EAAP 2008: 59th Annual Meeting
Vilnius, Lithuania

Functional Food of Animal Origin

Session 6

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Functional Food of Animal Origin:

Refinement of nutrition or a padding for the market?

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Functional Food of Animal Origin: What's That?

Scientific Concepts of Functional Foods in Europe Consensus Document:
British Journal of Nutrition (1999), 81, S1-S27

ILSI Europe International Symposium on Functional Food; Malta 9 – 11 May 2007
http://europe.ilsi.org/A

Definition:

*A food can be regarded as „functional" if it is satisfactorily **demonstrated** to affect beneficially one or more target **functions** in the body, **beyond** adequate **nutritional effects** in a way which is relevant to either an **improved state of health** and well-being and/or the **reduction of risk of disease**.*

Nils-Georg Asp, Lund University, Sweden (2007)

Functional Food of Animal Origin: What's That?

Functional Foods are Foods with Claims!

Two basic types of claims:

1. **What the product contains: Nutrion claims**
   (comparative claims, energy reduced)
   (nutrient increased or reduced, light products)

2. **What the product does: Health claims**

Nils-Georg Asp, Lund University, Sweden (2007)

Functional Food of Animal Origin: What's That?

Food ***Functional Food***

Natural

- A food to which a component has been added

- A food from which a component has been removed

- A food in which the bioavailability of one or more components has been modified

FUNCTIONAL FOODS must remain FOODS (no drugs)

(FUFOSE, 1999)

Functional Food of Animal Origin: What's That?

Functional Foods are Foods with Claims!

The establishment of nutrient profiles should take into account the content of different nutrients and substances with a **nutritional or physiological effect, in particular those such as fat, saturated fat, trans-fatty acids, salt/sodium and sugars, excessive intakes of which in the overall diet are not recommended**, as well as **poly- and mono-unsaturated fats, available carbohydrates other than sugars, vitamins, minerals, protein and fiber**. When setting the nutrient profiles, the different categories of foods and the place and role of these foods in the overall diet should be taken into account and due regard should be given to the various dietary habits and consumption patterns existing in the Member States.

REGULATION (EC) No 1924/2006 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 20 December 2006 on nutrition and health claims made on foods

Functional Food of Animal Origin: What's That?

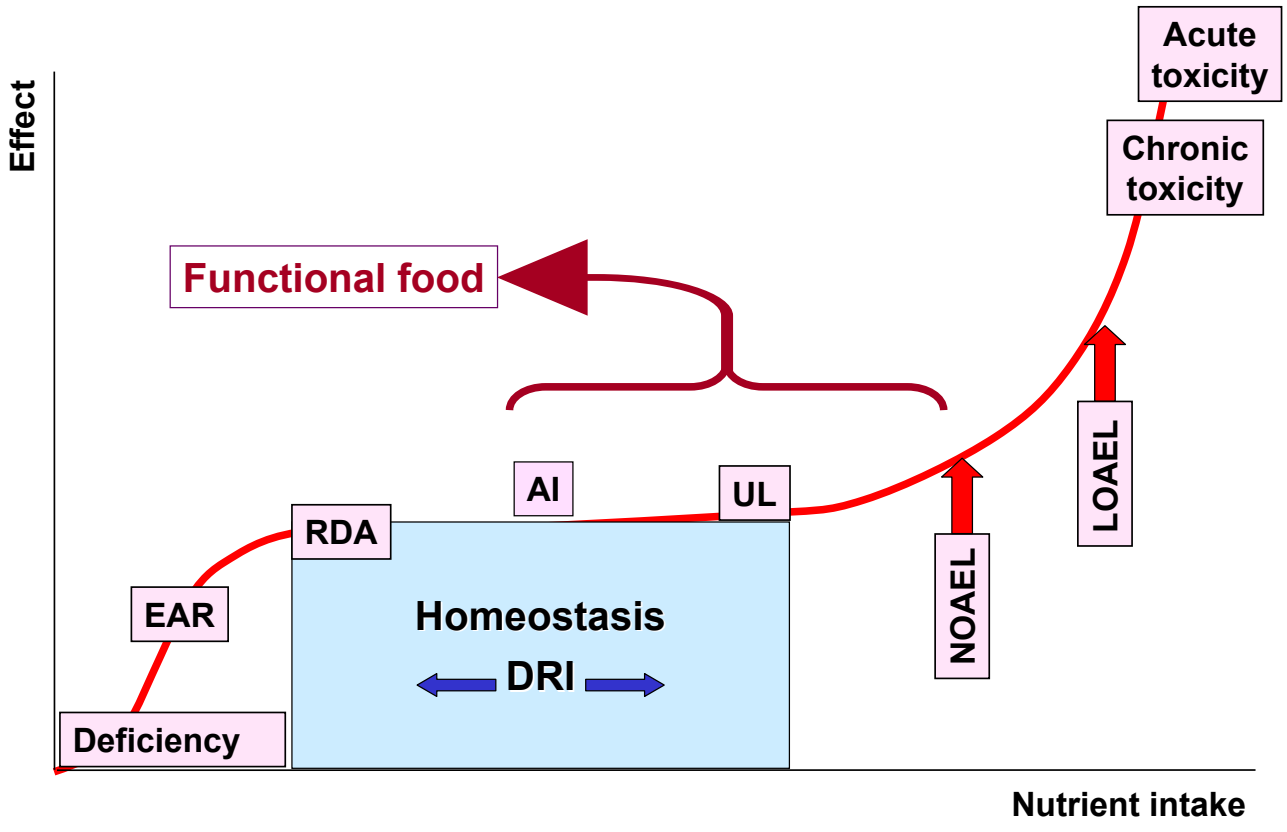
Functional Foods are Foods with Claims!

Hot areas for Functional Food development:

- **Diet-related cardiovascular disease**
- **Bone health and osteoporosis**
- **Physical performance and fitness**
- **Body weight regulation, insulin sensitivity and diabetes**
- **Diet related cancer**
- **Mental state and performance**
- **Gut health and immunity**

Passclaim: Nils-Georg Asp, Lund University, Sweden (2007)

Nutrient Requirements



Nutrient Content of Typical Animal Products (selection)

	DM	ME	CP	CHO	CL	Cholest.
Per 100 g	**g**	**kJ**	**g**	**g**	**g**	**mg**
Milk						
Cow	**12.8**	**280**	**3.3**	**4.7**	**3.8**	**12**
Others*	**13 – 17**	**280 – 403**	**3.6 – 5.3**	**4.2 – 4.7**	**3.9 – 6.3**	**10 - 12**
Meat (lean)						
Ruminants	**29 - 32**	**560 - 695**	**21 - 23**	**< 1**	**4.5 – 9**	**46 - 58**
Pig	**30 - 35**	**580 - 845**	**19 -23**	**< 1**	**5 – 14**	**56 - 60**
Poultry	**27 - 34**	**456 - 685**	**18 - 25**	**< 1**	**1 – 10**	**63 - 94**
Eggs	**25.6**	**645**	**12.8**	**0.7**	**11.3**	**396**

* From goat to sheep

Souci-Fachmann-Kraut (2000) and Swiss Meat Table (2006)

! Enormous variation between species, origin, animal feeding and different products !

Swiss Table on Nutrient Composition of Meat 2006

Pork Loin

n = 15

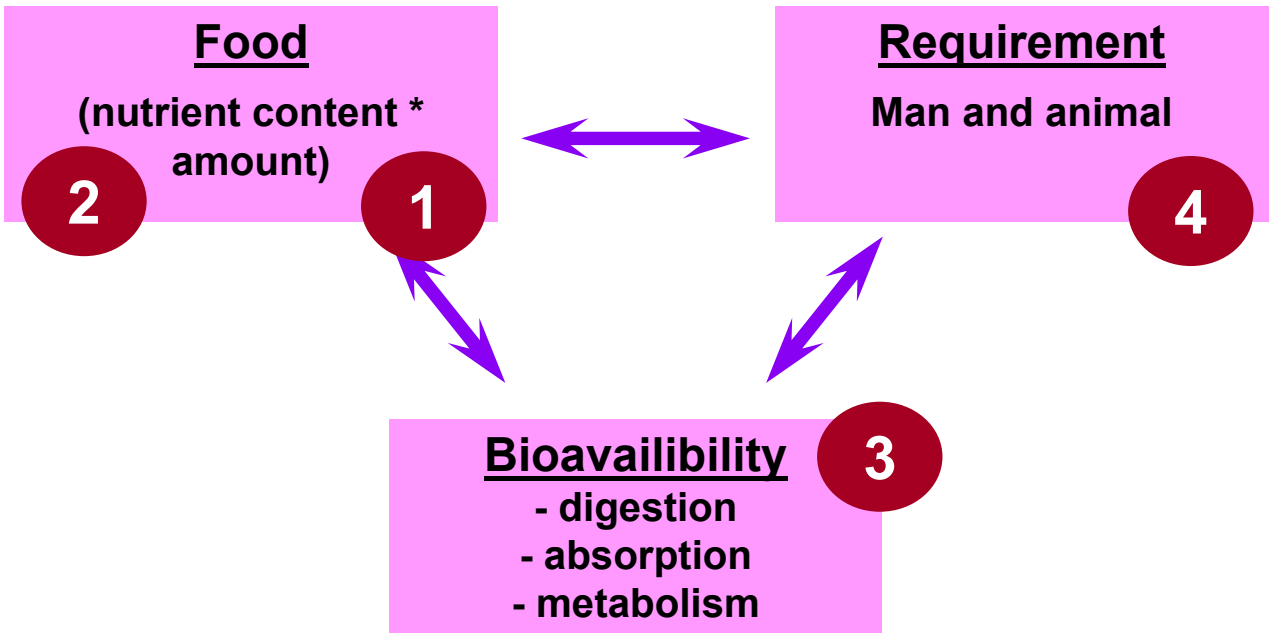
Constituents	Unit	Average	*SD*	Min	Max
Main ingredients					
Energy	kJ	579	*54.68*	*486*	*670*
	kcal	138	*13.30*	*115*	*160*
Water	g/100g	69.5	*1.38*	*67.2*	*71.5*
Total Nitrogen	g/100g	3.7	*0.11*	*3.4*	*3.9*
Protein	g/100g	22.9	*0.66*	*21.5*	*24.4*
Fat	g/100g	5.1	*1.50*	*2.5*	*8.0*
Ash	g/100g	1.2	*0.15*	*1.0*	*1.6*
Minerals and trace elements					
Sodium	mg/100g	38	*4.11*	*33*	*45*
Potassium	mg/100g	368	*16.76*	*327*	*396*
Calcium	mg/100g	3.7	*0.27*	*3.3*	*4.1*
Magnesium	mg/100g	21	*1.59*	*18*	*23*
Phosphorus	mg/100g	202	*8.32*	*182*	*215*
Iron	mg/100g	0.4	*0.06*	*0.3*	*0.5*
Zinc	mg/100g	1.3	*0.15*	*1.1*	*1.7*
Manganese	µg/100g	7.7	*2.74*	*1.9*	*11.0*
Copper	µg/100g	41	*22.98*	*4*	*71*
Molybdenum	µg/100g	1.1	*0.51*	*0.4*	*1.7*
Selenium	µg/100g	16	*4.73*	*11*	*25*
Lead	The concentrations of these two elements are much lower than the				
Cadmium	than the levels allowable in meat (100 and 50 µg/100 g)				

Swiss Table on Nutrient Composition of Meat 1990 - 2006

Species	Cut	Total fat g/100g		Protein g/100g	
		2006	*1990*	2006	*1990*
Beef	Entrecote	4.5	*6.4*	23.2	*22.1*
	Braising steak	1.8	*3.5*	22.4	*21.6*
	Simmer meat lean	5.5	*7.0*	20.7	*19.6*
	Simmer meat streaky	16.6	*21.8*	19.5	*17.3*
	Minced meat	7.5	*8.9*	21.6	*19.8*
Veal	Chop *(without bone)*	8.7	*13.8*	20.7	*18.9*
	Braising steak	1.8	*1.6*	21.9	*22.2*
	Breast	14.5	*14.5*	18.3	*18.7*
Pork	Chop *(without bone)*	10.4	*10.9*	21.4	*20.6*
	Braising steak	4.9	*7.8*	20.6	*19.4*
	Minced meat / Ragout	6.6	*6.9*	20.8	*20.4*
Lamb	Chop *(without bone)*	9.5	*20.6*	20.2	*17.3*
	Gigot	8.2	*10.5*	20.2	*19.6*
Chicken	Breast with skin	6.5	*5.9*	23.3	*21.0*
	Breast without skin	1.0	*1.8*	24.6	*22.1*
	Leg with skin	10.2	*12.6*	17.9	*17.6*
	Led without skin	6.2	*8.4*	19.7	*18.2*
Turkey	Escalope	1.1	*1.3*	25.6	*24.1*

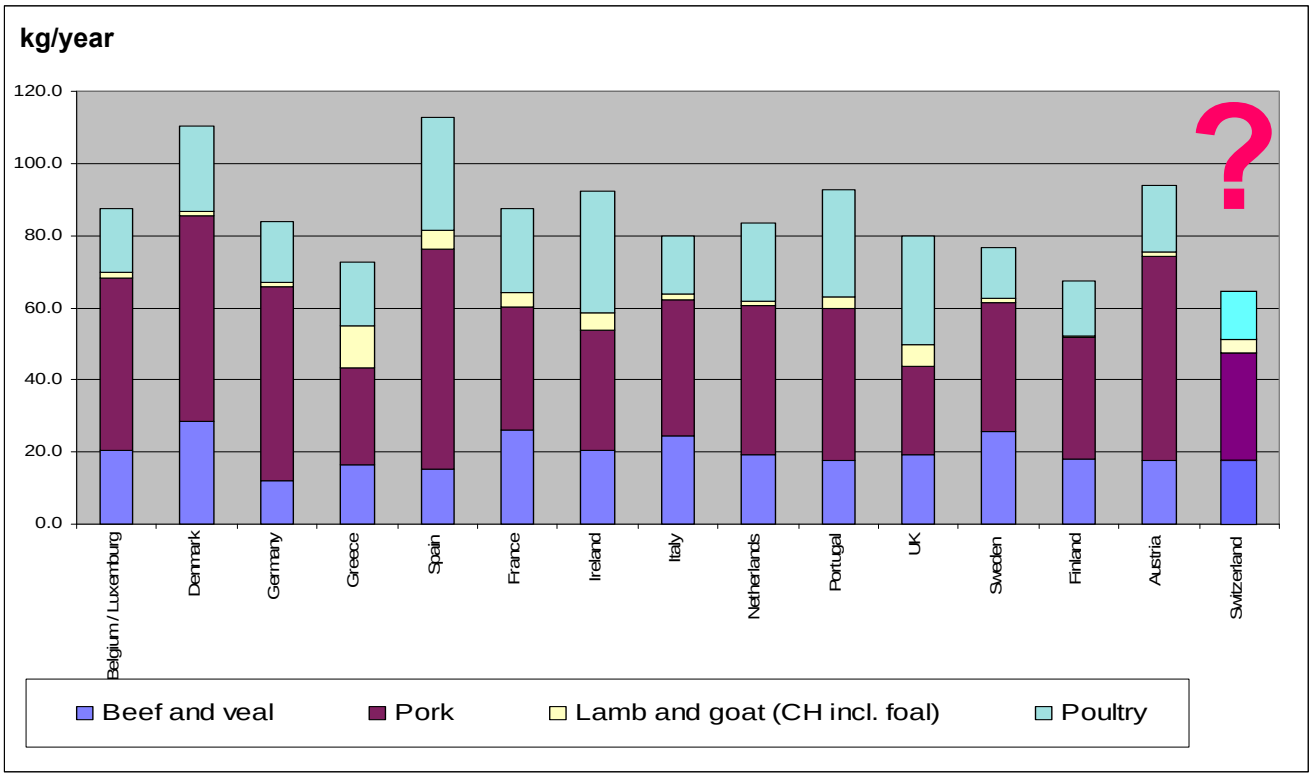
Nutrients and Nutrient Requirement

Farm animal and man!!!



Meat Supply in Countries of EU and Switzerland (without Fish) 2006

[Data from ZMP (EU) and Proviande (CH), 2007] in kg/year



Meat Production and Supply in USA

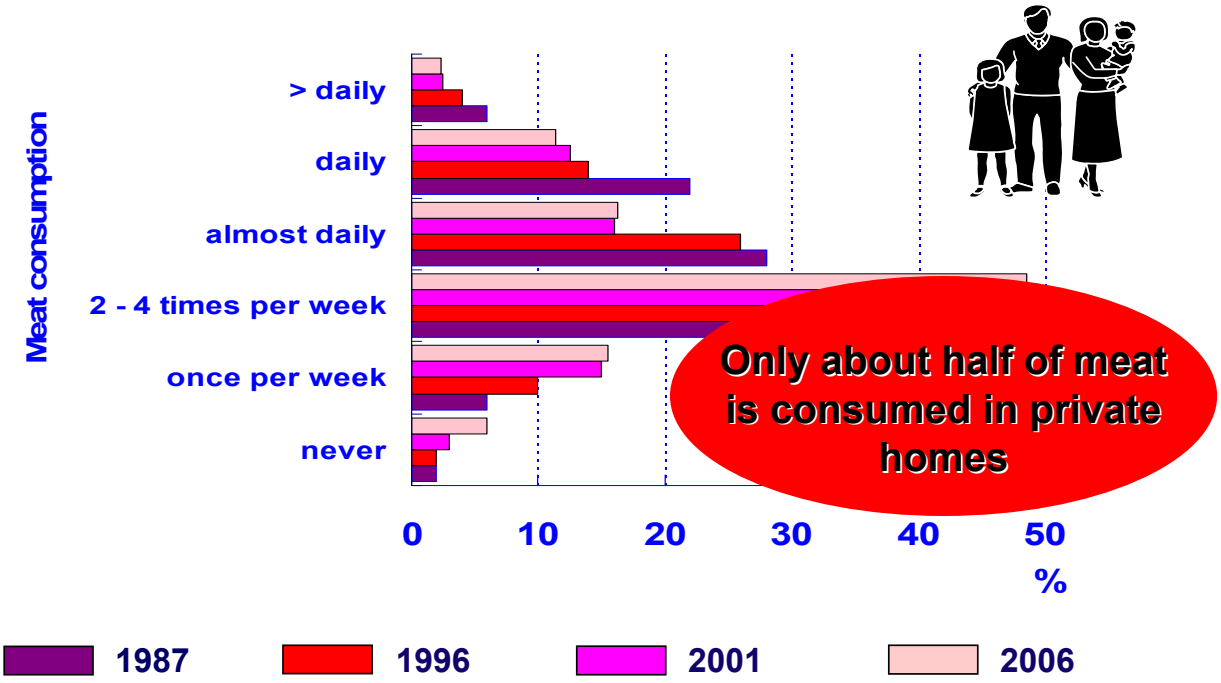
Estimated carcass - retail – boneless (g/d)	carcass	retail	USA (2005) boneless
pork	79	62	58
beef	116	81	78
veal	1	1	1
sheep & goat	2	1	1
slaughter animals	**198**	**145**	**138**
poultry	146	123	92
fish & shellfish	?	20	?
total meat	**≈ 370**	**288**	**≈ 240**

Sources: USA: ers.usda.gov/Data/FoodConsumption/FoodAvailSpreadsheets.htm#mtredsu (2007)

Habits of Meat Consumption in Switzerland

(private homes)

(GSF-Proviande / IHS, 1987, 1996, 2001 & 2006)

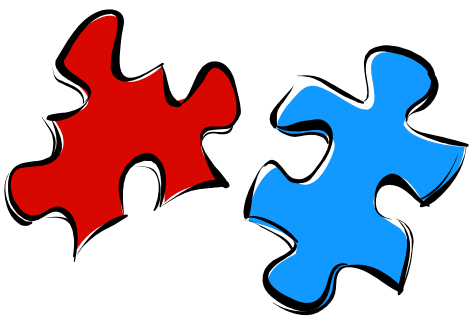


Functional Food of Animal Origin

Food tables contain usually data only from raw food. Losses from cooking and dissection of adipose tissues are usually not considered.

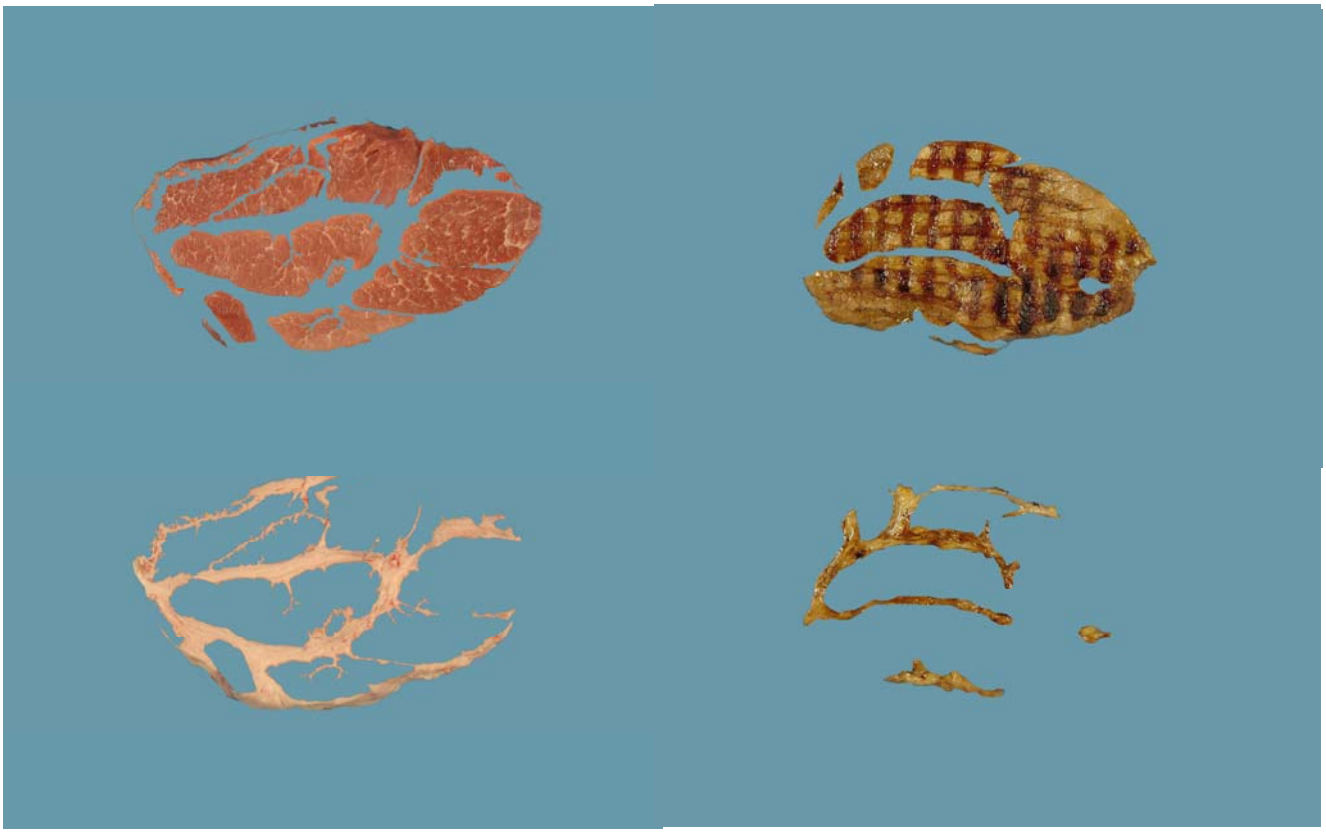
Improved estimation of „real“ nutrient intake by:

- **Analysis of fresh and cooked meat cuts**
- **Split into meat and adipose tissues**



Puzzle study:
N. Gerber et al., 2007

Puzzle-Study: Analysed Cuts Nadine Gerber 2007



Puzzle-Study: Fat Losses Nadine Gerber 2007

Fat losses by cooking **18 – 44 %**

+

Fat losses by dressing fat tissues **24 – 59 %**

Total fat losses **50 – 78 %**

Puzzle-Study: Mineral Losses

Nadine Gerber 2007

- Losses depend primarily method of cooking
- Dry cooking
  - Losses from 10 to 20%
- Wet cooking (boiling)
  - Losses from 10 to 20%
  - Washing out effects
  - Depends on use of meat stock

Puzzle-Study: Vitamin Losses

Nadine Gerber 2007

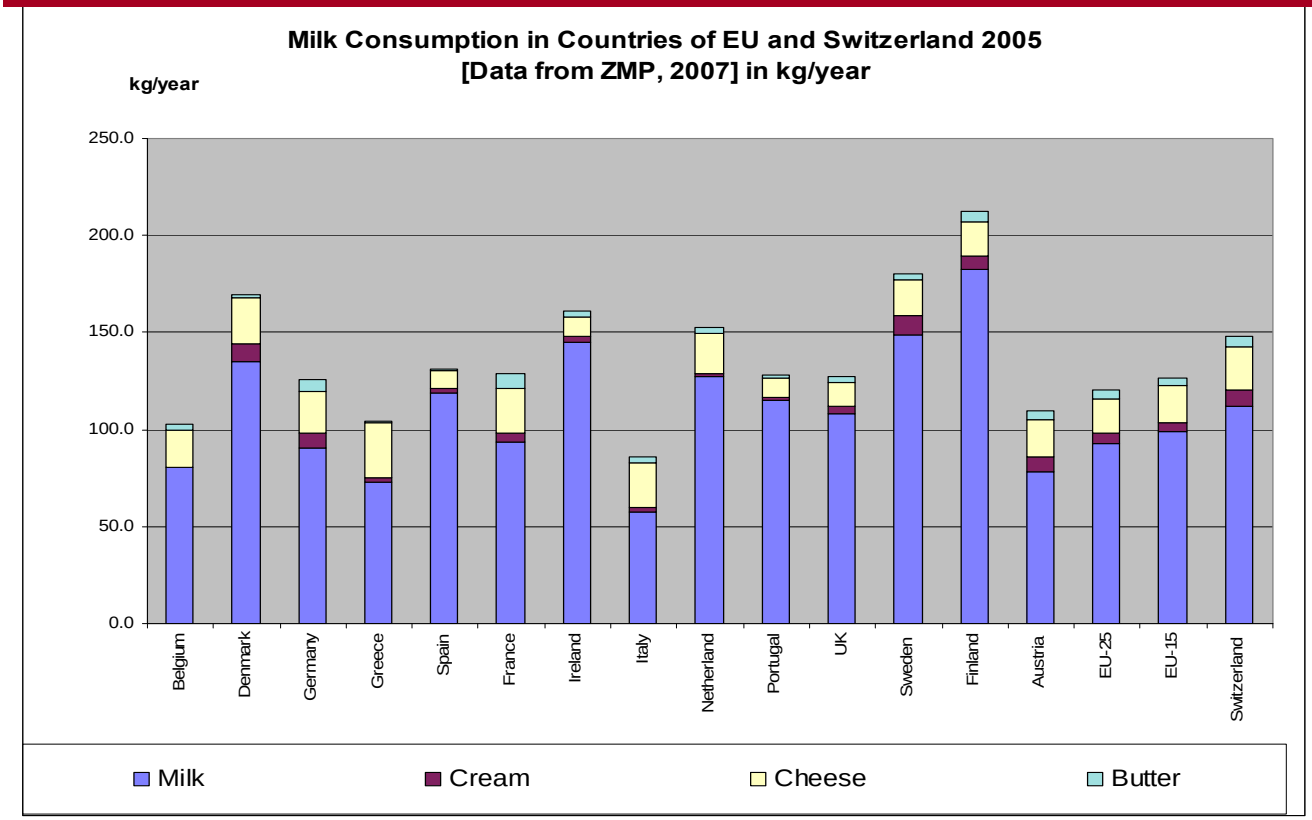
Losses of all analyzed vitamins

- Fat soluble vitamins less than water soluble
- Water soluble vitamins:

  Thiamin (B_1) biggest losses from 73 to 100%
  (inactivation by heat or extraction)

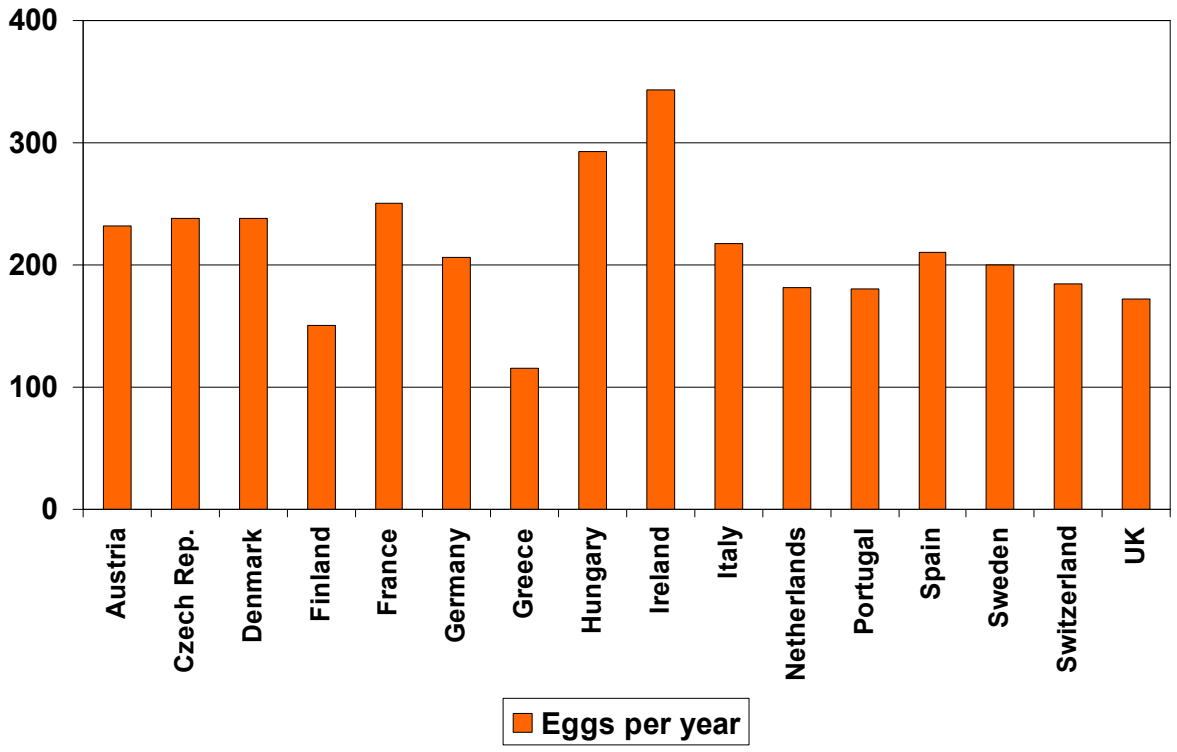
Milk Supply in Countries of EU and Switzerland 2005

Data from ZMP, 2007



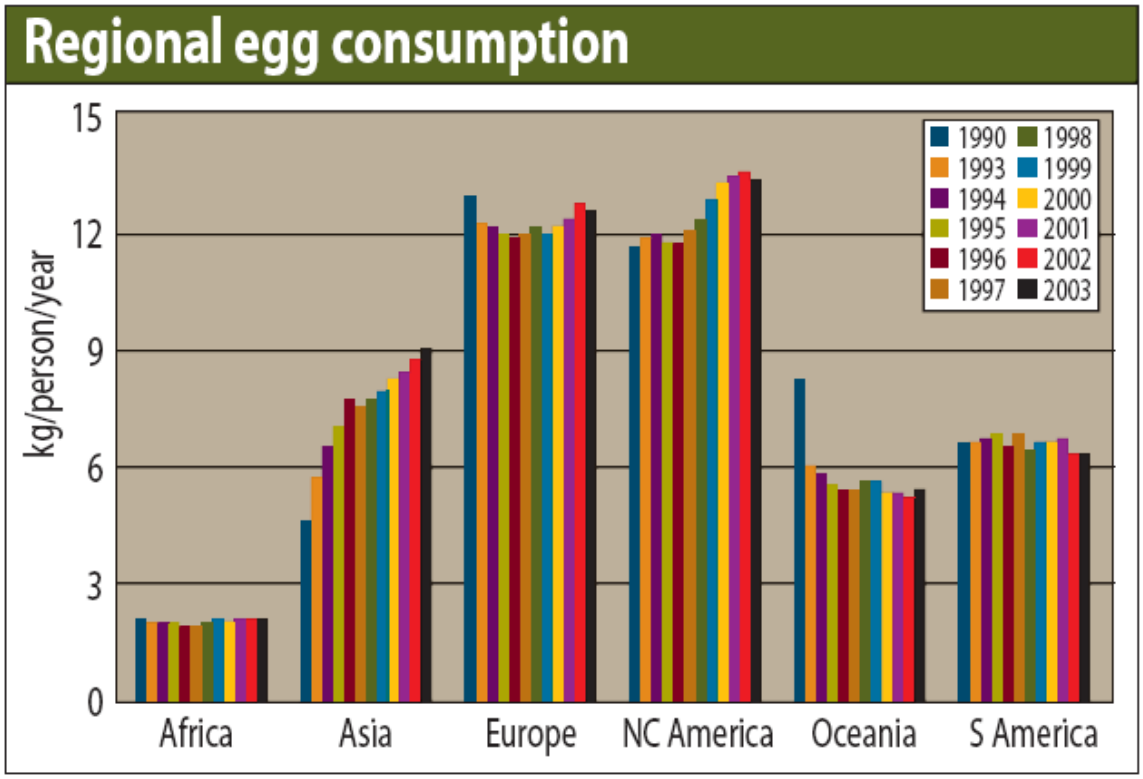
Egg Supply in Countries of EU and Switzerland 2005

www.wattexecutiveguide-digital.com, 2007

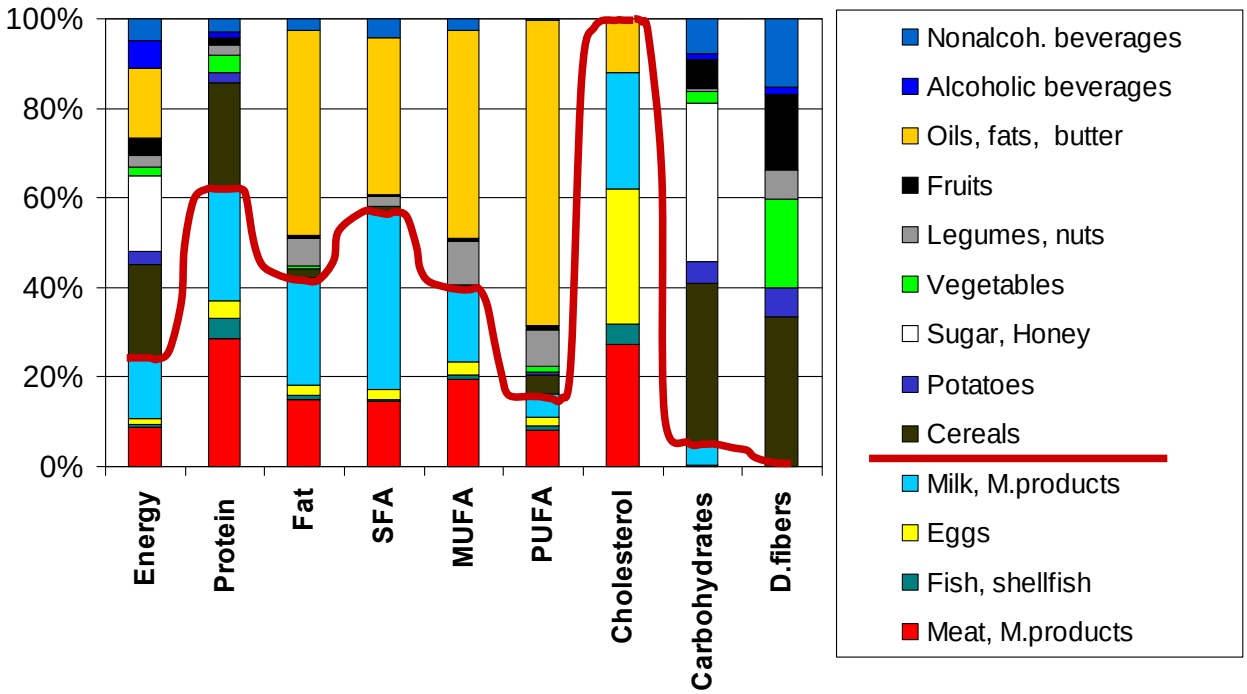


Egg Supply in World Regions 1990 - 2003

www.wattexecutiveguide-digital.com, 2008

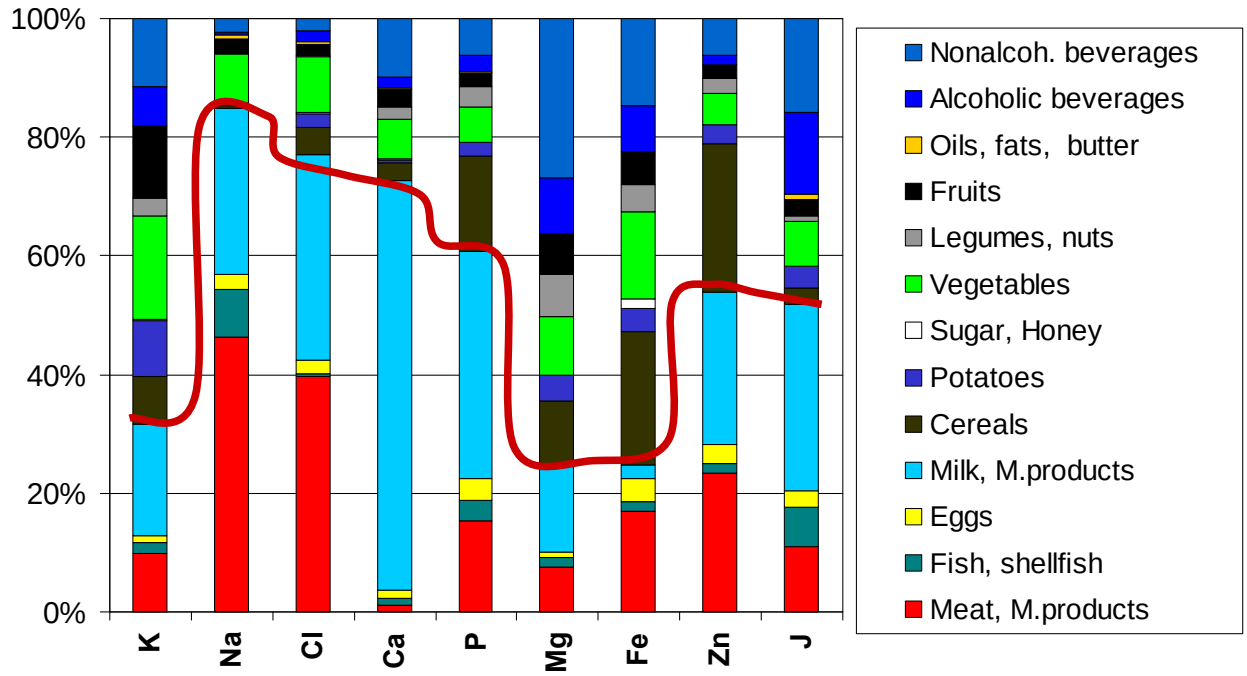


Nutrient Supply in Switzerland 2001/02: Macro Nutrients



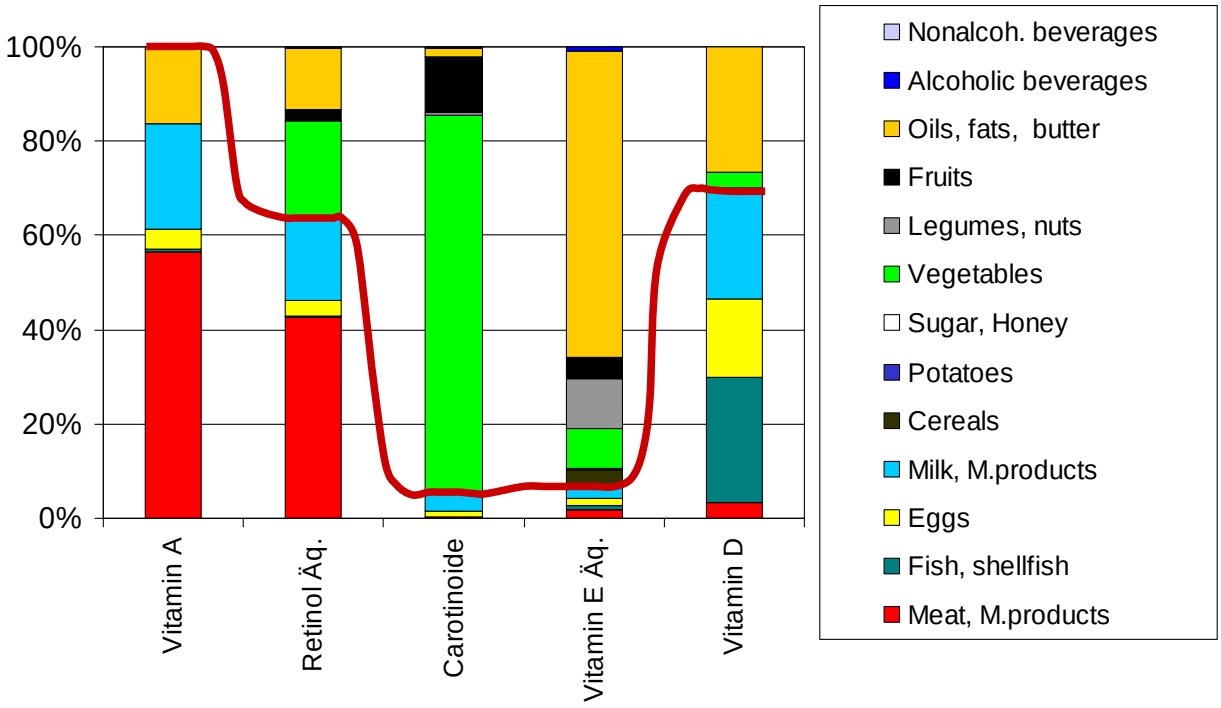
(BAG. 5. Schweizerischer Ernährungsbericht, Bern, 2005)

Nutrient Supply in Switzerland 2001/02: Minerals



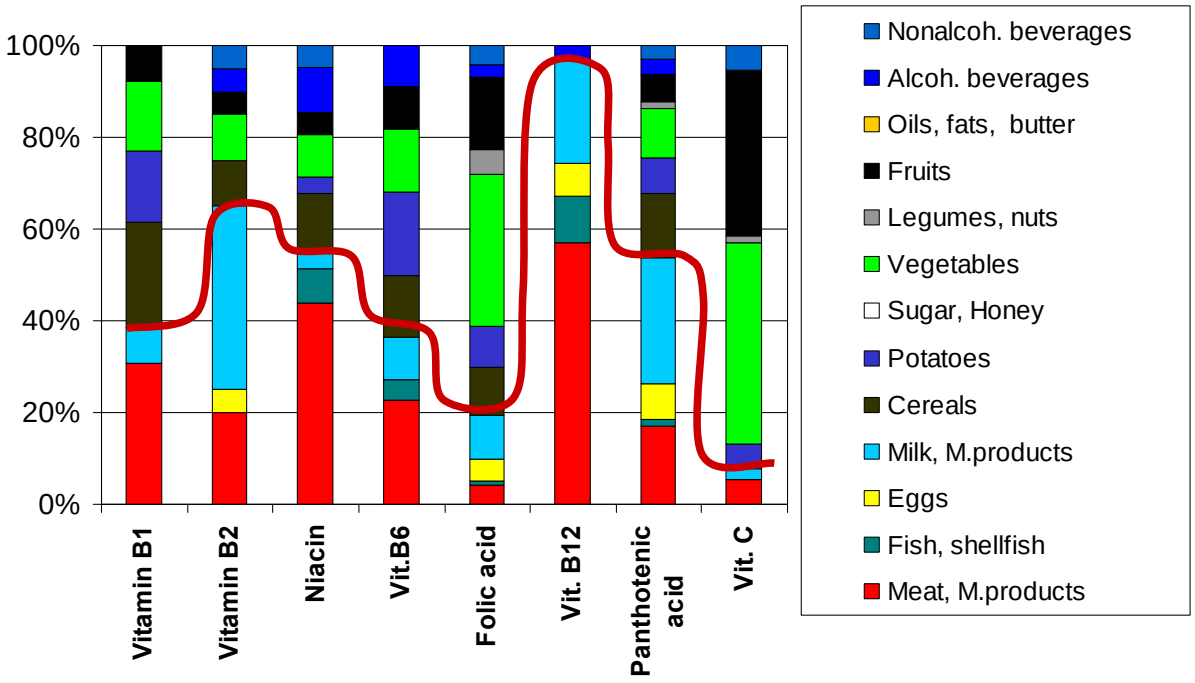
(BAG. 5. Schweizerischer Ernährungsbericht, Bern, 2005)

Nutrient Supply in Switzerland 2001/02: Fat Soluble Vitamins



(BAG. 5. Schweizerischer Ernährungsbericht, Bern, 2005)

Nutrient Supply in Switzerland 2001/02: Water Soluble Vitamins



(BAG. 5. Schweizerischer Ernährungsbericht, Bern, 2005)

Iron, Heme Iron And Zinc Intake Provided by Daily Lean Meat Consumption in Switzerland 2004 (M. Leonhardt, 1999)

Meat cut	meat consumption g/d	Thiamin intake mg/d	Riboflavin intake mg/d	Vitamin E intake mg/d	Iron intake mg/d	Zink-intake mg/d
Pork	***49***	***0.40***	***0.11***	***0.17***	***0.5***	***1.7***
Beef	29	0.01	0.04	0.06	0.5	1.6
Veal	10	0.01	0.02	0.03	<0.1	0.3
Chicken	14	0.02	0.03	0.12	0.1	0.2
Total	**102**	**0.44**	**0.20**	**0.38**	**1.1**	**3.8**
DACH (2000) *	**men:**	**1.3 (34 / *31*)**	**1.5 (13 / *7*)**	**15 (3 / *1*)**	**10 (11 / *5*)**	**10 (38 / *17*)**
recommendation	**women:**	**1.0 (44 / *40*)**	**1.2 (17 / *9*)**	**12 (3 / *1*)**	**15 (7 / *3*)**	**7 (54 / *24*)**
** in parentesis: Contribution of meat consumption (in %) to cover the recommendations of DACH (2000)*						
** In italics: Contribution of pork consumption (in %) to cover the recommendations of DACH (2000)*						

35 % Vit. B1 from pork

10 to 30 % available Fe
30 to 50 % available Zn

Contribution of Meat Consumption on the Nutrient Intake in Switzerland

Swiss Nutrition Report 2005 and N. Gerber 2007

Meat	Consumption	Iron	Zinc	Selenium
	g/d	mg/d	mg/d	µg/d
Pork	60	0.4	1.3	9.7
Beef	25	0.4	1	2.4
Veal	9	0.1	0.2	0.9
Lamb	3	0.1	0.1	0.4
Poultry	24	0.1	0.2	5.4
Total	121	1	1.9	18.8

	Men	Women	Men	Women	estimated values
Recommendation D-A-CH [a]	10 mg/d	15 mg/d	10 mg/d	7 mg/d	30-70 µg/d
Contribution of meat	**10%**	**7%**	**27%**	**39%**	**27-63%**

[a] DGE – ÖGE – SGE

Estimated Daily Intake of Animal Food (EU)

Consumption of food from animal origin (Commission Directive 2001/79/EC) or SCOOP data (EC, 2004)

Tissue/product	EU Guidelines daily intake (g)	Se load µg/d	SCOOP data daily intake (g)	Se load µg/d
Muscle meat	300	105	105	37
Liver	100	80	35	28
Kidney	50	125	10	9
Fat	50	-	?	-
Milk	1'500	68	280	13
Egg	100	50	36	18
Σ		428		105

Contribution of Meat to Human Nutrition

Desired	Milk	Meat	Egg
Protein	***	***	***
essential amino acids	***	***	***
Carbohydrates	**		
Lipids	*	**	**
Ess. FA	*	**	***
CLA	***	**	*
Minerals (generally well absorbed)	Ca others	Fe, Zn, Se others	Se others
Vitamins	B vit., vit.D others	B vit. others	B vit., vit.E others

Contribution of Meat to Human Nutriton

Desired

Protein
Ess. amino acids

Lipids
Ess. fatty acids, CLA, ...

Minerals
Fe, Zn, Se, Cu, others
(generally well absorbed)

Vitamins
B vitamins, others

Undesired

Purins (bowels)

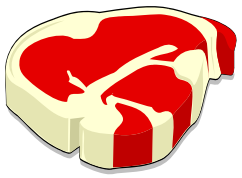
Total fat, cholesterol,
sat. FA (<C16), to many PUFA

ev. Na in meat products

ev. Vit. A in bowels (liver)

How Can we Influence Meat Quality by Nutrition

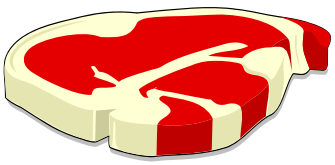
Protein
Essential amino acids — hardly
Purines — hardly



Fat
Total fat — yes
Fatty acids (PUFA, MUFA, SFA) — yes — most FA
Cholesterol — hardly

How Can we Influence Meat Quality by Nutrition

Minerals
Fe, Zn, Se, others — yes for Zn, Se



Vitamins
B - vitamins — hardly
Fat soluble vitamins — yes — vit. A in liver

Residues — hardly
Additives — hardly — If properly applied

Functional Food of Animal Origin:

Refinement of nutrition or a padding for the market?

Milk, meat and eggs contribute (eaten in reasonable amounts) significantly to cover the nutrient requirements of men in a highly natural way. They do not need the claims as FUNCTIONAL FOOD.

Negative nutritional aspects are often overvalued.

Fresh food or products from animal origin can be enriched via animal nutrition or with supplements during processing.