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COLLOID OSMOTIC PRESSURE IN THE BOVINE SPECIES

The University of Nebraska - Lincoln PH.D. 1985

COLLOID OSMOTIC PRESSURE IN THE BOVINE SPECIES

by

Rebecca Lynn Arnold-Nichelson

A DISSERTATION

Presented to the Faculty of
The Graduate College in the University of Nebraska
In Partial Fulfillment of Requirements
For the Degree of Doctor of Philosophy

Major: Animal Science

Under the Supervision of Dr. James F. Amend and Dr. Dwane R. Zimmerman

Lincoln, Nebraska

August, 1985

TITLE

Colloid Osmotic Pressure in the Bovine Species

BY

Rebecca Lynn Arnold-Nichelson

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COLLOID OSMOTIC PRESSURE IN THE BOVINE SPECIES

Rebecca Lynn Arnold-Nichelson

University of Nebraska, 1985

Advisors: Dr. James F. Amend and Dr. Dwane R. Zimmerman

Abstract

Bovine respiratory disease (BRD) is a substantial problem in virtually every location where cattle are produced. Pathophysiologically, pulmonary edema is often associated with BRD. Colloid osmotic pressure (COP) is one of several physiological factors involved in general regulation of tissue fluid balance in mammalian species. Past research has not characterized COP, pulmonary edema, or their relation to BRD. The objective of this study, therefore, was to characterize COP and its determinants in several species, with primary emphasis upon the bovine.

Normal values for COP, total protein, albumin, globulin, albumin-to-globulin ratio, pH, and osmolality, were established in bovine serum. Linear relationships were established between COP and each mentioned variable. Normal values for the same parameters (except osmolality) were determined in porcine, lapine, caprine, and equine.

Simulated bovine serum was made by suspending purified fractions of albumin and globulin, in various proportions and concentrations, in balanced electrolyte solution. An individual variable of the above mentioned group was then evaluated in terms of its relationship to COP.

Relationships between COP and each variable were determined for each simulated serum. Relationships between COP and evaluated variables were linear with the exception of albumin which was curvilinear.

Equations for prediction of COP were developed from simulated serum data, and compared to similar equations developed from actual calf serum data. It was concluded that equations developed from simulated serum can not be used to precisely predict **in vivo** COP, but do provide a useful frame of reference. Equations derived from the relationship of COP to total protein, albumin, and globulin were applied to actual calf data. It was concluded that total protein was predominant in influencing accuracy of prediction of COP in the bovine. Bovine COP prediction equation (COP = 2.98 X total protein [gm/dl] + 1.8) was tested with data collected from other evaluated species. It was concluded that the bovine equation closely predicted COP in equine, caprine, and lapine but not in porcine.

DEDICATION

This dissertation is dedicated to my husband, Steve, for allowing me the chance to meet the challenge and for all the meals he had to fix and eat alone.

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