Session: C9.3

Plasma leptin and insulin-like growth factor I (IGF-I) as potentially phenotypic markers for carcass composition and growth rate in lambs

E. von Borell[1], H. Sauerwein[2] and M. Altmann[1]

[1]Institute of Agricultural and Nutritional Sciences, Martin-Luther-University, Halle, Germany; E-mail: eberhard.vonborell@landw.uni-halle.de

[2]Institute of Physiology, Biochemistry and Animal Hygiene, Bonn University, Germany

Introduction

- **The utilization of hormones as early predictors for growth rate, feed intake, and carcass composition is discussed since several years.**

- **Studies have mainly focused on IGF-I.**
- **The IGF-I test at weaning is commercially used since 2004 in Australia's cattle performance test and increases the calculated profit to 16 %.**

- **Leptin is mainly released from adipose tissues and correlates with body fat.**
- **It is considered as a potential hormone for an assay based prediction of carcass composition.**

Correlations between plasma leptin concentration and fat tissues (studies in sheep)

Animals	Analyzed fatty tissues	Correlations to leptin	Author
female, adult	total body fat	0.68	Delavaud et al. (2000)
female, pregnant	carcass fat	0.73	Thomas et al. (2001)
female, adult	back fat thickness	0.55	Blache et al. (2000)
female, adult	back fat thickness	0.73 – 0.89	Daniel et al. (2002)
female, pregnant female, lactating	body condition score	0.32 0.37	McFadin et al. (2002)
male lambs	carcass fat visceral fat	0.48 – 0.51 0.49 – 0.56	Altmann et al. (2005)

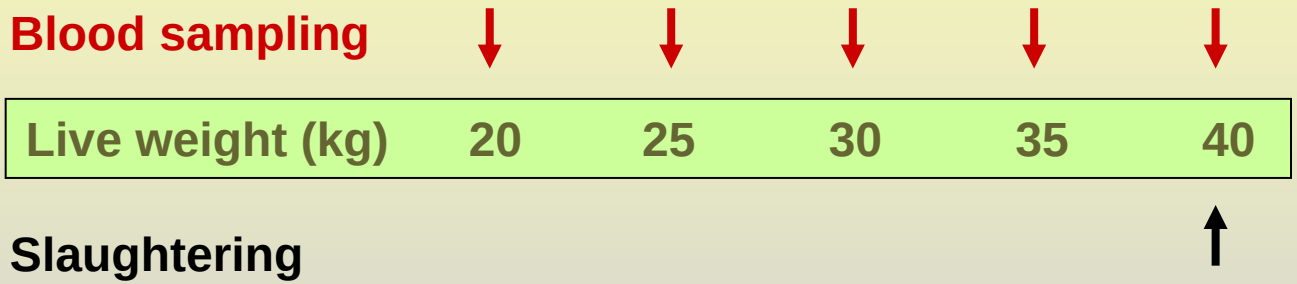
The objective of this study

1. **Relationship between plasma leptin concentrations during growth and final daily gain and carcass composition?**

2. **Confirmation of results from others on the relationship between IGF-I concentrations and carcass composition / growth rate ?**

Material and Methods

Animals: 30 intact male lambs, ad libitum fed
(15 East Frisian Milk sheep and 15 Blackheaded Mutton x East Frisian Milk sheep)

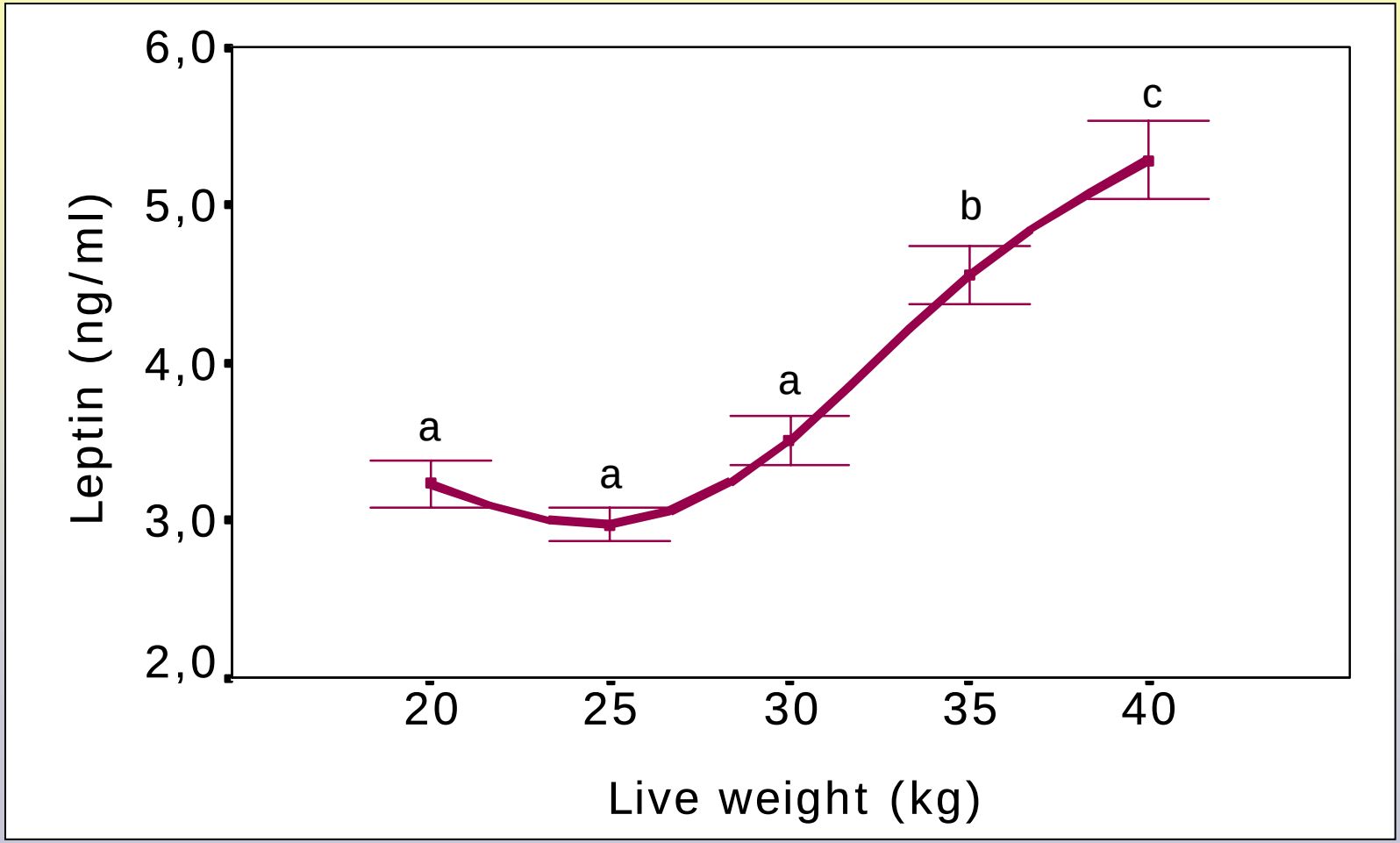


Leptin assay: Enzyme immunoassay (Sauerwein et al., 2004)
IGF-I assay: Enzyme immunoassay with acid-ethanol extraction and cryo-precipitation (Blum and Breier, 1994)

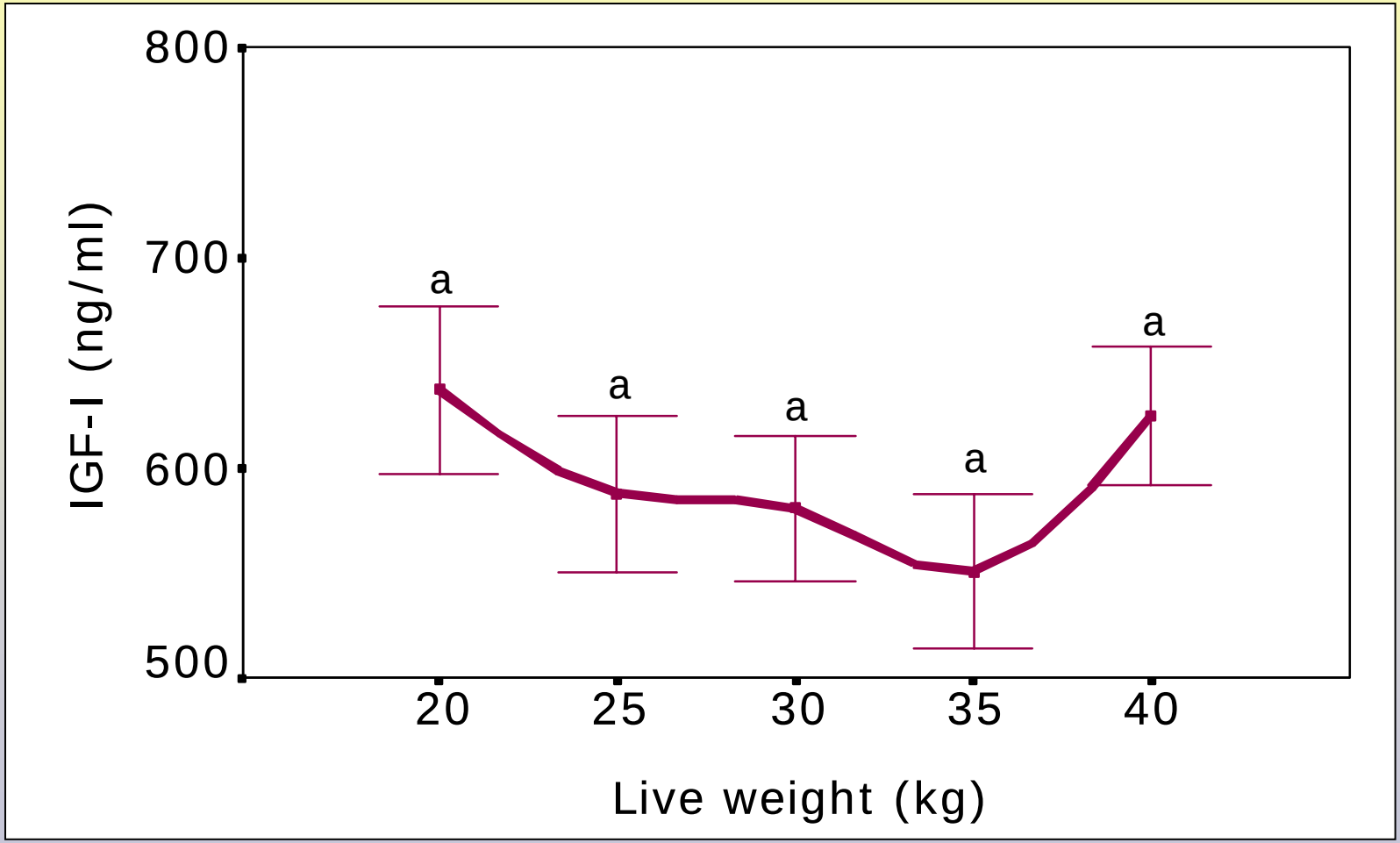
Carcass measurements: visceral fat depots
dissection of the left carcass side into lean, subcutaneous and intermuscular fat and bones

Statistics: ANOVA & Duncan; Pearson correlation; regression analysis

Leptin concentration during growth between 20 and 40 kg live weight



IGF-I concentration during growth between 20 and 40 kg live weight



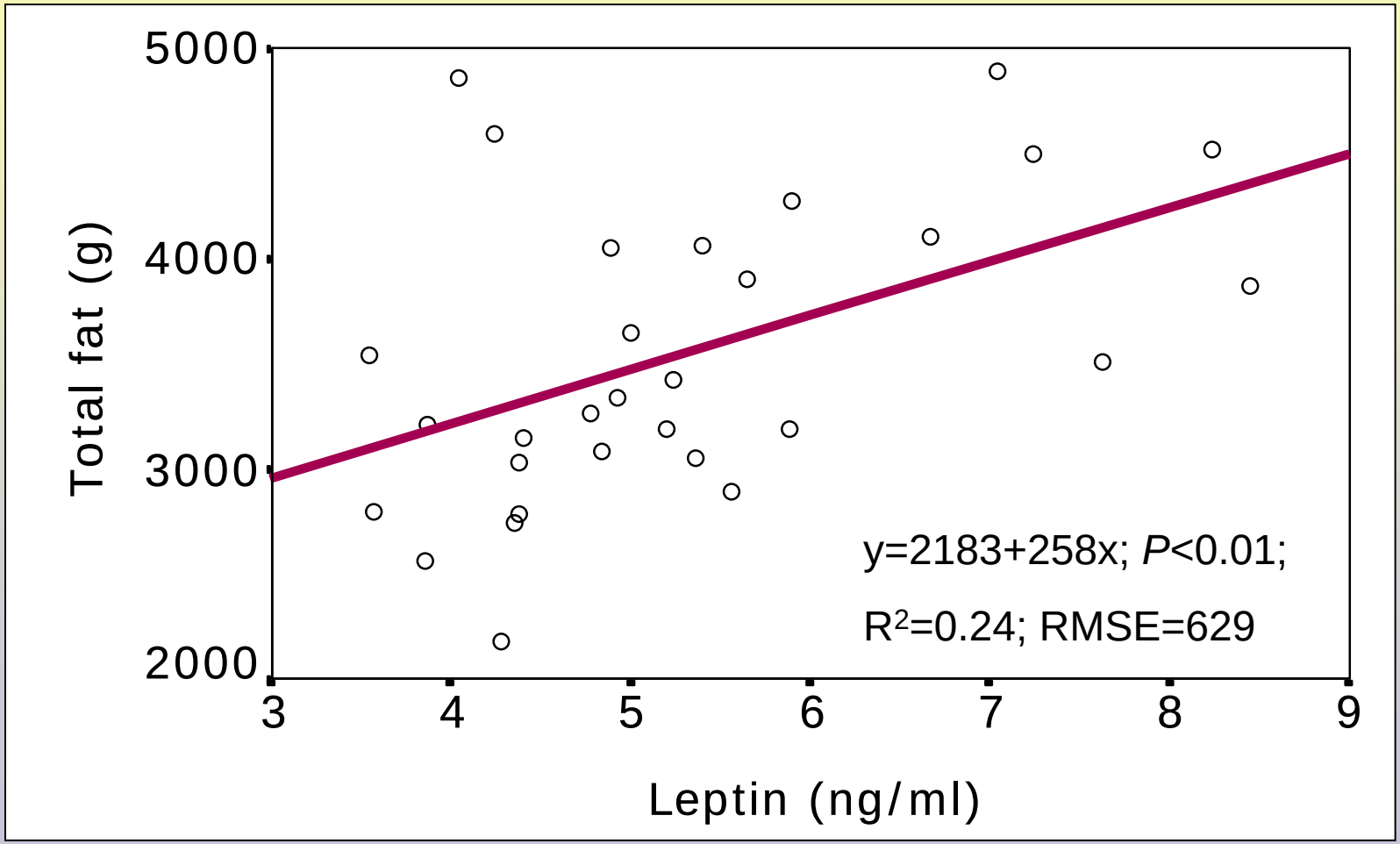
Correlations between leptin, final daily gain and tissue masses

Live weight (kg)	20	25	30	35	40
Final daily gain	0.21	-0.10	-0.56**	-0.61**	-0.19
Total fat	0.09	0.26	0.22	0.26	0.49**
Visceral fat	0.06	0.41*	0.43*	0.54**	0.58**
Carcass fat	0.09	0.19	0.13	0.14	0.41*
Intermuscular fat	0.14	0.18	0.09	0.08	0.36*
Subcutaneous fat	0.01	0.18	0.19	0.23	0.45*
Lean	0.23	-0.19	-0.34	0.00	0.04

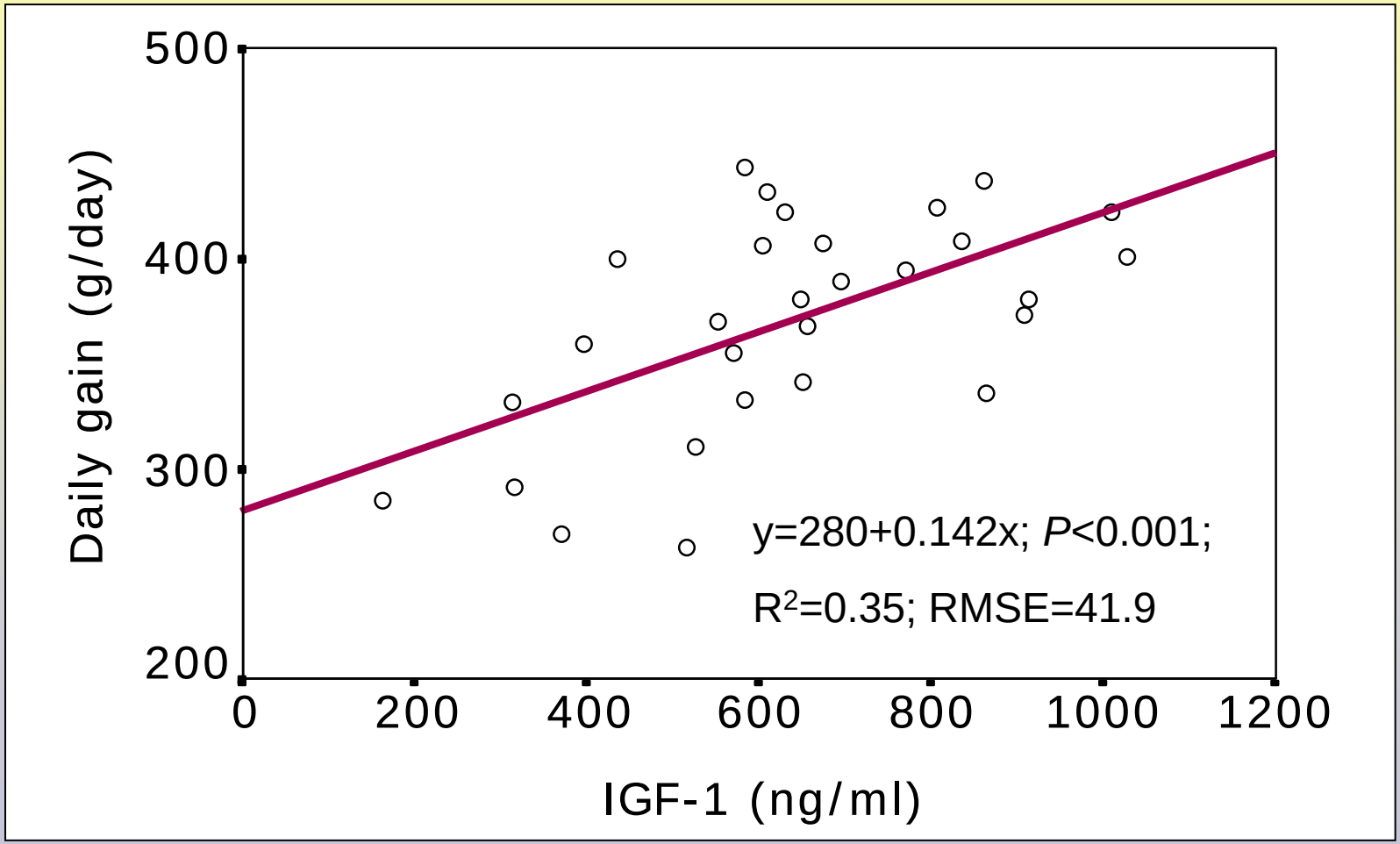
Correlations between IGF-I, final daily gain and tissue masses

Live weight (kg)	20	25	30	35	40
Final daily gain	0.59**	0.52**	0.58**	0.22	0.23
Total fat	0.08	0.04	0.29	0.23	-0.08
Visceral fat	-0.10	-0.21	0.00	0.14	-0.31
Carcass fat	0.13	0.12	0.36*	0.23	0.00
Intermuscular fat	0.17	0.16	0.40*	0.23	-0.03
Subcutaneous fat	0.06	0.05	0.27	0.22	0.05
Lean	-0.13	-0.19	-0.42*	-0.06	0.09

Relationship between leptin concentration at 40 kg live weight and total fat



Relationship between IGF-I concentration at 20 kg live weight and final daily gain



Conclusions

- **Plasma leptin concentration can not be recommended as an early predictor for total fat.**

- **Leptin concentration immediately before slaughter is correlated to fatty tissues and could be used as a second stage selection criterion in breeding rams at 40 kg live weight.**

- **IGF-I measured at an early growth phase correlates to final daily gain and confirms other studies showing the potential of IGF-I as an early predictor for growth rate.**

- **In contrast to other reports, IGF-I was not related to carcass composition.**