

Fertility – energy metabolism – insuline resistance (RQUICKI) - IGF1

Auglība – enerģijas metabolisms – insulīna rezistence - IGF1

a) genotype – 50%

b) **phenotype – 50% :**

- **Environment**/vide climate, housing

- **Feeding**/ēdināšana

Energy

FFA, BHB, bilirubine, cholesterol

Protein

urea, protein, albumin

Minerals

Na, K, Pi (Ca, Mg)

Acid-Base-Balance

alkalosis [K (NSBA)], (azidosis)

Trace elementes

Se, Cu, Zn, Co, Mn,

Vitamines

β-Carotin, Vitamin A, - E, - C

Antioxidants

vitamins, trace elementes/mikroelementi

Fertility – energy metabolism – insuline resistance (RQUICKI) - IGF1

Main focus:

/galvenokārt par brīvajām taukskābēm (FFA – free fatty acids)

1. **F F A: after calving** /pēc atnešanās

during calving /atnešanās laikā

before calving /pirms atnešanās

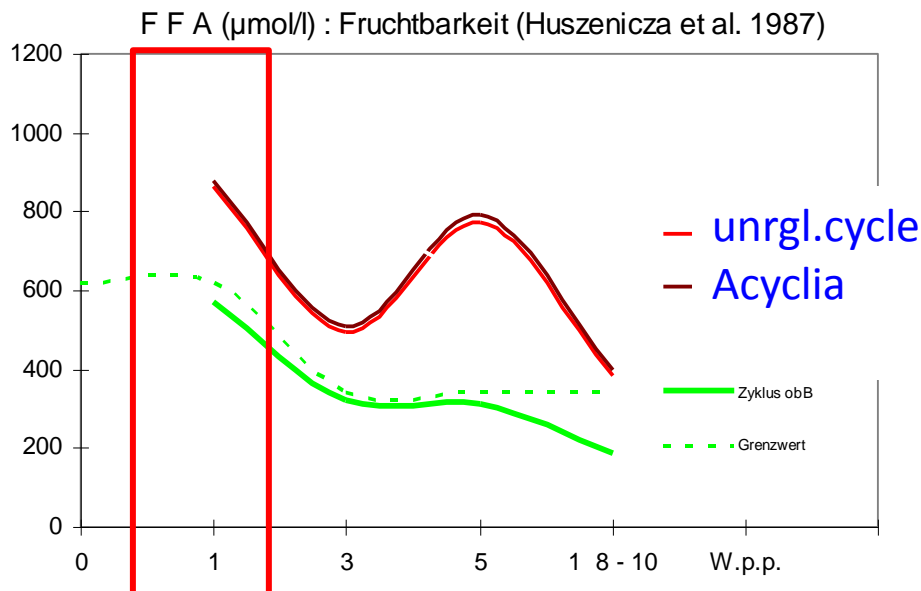
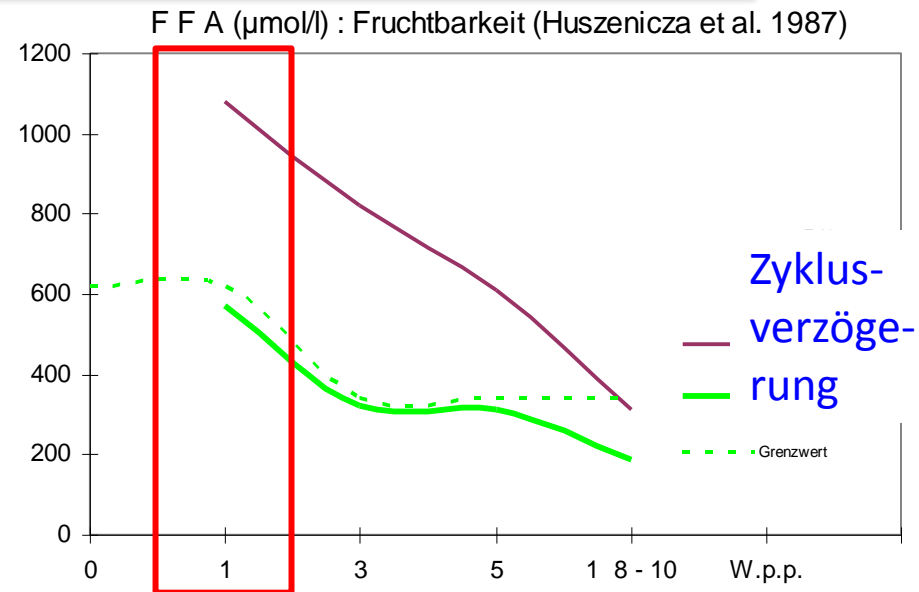
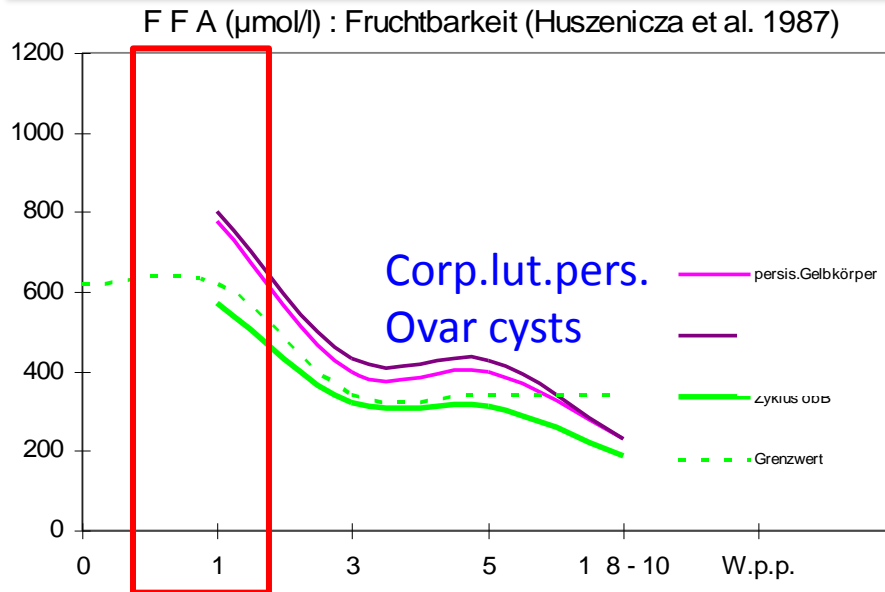
2. F F A : days open /dienas līdz grūsnībai

3. F F A : insuline resistance = RQUICKI

4. IGF₁

FFA after calving and ovar function

/ Brīvo taukskābju koncentrācija pēc atnešanās un olnīcu darbība



↑ Lipolysis : → ↑ Luteal phase
(Corp.lut.pers.)
oder Lutein cysts

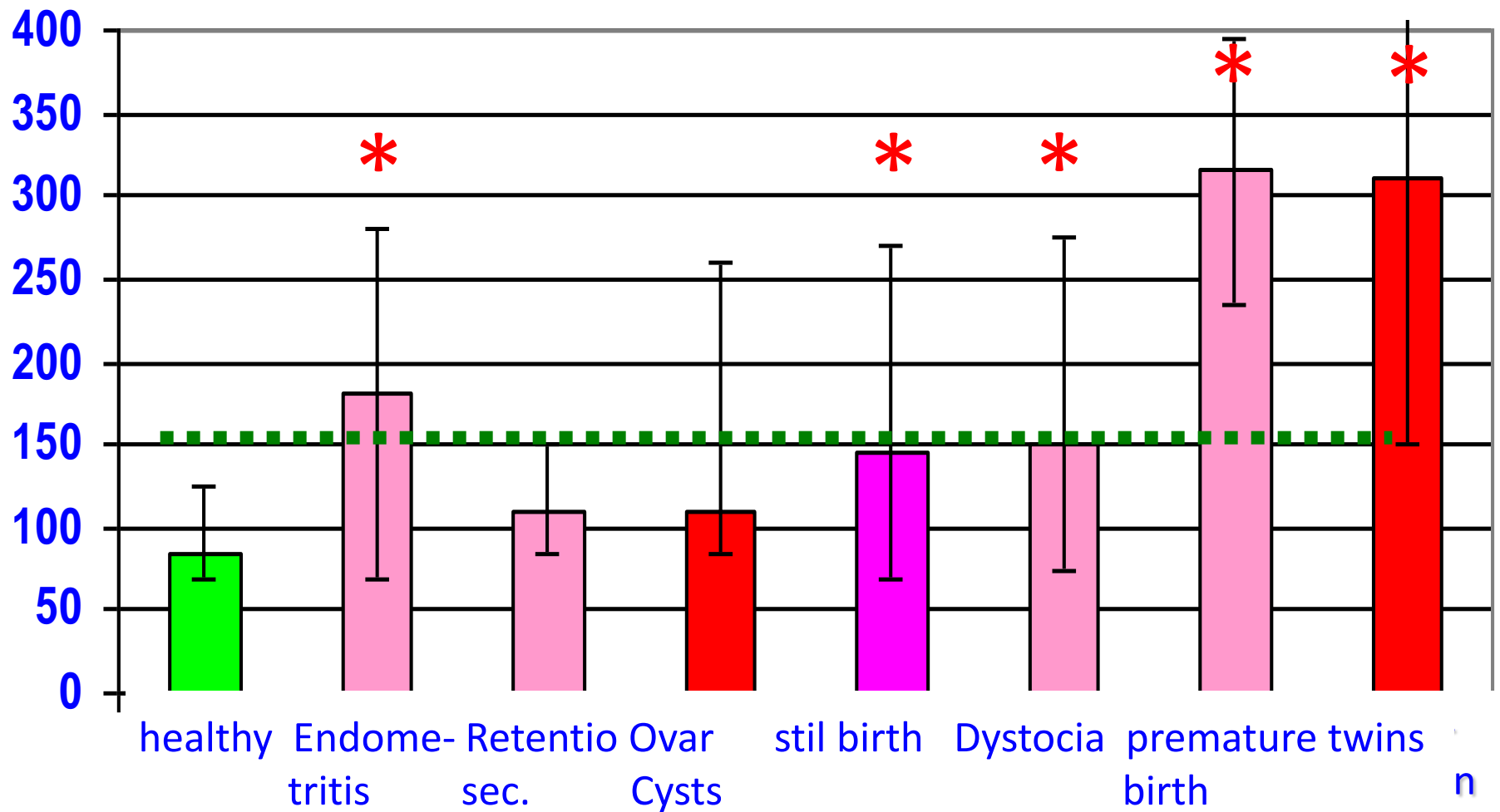
↑↑↑ Lipolysis : → Azyklia or
Follikel cysts

Fertility – energy metabolism – insuline resistance (RQUICKI) - IGF1

Main focus:

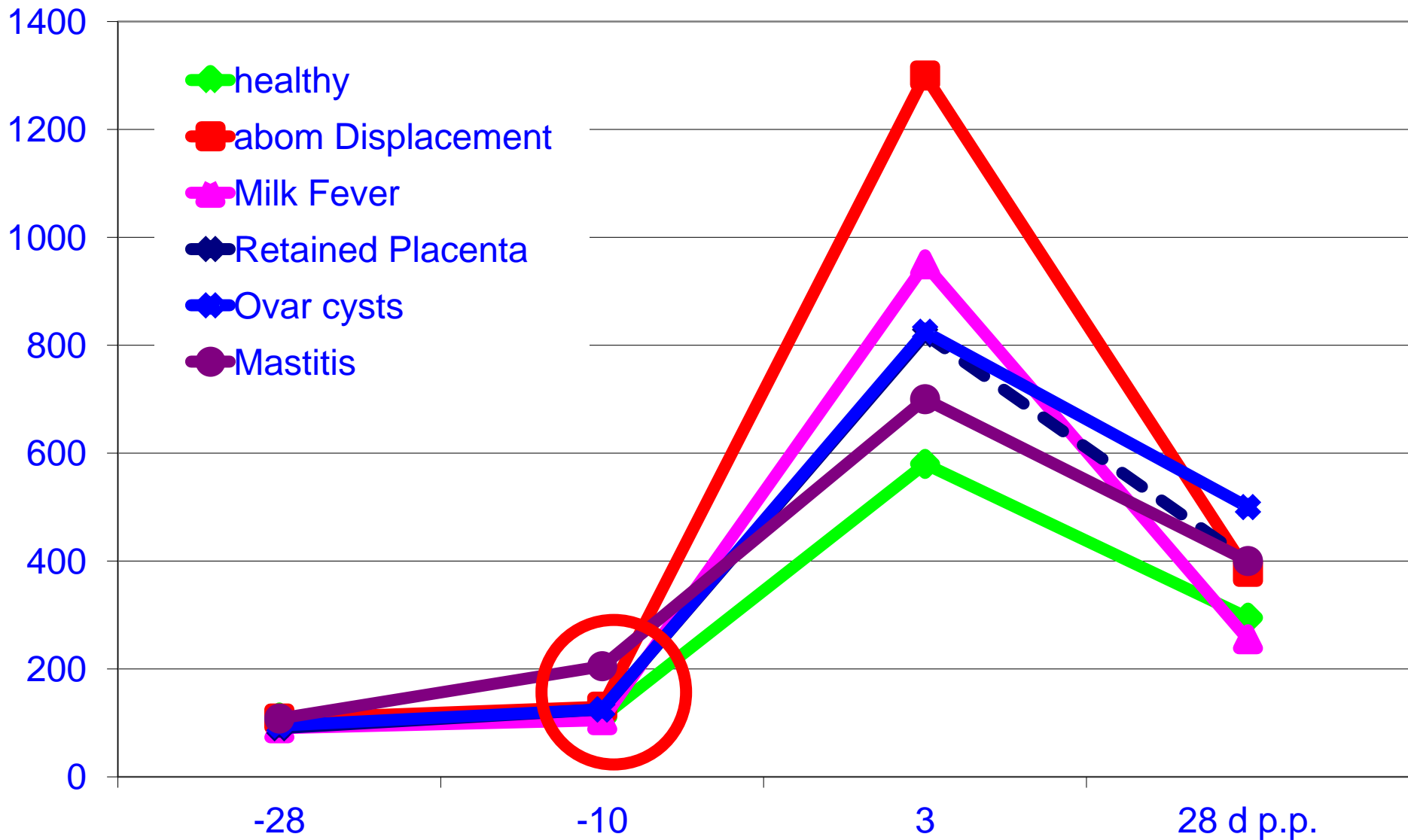
1. **F F A**: after calving
during calving
before calving
2. F F A : days open
3. F F A : insuline resistance = RQUICKI
4. IGF₁

Free fatty acids ($\mu\text{mol/l}$): 10 d **a.p.**



$p < 0.05 = *$

Free Fatty Acids ($\mu\text{mol/l}$) Hädrich 2007

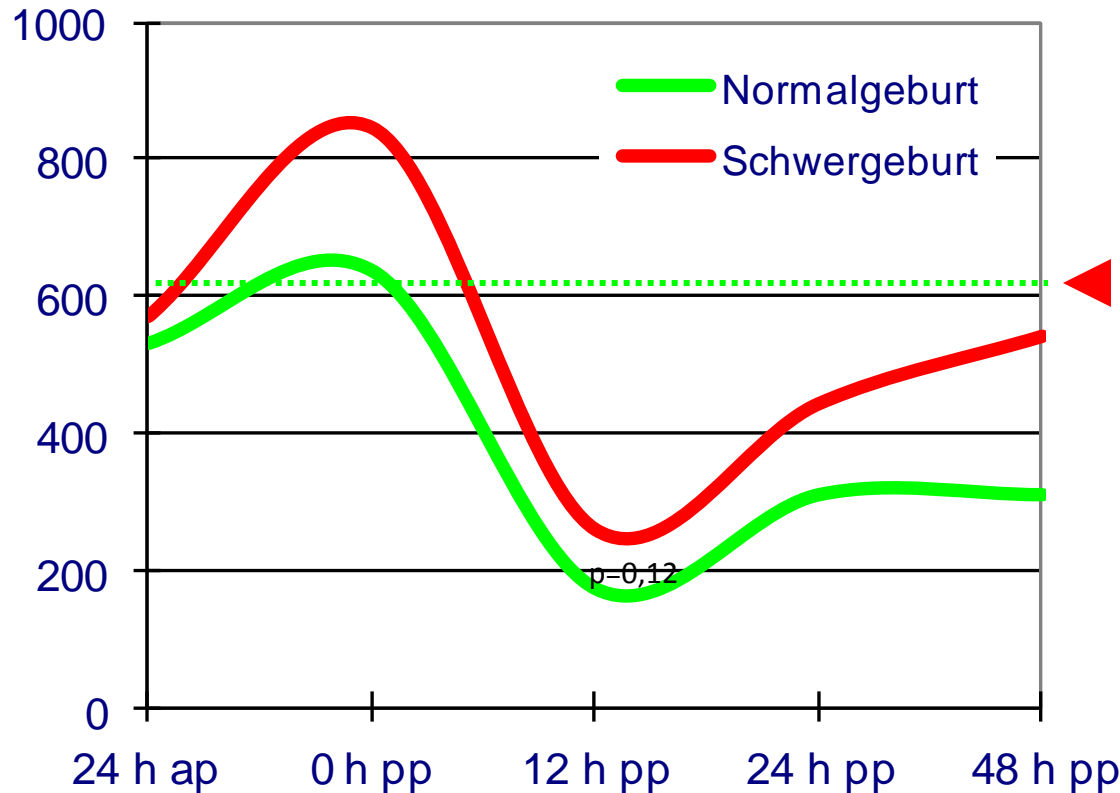


Fertility – energy metabolism – insuline resistance (RQUICKI) - IGF1

Main focus:

1. **F F A:** after calving
during calving
before calving
2. F F A : days open
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4. IGF₁

FFA during calving ($\mu\text{mol/l}$)



Dystocia:

- \uparrow during delivery
- = \uparrow **Lipolysis**
- permanent high \leftrightarrow diseases

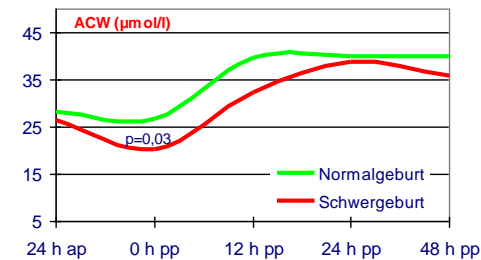
Relation to AO

- neg. correlations to TEAC
- pos. to SOD, Albumin, Bilirubin

= \uparrow **AO-loading,**

\uparrow **wastage**

FFS r:	SOD GPX TEAC			GPX	TEAC	Albumin	Bilirubin
	-	-	-	0,22	-	0,30	0,68
	0,28	-0,28	-0,31	-0,28	-0,31	0,25	0,66



Fertility – energy metabolism – insuline resistance (RQUICKI) - IGF1

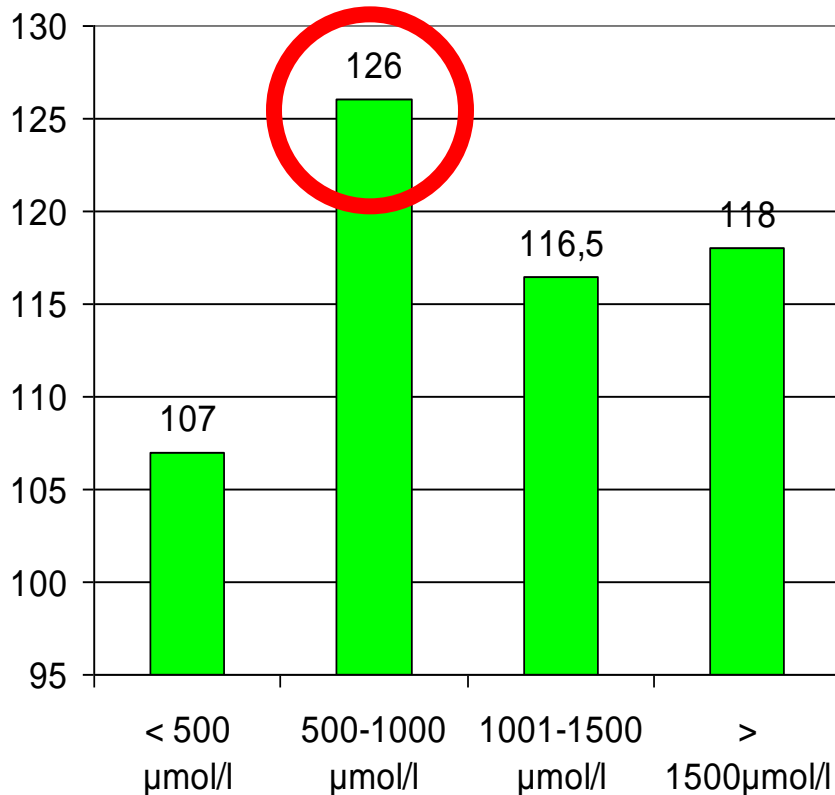
Main focus:

1. F F A: after calving
during calving
before calving
2. **F F A : days open**
3. F F A : insuline resistance = RQUICKI
4. IGF₁

FFA and days open

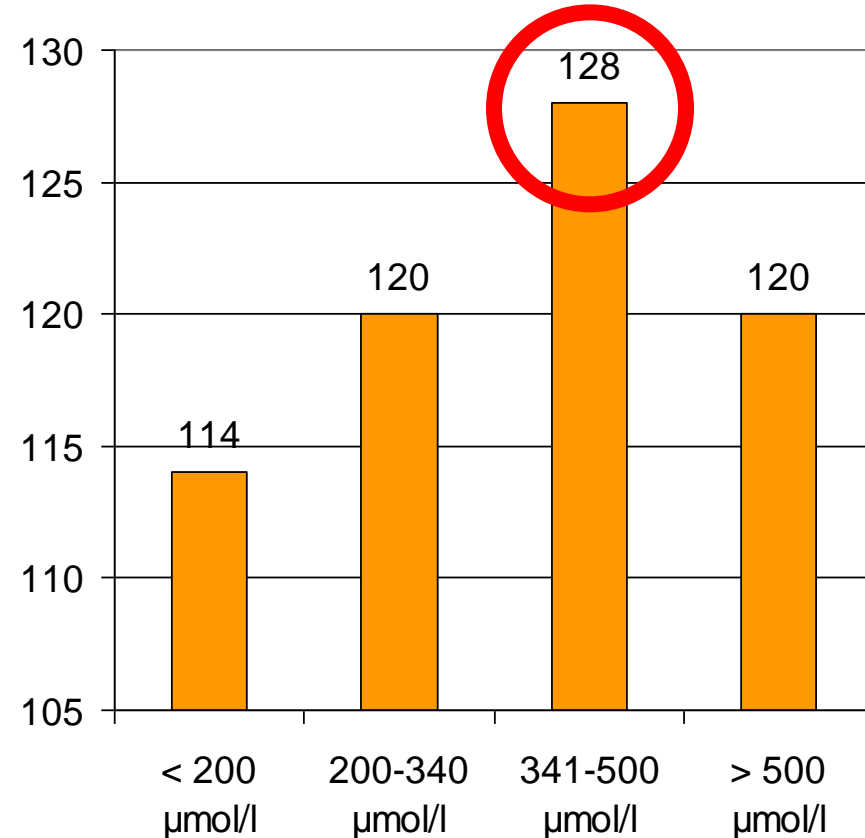
/ brīvās taukskābes un dienas līdz grūsnībai

FFA class 3 d p.p. : days open



< 620 $\mu\text{mol/l}$

FFA class 28 d p.p. : days open



< 340 $\mu\text{mol/l}$

limit values / norma

Fertility – energy metabolism – insuline resistance (RQUICKI) - IGF1

Main focus:

1. F F A: after calving
during calving
before calving
2. F F A : days open
3. **F F A : insuline resistance = RQUICKI**
4. IGF₁

Insuline resistance / insulīna rezistence

- abnormal insulin **receptors** / izmainīti insulīna receptori
- ↓ **number** of receptors, - permanently elevated insulin levels
/ ↓receptoru skaits, - visu laiku ↑ insulīna līmenis
- **IgG antibodies** which inhibit the biological activity of the insulin / Antivielas (imūnglobulīni), kas kavē insulīna bioloģisko iedarbību
- ↑ **enzymatic cleavage** of insulin / ↑insulīna fermentatīvā šķelšana
- ↓ **binding** of insulin to its receptors / ↓ insulīna saistīšanās pie tā receptoriem
- **Insulin resistance-promoting proteins:** / insulīna rezistenci veicinošie proteīni
TNF-alpha, PAI-1 and resistin

Insuline resistance

- Insulin resistance-promoting proteins:

TNF-alpha, PAI-1 and resistin

→ ↑ Glucose

→ ↑ FFA

→ ↑ insuline

1

lg glucose + lg FFA + lg insuline

Revised Quantitative Insulin Sensitivity Check Index" (RQUICKI)

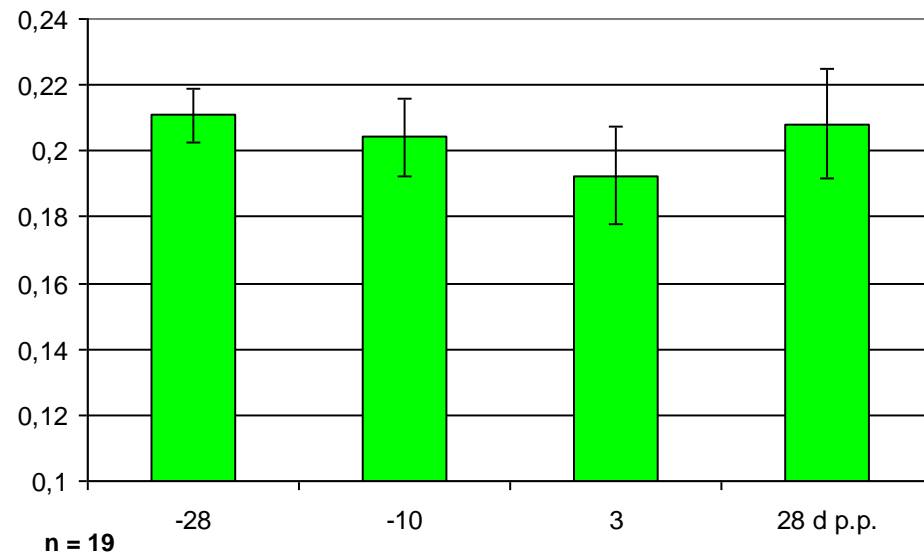
/standartizēts insulīna jutības pārbaudes indekss

1

0,18 – 0,22

$\lg \text{ Glucose} + \lg \text{ FFS} + \lg \text{ Insulin}$

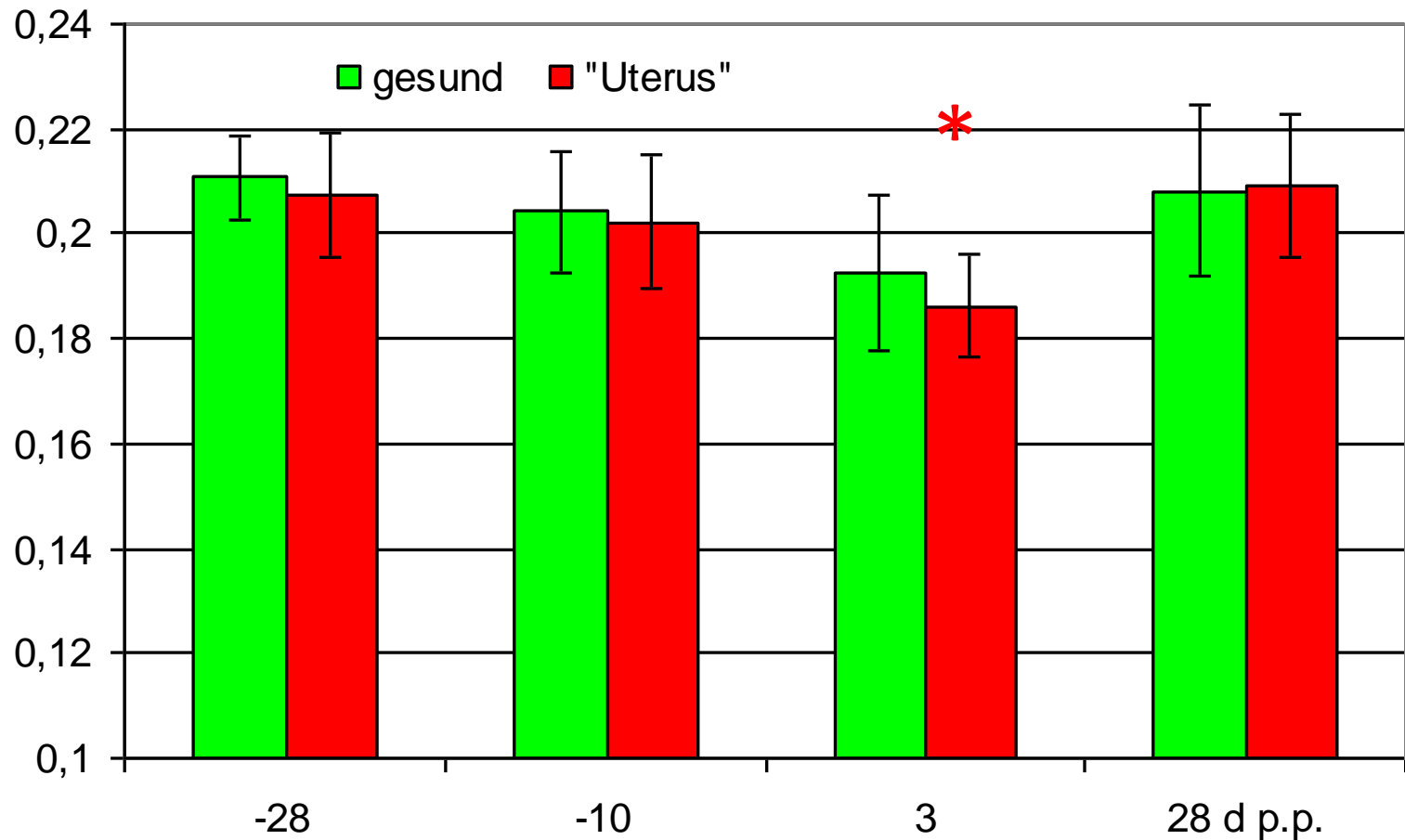
“Insulīnrezistence” veselām govīm atnešanās periodā
„Insulinresistenz“ peripartal (RQUICKI mod.): **gesunde Kühe**



Revised Quantitative Insulin Sensitivity Check Index"

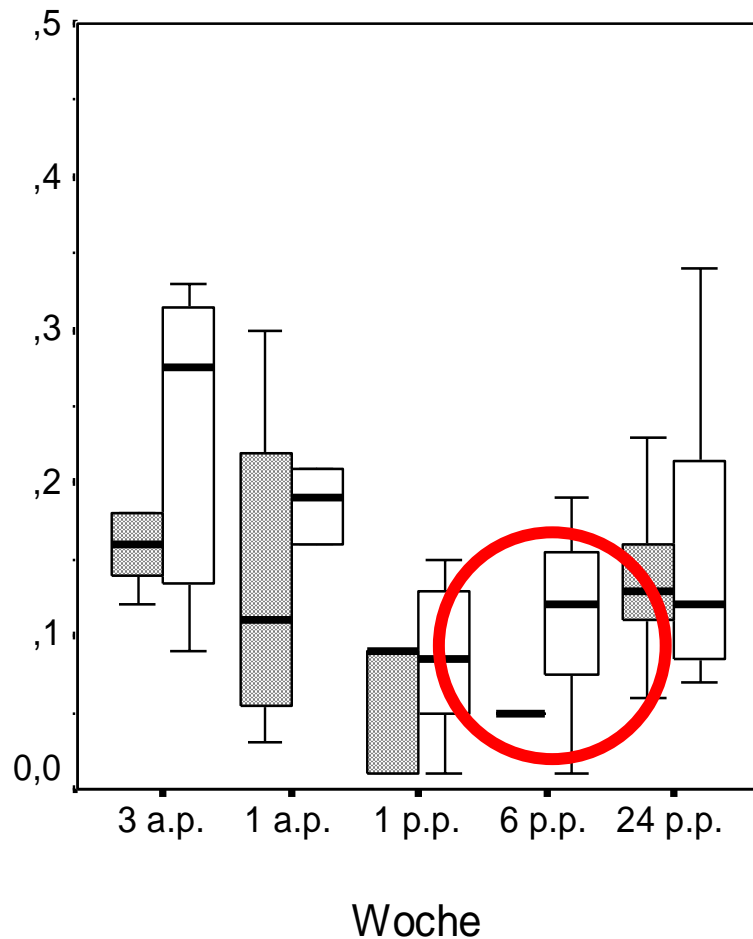
healthy : uterus ill cows

/veselas govis : slimas govis (drudzis, nometekla aizture,
endometrīts, lohiometra, olnīcu cistas)

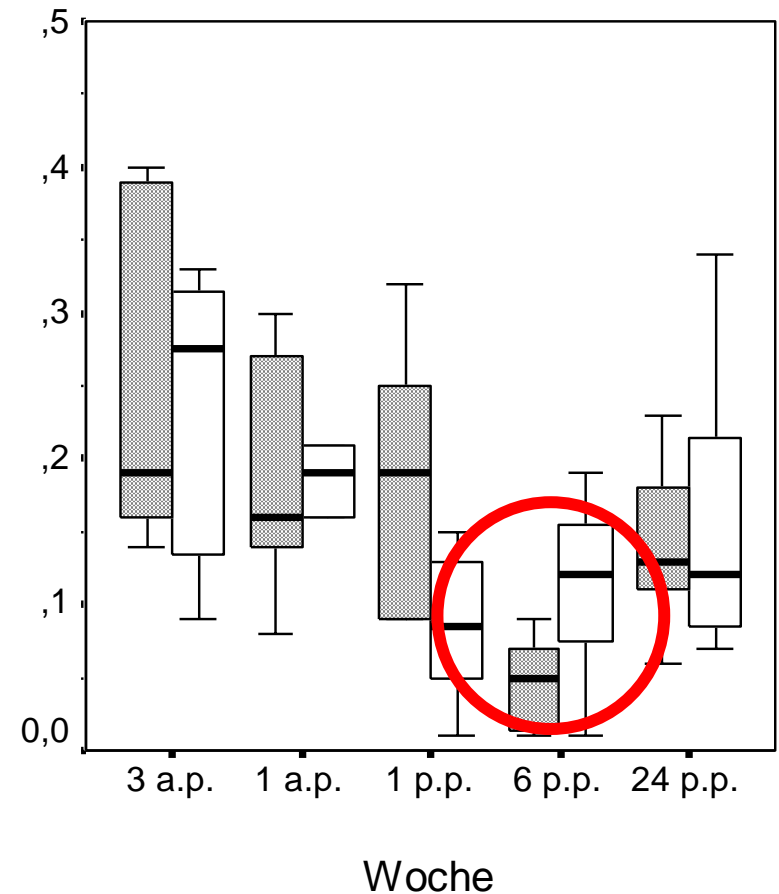


uterus ill: Fieber, Ret. sec., Endometritis/Lochiometra, Ovar cysts, twins * = $p < 0,05$

Insuline in healthy and cows with Ret. sec. and Ovar cysts (healthy= white)



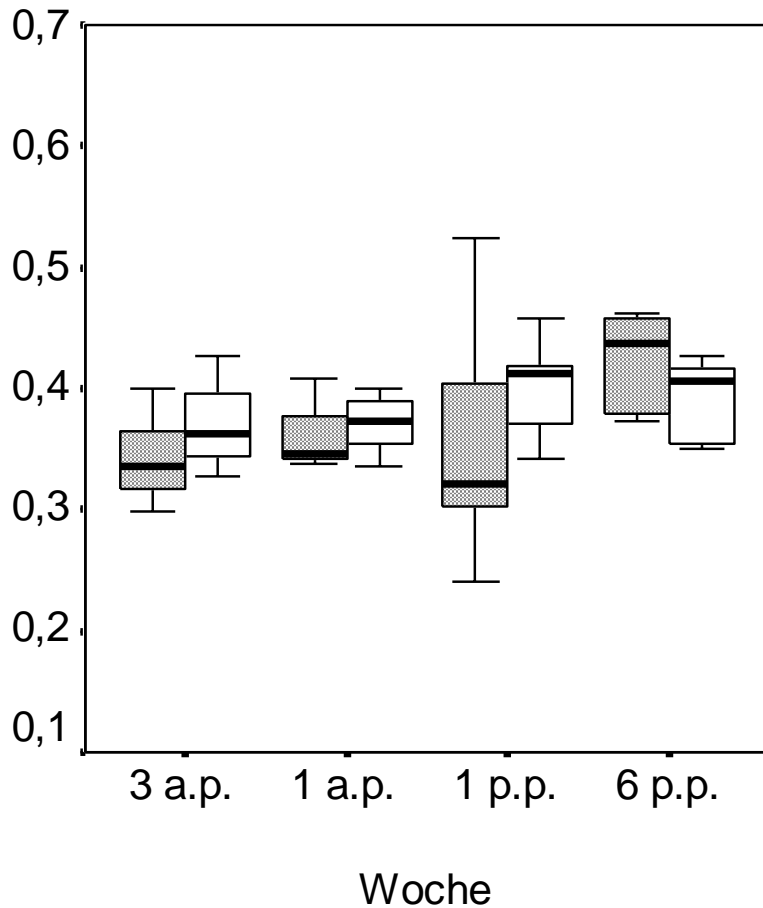
Ret. sec. : healthy



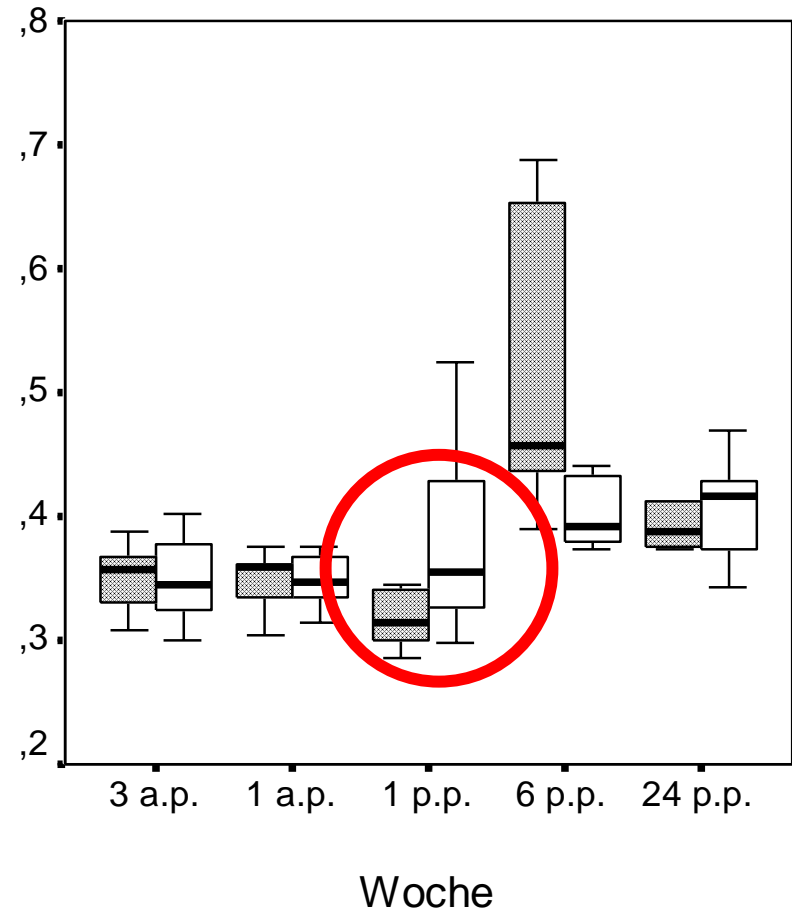
Ovar cysts: healthy

RQUICKI in healthy and cows with Ovar cysts

(healthy= white)



1. lactation : > 1 lactation



Ovar cysts: healthy

Fertility – energy metabolism – insuline resistance (RQUICKI

Σ: Free fatty acids / Brīvās taukskābes

- Level and duration of lipolysis p.p. \approx ovar disorders
/lipolīzes intensitāte un ilgums *post partum* \approx olnīcu darbības traucējumi
- \uparrow lipolysis already a.p. \rightarrow fertility problems
/ \uparrow lipolīze jau pirms dzemdībām \rightarrow ietekmē auglību
- Dystocia $\rightarrow \uparrow$ FFA and \downarrow Antioxidants
/ Apgrūtināts dzemdības $\rightarrow \uparrow$ FFA un \downarrow antioksidanti
- fertility disorders = insulin resistance in 1th wk p.p.
/auglības samazināšanās = insulīna rezistence jau 1 ned. *post partum*
- \uparrow FFA at 1th and 4th wk p.p. \rightarrow longer days open
/ \uparrow FFA 1. un 4. ned.p.p. \rightarrow pagarināts laiks līdz grūsnībai
- tendency: \uparrow FFA at 1th wk p.p. $\rightarrow \downarrow$ productive live
/ tendence: \uparrow FFA 1.ned.p.p. $\rightarrow \downarrow$ govs produktīvais mūžs

FFA:

-most informative parameter

/informatīvākākais rādītājs

- best control = – 4 days p.p.

- different normal values a.p. – p.p. /atšķirīgas normālās vērtības

↔ ad hoc therapy

↔ prophylaxis

NEUER Blut-Schnelltest – Calcium, Magnesium, Laktat und NEFA

- a. Calcium**
- b. Magnesium**
- c. L-Laktat**
- d. NEFA**



digitales Photometer

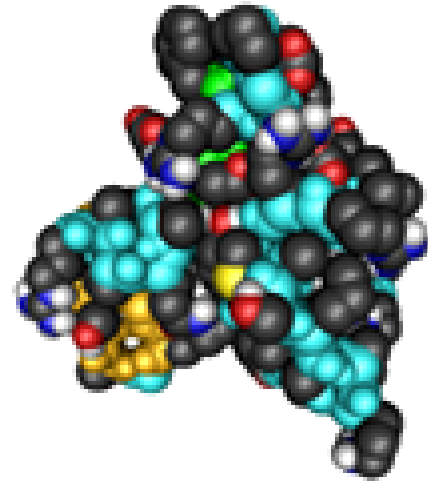
- i. Calcium 1 Euro
- ii. Magnesium 1 Euro
- iii. Laktat 1,60 Euro
- iv. NEFA 3,80 Euro



Clevere Produkte für erfolgreiche
Tierhalter und Tierärzte

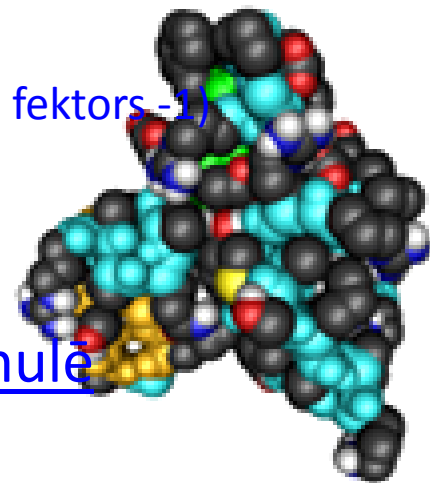
QUIDEE GmbH

IGF1



?

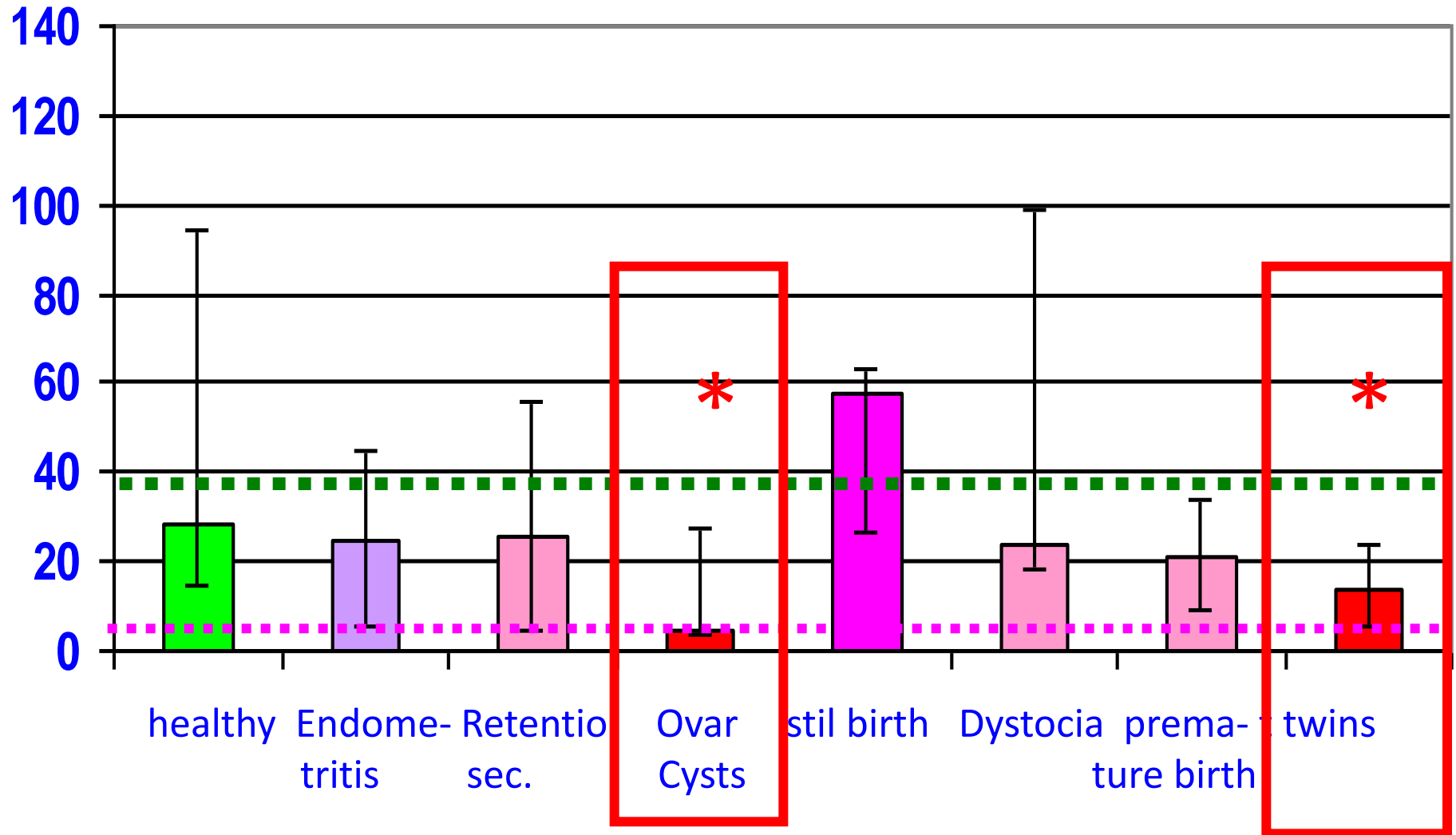
IGF₁ (Insulin-like growth factor-1) (insulīnam līdzīgais augšanas faktors -1)



- Stimulator of cell growth and proliferation / stimulē šūnu augšanu un dalīšanos
- Inhibitor of programmed cell death / aizkavē apoptozi
- Synthesis in the liver / veidojas aknās
- indicator of the power supply / enerģijas nodrošinājuma indikators
- key role in the follicular maturation and ovulation / absolūti nepieciešams folikula nobriešanai un ovulācijai



IGF1 (ng/ml): 10 d a.p.

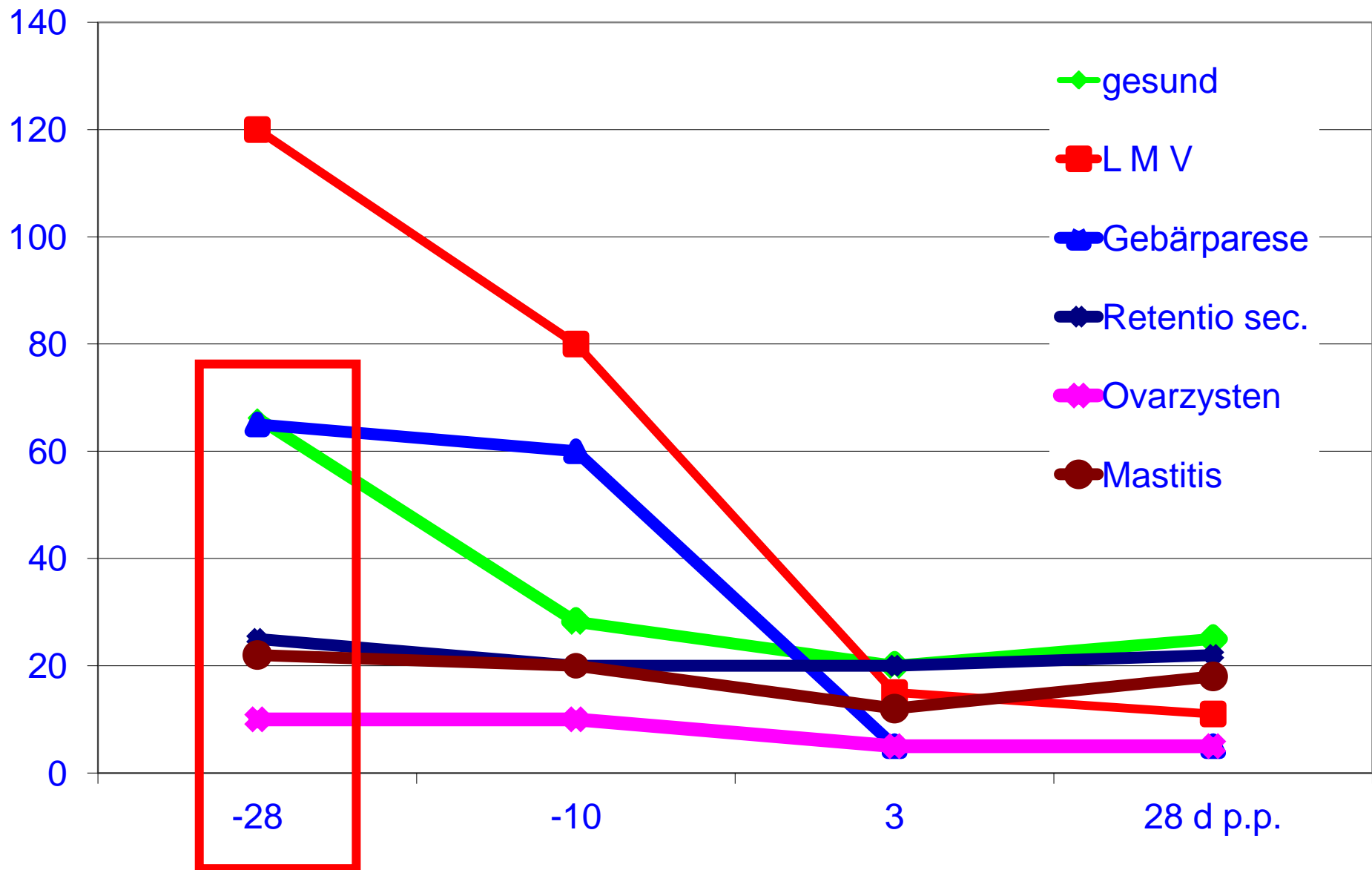


$p < 0,05 = *$

IGF = Insulinähnlicher Wachstumsfaktor

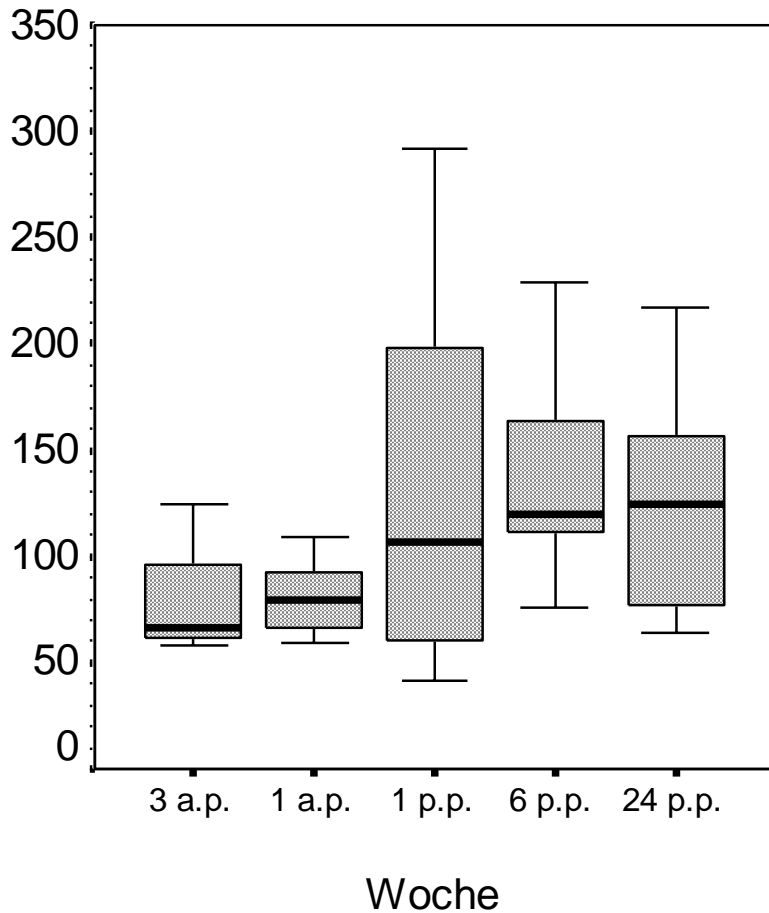
(Fürl et al. 2005)

IGF1 (ng/ml) – Hädrich 2007

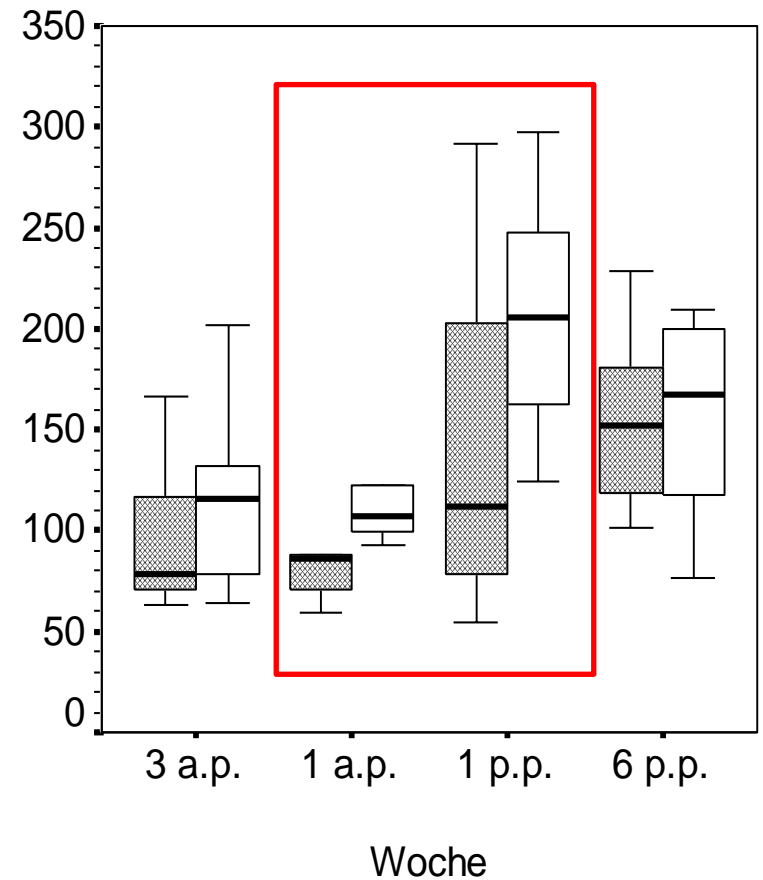


IGF1 peripartal 1. : > lactation

(Söllner-Donath 2013)



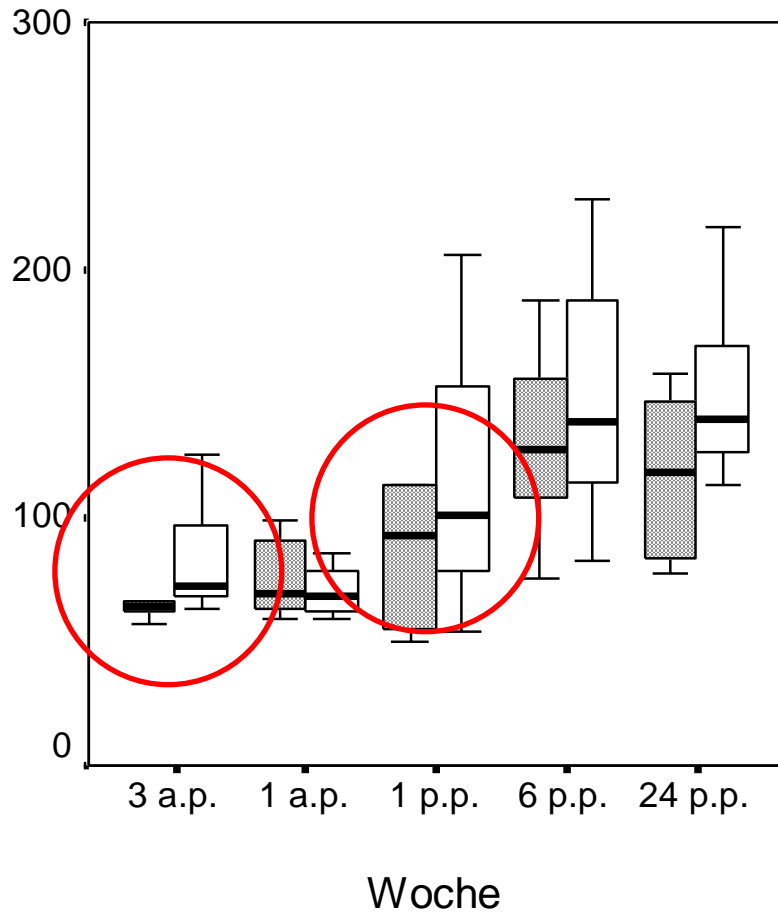
1. lactation



> 1 Lactation

IGF1 in healthy and cows with Ovar cysts

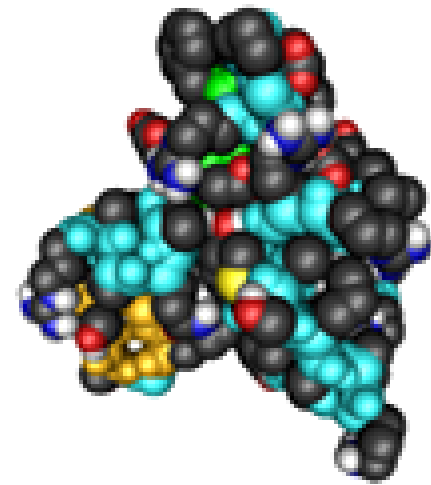
(healthy= withe)



Ovar cysts: healthy



IGF1:



... agrīnais indikators-

jau 4 nedēļas a.p. ...

Metabolic-Screening-Fertility

Problem	Kontrole, nedēļas			Laboratoriskie rādītāji asinīs vai citos substrātos
	1 a.p.	1 p.p.	3-8 p.p.	
Energy	X	X	X	FFS, BHB , Cholesterol, Bilirubin
Protein		X	X	Harnstoff , Protein (Albumin)
Liver metabolism	X	X	X	GLDH, GGT: B
Uterus	X	X	X	CK, AST: B
ABB	X		X	K, NSBA, pH-Wert , Pi, Ca: H
Minerals	X	X	X	Ca: B, H; Pi.: B, H
	X		X	Na, K: H
Trace elements			X	J: B, Ha; Mn: Voll-B, Ha , AP: B Cu: B, Ha ; Zn: Ha; Se: B , GPX: Voll-B
β-Carotin			X	β-Carotin (B, L)
Vitamin E, -C, -A			X	Vitamin E, -C, -A (Vit. A B, L)
Antioxidants			X	TEAC,(ACW, ACL)

Veselības stabilizēšana– veterinārārsts „ad hoc“

Konc. enerģijas vielas	Propylene glycole et al
Lipolīzes kavēšana	„Energy“ (izdzirdināšana ar ūdeni, iev.caur zondi, parenterāli) Vitamin B12 (Catosal [®] , TIRASANA [®]) „Dexamethason“
Veicina gremošanu	Genabil [®]
Zarnu trakta aizsardzība	Dystikum [®]
Antioksidanti	Vitamin E/ Selen, Cu, Mn, Se, u.a. β-Carotin
Ca homeostāze	DCAD, Ca-sāļi po, Vitamīns-D ₃

Mastitis accumulation - are not enough antioxidants to blame? / Problēma ar mastītiem – varbūt vainīgs antioksidantu

trūkums **M. Füll**, Medizinische Tierklinik, Leipzig

Mastīti



<http://www.que.at/html/nutztiere/rind/mastitis.html>

- cause for selection before fertility disorders and claw diseases / kopā ar neauglību un nagu slimībām galvenais govju brākēšanas iemesls
- 2-4 centi uz litru piena → apm. 150-200 € / uz govi / gadā
- by subclinical mastitis = damage 20↓50 times more likely

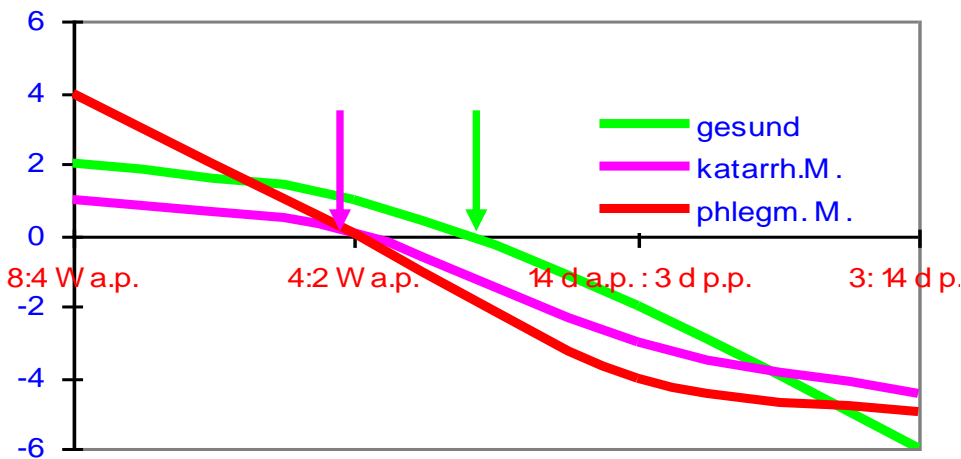
Ietekme uz ekonomiku un dzīvnieku labturību ↑

Ēdināšana un tesmeņa veselība (Wendt et al. 1998)

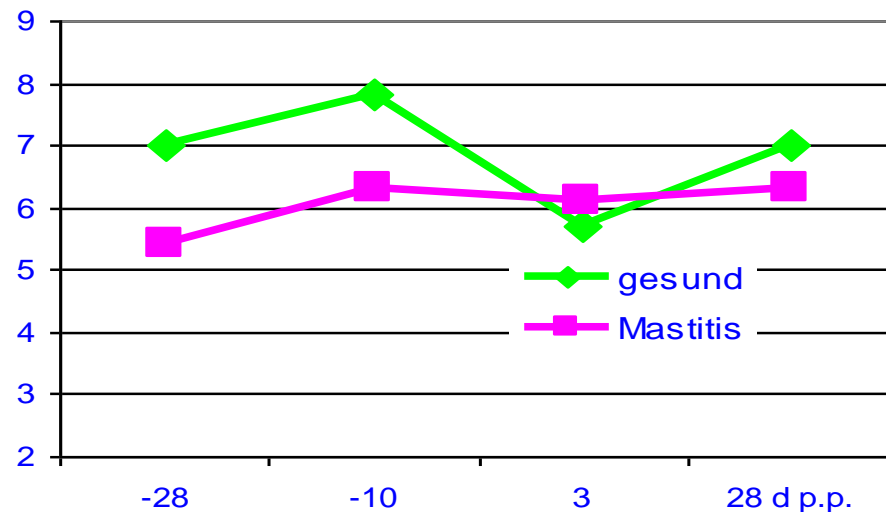
Faktors	ietekme	sekas
* ↓ Energy post partum Ketosis – subklinisch - klinisch	„liver damages“ ↓ Phagozytosis Immunsuppression	Mastitis ↑ cell count ↑ Fat
* ↑ Protein	↑ NH3/rumen Liver stress	subcl. Mastitis clin. Mastitis
* ↑ carbohydrates ↓ crude fiber	Rumen azidosis ↓ Ca	↑ cell count clin. Mastitis
* Phytöstrogens Mykotoxins	Östrogen effects Immunsuppression ↓ Phagozytosis	edema ↑ cell count Mastitis
* Nitrat/Nitrit manure-N Brassica-feeding	Immunsuppression Hypoxämia, mucous membrane irritation	↑ cell count, Vitamin demand, mucous membrane irritation
* ↓ β-Carotin ↓ Vitamin E/Se	Immunsuppression ↓ Antioxidants	subkli. Mastitis latent infections

Mastīta agrīnā diagnostika

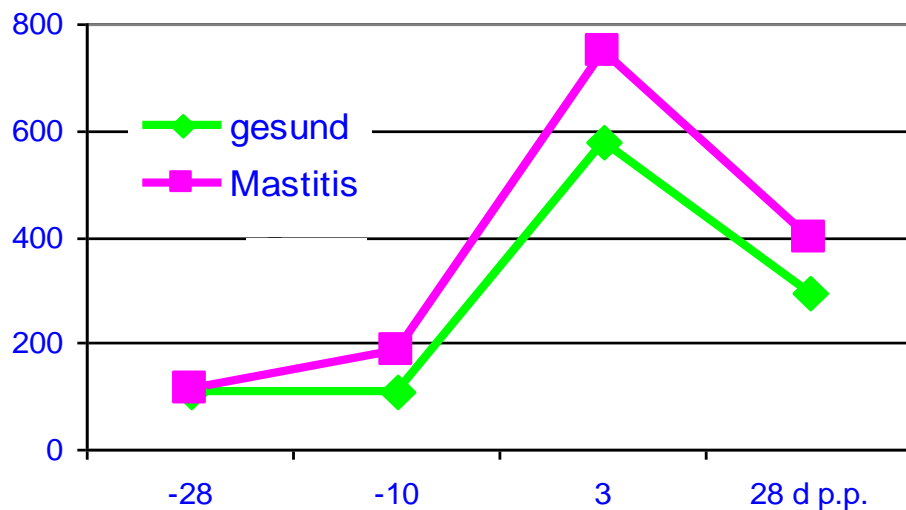
Differenz der Rückenfettdicke (mm)



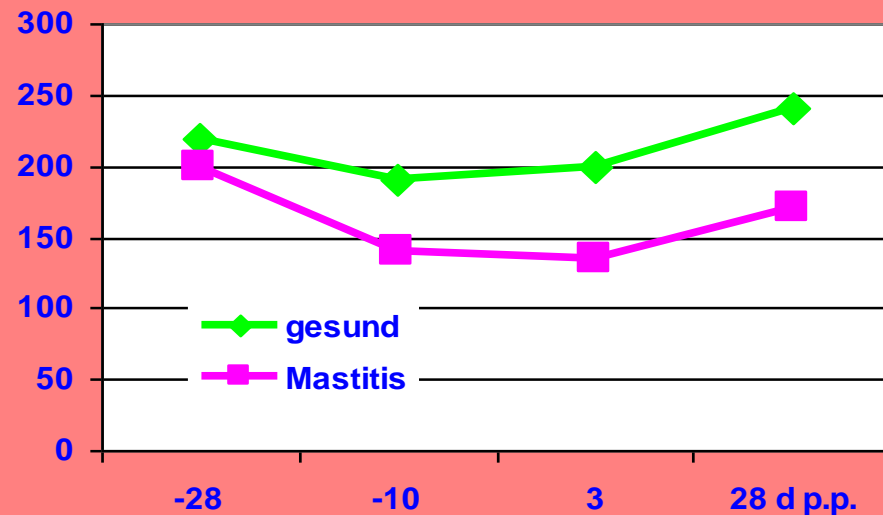
Leukozyten (G/l)



freie Fettsäuren ($\mu\text{mol/l}$)

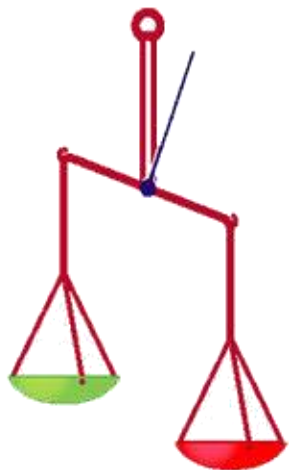


TEAC ($\mu\text{mol/l}$)



Mastīta agrīnā diagnostika

- Antioksidantu noteikšana?
- **Tesmeņa limfa izmeklēšana?**

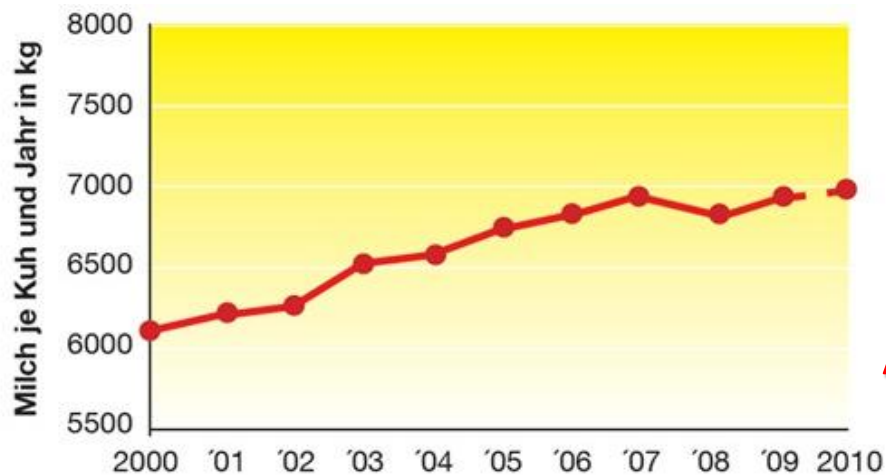


Oksidatīvais stress

Govs izslaukums



Vielmaiņas procesi tesmenī



Quelle: BMELV, Stat. Bundesmt, BLE

Pastiprinās skābekļa izmantošana



Aktīvo skābekļa radikāļu veidošanās



Antioksidantu lielāka vajadzība un patēriņš



- Rupjās barības kvalitāte un sastāvs



- Barības piedevas

- Nepieciešamas rekomendācijas???

Antioксидanti

Trolox equivalent antioxidativ capacity (TEAC) (Miller et al. 1993)	Antioxidant Capacity of Lipid-soluble Components (ACL) (Popov u. Lewin 1996)	Antioxidant Capacity of Water-soluble Components (ACW) (Popov u. Lewin 1994)
Desferroxamin	Vitamin E (α -, β -, δ -Tocopherol, Tocotrienol)	Vitamin C
Bilirubin		Bilirubin
Harnsäure / urīnskābe	Vitamin A und Provitamine (α -, β -, γ -, Carotine, Retinol, Retinsäure)	Liponsäure
Vitamin C		Melatonin
A-Tocopherol	Vitamin D	Albumin, Ceruloplasmin, Hemopexin, Haptoglobin, Glutathion, Aminosäuren
Glutathion, Albumin	Ubiquinol-10	
Mannitol, Glucose, Ethanol, Heparin, Harnstoff, Creatinin	Xanthine und Luteine	Glucose, Mannitol

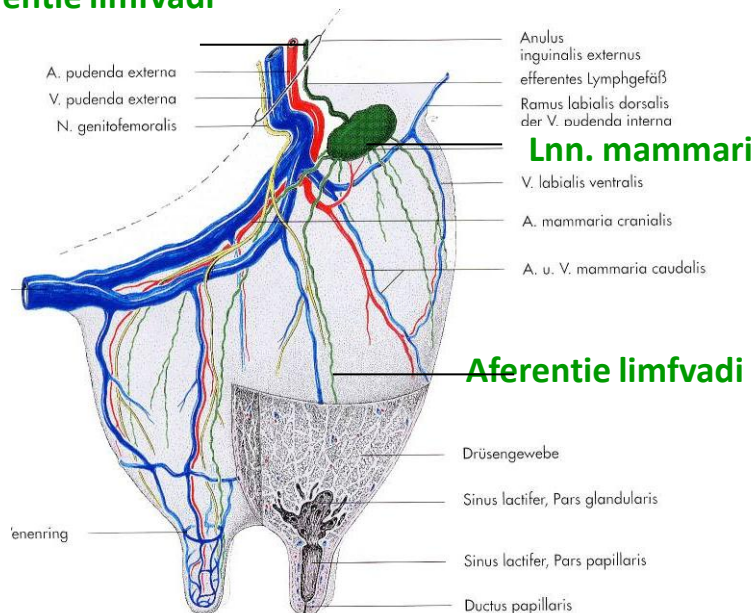
Limfātiskā sistēma un piena dziedzeris

- Paralēli asinsvadiem:

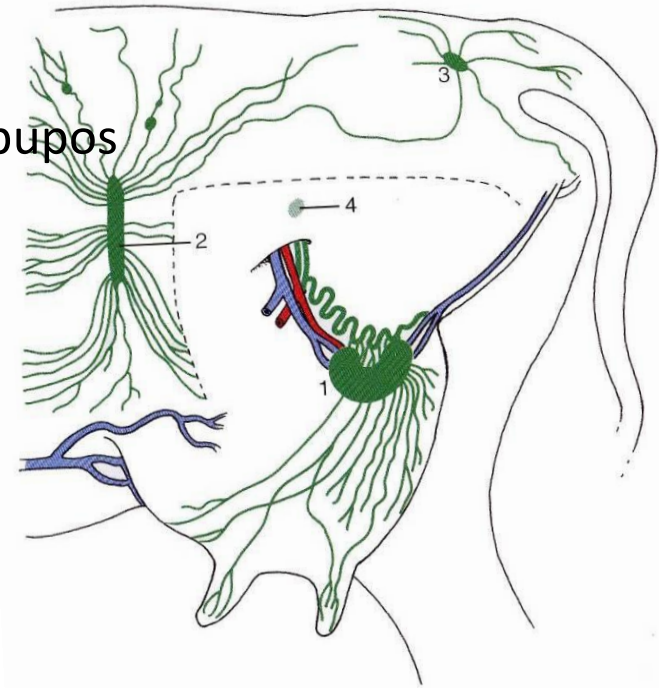
paranhīmā un zemādā un pastāvīgs tīklojums pupos

(Ziegler u. Mosimann 1960)

Eferentie limfvadi



Quelle: König, H.E., Liebig, H.G. (2008): Anatomie der Haussäugetiere. 4. Aufl., Schattauer, S.471



Quelle: Dyce K.M., Sack, W.O., Wensing, C.J.G. (2010): Textbook of veterinary Anatomy. 4. Aufl, Elsevier Verlag, S. 725

- Šķidruma un molekulu transporta sistēma no intersticiālā šķidruma (Swartz 2001)

- Sastāvs atbilst intersticiālajam šķidrumam.

Dzīvnieki un metodes

- Asiņu paraugi: *vena caudalis median* (astes vēna)
- Limfas paraugi: perifēro limfvadu punkcija(zemādas) afferent,
limfvadi tesmeņa kaudolaterālajā virsmā



Dzīvnieki un metodes

vesels



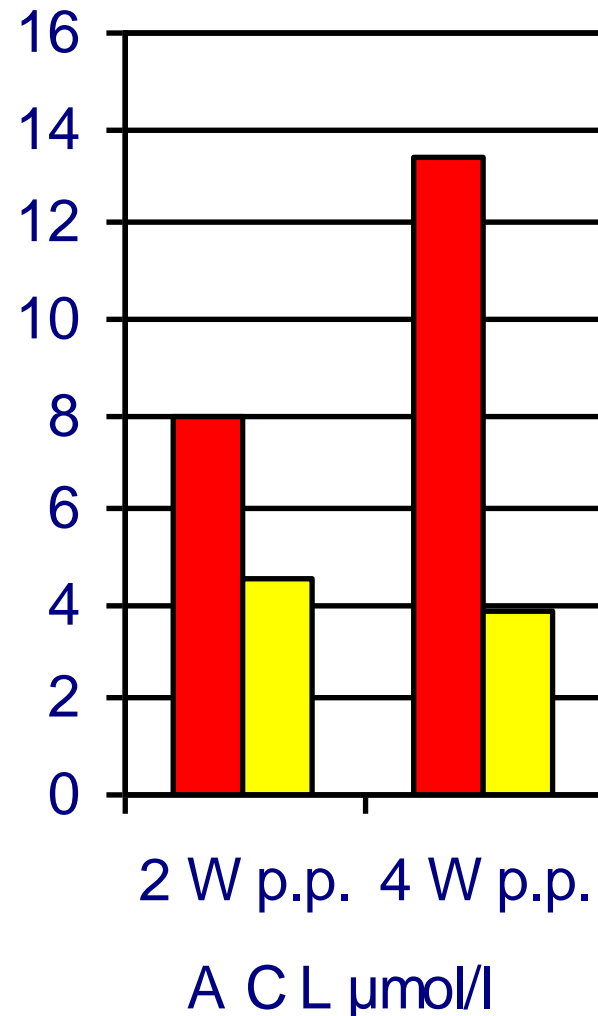
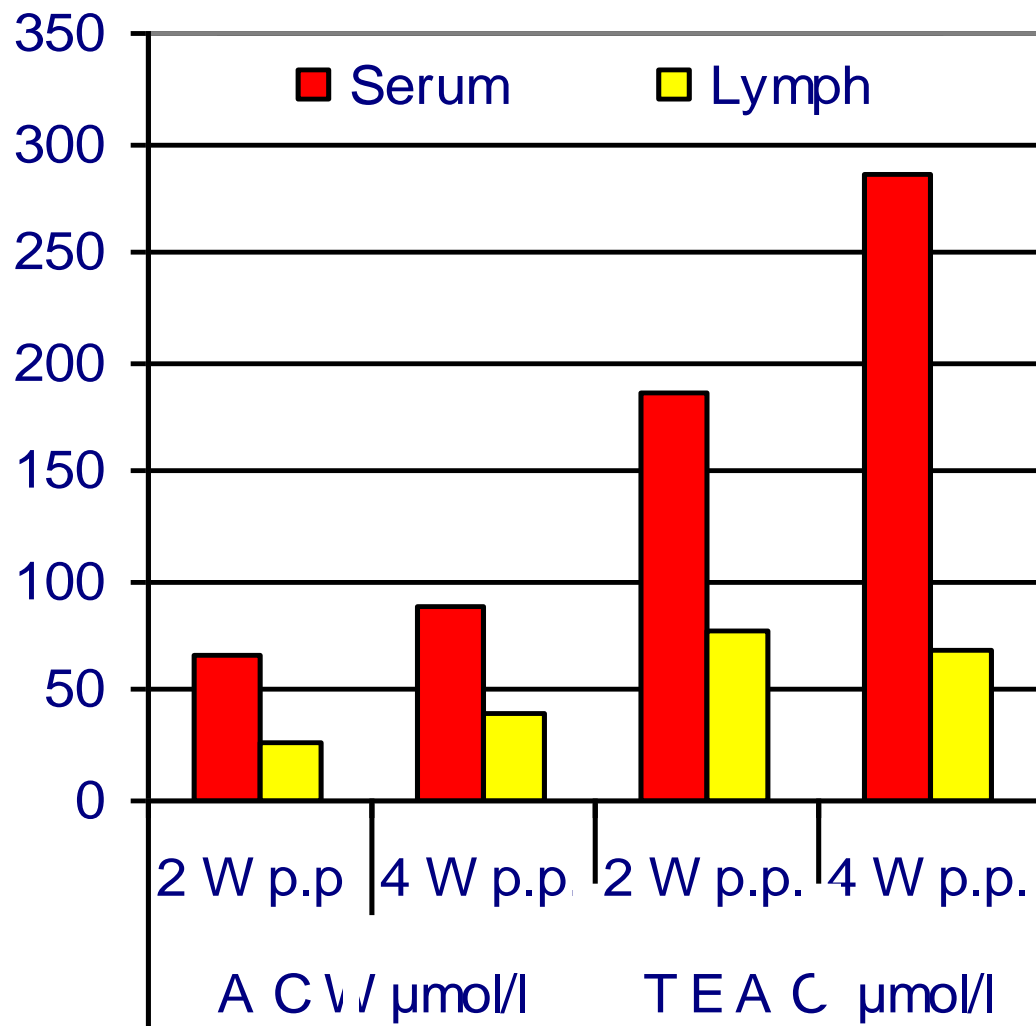
Lymph Blood Milch

Akūts klīniskais mastīts



Lymph Blood Milch

Antioksidanti laktācijas laikā



AO – asinīs pieaug, limfā konstanti

Mastitis and Se- lack!

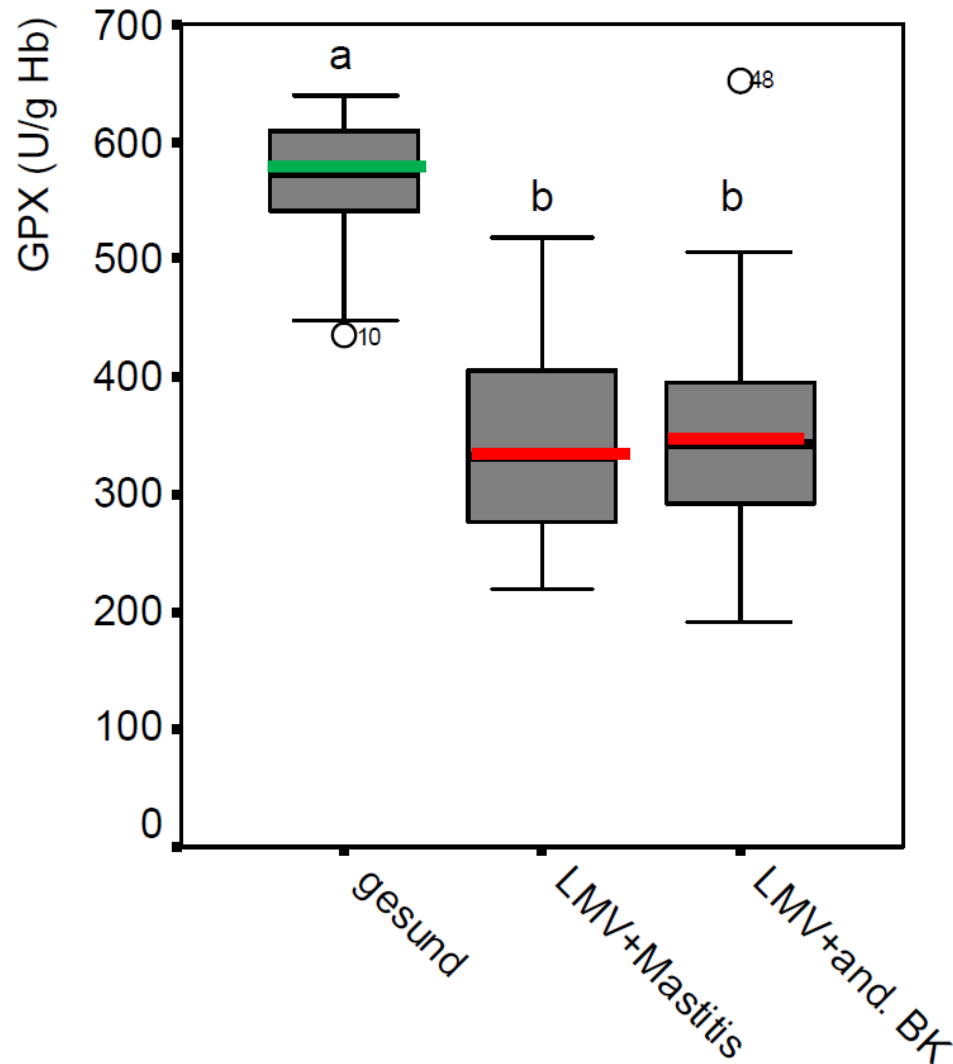


Abbildung 6: GPX-Aktivität (U/g Hb) im Vollblut bei gesunden und an LMV erkrankten DSB-Kühen mit und ohne Mastitis (unterschiedliche Buchstaben kennzeichnen signifikante Unterschiede zwischen den Gruppen)

Tabelle 25: ACL-Konzentrationen ($\mu\text{mol/l}$) im Blutserum und in der Euterlymphe bei gesunden und an LMV erkrankten DSB-Kühen mit und ohne Mastitis (\tilde{x} (P_{25} - P_{75}), unterschiedliche Indices kennzeichnen signifikante Unterschiede innerhalb einer Zeile),

		gesund	LMV+ Mastitis	LMV+ andere BK
ACL $\mu\text{mol/l}$	Serum	8,47 (6,80 - 13,70)	8,57 (6,15 - 10,82)	7,61 (6,07 - 8,67)
	Lymphe	4,52 ^a (3,65 - 6,22)	2,58 ^b (2,01 - 4,06)	2,22 ^b (1,64 - 3,74)
SP (Mann-Whitney-U-Test)		p < 0,01	p < 0,01	p < 0,01

Mastitis, β -Carotin und Vitamin E !

Mastitis and Ca !

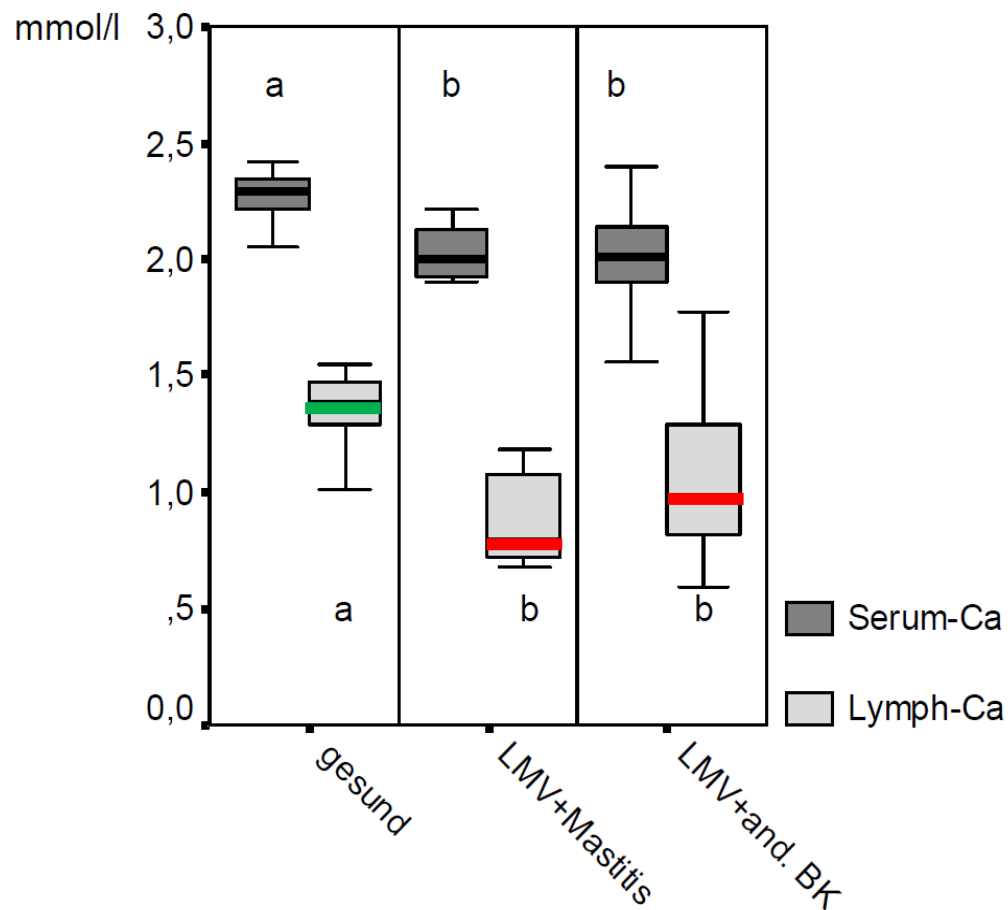
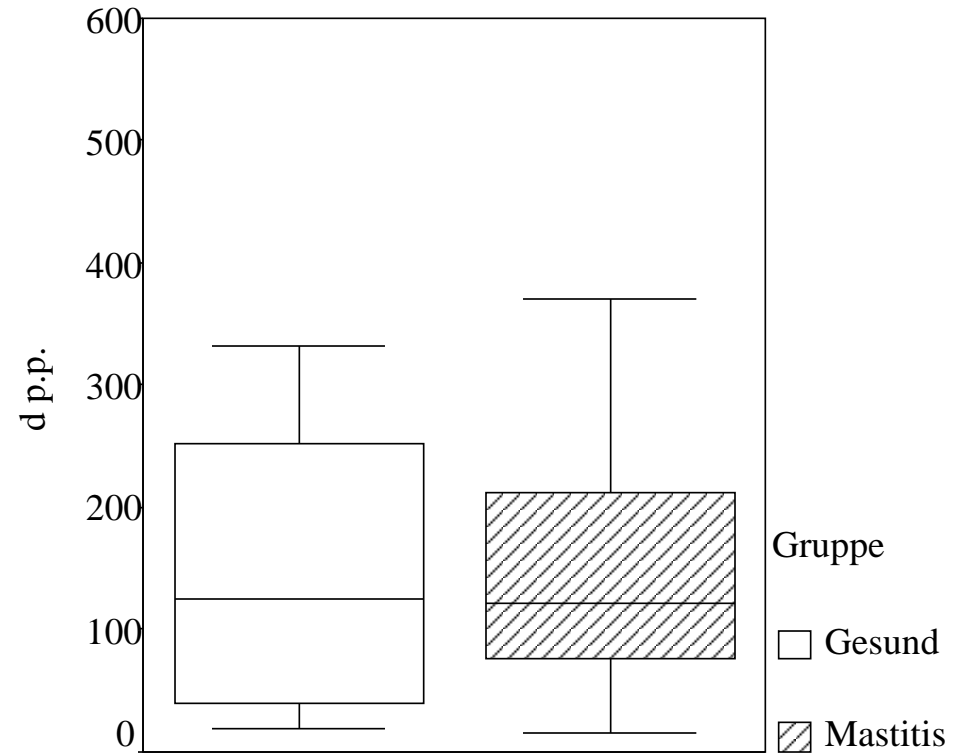
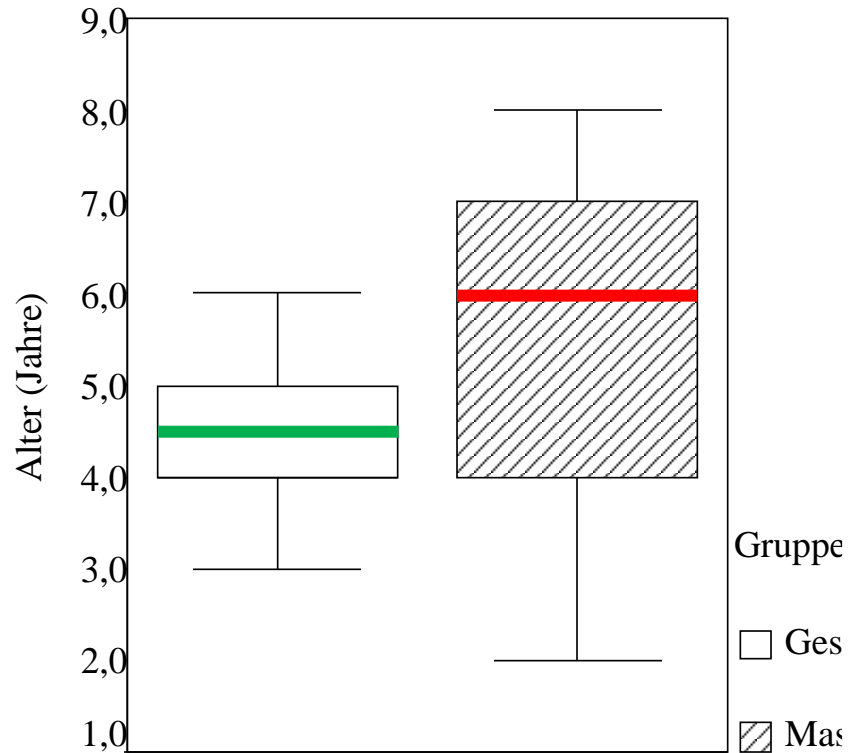


Abbildung 9: Calciumkonzentrationen (mmol/l) im Blutserum und in der Euterlymphe bei gesunden und an LMV erkrankten DSB-Kühen mit und ohne Mastitis (unterschiedliche Buchstaben einer Zeile kennzeichnen signifikante Unterschiede innerhalb des Mediums)

Results

Age of cows and days p.p.



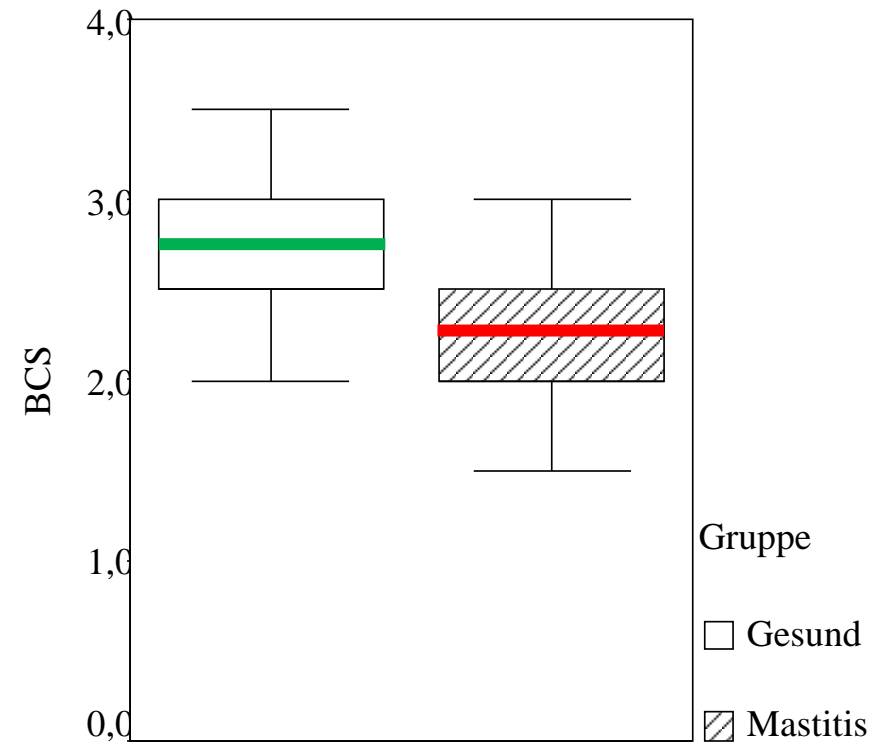
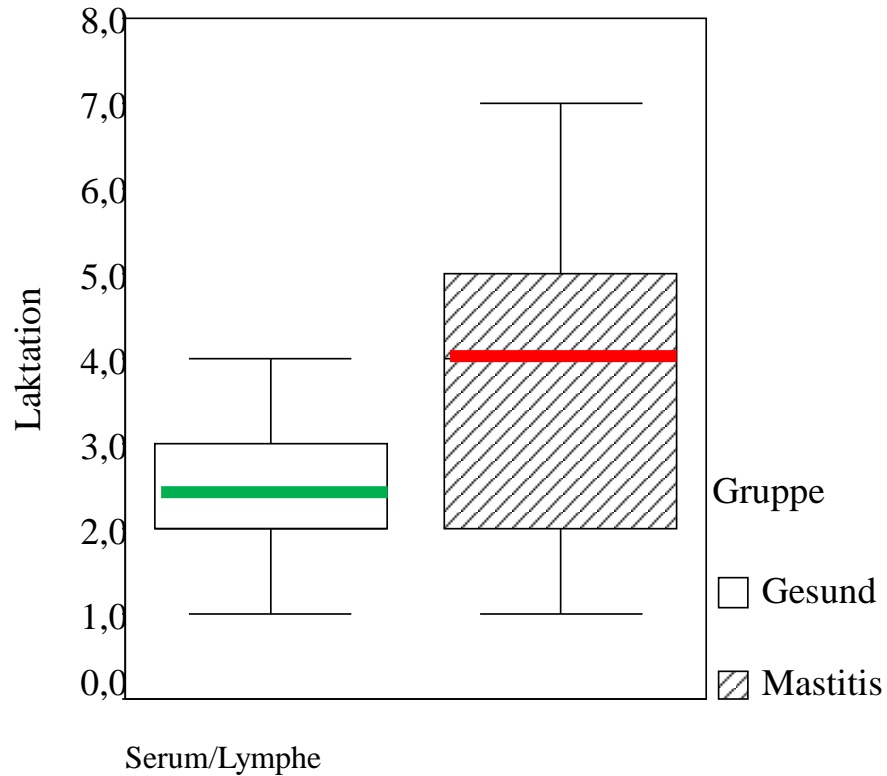
older cows

Hagen J, Sack U, Fürll M. Wien Tierärztl Mschr. 2011: 98; 25-32

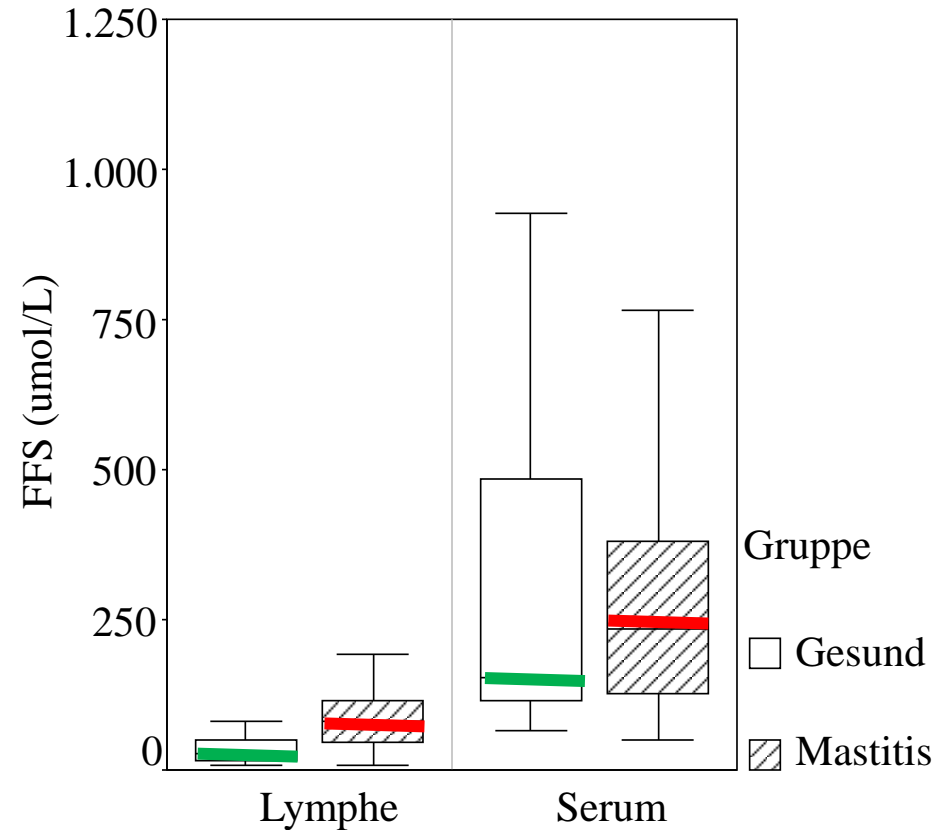
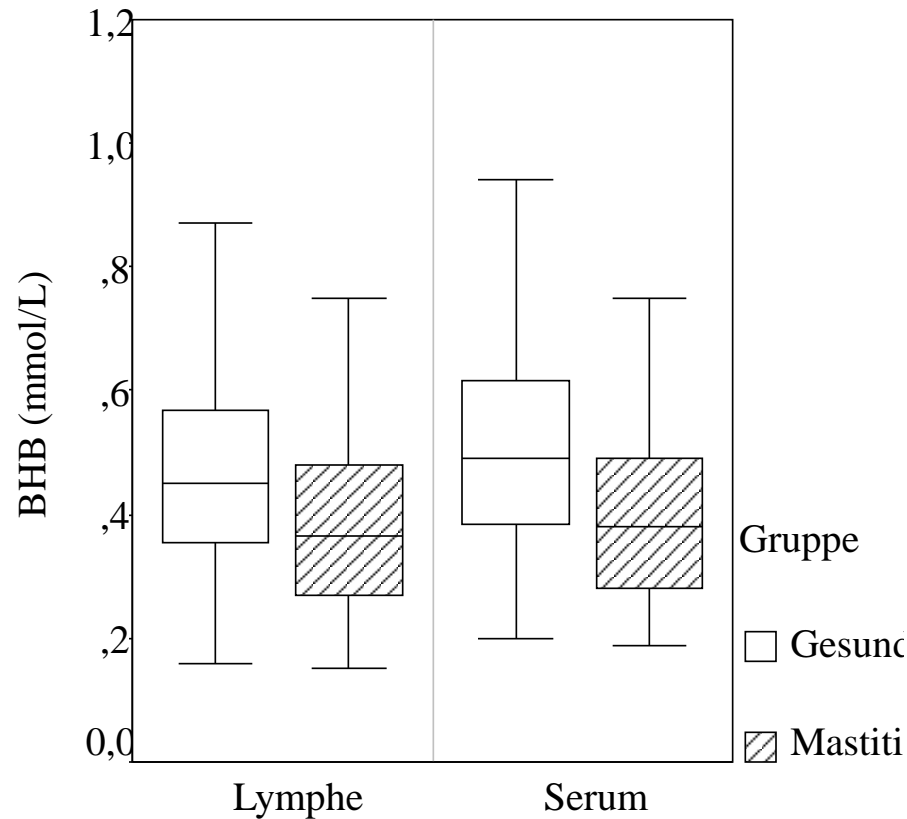
Hagen J, Fürll M. Wien Tierärztl Monatsschr. 2010: 97,270-8

Results

Lactation and BCS



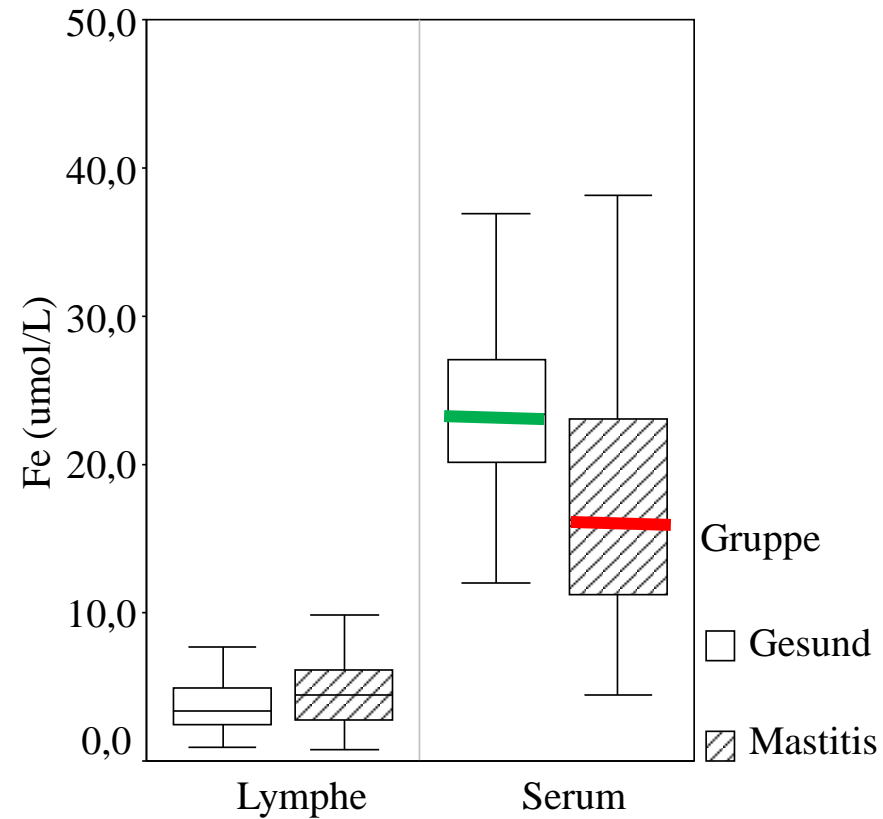
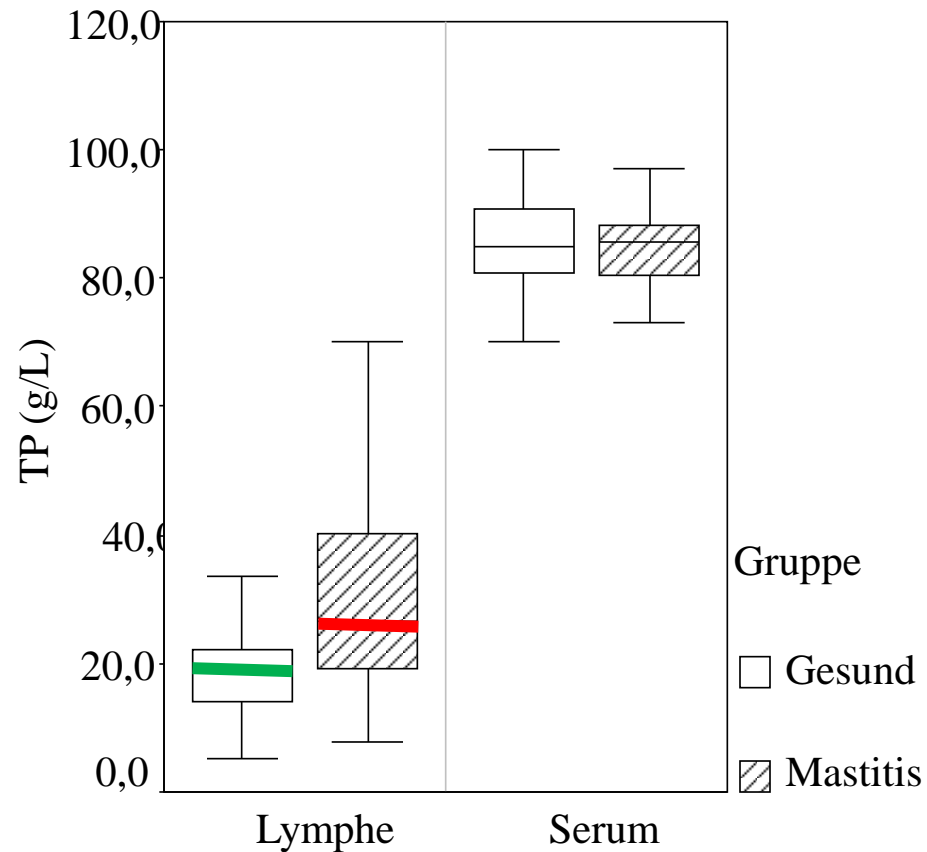
higher lactation
lower BCS



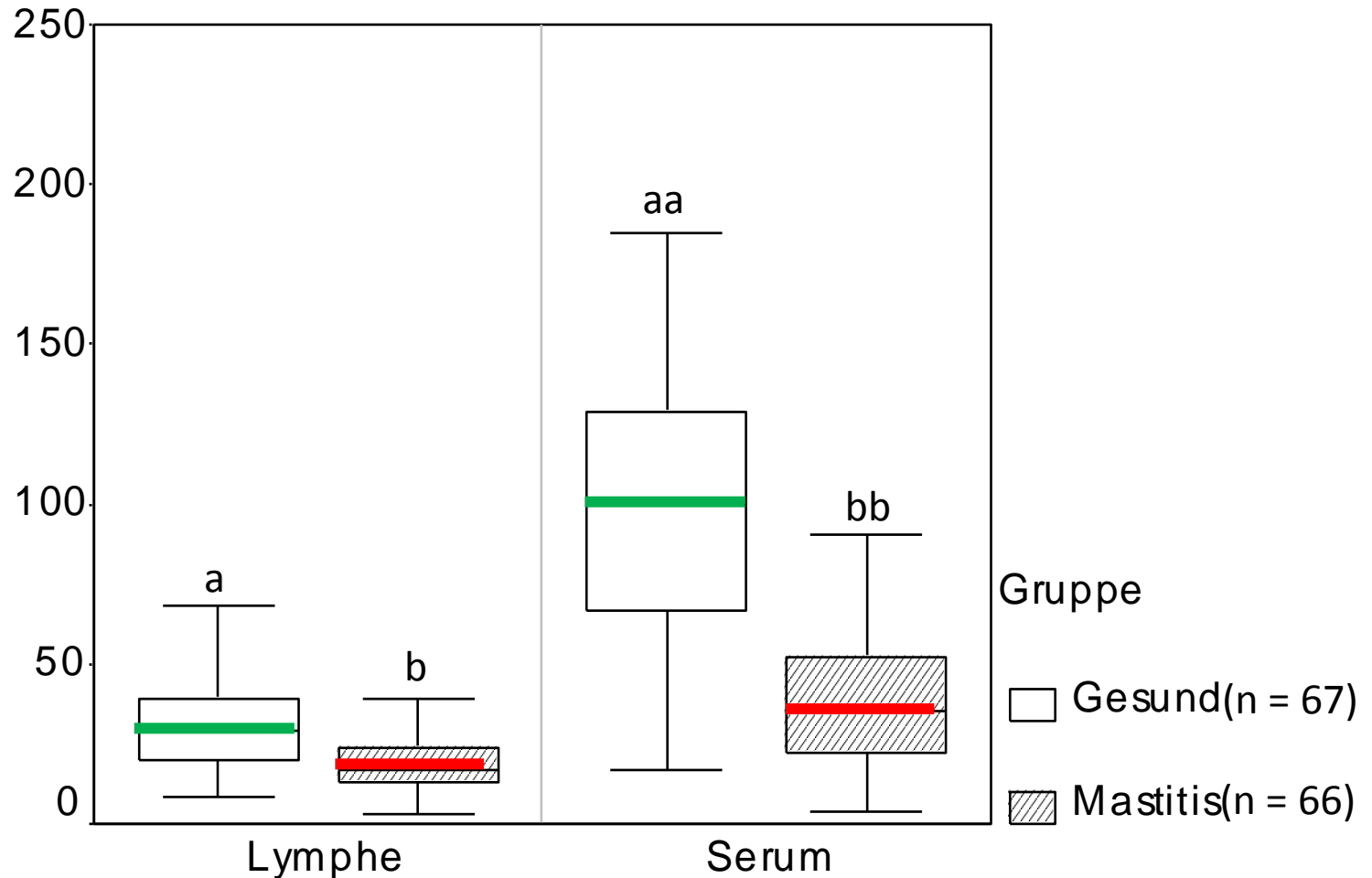
greater fat mobilization

Results

Protein and Fe



higher Protein
lower Fe



a/b u. aa/bb $\rightarrow p < 0,0001$; a/aa u. b/bb $\rightarrow p < 0,0001$

fewer ACW

Vitamin E/ Selenium piedevas

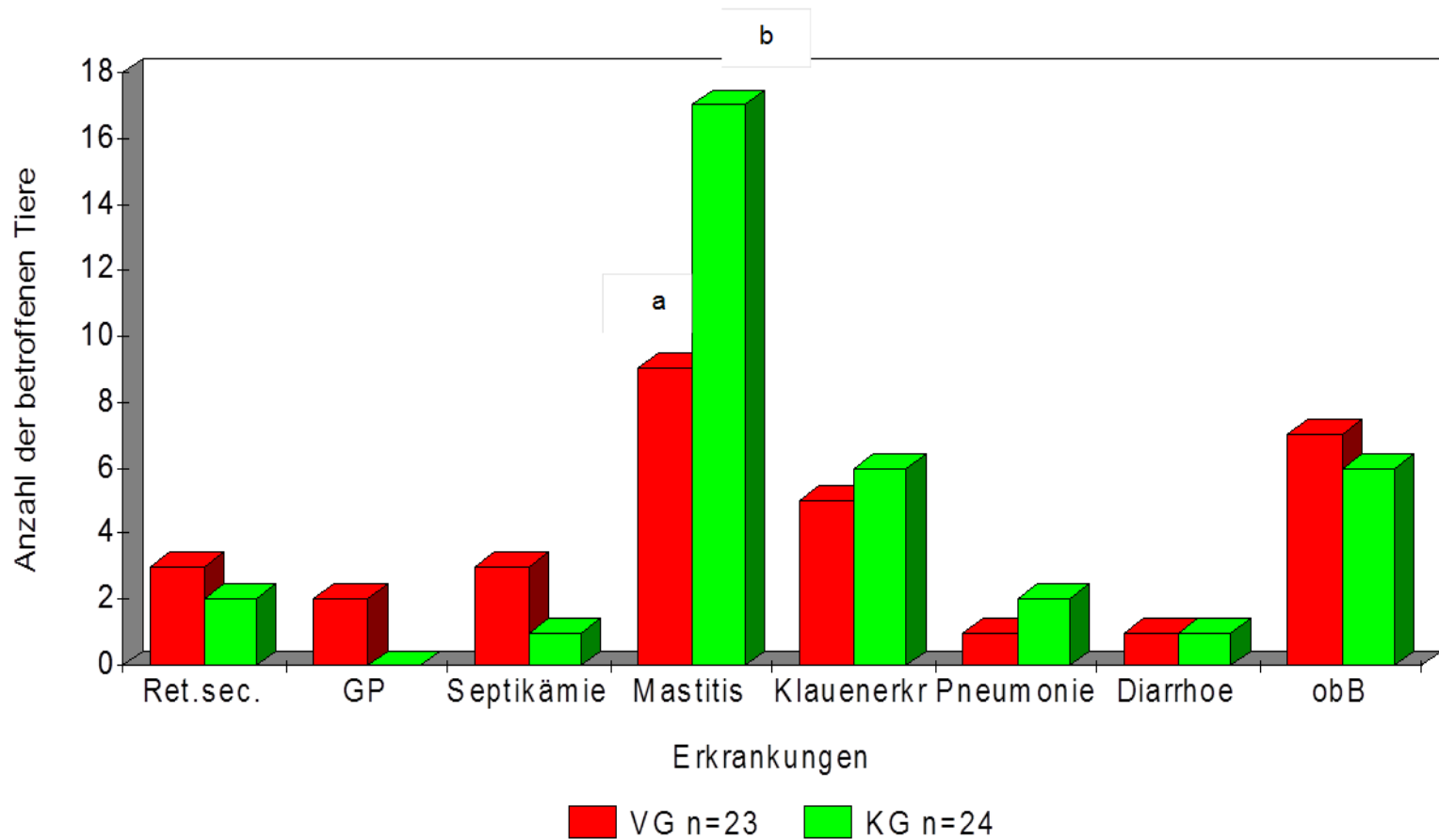
Experimental grupa VG

- Totale mixed ration
- Minerālbarība ar vitamīnu E un Selēnu :
- **Selengehalt: 0,5 mg/kg TS**
- **Vitamin E: 300 mg/kg TS = 447 IU/kg TM**

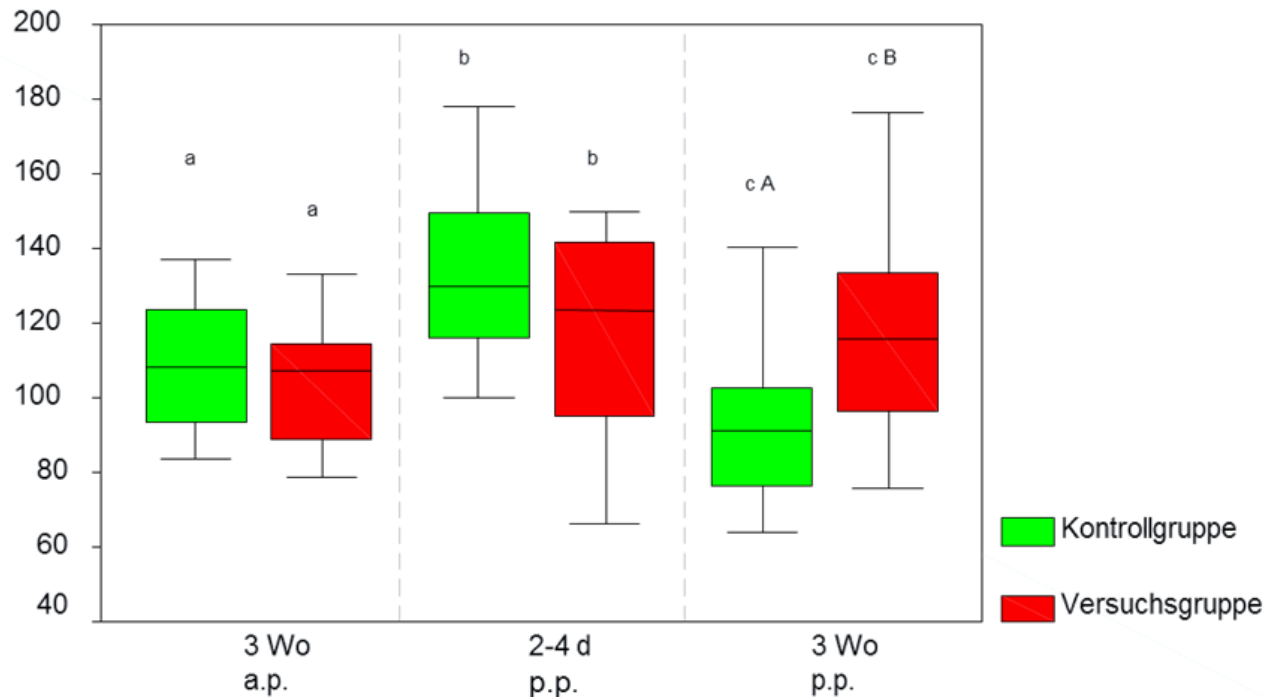
Control grupa KG

- Totale mixed ration
- **Selengehalt: 0,3 mg/kg TS**
- **Vitamin E: 75 mg/kg TS = 111,75 IU/kg TM**

Results- Morbidity (n)



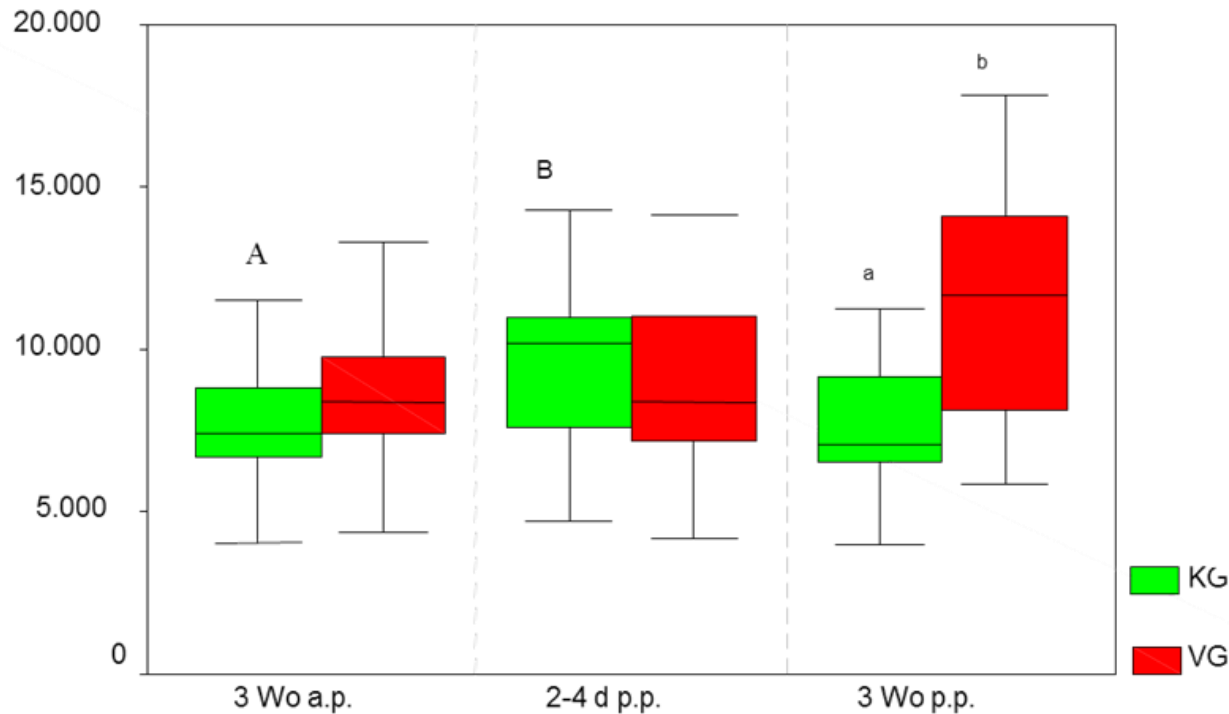
Results- GPX



GPX-Aktivitäten (U/gHk) in Versuchs- und Kontrollgruppe zur klinischen Wirksamkeitsprüfung einer mit Vitamin E und Selen angereicherten Mineralstoffmischung im peripartalen Zeitraum, Signifikanzen ($p \leq 0,05$) zwischen den Gruppen (A/B) und zwischen den Entnahmezeitpunkten (a/b/c)

Results- SOD

SOD (U/g Hb)

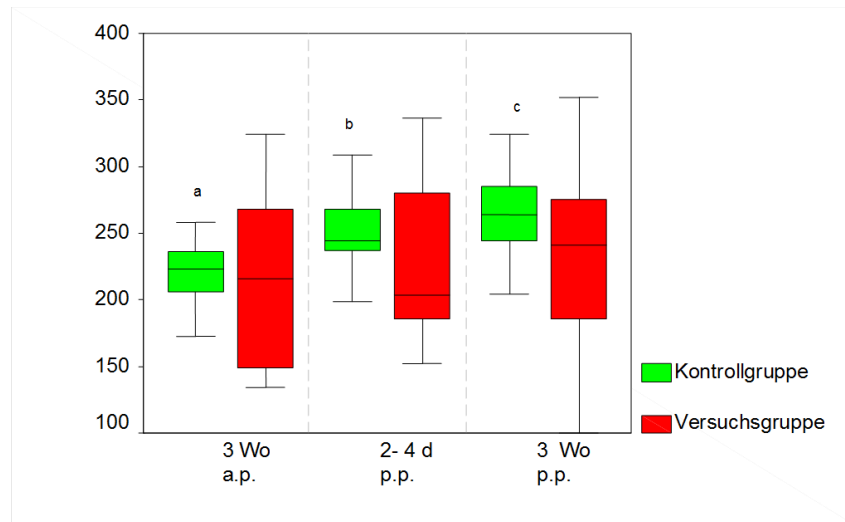


SOD-Aktivitäten (U/gHb) in Versuchs- und Kontrollgruppe zur klinischen Wirksamkeitsprüfung einer mit Vitamin E und Selen angereicherten Mineralstoffmischung im peripartalen Zeitraum, Signifikanzprüfungen ($p \leq 0,05$) zwischen den Gruppen (a/b)

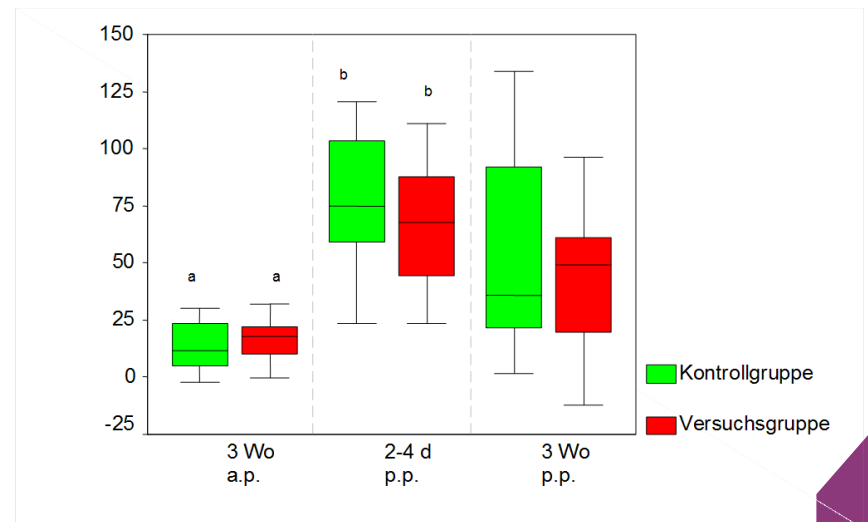
Results - TEAC and ACW

TEAC

TEAC ($\mu\text{mol/l}$)



ACW ($\mu\text{mol/l}$)



TEAC = Trolox equivalente of antioxidative capacity
ACW = water soluble antioxidative capacity

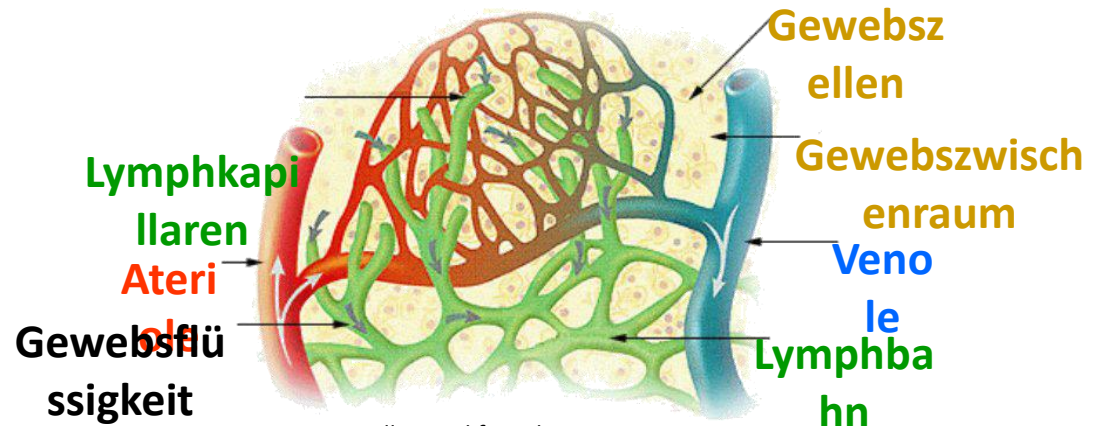
Kopsavilkums

- Mastīta riska faktori: **acidoze, lipomobilizācija, ketoze**,
selēna / vitamīnu / antioksidantu trūkums
- Imunoloģiski paaugstināts haptoglobīns + TBF α
- AO p.p. Paaugstinās asinīs un limfā
- Mastīta gadījumā limfā: **AO** (ACW, ACL, GPX) būtiski ↓, tāpat Fe, Mg, Ca
- **neutrophils, lymphocytes, monocytes** ↑↑
- ⇕ AO izmaiņas dažādu mastītu gadījumos
- Vitamīna E un Se papildus došana samazina mastīta iespēju - ↑AO
- **Vielmaiņas rādītāju kontrole, ja mastīts kā ganāmpulka problēma!**

Mastitis-Prophylaxis

... tai skaitā:

- Vitamīna E-, Se-, β -karotīna-nodrošinājums,
- Nodrošinājums ar enerģiju
- Nodrošinājums ar Ca, Mg, Fe



Quelle: modif. nach:
www.wapedia.mobi/de/Lymphe