funded through alternative sources, were successful, and preliminary results from the initial testing suggest a treatment effect. These preliminary results were presented at the 2020 Dairy Research Foundation Symposium, winning Best Abstract in the Emerging Scientist competition. This initial testing explored calf responses to social isolation in an enclosed arena when they were 12 weeks old. Following a 5-minute habituation period in groups of 5 conspecifics, calves were individually tested, and behaviour was continuously recorded for 4 minutes. Data for 10 calves were collected and analysed using a Mann-Whitney U Test to compare the behavioural responses of -S and +S calves to social isolation. Median values are reported with ranges. When compared with +S calves, -S calves walked more frequently (-S=12, range 7-15 vs +S=6, range 2-10 bouts,  $p=0.016$ ) and for a longer duration (-S=52.85s, range 23.0-64.9s vs +S=16.6s, range 2.5-47.5s,  $p=0.032$ ), and displayed vigilance behaviour more frequently (-S=4, range 2-6 vs +S=0, range 0-2 bouts,  $p=0.08$ ) and for a longer duration (-S=38.0s, range 12-70.8s vs +S=0s, range 0-21.3s,  $p=0.016$ ). This suggests -S calves performed more stress-associated behaviours when subjected to isolation, possibly indicating lower independence and stronger motivation for social reinstatement. These preliminary results are promising for the results of the recently completed data collection, as they suggest that providing dairy heifers with exposure to social models during early life may improve calves' behavioural responses to stressful situations – including the multiple regrouping associated with calving and lactation management - particularly mixing with older animals - and adapting to twice daily milking.