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Nutritional problems related to rumen acidosis in Cattle

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Contents

List of Abbreviations

µmol/l	Micromol per litre
ALT	Alanine aminotransferase
APP	Acute phase protein
AST	Aspartate aminotransferase
CRP	C-reactive protein
FOS	Fructo-oligosaccharides
GGT	Gamma-glutamyl transferase
GOS	Galacto-oligosaccharides
HDL	High density lipoprotein
HP	Haptoglobulin
LPS	Lipopolysaccharides
Mg Kg^{-1}	Milligram per kilogram body weight
MHz	Mega Hertz
NEFA	Non-esterified fatty acid
SAA	Serum Amyloid A
SARA	Sub-Acute Ruminal Acidosis
TLC	Total leukocytic count
TNF-α	Tumor necrosis factor alpha
TP	Total protein
VFA	Volatile fatty acid
β-HBA	Beta Hydroxy Buteric Acid
HCO_3^-	Bicarbonate
pCO_2	partial pressure of carbon dioxide
pO_2	Partial Pressure of oxygen
INR	International Normalized ratio
peNDF	physically effective fiber
NDF	Non digestible fiber
NSCs	Non-structural carbohydrates
SCFA	Short- chain fatty acids

CBC	Complete blood count
NEB	Negative energy balance
RDP	rumen degradable protein
BSC	Body Condition Score
MCV	Mean corpuscular volume
MCHC	Mean corpuscular hemoglobin concentration
RDW	Red cell distribution width
MPV	Mean platelet volume
PDW c	Platelet distribution width
PCT	Platelet-Crit
CP	Crude Protein
Ca^{++}	Calcium
P^{--}	Phosphorus
K^{+}	Potassium
HPA	hypothalamic–pituitary–adrenal axis
DCP	Di-calcium phosphate
ATP	Adenosine triphosphate
AG-Na^{+}	Anion gap sodium
AG-K^{+}	Anion gap potassium

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VI. Summary

Introduction

Sub-acute rumen acidosis is considered one of the most substantial nutritional diseases which affect the dairy industry worldwide, having a great economic importance. Moreover, SARA was found to be associated with feed intake depression, reduced fiber digestion, milk fat depression, ruminitis, diarrhea and laminitis.

Material and Methods

A total number of 210 dairy cattle, belonged to 12 different farms in Dakahlia governorate, Egypt was included in this study. Of which, 30 apparently health cattle were served as a control group, besides 73 cattle supposed to clinically suffer SARA**.** The examined cattle were aged (26±5) months old and weighed (560±20) Kg. The average values of cattle' body condition scores (BCS) were (3.03 ± 0.07), using 1 to 5 scale degrees, according with the procedure previously described by ***Edmonson et al. (1989).*** Generally, all cattle were studied during the first 60 days of lactation.

I-Risk factors investigation

In this regard, data were recorded and categorized into animal level including; age of cattle, breed, and daily milking production. In addition to the farm level that involved the feeding regimen, feed additives, impact of mycotoxins and the milking production routine. All investigated parameters were recorded and given scores for further statistical analysis.

II-Ration Analysis

In current study, the ration was analyzed protein percentage, calcium, phosphorus, energy and ash were analyzed. The (VICAM) Instrument Calibration for rapid food analysis for mycotoxins (Ocratoxins & Aflatoxins).

III-Blood Sampling

Individual blood samples (10mL) were collected from all studied dairy cows from the jugular vein, where (7mL) of the collected blood were received in anticoagulant free tubes to get sera needed for the biochemical examination, while the

other blood sample (3mL) was kept in sodium fluoride tubes for rapid glucose analysis. Additionally, (3mL) blood samples were collected from all investigated cows via the tail coccygeal artery using ventilated syringes with 23 G × 1 needle, containing freeze-dried lithium heparin for blood gas analysis. Samples were kept in ice box and rapidly sent to the laboratory for analysis blood pH, partial pressure of Oxygen (pO_2), partial pressure of carbon dioxide (pCO_2), bicarbonate level (HCO_3^-), the base excess (BE), in addition to some electrolytes including; sodium (Na^+) (mmol/L), potassium (k^+) (mmol/L), ionized calcium (Ca^{++}) (mmol/L).

IV. Serum analysis of biochemical analytes

Serum samples were separated by centrifugation at 3000 r.p.m for 10 minutes. The clear sera were received in dry sterile sample tube using sterilized pipettes, processed directly for assessing glucose concentration and the enzymatic activities of liver markers; alanine transaminase (ALT), and aspartate transaminase (AST). Furthermore, serum triglycerides (TG) and total cholesterol concentrations were measured. Additionally, the non-esterified fatty acid (NEFA), β-hydroxybutyrate (β-HBA) and high density lipoprotein (HDL) concentrations were estimated. Finally, the acute phase proteins; albumin, haptoglobulin (Hp), serum amyloid A (SAA) and the C-reactive protein (C-RP) were measured.

V. Treatment

prebiotics on the outcome of SARA, next generation prebiotics powder (Ecocell prebiotics^R) containing derived cell wall of saccharomyces cerevisiae, with Mannan Oligosaccharides (MOS) enforced by extract of the root of chicory, β glucans and inulin (FOS), was used in a dose of 0.5kg/Ton in feed. Moreover, flash start-spirulina powder (250gm) was used in a dose rate of 1kg/Ton, added to feed for dairy cattle.