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Popular Article

Effect Of Climate Change on Animal Health and Production

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Introduction

Global climate change is one of the most pressing issues the world is currently dealing with. In emerging nations, the agricultural and livestock industries are some of the most vulnerable to climate change. Climate change has multiple effects on livestock welfare. It is now understood that animal production and health suffer significantly as a result of psychological stress. In reaction to changing environmental conditions and shifting interactions among hosts, reservoirs, vectors, and pathogens, the epidemiology of infectious diseases is constantly changing. The diseases have a cascading influence on the affected mammals' productivity. In contrast to other consequences that have a much more significant economic impact on livestock production, increased animal mortality only accounts for a small part of the overall effects of many diseases. The thermal neutral zone is a spectrum of ambient environmental temperatures shared by all animals. This is the temperature range that promotes health and productivity. The terrible temperature-humidity index factor will cause an increase in body temperature while decreasing milk production and reproduction. It will also cause an increase in salivation and respiration rate, feed intake that may be reduced, and water consumption that will increase. Thus, since cattle and buffalo are the primary sources of milk output, climate change has a significant impact on the occurrence of disease.

Causes Of Climate Change

Natural causes of climate change:

1) Volcanic eruption
2) Ocean currents
3) Earthquake
4) Solar variations

Man-made causes of climate changes:

1) Green house effects
2) Deforestation
3) Coal mining
4) Burning of fossil fuel
5) Industrial processes

Direct Effect of Climate Change on Animal Health

1) Metabolic disorder:

Under heat stress, the higher rate of respiration leads to increased CO_2 exhalation. Blood CO_2 levels drop during hyperventilation, and the kidney secretes HCO_3 to keep this ratio stable. As a result, there is less HCO_3 available to be used as a buffer and to keep the rumen's pH at a safe level. Additionally, panting ruminants drool, which lessens the amount of saliva that would typically be secreted in the rumen. Furthermore, heat-stressed ruminants ruminate less and make less saliva as a result of decreased feed intake and decreased forage/concentrate ratio. The heat-stressed cow is much more vulnerable to sub-clinical and acute rumen acidosis due to decreased salivary flow into the rumen and diminished forage intake, which also increases the risk of other concurrent health and productivity issues. (Laminitis, milk fat depression, etc.). A relatively large concentration of ketone bodies characterizes the metabolic disease known as ketosis. It appears when an animal is in a severe condition of negative energy balance, experiences forced lip mobilization, and builds up ketone bodies as a result of insufficient fat catabolism.

2) Oxidative stress

Oxidative stress is described as an imbalance between the production of reactive oxygen species (ROS) and the antioxidant defense of the cell, which can cause oxidative damage to the DNA,

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proteins, and lipids of the cell and even cause apoptosis. In the peri and postpartum phases, total concentrations of antioxidant in heifer serum were lower in the summer than the winter. During the summer, plasma levels of reactive oxygen metabolites increased in mid-lactating cows. Vitamin E and total carotenes were decreased during the summer. Both dairy cows and buffalo have been observed to have elevated oxidant and reduced antioxidant blood molecule levels during the hot summer months. Oxidative stress and oxidative modification of lipids in ewes have been linked to the pathogenesis of pregnancy toxemia and lower total antioxidant levels. The hot season has more of an impact on the oxidative state of lactating animals in small ruminants like goats than it does on their nutritional status. The amounts of antioxidant enzymes (superoxide dismutase and glutathione peroxidase) and plasma reactive oxygen species (ROS) were higher in the hot season compared to the spring.

3) Death

A higher chance of death during the hottest months, as well as an increased death rate during extreme weather events. The highest mortality rate recorded during the summer season may be due to extremely harsh climatic conditions. the effects of a heat wave that lasted for a week in mid-central America in July 1995 on cattle. In the three days following the conclusion of the heat wave, the mortality risk remained higher.

Indirect Effect of Climate Change on Animal Health

1) Effect on milk production:

Animals typically go through acclimation to the shifting climate. Responses that decrease the heat load are part of acclimatization to high environmental temperatures. As the animals adapt to the thermal challenges, their feed consumption decreases, many physiological processes change and their reproductive and productive effectiveness changes. Reduced feed intake causes a drop in energy intake, which creates a negative energy balance and a decline in the secretion of calorigenic hormones (growth hormone, catecholamines and glucocorticoids in particular). All of these processes work together to decrease metabolic heat production and may be in charge of changes in the metabolism of minerals, lipids, proteins, and fats as well as liver function.

Due to decreased hepatic glucose synthesis, altered glucose turnover, and higher glucose demand for energy, blood glucose levels are typically lower in people who are under heat stress. The

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decrease in glucose has the effect of decreasing the amount of glucose available for lactose synthesis in the mammary glands. Milk production is primarily determined by lactose, so a decrease in glucose availability will result in a decrease in milk yield. The dairy cows were subjected to heat stress, which resulted in a 35% decrease in milk production in mid-lactating dairy cows and a 14% decrease in early lactating dairy cows. Early, medium, and late lactating dairy cows all experienced a decrease in milk yield of 11–14%, 2–26%, and 15–18% in field conditions, respectively.

In contrast to their others who were lactating early or late, the mid-lactating dairy cows were the most heat sensitive. In reality, when exposed to heat, dairy cows who were mid-lactating exhibited a greater decline in milk production (38%) than other animals. During the summer, the decline in milk output will be greatest in crossbred cattle (0.63%), followed by buffalo (0.5%) and native cattle (0.4%).

2) Effect on reproduction:

Around 60% of dairy farms worldwide are thought to experience financial loses as a result of heat stress. Heat stress hinders the development of oocytes in heifers by changing progesterone levels, the release of luteinizing hormone and follicle-stimulating hormone, and estrus cycle dynamics. Due to poor estrus expression brought on by decreased estradiol secretion from the dominant follicle that formed in an atmosphere with low luteinizing hormone, heat stress can affect dairy cow fertility in the summer.

In the quickly expanding livestock industry, disease control takes greater importance due to the size and variety of climatic-weather-ecological factors, the severity of livestock diseases, the limited supply of vaccines, and the shortage of veterinary personnel. As a practical and comprehensive strategy for the effective, efficient, and cost-effective management of livestock diseases in the nation, disease tracking, surveillance, and forecasting assume increasing significance in this situation.

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