

P55 W ASSOCIATIONS BETWEEN INSULIN RESISTANCE AND INFLAMMATION DURING THE TRANSITION PERIOD IN DAIRY COWS



P. Karis, H. Jaakson, S. Teder, K. Ling
Chair of Animal Nutrition, Estonian University of Life Sciences, Tartu, Estonia

Presented at International Symposium on Ruminant Physiology 2024
Wednesday, August 28, 12:45 PM

INTRODUCTION

There are still many unknowns regarding insulin resistance (IR) in dairy cattle, including when it develops (whether pre- or postpartum), its underlying causes, and its role in the development of various pathologies during the transition period.

AIM

The aims of the research are to compare the results of two intravenous glucose tolerance tests (IVGTT) performed shortly before and after parturition and to associate them with markers of inflammation.

RESULTS

No association between pre- and postpartum IR markers (insulin AUC) was evident ($r = -0.11$; $P = 0.76$). Insulin AUC calculated from the prepartum IVGTT was strongly correlated with positive acute phase protein serum amyloid A on both -4 DIM and 5 DIM (Table 1; Figure 1). By the 12 DIM the association had disappeared. However, the inflammation markers were poorly correlated with postpartum insulin AUC. This suggests that GTT performed shortly after partition holds little descriptive value, possibly due to the limitations of the test.

CONCLUSIONS

Results suggests an interplay between insulin resistance and immune response. Prepartum IVGTT holds more information on the metabolism of transition dairy cows, which supports our previous findings (Jaakson et al. 2018; Karis et al. 2020).

REFERENCES

1. Jaakson, H., Karis, P., Ling, K., Ilves-Luht, A., Samarütel, J., Henno, M., Jõudu, I., Waldmann, A., Reimann, E., Pärn, P. and Bruckmaier, R.M., 2018. Adipose tissue insulin receptor and glucose transporter 4 expression, and blood glucose and insulin responses during glucose tolerance tests in transition Holstein cows with different body condition. *Journal of dairy science*, 101(1), pp.752-766.
2. Karis, P., Jaakson, H., Ling, K., Bruckmaier, R.M., Gross, J.J., Pärn, P., Kaart, T. and Ots, M., 2020. Body condition and insulin resistance interactions with periparturient gene expression in adipose tissue and lipid metabolism in dairy cows. *Journal of dairy science*, 103(4), pp.3708-3718.

Table 1. Correlations (r) of insulin area under the curve values (AUC) with acute phase proteins

	DIM -4				DIM 5				DIM 12			
	Serum amyloid A		Albumin		Serum amyloid A		Albumin		Serum amyloid A		Albumin	
	r	P-value	r	P-value	r	P-value	r	P-value	r	P-value	r	P-value
Insulin AUC -10 DIM	0.69	0.04	-0.44	0.24	0.80	0.01	-0.30	0.40	-0.43	0.24	-0.13	0.71
Insulin AUC 6 DIM	0.17	0.67	0.66	0.05	-0.43	0.21	0.47	0.17	0.50	0.14	0.40	0.25

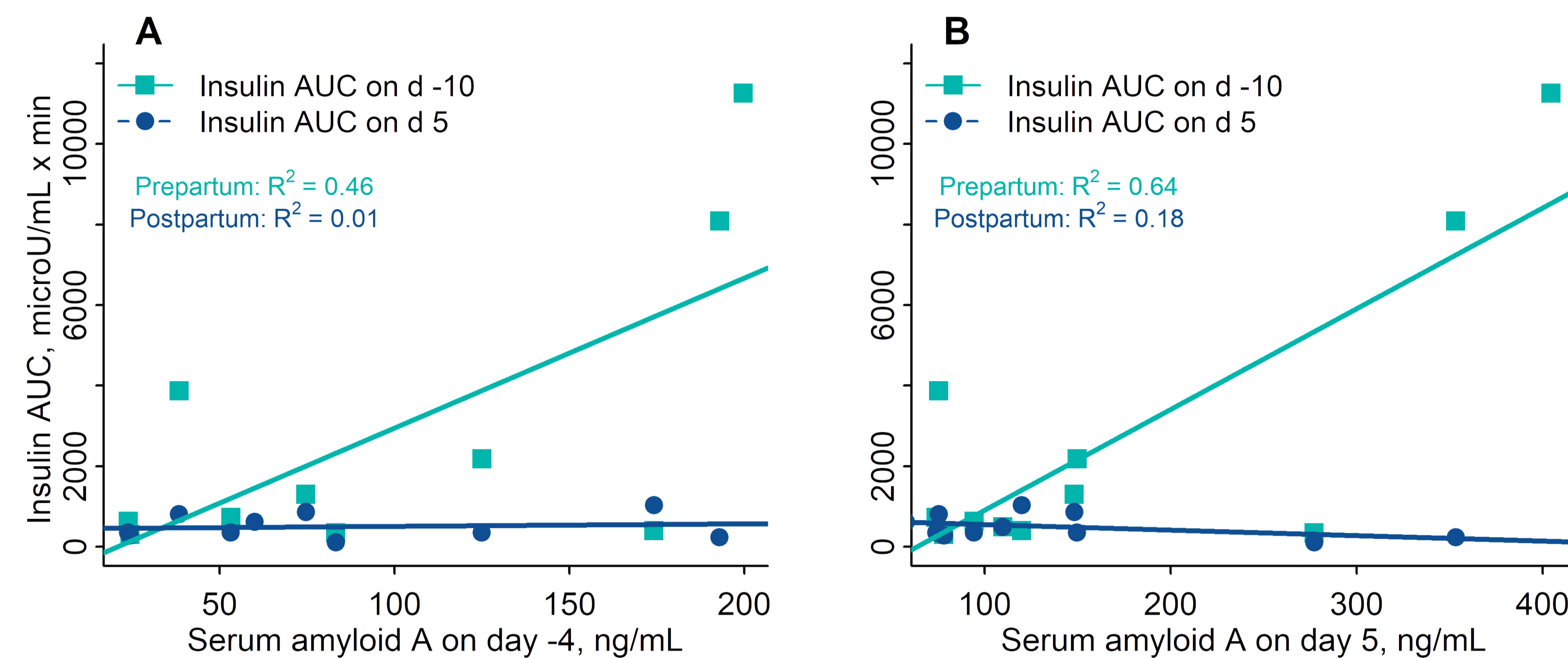


Figure 1. Linear regressions of serum amyloid A on day -4 (panel A) and day 5 (panel B) with insulin area under the curve (AUC) calculated based on prepartum (red lines) or postpartum (green lines) intravenous glucose tolerance test results.

MATERIALS AND METHODS

- 12 Estonian Holstein dairy cows enrolled from Nov 22 to March 23
- Intravenous glucose tolerance tests (IVGTT) performed a week before and after parturition.
 - On average at -10 (min -17; max -4) and 6 (min 4; max 6) days in milk (DIM).
 - 150 mg of glucose per kg body weight infused intravenously.
 - Blood samples taken at -5, 5, 10, 20, 30, 40, 50, and 60 min relative to the start of the infusion.
 - Insulin quantified with ELISA using commercial kits (Thermo Fisher)
 - Insulin response above the basal (-5 min) concentration was calculated as the area under the curve (AUC) between 5 to 60 min as insulin resistance (IR) marker.
- Blood samples taken from tail vein on -4 (min -5; max -3), 5 (min 4; max 6), 12 (min 11; max 13) DIM.
 - Serum amyloid A quantified with ELISA and albumin with clinical chemistry analyzer using commercial kits (Tridelta, Randox)
- Statistical computing and visualization done in „R“

The study was funded by the Estonian Rural Development Programme (2014-2022) measure 16.2 project nr 616221790116 (grant PRG554, grant IUT8-1, project EMBio).