

THEME course in Human Nutrition 2008

Evidence hierarchy

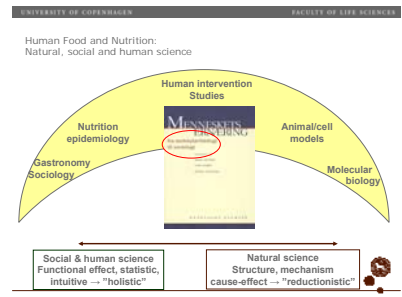
Introduction



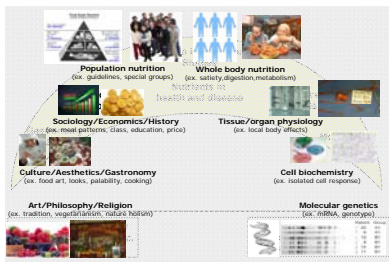
### Nutrition: Man's most intimate contact with surrounding nature

O<sub>2</sub>

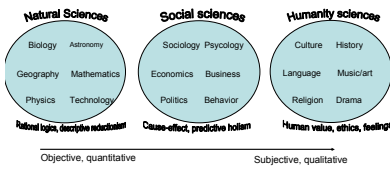
Place, date, unit, occasion etc.



### Human Nutrition: Natural, social and human science



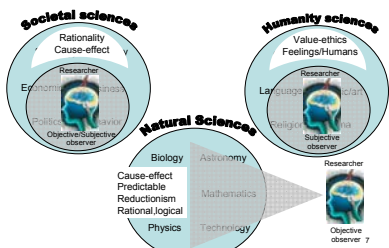
### What are the main fields of academic study?



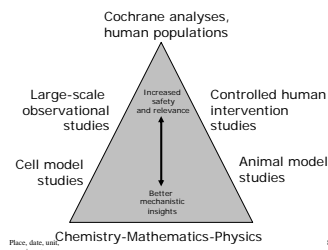
### The sciences – main categories:

	Topic	Study object	Field	Time Focus	Method
Humanity sciences	Human as acting, thinking and feeling beings	Cultural products like art, literature, philosophies	History, culture, literature, art, aesthetics, consciousness, language, religion, feeling	Present	Descriptive, analytical, interpretation, value estimation, Meaning
Social sciences	Organization of human behaviour	Material or immaterial production	Social structure, material production and distribution, politics, human control, trade and exchange	Future	Descriptive and mechanistic, observational, interviews, data collection and analysis, statistics
Natural science	Understanding and control of nature	Observation and calculation of nature phenomena	Physical matter, motion, energy, molecular structure and pathways, logical mathematical relations	Past	Experiments, verification, falsification, hypothesis testing, calculation, mechanism

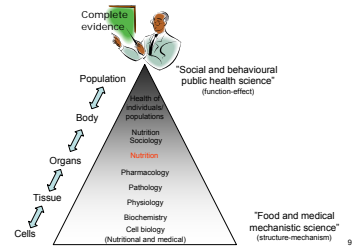
### The sciences – main categories:

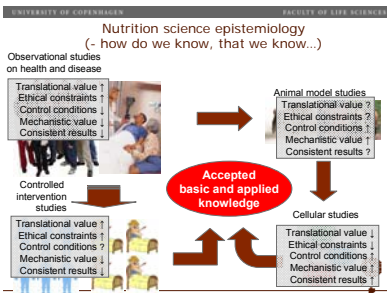


### Human Nutrition evidence hierarchy



### Nutritional/medical evidence hierarchy





## What is (natural) nutrition science?

(adapted from Henning Sørensen, Frydenlund, 2006)

- Reliability + Validity = Objectivity
- Use of acknowledged analytical techniques
- Wide publication of results
- Open towards criticism of theory and techniques
- Self-critique

Critical elements:  
**How** data is obtained? Attitude of researcher

Not critical:  
**What** is the result? **Who** is the researcher?

Do social and humanity "sciences" exist? 11

**Nutrition science epistemology**

Observational studies on health and disease:

### Secular Change in SI 2003: National Data 1

Low School Midlum,\* Christian Mølgaard,† Th. Kim F. Michaelsen\*

**Abstract**  
MICHAELEN, KIM, CHRISTIAN MØLGAARD, THORSEN, L.A., SØRENSEN, SØREN GABRIEL, and F. MICHAELSEN. Secular change in size at birth (1973 vs. 2003): National data from Denmark. *Am J Clin Nutr* 77: 1056-1061, 2003.

**Objective:** To explore whether body weight (BW) has increased in Denmark at the same level as in other high-income (HI) or whether body compositionally increased in leaner individuals (LI). We investigated the secular increase in ponderal index (PI), fat changes, and changes in body composition.

**Research Methods and Procedures:** The study included information from The Danish Medical Register including all single live births in Denmark (1973 vs. 2003) ( $n = 1,043,245$ ; BW, kg, gestational week at age, and sex/kg were used). From 1995 and 2000, we used data from the Danish National Cohort Study (DNCS) ( $n = 12,019$ ).

**Results:** Mean birth weight (BW) increased from 3.52 kg in 1973 to 3.67 kg in 2003. Mean gestational week at birth increased from 37.3 weeks in 1973 to 37.7 weeks in 2003. Mean ponderal index (PI) increased from 10.6 kg/m<sup>3</sup> in 1973 to 11.0 kg/m<sup>3</sup> in 2003. Mean fat-free mass (FFM) increased from 2.28 kg in 1973 to 2.43 kg in 2003. Mean fat mass (FM) increased from 0.24 kg in 1973 to 0.31 kg in 2003. Mean lean body mass (LBM) increased from 2.04 kg in 1973 to 2.12 kg in 2003. Mean body fat percentage (BF%) increased from 11.8% in 1973 to 12.5% in 2003. Mean muscle mass (MM) increased from 1.54 kg in 1973 to 1.61 kg in 2003. Mean bone mineral content (BMC) increased from 0.08 kg in 1973 to 0.09 kg in 2003. Mean bone mineral density (BMD) increased from 0.12 g/cm<sup>3</sup> in 1973 to 0.13 g/cm<sup>3</sup> in 2003. Mean bone mineral content (BMC) increased from 0.08 kg in 1973 to 0.09 kg in 2003. Mean bone mineral density (BMD) increased from 0.12 g/cm<sup>3</sup> in 1973 to 0.13 g/cm<sup>3</sup> in 2003.

**Nutrition science epistemology**

### Maternal Fish Oil Supplementation and Birth Weight: A Meta-Analysis

Lee London,† Joseph A. Sparano,† and David H. Gustafson,†

**Abstract:** Objective: To assess the effect of maternal fish oil supplementation on birth weight. Design: Meta-analysis of randomized controlled trials. Setting: Various countries. Participants: Pregnant women. Measurements and Main Results: We identified 10 studies involving 17,900 women and 18,200 infants. The mean birth weight of infants in the fish oil group was significantly higher than in the control group (mean difference, 110 g; 95% CI, 50-170 g). Conclusion: Maternal fish oil supplementation during pregnancy is associated with a small but significant increase in birth weight.

Controlled intervention studies

**Nutrition science epistemology**

### Nutritional Methodology

#### Caco-2 Cells Can Be Used to Assess Human Iron Bioavailability from a Semipurified Meal

Angela P. Au and Mary B. Rizzo†

Department of Food Science and Human Nutrition, Iowa State University, Ames, IA 50011

**Abstract:** A Caco-2 model was used to assess the effect of dietary iron on iron bioavailability from a semipurified meal. The effect of dietary iron on iron bioavailability was assessed by measuring the amount of iron absorbed by Caco-2 cells from a semipurified meal. The amount of iron absorbed was measured by measuring the amount of iron in the culture medium. The amount of iron absorbed was significantly higher from the meal with the highest iron content (10 mg iron/meal) than from the meal with the lowest iron content (1 mg iron/meal).

Cellular studies

**Nutrition science epistemology**

### BMC Microbiology

#### Dietary carbohydrate source influences molecular fingerprints of the rat fecal microbiota

Tim B. Clarke,†, Hans Holmberg,†, Gunnar Holmberg,†, and Lars O. Holmberg†

**Abstract:** Objective: To determine the effect of dietary carbohydrate source on the molecular fingerprints of the rat fecal microbiota. Design: Experimental study. Setting: Laboratory. Participants: Rats. Measurements and Main Results: We determined the molecular fingerprints of the rat fecal microbiota from rats fed with different carbohydrate sources. The molecular fingerprints were significantly different between the groups fed with different carbohydrate sources.

Animal model studies

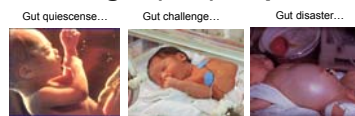
**TOPIC OVERVIEW**

Pregnancy (P) - Fetus (F) - Newborn (N) - Infant (I) - Child (C) - Adolescent/Teenager (T) - Adult (A) - Elderly (E)

TOPIC	Exam	Level	Intervention	Health	Basic	Experimental	Intervention	Health
Exam	Level	Intervention	Health	Basic	Experimental	Intervention	Health	Health
Fiber	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C
Non-diet	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C
Protein	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C
Fat	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C
Minerals	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C
Vitamins	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C
Alcohol	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C
Milk	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C
Milkfat	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C
Cocoa	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C
Iron	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C	P-F-N-I-C

Example of report hypothesis:  
Excess milk protein intake leads to later obesity

## Preterm gut (mal)adaptation



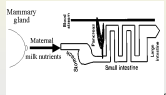
## CASE study: Human observational

- Following birth, preterm babies have severe digestive problems. You have unlimited resources to work with relevant nutrition observations. Suggest 3 experiments to understand and/or solve the problem? Indicate specific questions/methods



### CASE study: Human intervention

- Following birth, preterm babies have severe digestive problems. You have unlimited resources to work with nutrition intervention. Suggest 3 experiments to understand and/or solve the problem? Indicate specific questions/methods



19

### CASE study: Animal models

- Following birth, preterm babies have severe digestive problems. You have unlimited resources to work with pigs as a model animal. Suggest 3 experiments to understand and/or solve the problem? Indicate specific questions/methods



20



20

### CASE study: Cell models

- Following birth, preterm babies have severe digestive problems. You have unlimited resources to work with immature intestinal cells as a model. Suggest 3 experiments to understand and/or solve the problem? Indicate specific questions/methods



21



21

### Nutrition of an immature gut?

- How to understand and/or solve the problem?

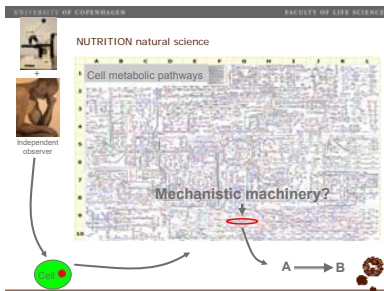
Q: Mode of birth?  
Exp: Caesarean section versus vaginal birth  
Anal: Hormonal levels, gut microbiology?



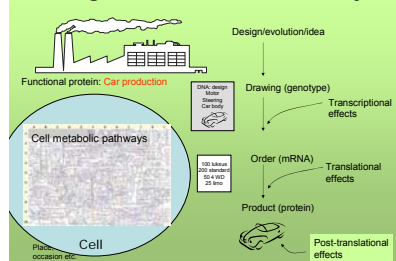
22

Observational studies  
Intervention studies  
Animal model studies  
Tissue/cell model studies

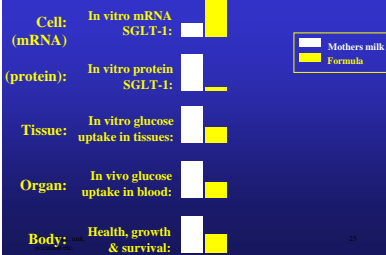
22



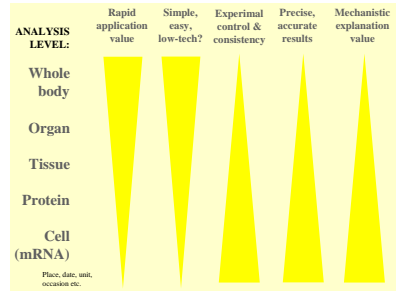
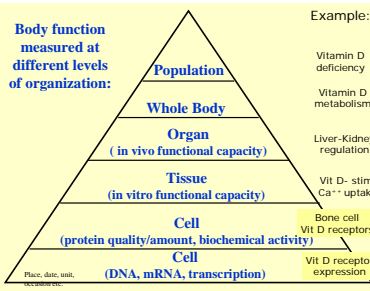
### Biological cells like a car factory:



### Glucose-uptake in preterm neonates:



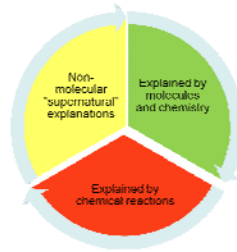
23



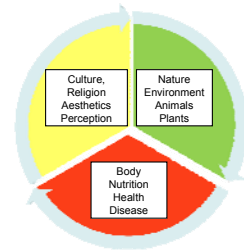
**The pessimistic view:  
In Nutrition Science we choose  
to measure based on:**

- 1) Own insight and science expertise
- 2) Tradition - what do we usually do
- 3) Access to competent collaboration
- 4) Available technical equipment
- 5) What is easiest to perform/interpret
- 6) What is most popular at this time
- 7) What gets into the "best" journals
- 8) Economical/social working structure
- 9) Solid science argument and rationale
- 10) Greatest possible basic/applied outcome

**The nature of biological systems**



**Human relationship with nature**



**Human relationship with nature**



**Food = experience?**  
(- Not only fuel for chemical machine, advertisement in a Danish Newspaper Nov. 2007)

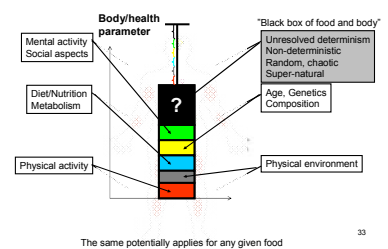
Afternoon tea.

Food and meals are becoming part of the "experiential living"  
Tea is a good example of food that has a role beyond nutrition

Tea functional food?  
Tea for go(ol)d health?  
Tea meditation?

Adventure om dagen. Lüksus resten af døgnet.  
Bestil din rejse på topas.dk

**Health determinants:**



**PHD course:  
Food, medicine and philosophy**

What determines what we choose to eat? Instinct, culture, religion, or science? How important is food for human health, and what is the role of culture and religion for health choices? Diets and food supplements previously restricted to geographical regions are now becoming available world wide. The dietary habits of individuals and populations are determined by more than food availability, technology and science. Culture, religion and philosophical views of nature and the human body also play important roles.

**"Food, Medicine and Philosophy in East and West"**  
3-week international Scandinavian-Chinese PhD course:

Improved understanding of:  
- Diet choices in East & West  
- Globalization of diet & health  
- Basic science epistemology in food and medicine fields  
- Science synergy & creativity  
- East-West cultural diversity

Researchers:  
Food science  
Food technology  
Human nutrition  
Agriculture

Medicine:  
Pharmacy  
Medicine  
Health/Exercise

Philosophy:  
Philosophy  
Religion  
Theology  
Sociology

Learning by observing contrasts

Field studies, Lectures, report

**The function of meals?**

