Protein Concentrations in Cows’ Milk During the Four Stages of Lactation

By Madeleine Wilson
North Bay Haven Charter Academy
Introduction
Research Question

To what extent does protein concentration vary in samples of cows’ milk collected from the four stages of lactation?
If protein concentrations are measured in samples of cows’ milk collected from the four stages of lactation, then the total protein concentration will decline in later stages of lactation because protein is an essential nutrient required for the development of a calf early in life.
Casein and whey are the two primary milk proteins. Undigested whey is responsible for the symptoms of lactose intolerance.
Multiple studies have identified fluctuations in milk protein concentrations.

◆ Effect of feed restrictions and acute stress factors on milk protein yield

National Academy of Sciences (2012)  
◆ Targeted microRNA expression of beta-lactoglobulin
Methods
Research Design

- **Independent variable:** stage of lactation
- **Dependent variable:** protein concentration measured in mg/mL
- **Important materials:** PASCO wireless spectrometer
Procedure

➔ Construct a standard curve using BSA protein standards of known concentrations.
➔ Prepare the whole milk samples for testing.
➔ Centrifuge the remaining whole milk samples to make the casein and whey proteins accessible for testing.
➔ Place the samples in the spectrometer to obtain absorbance readings.
Results and Conclusions
Conclusion

➔ Possible explanations for the trends observed
  ◆ Casein is specific to the nurturing of young calves.
  ◆ Lactoferrin confers disease resistance at the end of lactation.
Limitations

- Difficulty of extracting casein protein
- Ambiguity of time frames established for the stages of lactation
- Samples were collected from only one cow
Directions for Future Research

➔ Case studies
➔ Experimental restriction of the synthesis of whey protein
➔ Changes in marketing practices
References


References


Thank You!