Automatic Detection of Lameness in Dairy Cows

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■ Take Home Messages

⁃ Lameness is a symptom of a problem or problems with many possible causes.

⁃ Cows that are lame have a variety of problems including reduced milk production and increased days to conception, most likely from the cows not eating and not resting adequately.

⁃ Lame cows can be identified by a visual scoring system that has been shown to be accurate and reliable, though it can be labor intensive.

⁃ Electronic systems to automatically identify the lame leg in cows have been developed and shown to be accurate.

■ Introduction

Cows that are lame in one or more legs are an important problem on dairy farms. Lameness can be caused by many factors or causes, and sometimes lameness has multiple causes. For example, a cow that injures the left rear leg will place greater weight on the right rear leg, which can lead to later joint or locomotion problems. The major cause of lameness is thought to be triggered by subclinical laminitis, or founder, which then leads to various disorders of the cow's claw (Shearer and van Amstel). Those disorders include sole ulcer and white line disease and are usually associated with rear legs. Lameness can also be caused by infections of various types. Some of the names for infectious problems include interdigital dermatitis, heel erosion, slurry heel, stinky foot, stable footrot, foot rot and papillomatous digital dermatitis (Moretellaro's Disease, hairy heel warts, digital warts, or strawberry foot). Whatever the cause, cows that are lame typically suffer from pain and they are at greater risk of being culled from the herd.

The economic losses from lameness are significant. Estimates of losses have

ranged from 730 to 150 Canadian Dollars per cow with a clinical case of sole ulcer or foot rot, respectively. Economic losses can be significant in herds with a high incidence of lameness. Treatment and prevention of lameness have been the subject of excellent presentations at past Western Canada Dairy Seminars (Blowey, Greenough), and those topics will not be discussed during this presentation.

■ Recent Research on the Effects of Lameness

Recent studies have been conducted to determine the extent of lameness in dairy herds in Michigan (Kopcha, et.al). These veterinary scientists evaluated over 13,000 dairy cows in over 550 herds during two farm visits. They used a visual scoring system to body condition cows and classify cows as normal, or mildly, moderately or severely lame. Approximately 50% of cows were classified as normal, while 12%, 37% and less than 5% of cows were mildly, moderately or severely lame, respectively. The high degree of lameness surprised the investigators. Cows that were moderately or severely lame had lower body condition scores and milk production.

Florida veterinary scientists recently evaluated the effect of differing degrees of lameness on milk production (Hernandez). Over 450 cows were examined weekly during their first 100 days in lactation using a visual lameness scoring system. Lame cows produced significantly less milk than did cows that were moderately lame or not lame at all. Lame cows also have delayed onset of ovarian activity. On average, lame cows took 66 days longer to get pregnant.

■ Visual Scoring Systems for Lameness

A variety of systems have been developed to quantify the degree of lameness in dairy cattle, using a simple system of watching the cows walk, looking at the curvature of the back as they move. These systems have been described by Sprecher and coworkers from Michigan and Shearer and coworkers form Florida. A training CD has been developed by Derek Haley with Alberta Agriculture and Food to use this general classification system and is available at the 2007 Western Canada Dairy Seminar.

■ Electronic Systems to Identify Lameness

Electronic and mechanical devices have been tested to identify lameness in a variety of species, including cattle. These types of devices have the potential of providing an objective evaluation of lameness and to do so more frequently than is typically done via visual evaluation. A walk-through cattle scale was

modified to measure the ground reaction forces applied by the cow's hoof when it struck the metal plate at the base of the scale. Those forces were measured, recorded and compared to the past recordings for the same animal. The results of these studies were recently published (Rajkondawar, et al). The system was patented and the technology is currently being marketed by Boumatic, Inc. of Madision, WI as StepMetrix.

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