

# Effect of milking frequency on glucose metabolism of early lactation dairy cows

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## Introduction

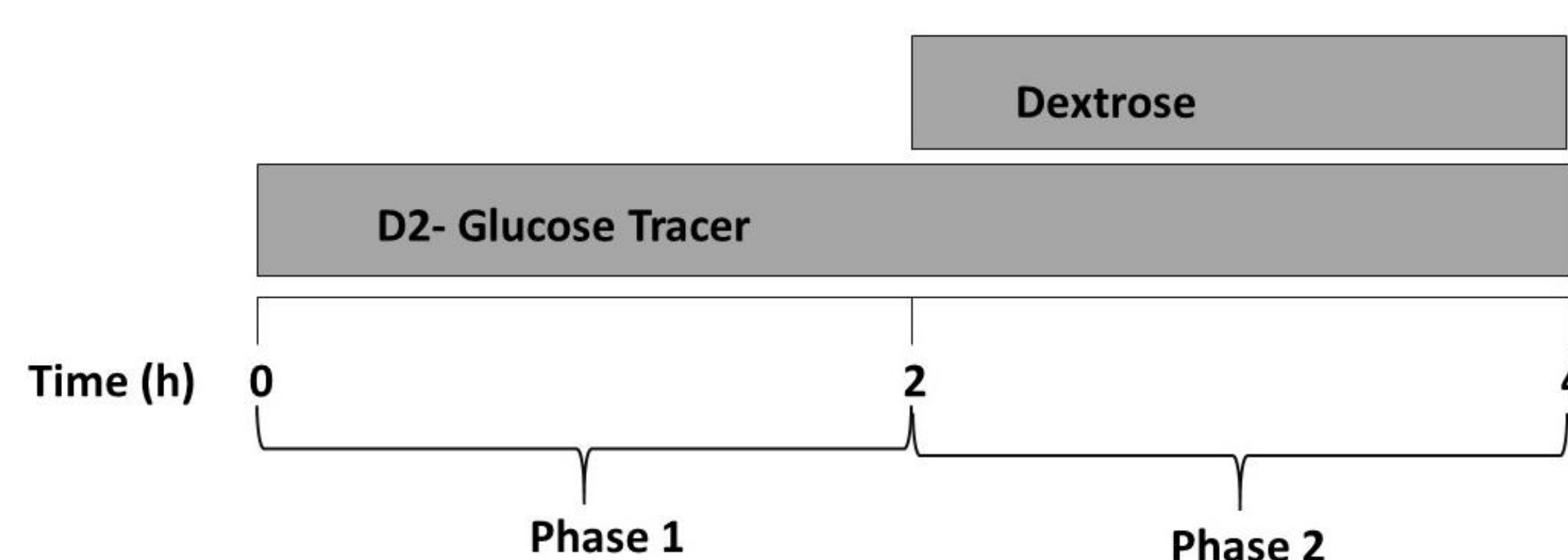
- Glucose demand increases drastically in dairy cows following parturition because of the onset of milk production and the glucose that is required for lactose production
- Cows with high levels of milk production are in high risk of hypoglycemia, which may impact their health and performance
- Frequency of milking affects milk yield and subsequently may alter the glucose demand of the cow
- Less frequent milking may allow the ruminant liver to adapt more easily to the glucose demands of early lactation

## Objective

To determine the rate of glucose utilization due to milking frequency in early lactation dairy cows

## Methods

- 33 multiparous cows were enrolled within 12 hours of calving and assigned to a milking frequency of one (1X) or three (3X) times daily
- Feed and water intake and milk yield were recorded daily
- On day 3, bilateral jugular catheters were inserted
- On day 5, cows were assessed for glucose utilization:
  - Phase 1 (basal phase): for the first 2 hours, 6,6-D2 was continuously administered intravenously to achieve an approximate 1% enrichment over baseline levels
  - Phase 2 (euglycemic phase): dextrose was continuously infused to achieve and maintain a targeted blood glucose concentration of 60 mg/dL



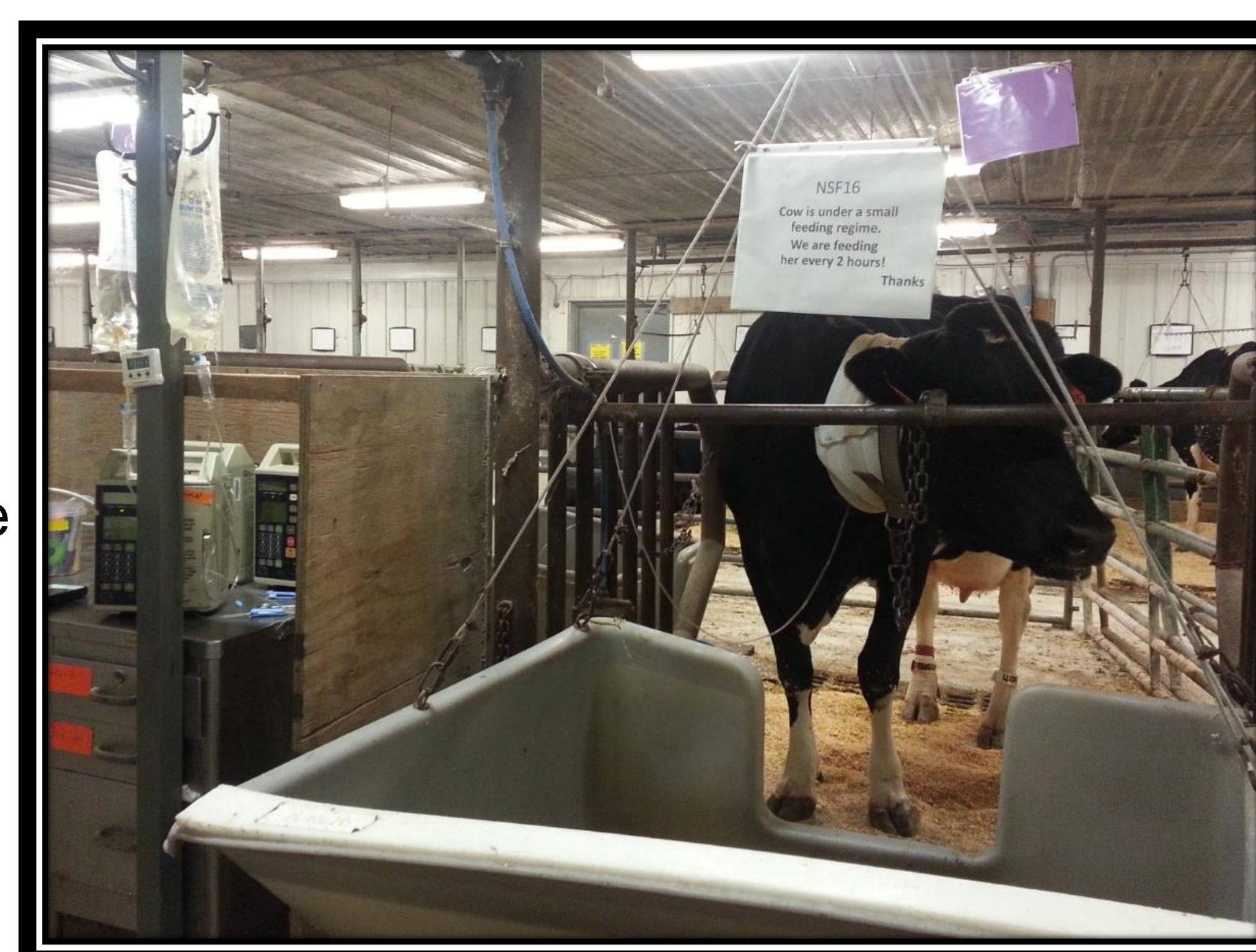
- Blood samples were collected every ten minutes for the last half hour of each phase. Samples were analyzed for glucose and 6,6-D2 concentrations; EGP and GTR were calculated.

### Endogenous Glucose Production (EGP)

The amount of glucose that the body is making and releasing into circulation

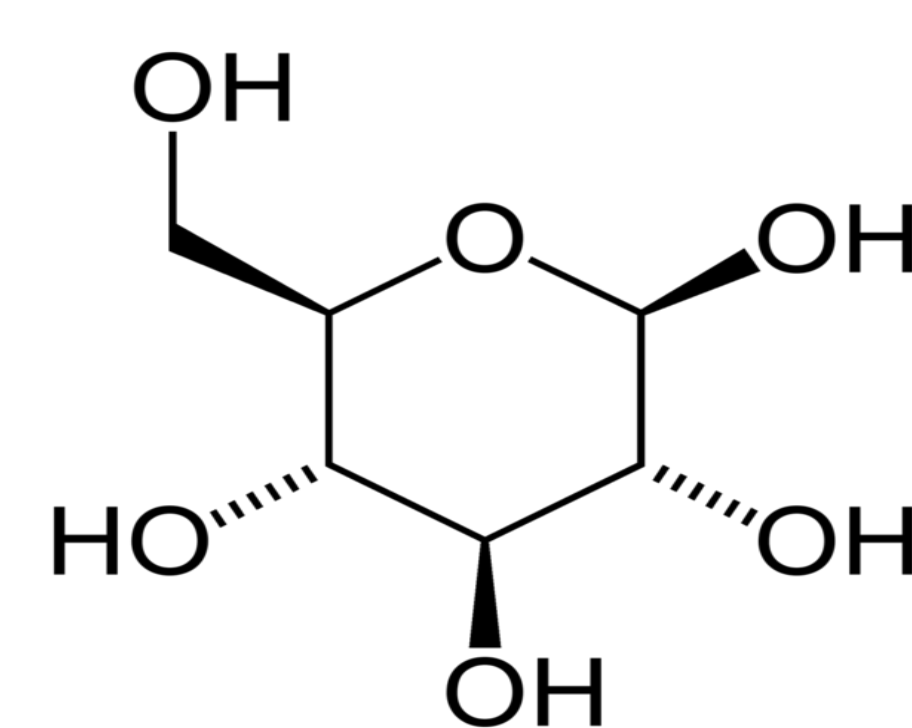
### Glucose Turnover Rate (GTR)

All glucose that appears in circulation, this includes exogenous glucose and EGP

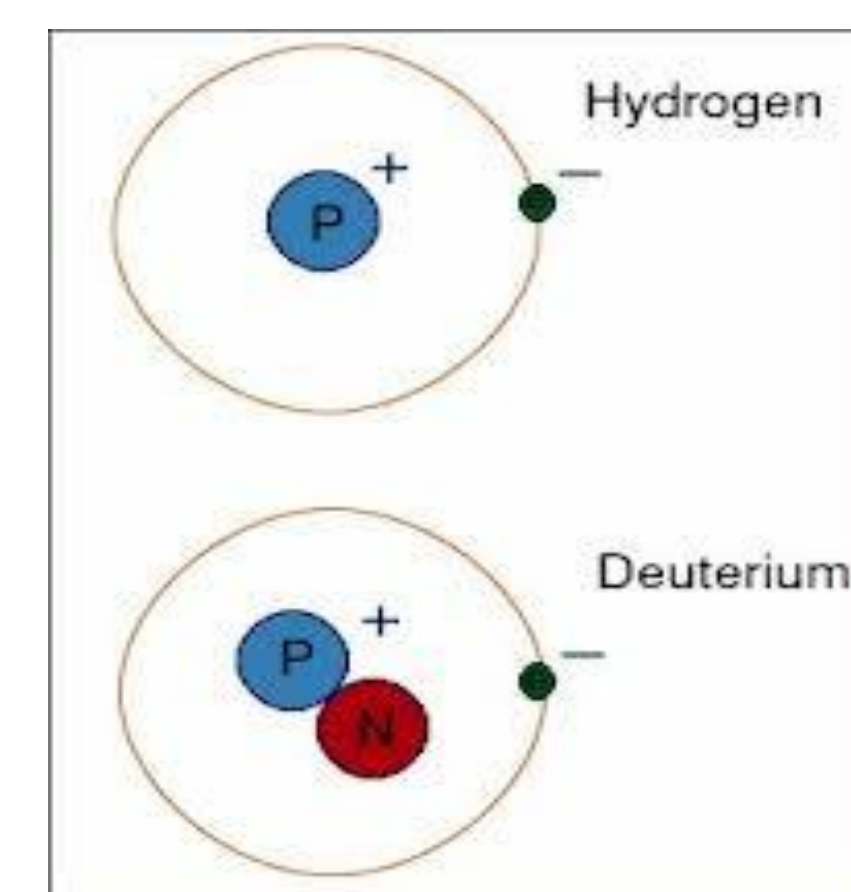


### 6,6- deuterium Glucose (6,6-D2)

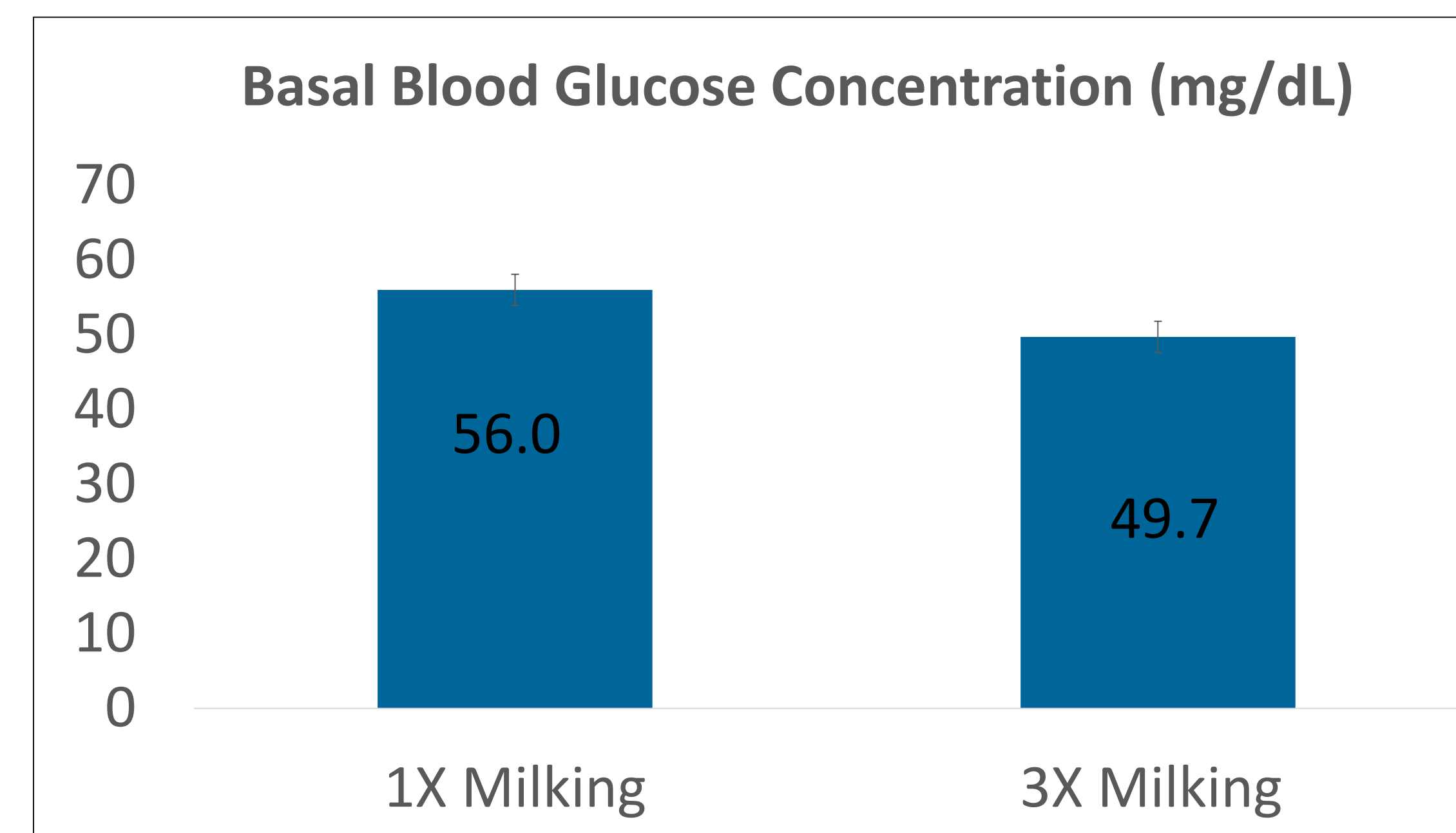
6,6-D2 is a glucose molecule that has two deuterium atoms on the 6- carbon instead of the conventional Hydrogen atoms. This alters the mass of the glucose molecule, allowing us to calculate endogenous glucose production by the cow



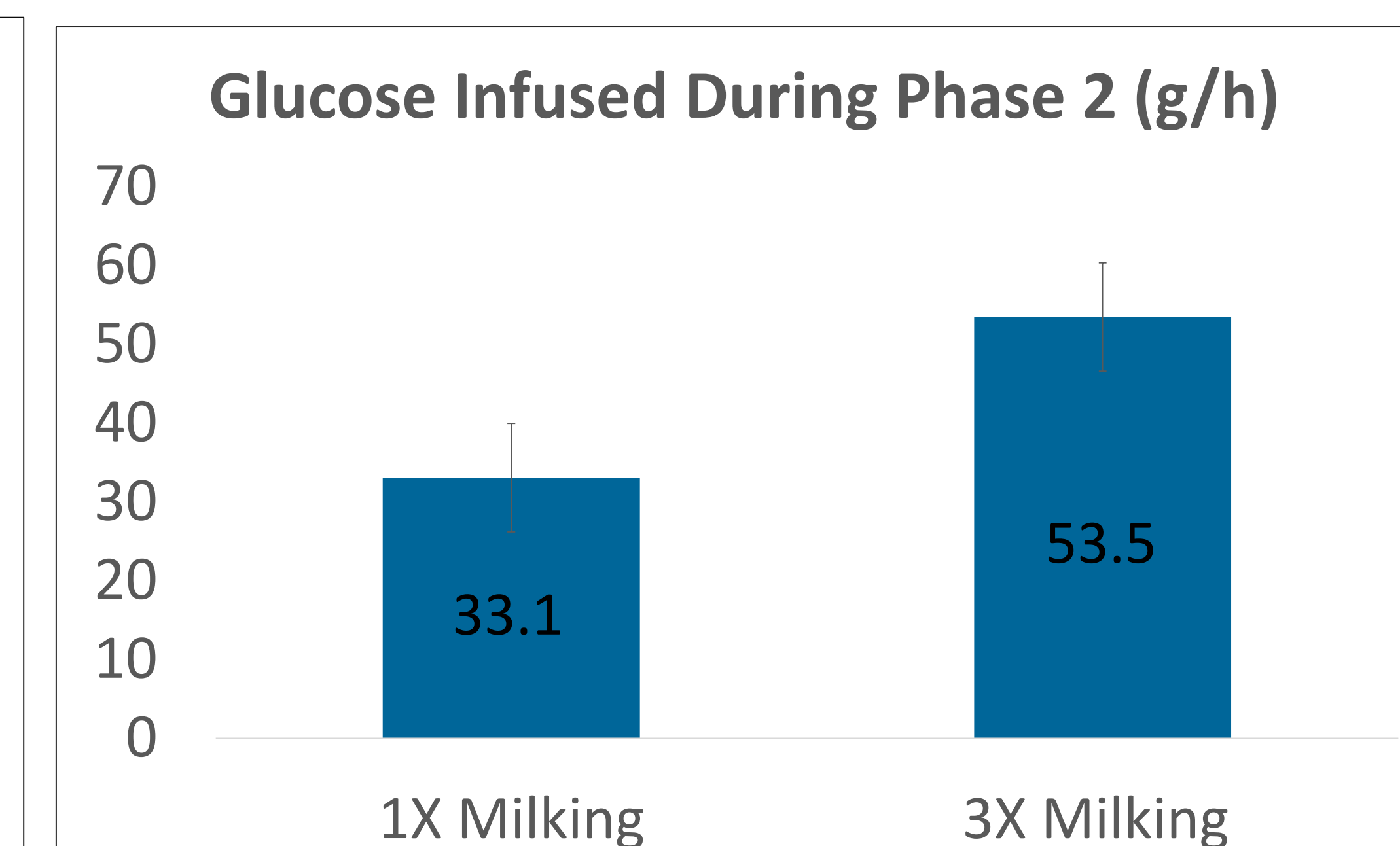
Glucose



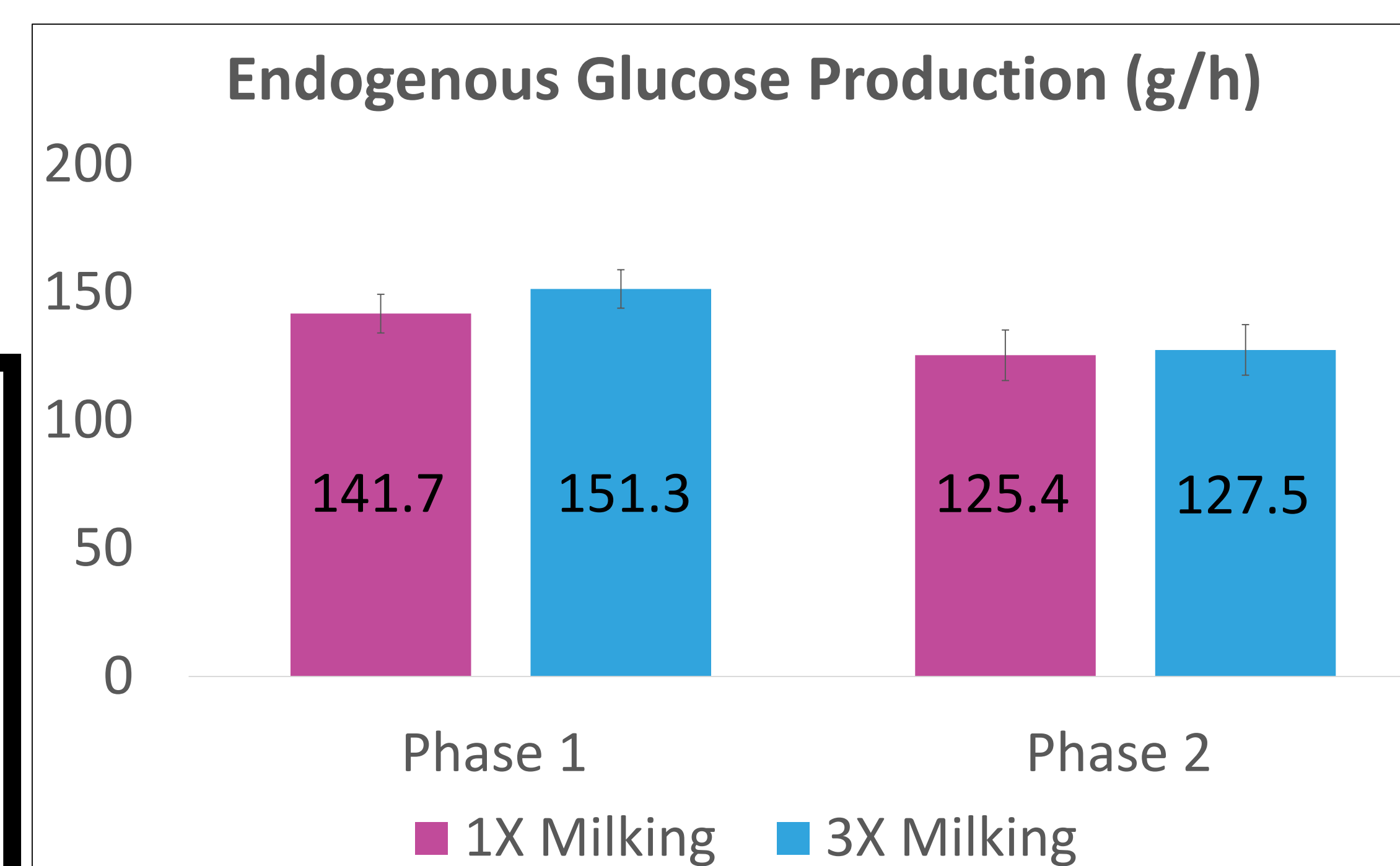
## Results



Effect of Milking Frequency:  $P = 0.04$

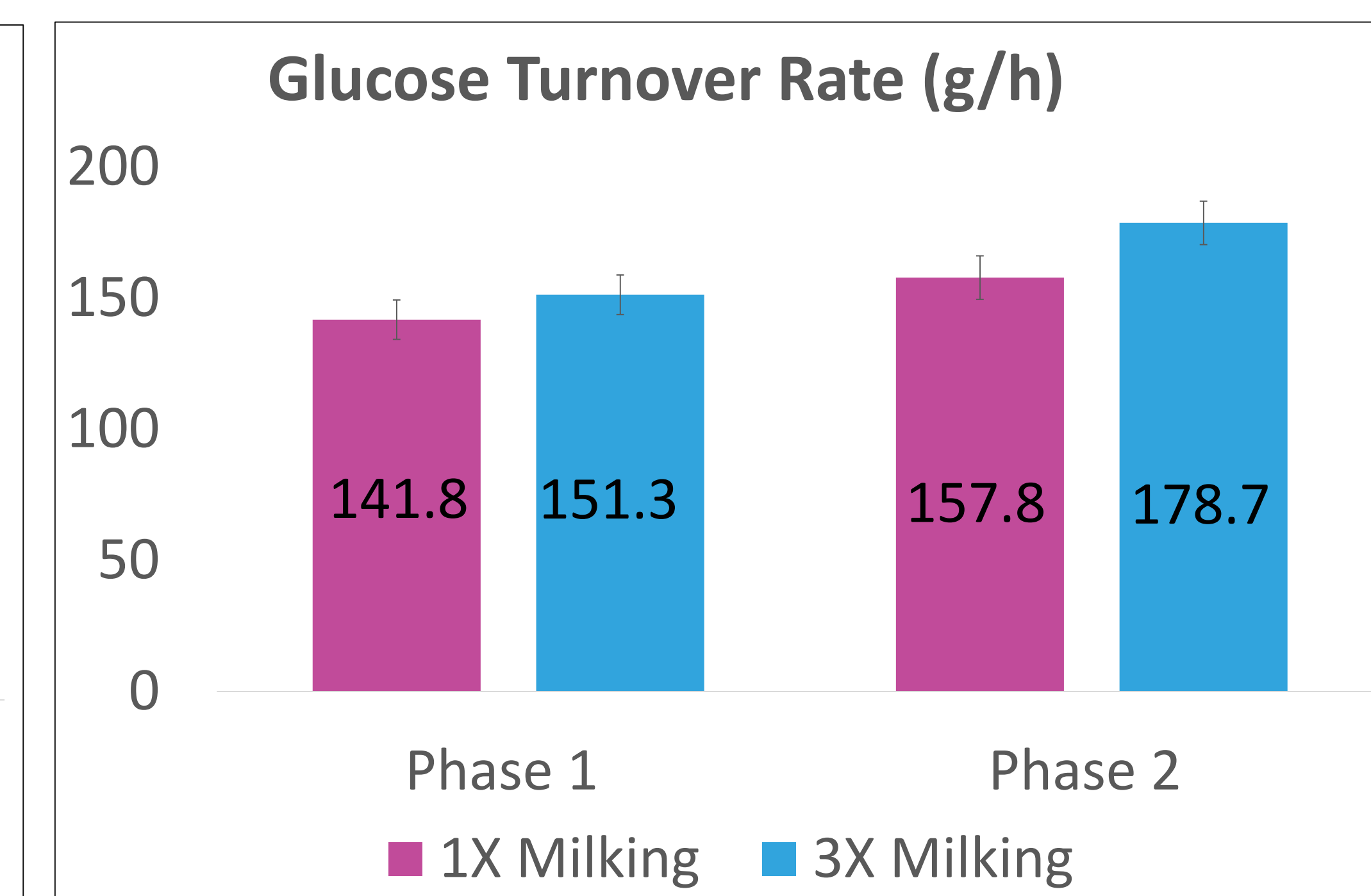


Effect of Milking Frequency:  $P = 0.04$



Effect of Milking Frequency  
 $P = 0.37$  (Phase 1) and  $P = 0.88$  (Phase 2)

Effect of Phase  
 $P < 0.01$  (1X Milking) and  $P < 0.0001$  (3X Milking)



Effect of Milking Frequency  
 $P = 0.38$  (Phase 1) and  $P = 0.08$  (Phase 2)

Effect of Phase  
 $P < 0.01$  (1X Milking) and  $P < 0.0001$  (3X Milking)

## Summary and Conclusion

- Infrequent milking increased basal glucose levels and reduced the amount of exogenous glucose needed to achieve euglycemia
- Milking frequency did not affect endogenous glucose production
- 3X milking tended to increase glucose turnover rate in Phase 2 compared with 1X milking
- **Although glucose demand is greater with increased milking frequency (and milk yield), gluconeogenesis was not increased to match that demand, leaving higher-producing cows in a glucose deficient state**

## Acknowledgements



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