Telemetric monitoring of calving using a novel calf alert device

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In extensive grazing systems, lack of methods to monitor calving has been an impediment to characterizing and managing calf losses. A device that could telemetrically detect time and location of a portion of parturition events would allow timely recording of calving-related data, increase opportunities to conduct necropsies and be useful to quantify and derive scientifically based conclusions for neonatal calf mortality and morbidity. Objective was to build and evaluate a telemetric calf alert device suitable for identification of the time and location of calving events in extensive beef production herds in northern Australia. A prototype device was selected from several preliminary designs, based on cow safety and 100% vaginal retention as tested in a 28 day field trial in 5 nonpregnant cows. The device was further developed incorporating a Taggle™ PCB (printed circuit board) and a battery (life of 2 years) within a cargo pod. Taggle™ location system consists of 3 components - a transmitter that outputs a low-power radio signal; a sensitive terrestrial receiver that detects the Taggle™ ping and its time of arrival; and a method of transmitting the time of ping arrival at each receiver to a central location server. When Taggle™ ping is detected by 3 or more receivers, the time difference of arrival of these signals is used to calculate the location of the transmitter. Device transmits signals every 15 minutes and can transmit to receivers up to 7 km away. Device was active from the time of intravaginal insertion, sending out attenuated signals detectable by receivers. At device expulsion during parturition, improved reception of the unattenuated signal allowed the timing and location of calving event to be transmitted. A field trial was conducted where devices were inserted into the cranial vagina of 20 early (2 - 3 months) pregnant cows, with 20 contemporary controls. Cows were monitored monthly until calving, using an intravaginal endoscope and complete blood counts, plus assessment of acute phase serum proteins. With modifications following the initial field trial, the device was further tested in 80 mid to late gestation cows. Devices were monitored over 150 days for reception and location data utilizing Taggle™ terrestrial receivers mounted at heights of 12 - 15 metres. Parturition events and locations were confirmed by daily visual surveillance of calving paddocks. There was an 85% retention rate of the modified calf alert devices in pregnant cows, without any adverse effects on cow or calf. Modified devices functioned without interruption throughout the trial period and 83% of inserted devices provided locations throughout the data collection period. Modified devices detected calving date in 66% of cows, with calving location derived for 64% of cows. Precision of calving location was within 100 metres in a 150 hectare network, and 200 metres in a 1050 hectare network. We successfully developed and deployed a calf alert device that can be placed within the vagina of pregnant beef cattle for at least 6 months to provide calving time and location alerts by SMS or computer messaging. Ability to detect calving within 24 hours of actual calving date would enable neonatal calves to be monitored, thereby increasing the opportunity to identify, investigate, and address any calf losses.

Keywords: Calf alert device, telemetry, calving, receiver, location