**Application**

Virtual fence (VF) technology uses a combination of audio and electrical stimuli to contain grazing livestock within a boundary. The study demonstrated that VF can facilitate creep grazing and feeding of concentrates in beef cow calf systems.

**Keywords:** virtual fencing; cow; calf; creep grazing; management

**Introduction**

Virtual fencing (VF) is a novel technology which enables grazing livestock management without the need for physical fences. It offers flexibility and may deliver benefits for farm productivity and labour efficiency. Typically, VF systems use a GPS-enabled neck collar coupled with a mobile phone application through which the user sets the VF boundary. When the animal approaches the boundary, it receives an audio cue as a warning to turn around, and if it continues beyond the boundary it will receive an electric pulse. Through associative learning after a short training period, the animals learn the correct response to the audio cues (Lee et al., 2009). For suckler beef systems, this technology has the potential to enhance grazing management and improve animal performance. The aim of this study was to determine if VF could be used to adopt creep grazing in a beef cow and calf system.

**Materials and Methods**

Twenty-three beef cows and their calves were fitted with VF collars (Nofence, Norway). All 46 animals were initially grazed as one group for a 6 day training period with a single VF line. Following this, the animals were rotationally grazed with VF, with the calves having access to a larger pasture area than the cows; thereby restricting the cows and enabling the calves to creep graze. The VF boundaries were moved every 5 days to allow fresh grass allocation. After 14 days, an additional challenge was introduced, with calves being offered concentrates in a conventional feed trough in the ‘creep area’ for 19 days prior to weaning. The number of audio cues, duration of audio cues, number of pulses, and activity were obtained from the VF collars. The ‘proportion of pulses’ indicates the percentage of boundary interactions that resulted in a pulse. Data were analysed with R (version 4.2.2), using the non-parametric Dunn test from the “rstatix” package.

**Results**

Results outlined in Table 1 show that during the training period cows received more audio cues than calves (P < 0.05) which indicates that cows had more interactions with the VF. Despite this, the calves received more pulses (P < 0.01), which suggests calves were slower to learn the system than cows. During the subsequent periods, similar results were observed in the number of audio cues received and pulse proportion alongside an increase in the duration of the audio cues after the introduction of the concentrates. Increases in audio cue duration signify a less immediate response to the audio cue, and this coupled with the reduction in pulses in the period after training (decrease of 14 percentage points for cows and 17 percentage points for calves) suggests that the animals became more familiarized with the system.

Table 1: Variables collected by the collars, reported by period for cows and calves

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Period | Training  (day 1-6) | | | Creep grazing  (day 7-21) | | | Creep grazing plus concentrates  (day 22-39) | | | Whole experiment (day 1-39) | | |
|  | Cows | Calves | *P* | Cows | Calves | *P* | Cows | Calves | *P* | Cows | Calves | *P* |
| Audio cues per day | 6.77 | 5.81 | \* | 9.51 | 6.81 | \*\* | 22.62 | 9.3 | \*\*\* | 17.30 | 8.10 | \*\*\* |
| Audio cue duration (s) | 61.17 | 67.25 | NS | 54.31 | 51.44 | NS | 156.2 | 71.98 | \*\* | 113.92 | 61.71 | \*\*\* |
| Pulses per day | 1.25 | 1.51 | \*\* | 0.44 | 0.61 | NS | 0.51 | 0.44 | \* | 0.47 | 0.52 | NS |
| Pulse proportion (%) | 18.42 | 26.06 | NS | 4.66 | 8.94 | \*\* | 2.24 | 4.75 | \*\*\* | 2.73 | 6.39 | \* |

The data is presented as mean per day, P = probability, \* indicates *P*<0.05, \*\*indicates *P*<0.01, \*\*\*indicates *P*<0.0001 and NS indicates P>0.05.

**Conclusions**

This study demonstrated that VF can successfully facilitate creep grazing, and creep feeding of concentrates, in beef cow and calf systems. Animals adapted to the system with the number of pulses reducing after the initial training period. There were however differences observed between cows and calves, with calves having a higher pulse proportion. This might indicate a slower rate of learning among calves than their dams.

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**References**

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