

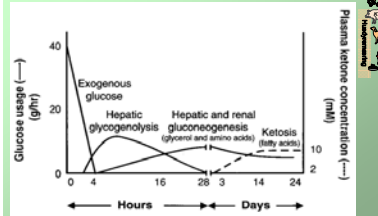
## Ernæring og sygdom

ERNÆRING ⇌ SUNDHED/SYGDOM

= KLINISK ERNÆRING

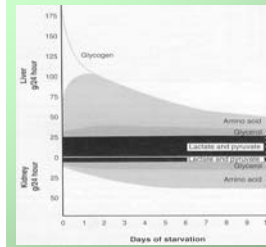
- EN RELATIV NY VIDENSKABELIG DISCIPLIN, p.gr.a.
- lille kontakt mellem kliniske og basale videnskaber
- klinisk ernæring præget af ikke-medicinsk empirisk evidens
- klinisk ernæring lille fokus i offentligt sundhedssystem
- kort liv af husdyr og fokus på produktionshusdyr

## Effekt af faste på glukose omsætning (12.3, Hand et al., 2000)



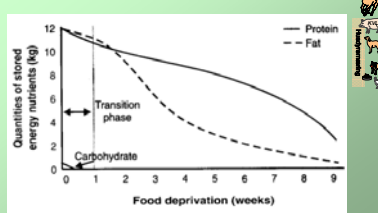
Først anvendes de mest labile depoter af glukose, så egges glukoneogenese, først i lever senere i nyrer. Sidst i fastetilstand egges produktion af ketonstoffer

## Effekt af faste på glukoneogenese (12.4, Hand et al., 2000)



Model fra hunde/katte. Bemærk at substraterne "slipper op" efter 5-10 dages faste. Andre husdyrarter vil have andre profiler for substrater (e.g. hos dorygtere er proportionen meget vigtig) Forskelle mellem lever og nyre glukoneogenese for: 1) total kapacitet 2) reserver (glykogen) 3) aminosyreanvendelse

## Effekt af faste på nedbrydning af kropsvæv (12.2, Hand et al., 2000)



Først nedbrødes labile glukose-reserver. Dernæst egges nedbrydning af fedt. Sidst i fasteperioden egges netto-nyttiggørelse af protein-væv (>25% tab anses for at være KRITISK for normal kropsfunktion)

## Effekt af faste på blod-parametre (12.1, Hand et al., 2000)

Tests	Results	Reference ranges
Complete blood count*		
RBC (x 10 <sup>12</sup> /mm <sup>3</sup> )	9.79	4.60-8.3
Hb (g/dl)	6.8	11.0-20.6
HCT (%)	18.2	33.1-48.4
Reticulocyte (%)	0.0	0-5
WBC (x 10 <sup>3</sup> /mm <sup>3</sup> )	2.4	4.8-16.2
Platelets (mg/dl)	430	88-580
Serum biochemistry profile**		
Glucose (mg/dl)	172	65-110
AST (IU/l)	75	9-43
ALT (IU/l)	75	14-50
Alkaline phosphatase (IU/l)	200	2-125
Total protein (g/dl)	4.0	4.6-7.0
Albumin (g/dl)	2.1	2.5-4.2
Calcium (mg/dl)	8.5	8.0-11.1
Phosphorus (mg/dl)	2.8	3.0-6.8
BUN (mg/dl)	28	7.0-28.0
Creatinine (mg/dl)	0.2	0.6-1.6
Uricic acid		
Specific gravity	1.052	1.015-1.045
pH	7.0	6.0-7.5
Ketones	Trace	

Reduceret blood count - plasma protein - kreatinin - WBC

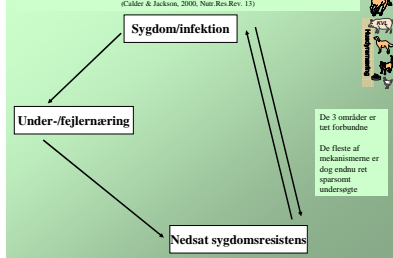
Overt glukose - leverenzymmer - urea - ketonstoffer

Før ernæringsterapi:

- Syre-base OK?
- Væske/miksturer OK?
- Hæmodymisk status?
- Kropsprotein-tab?

Key: WBC = hemoglobin, HCT = hematocrit, AST = aspartate aminotransferase, ALT = alanine aminotransferase, BUN = blood urea nitrogen \*MCV, MCH, MCHC, platelet numbers, WBC differential, blood lead and coagulation profile were normal. \*\*Serum K, Mg, Na, Cl and total bilirubin concentrations were normal.

## Relation mellem ernæring, sygdom og resistens (Cahill & Jackson, 2000, Nutr Rev 13)



De 3 områder er tæt forbundne

De fleste af mekanismerne er dog endnu ret sparsomt undersøgt

## Relation mellem ernæring, sygdom og resistens (Cahill & Jackson, 2000, Nutr Rev 13, Bilag "Nutrition and Disease")

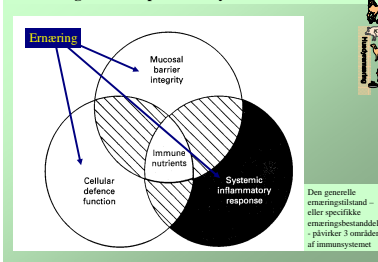
- Ændringer i:
- Hormoner: Insulin, glukagon, cortisol, catecholamin, T<sub>3</sub>/T<sub>4</sub>, IGF, GH
  - Metabolitter: Glukose, glykogen, fedtsyrer, ketonstoffer, aminosyrer
  - Organer: Lever, tarmkanal, muskler, fedtvæv (lunger, hjerte, nyrer)
  - Krop: 25-30% tab af kropsprotein kritisk for normalfunktion

Underernæring (protein-energi)

- Ændringer i:
- Immunitet: IgA (ikke IgG), cytokiner, T-lymfocytter, Th response, NK celler, macrofager, fagocytose, mucus
  - Livsytninger: Aktivitet, foderoptagelse, reproduktion,
  - Basal metabolisme: 0-30% reduktion ("accommodation")

Nedsat sygdomsresistens

## Ernæringens effekt på immunsystemet (Cahill et al., 2000, Proc Nutr Soc)

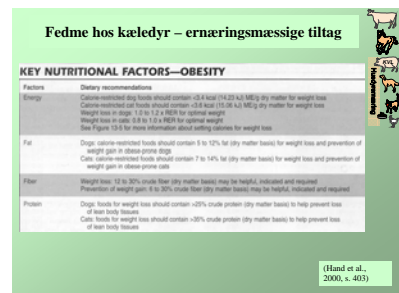
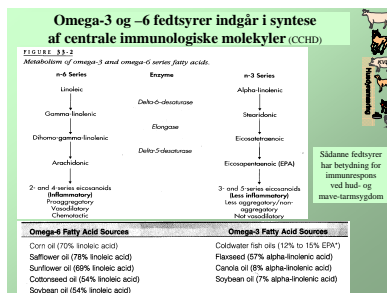
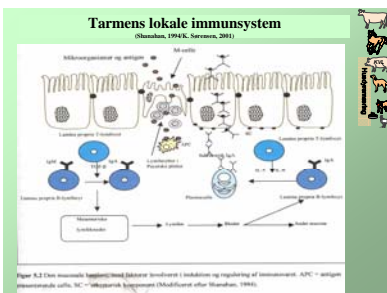
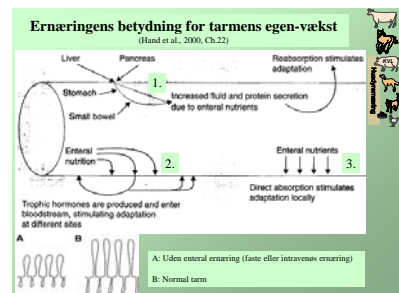
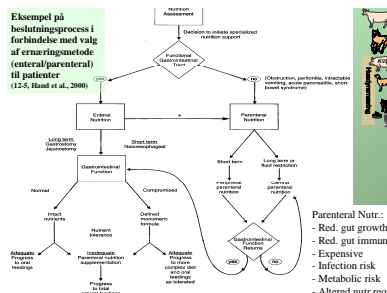
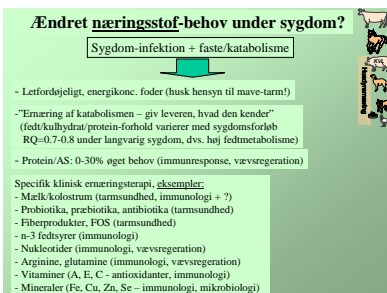
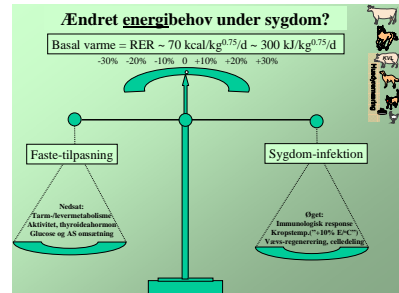
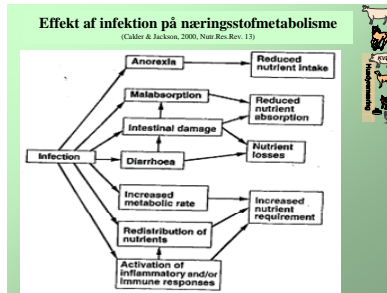
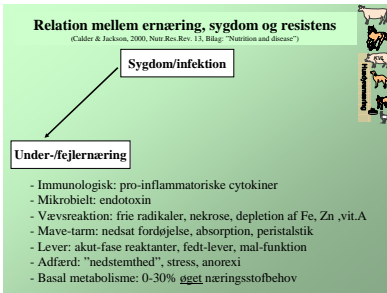


Den generelle ernæringstilstand - eller specifikke ernæringselementer påvirker 3 områder af immunsystemet

## Effekt af ernæring på immunitet (Cahill & Jackson, 2000, Nutr Rev 13)

Protein-energi eller vit./min. (vit.A, Fe, Zn, Se, Cu) undersøgt kan påvirke:

- Weight of thymus, spleen, tonsils
- Leucocyte counts
- T lymphocytes in blood
- CD4 cells in blood
- CD4: CD8 in blood
- Blood lymphocyte proliferation
- TNF, IL-1 and IL-6 production
- IL-2 and IFN-γ production
- B lymphocytes in blood
- Antibody response
- Immunoglobulin A in tears, saliva
- Thymulin levels in blood
- Activity of leucocytes to kill bacteria
- Delayed-type hypersensitivity response



**Cellulære mekanismer for "cross-talk" mellem bakterier og tarmmukosaens immunsystem**

(Bobby & Counts, 2000, Proc-Nutr-Sci, 53)

