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Lameness detection in dairy cows, a multidisciplinary approach

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Lameness classified as an orthopedic condition belongs to the most common and economically relevant production diseases of dairy cattle. The main causes of lameness are hoof lesions especially in lateral claws of the hind feet. The annual incidence of major hoof lesions (Sole ulcer, White line disease, Interdigital necrobacillosis and Digital dermatitis) reported between 12-62% with average of 30-32% among dairy farms in Iran. However, the prevalence of bovine lameness in European countries and the United States ranges between 5 and 48%. Lameness besides infertility, some infectious diseases (like Paratuberculosis) and mastitis are the most important causes of culling in Iran's dairy farms. Iran dairy farming is growing in herd level as most farms are increasing in number, otherwise because of financial problems they have to end up their work. Increasing in number and production also affect health status of the cows and lots of production diseases including lameness potentially increase in the farm. Reduced milk yield and fertility, increased risk of culling, treatment costs, and additional expenditure for extra labor cause considerable economic loss. Labor and treatment expenses nowadays are considerable cost of lameness in Iran. However no significant effect of lameness recorded on the rate of culling in Iranian dairy farms. Lameness notification in the herds is a constant problem and different investigators try to find proper indices for detection of lameness. Validation of different ways of lameness detection is very important; lots of these indices are subjective and can easily change during time and between herds. Finding a standard protocol for lameness detection may lead to misinterpretation of the results and finally making wrong decisions about lameness concepts. Unfortunately still many farmers are not aware of the financial consequences caused by lame animals and did not realize how the lameness problem affected the productivity and profitability of their dairy farm. In an investigation of 222 English dairy farms, 90% of the farmers did not judge lameness as being a big issue, although the average prevalence of lameness was 36%. Digital dermatitis, heel horn erosion, sole ulcers, and white line disease were shown to be the predominant claw lesions of dairy cows. Cows seldom show signs of pain until the stimulus is severe and in first steps of lameness lowering BCS proceed milk reduction and other economic important losses.

In practice, lame cows are often insufficiently identified and treated and the mean time from the onset of Lameness to clinical recognition by the farm personnel recorded as 27 days.



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In general, veterinary treatments and management decisions are more effective in earlier stages of the disease. A decrease in milk yield lasted from 4 month before individual cows were diagnosed clinically lame until 5 month after this point in time. An increase in locomotion scores 3 month before start of sole ulcer were recorded that lasts till 3 month after treatment of the disease.

Generally, lying bouts of lame cows lasted longer than those of nonlame cows. Acute locomotion disorders lead to a decrease in (1) feed intake, (2) number of meals, (3) visits to the feeders, and (4) a considerable decrease in eating time.

Diagnosis of lame cows in Iran based on the practical procedures in the farm.

What are the main findings in a lame cow?

As previously described a lame cow have lower bouts of feeding, lower rumination, longer lying time between bouts of standing, higher locomotion score, lower body condition score, lower fertility, possibly higher mastitis etc. Each of these findings may appear with different causes and necessarily are not a result of lameness. For example lameness is not the only cause of infertility and a long list of problems in a herd may cause infertility. This is the case for other above mentioned problems.

Lameness is a herd problem and lots of these findings are obvious in herd level not in a single animal. In a stepwise plan we may be able to approach the level of lameness in the herd and finding what we should do for it.

Increasing diseases among the herd

Generally a lame cow may lose lots of her normal functions. As a retrospective look lame cows are more prone to infertility so if you consider lameness as a very important finding in a herd, logically you should see lower fertility rate in such a herd.

This is the case for other disease or conditions like mastitis. Lots of papers show higher prevalence of SCC among lame cows. I 've visited a herd that separate high SCC cows for increasing times of milking, the average of locomotion score were highly significant higher than counter sound cows, that means by using a criteria (SCC) the lame cows were selected and separated from other cows.

Some metabolic markers like increasing in NEEFA or BHBA in transition period and higher level of abomasal disorders in the herd also can be considered as a predictive value for lameness that needs further investigation.

Cow Comfort indices:

Lying time and time budgeting: As a rule of thumb a cow needs a clean and comfortable bedding in a well ventilated weather with reasonable ambient temperature to be able to rest and doing her normal physiological actions.

Cows in high producer herds should rest at least 12 hours a day that by increasing an hour in their resting time, the milk production also may increase about a liter. However cows needs standing up and feeding among these 12 hours resting and should be divided to about 12 bouts. Lame cows normally have longer bouts of resting than normal cows. Also lame cows may have less resting time in comparison to sound counterparts.

Hygiene scoring: Most infectious agents of digital lesions transmitted through bedding of the cows. It is obvious that reducing the infectious agent to zero is impossible but by using good hygienic materials it can be reduced to minimal level so immunity of the body besides good trimming in making normal shape of the hooves, can make good dam against infectious agents. Assessing hygienic condition of the cows is possible by using hygiene scoring system. This scoring system like other scoring systems needs to be done on a regular basis to evaluate changes during time.

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Heat stress: Consider as one of the most important predisposing factors in lameness occurrence, different effects of heat stress like more standing time, less lying time, saliva drooling and possible ruminal acidosis, endotoxin absorption and possible problems besides consequences of cooling cows like making ponds of mud and manure are the most important roles of heat stress in making cows lame.

Cow behavior

Locomotion scoring (LS): Normal walking of the cows measured or qualified by locomotion scoring. Different scoring systems have been used and a five point scale scoring system normally used in our field. By using LS we try to quantify a quality of the animal so it will have a very tiny margin of changes and some basics should be considered for doing reliable LS.

- On a monthly basis by a person, don't change during time as much as possible.
- In a flat area any slope can change the outcome of LS.
- In a normal weather condition, in very hot or very cold conditions or under storms, high speed winds results may be unreliable.
- The surface for doing LS should be clean without gravels or other particles that may affect the scoring; the slippery surfaces may increase the scoring.

Interpretation results of LS are very important in finding and estimating lameness status of the herd. Higher locomotion score maybe consider as the first finding in a lame herd. In five point scale locomotion scoring system we can consider scores one and two as non-lame and 3-5 as lame cows. In our local situation I always use scores 4-5 as lame cows and 1-3 as non-lame cows. Locomotion scoring (mostly 5 point scale, Sprecher method) used in Iran but there are not enough data available on the result of these locomotion scorings and its accuracy or possible sensitivity and specificity of the tests.

Leg scoring: Most of the dutch hoof trimmers believe in this scoring system. The basis of the leg scoring system is outward rotation of the hooves and making an angle with the vertebral column. In this scoring system the score one refers to the most normal hoof that doesn't have any deviation from vertebral column line or less than 7 degree deviation and score three with more than 24 degree deviation consider the worst score. Our local investigations show that usage of this scoring system is not successful in all dairies and stage of lactation and milk production affect this system. However this system believes that outward rotation is a result of hoof growing.

Hock scoring: this scoring was done on hock of the cows as the score one gives to a normal hock without any lesion and score 4 to a wounded hock. Wounds or other problem in hocks maybe a result of bedding and also an indicator of comfort of the cows.

Hoof trimming

Data of hoof trimming are very important for understanding what happened in the herd in past time. The first step is to know what was done in the herd, is there any recorded data? Are people in the herd have proper knowledge of digital disorders? Do they know when these disorders happens? Do they know the extent of the lesions? If there is any recorded data, it should be analyzed, otherwise some animals in different stages of lactation and ages should be evaluated for possible lesions. For getting reasonable analysis at least ten cows in each of the following categories should be evaluated:

- Ten fresh first parity cows with DIM less than 50
- Ten fresh older than 2 parity cows with DIM less than 50
- Ten cows with DIM between 120-150
- Ten cows with DIM more than 300





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The results can give some clues about the possibility of infectious and noninfectious lesions in the herd. However, a reasonable sampling strategy may be to observe up to 100 cows from the middle of the milking order. Also, presence of severely lame cows at the end of milking may be useful for identifying lame farms. In data recording, data recorded in a separate sheet on excel software on daily basis and its total outcome easily extracted from recorded data. Since in some herds, diagnosis of the lesions as white line disease or sole ulcers may controversial, the data recording should be done on a zony basis that hooves divided into 12 zones.

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