Seafood and gut health

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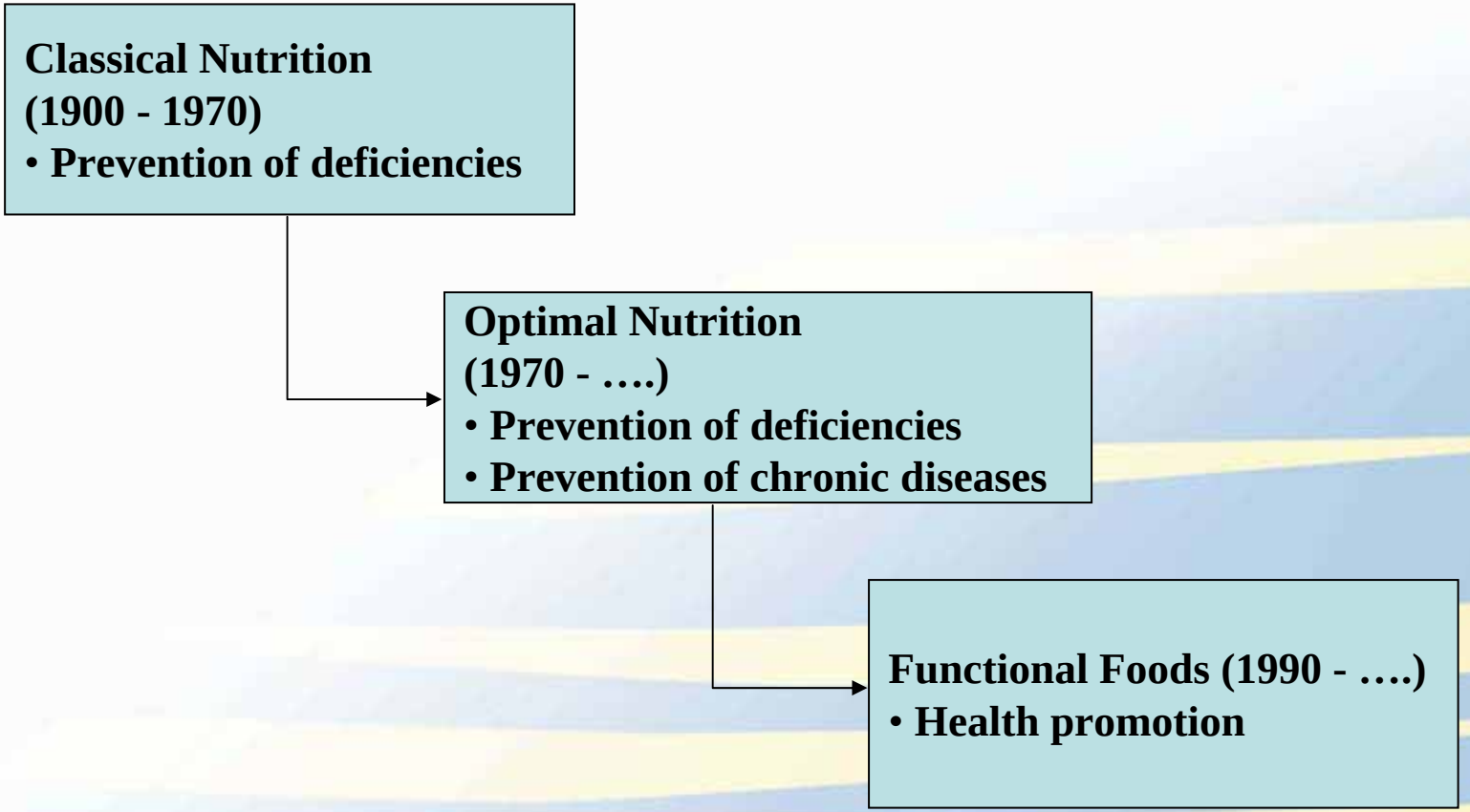
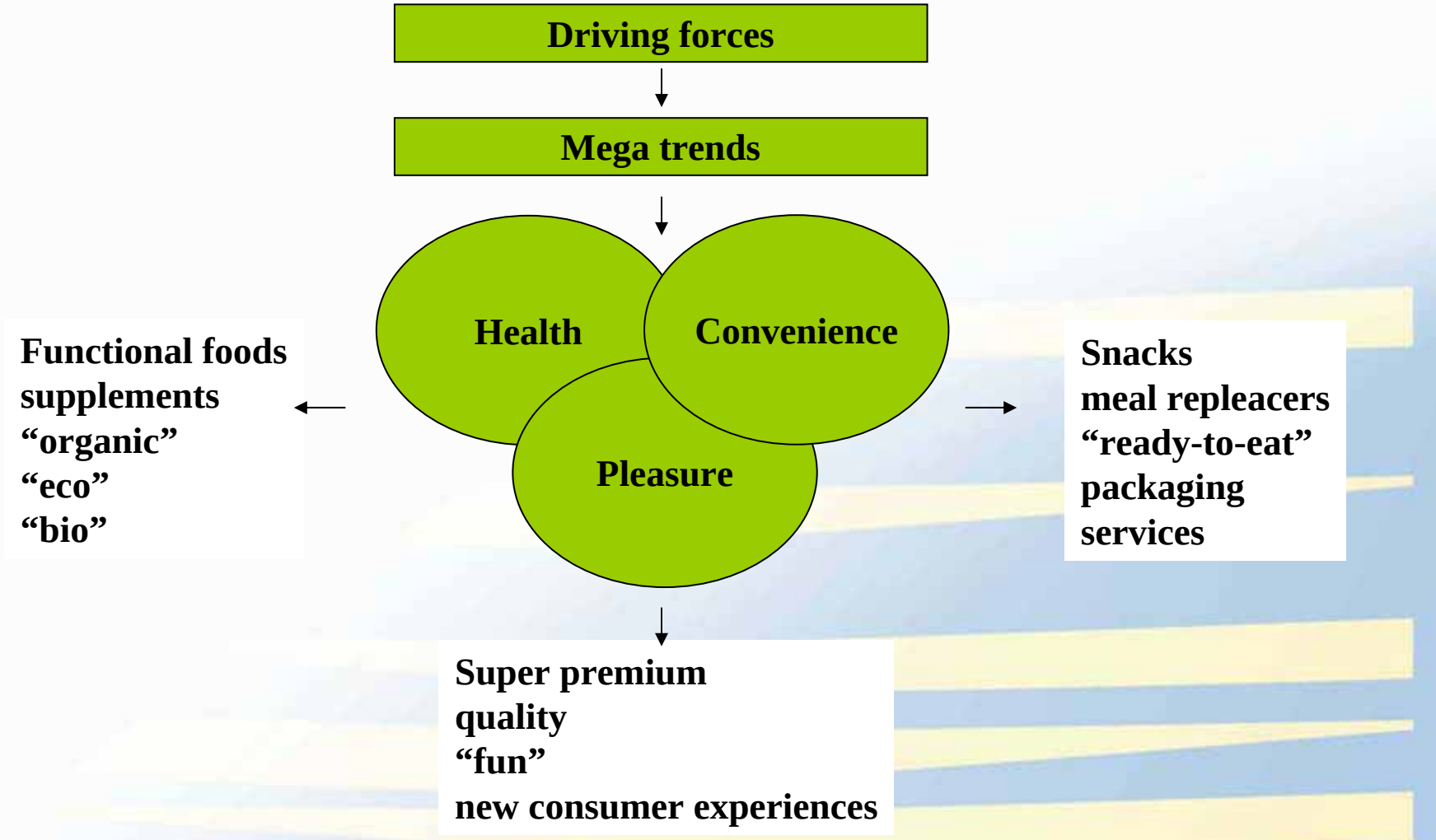
Seafood and gut health

- Developments in nutrition science
- The concept of gut health
- Diet and gut health
- Role of seafood in gut health

Developments in Nutrition Science



Driving forces and mega trends



Functional foods actions
Disease risk reduction
Enhancement of wellness and body functions

Diseases	Wellnes, body functions
- Obesity - Cardio Vascular Disease - Hypertension - Hypercholesterolaemie - Diabetes type II - Metabolic Syndrome - Osteoporosis - Allergy - Constipation - Inflammatory diseases	- Natural resistance - Gut health - Cognitive functions - Mood - Anti-oxidative capacity - Satiation/Satiety - Physical Performance

Concept of functional foods

- Made on the basis of knowledge on the nutrition and health relationship
- No negative side effects at normal use
- No disturbance of normal eating pattern
- Two generations

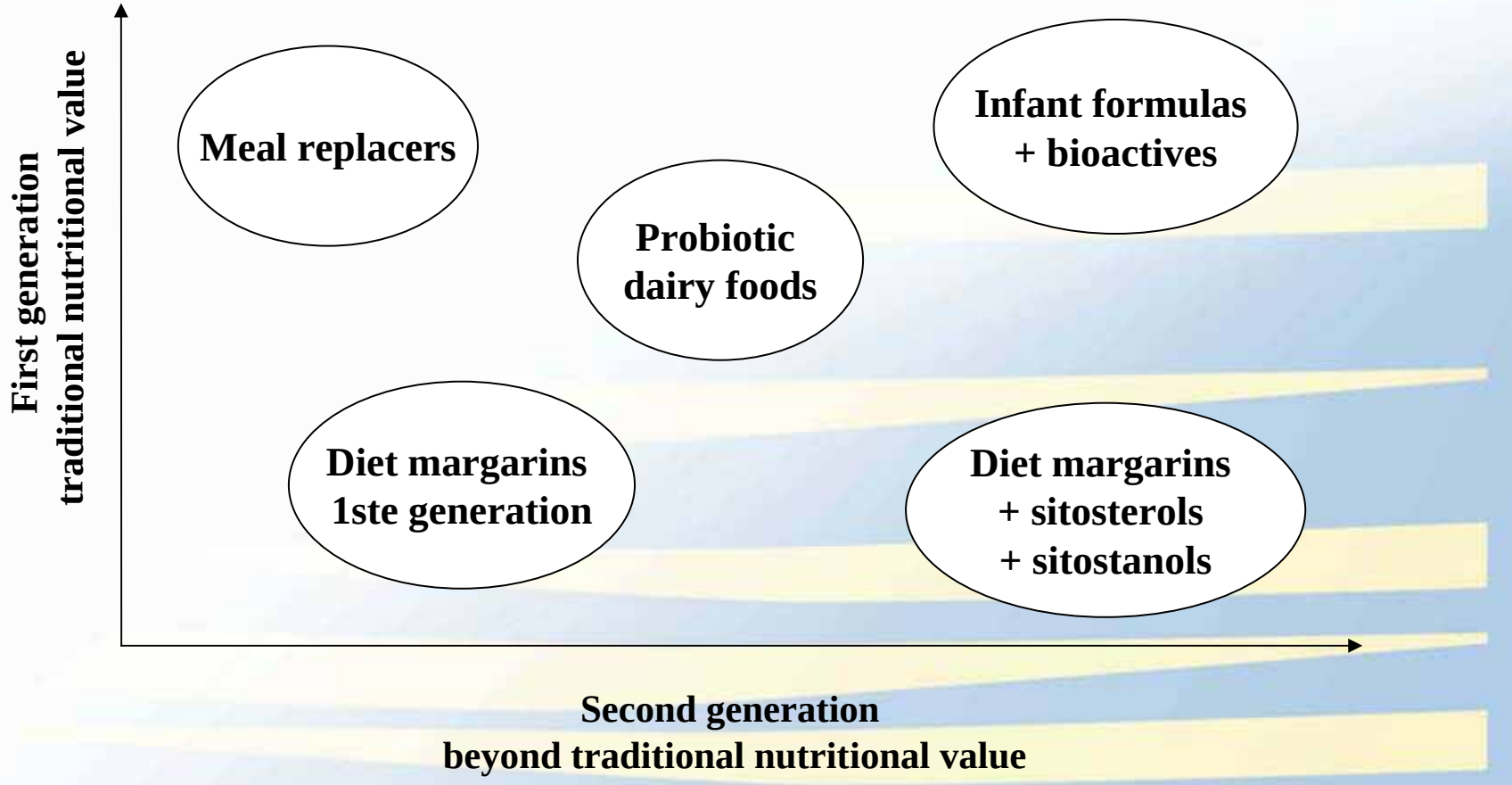
First generation of functional foods

- Focus on traditional nutritional value
- Nutrient fortification
- Elimination of negative substances
- Intelligent recipes
- Nutrition claims
- Development costs relatively low

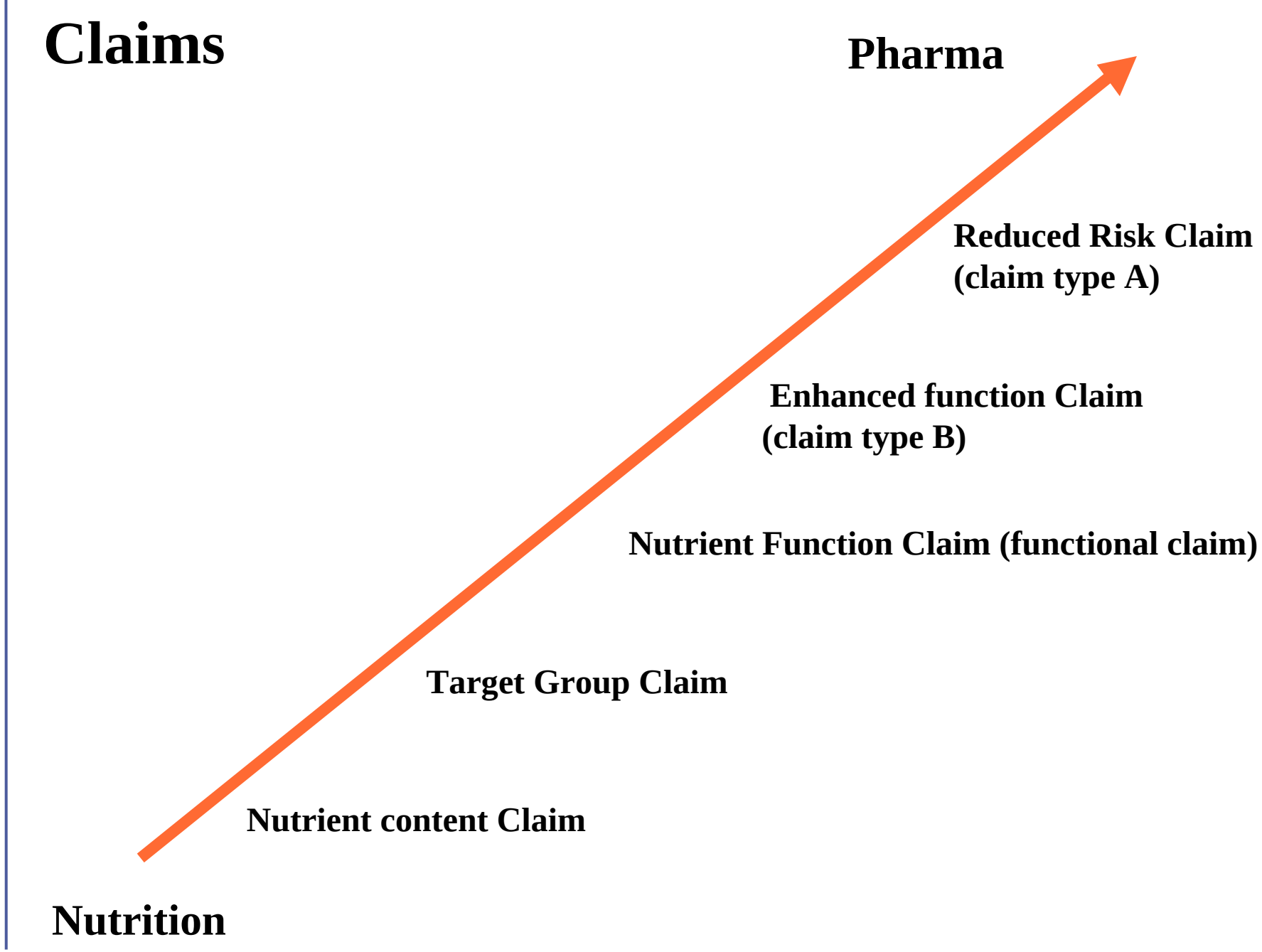
Second generation of functional foods

- Focus on effects beyond traditional nutritional value
- Application of bioactive substances
- Use of health claims
- Development costs relatively high

First and second generation of functional foods



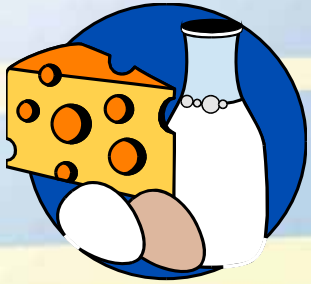
Claims

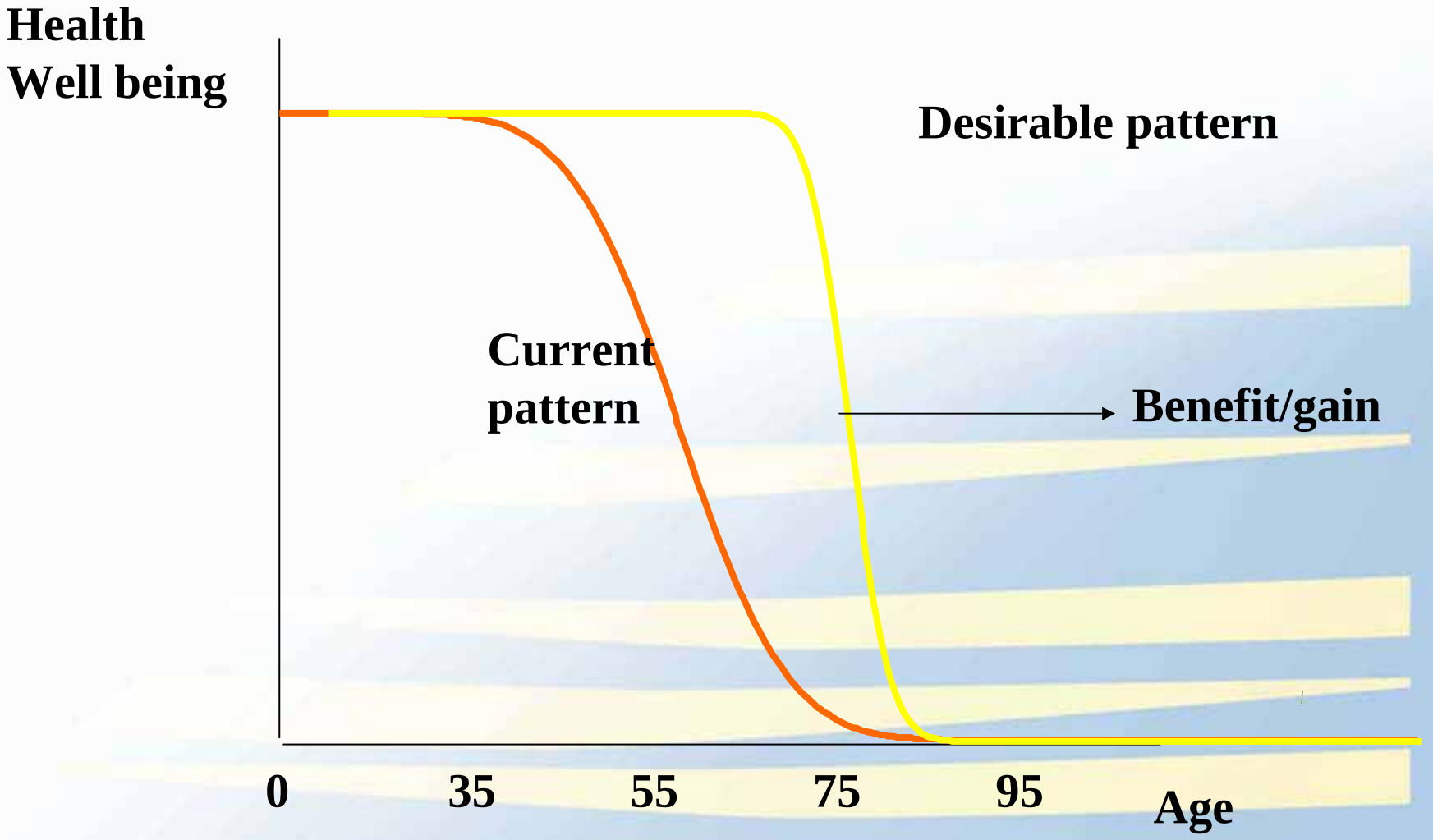

Pharma
Reduced Risk Claim
(claim type A)
Enhanced function Claim
(claim type B)
Nutrient Function Claim (functional claim)
Target Group Claim
Nutrient content Claim
Nutrition

The optimal diet and functional foods

Health Promotion

- **Reduction of disease risk**
- **Improvement of performance and wellness**




Health
Well being
Desirable pattern
Current
pattern
Benefit/gain
0
35
55
75
95
Age

The concept of gut health

- **Decrease of the risk of GI disease**
- **Enhancement of the GI function**

Nutrition-related diseases of the gut

- Colon cancer
- Inflammatory bowel disease (IBD)
  - colitis
  - Crohn's disease
- Constipation
- Diarrheal diseases
- Helicobacter pylori infection

Functions of the intestine

- **Absorption**
- **Barrier**
- **Excretion**

The defense (immune) system

- **Innate (not affected by prior contact with the infectious agent)**
- **Specific or adapted**

Innate immune and defense system

The first line of defense

- Skin and mucosal surfaces
- Mucous
- Digestive enzymes, bile, HCl
- Epithelial turnover
- Peristaltic movements (house keeper)
- Lysozyme, lactoferrin
- Immunoglobulins
- Macrophages, NK cell activity

Metabolic activity of the intestinal flora

- **Saccharolytic (favourable)**
- **Proteolytic (unfavourable)**

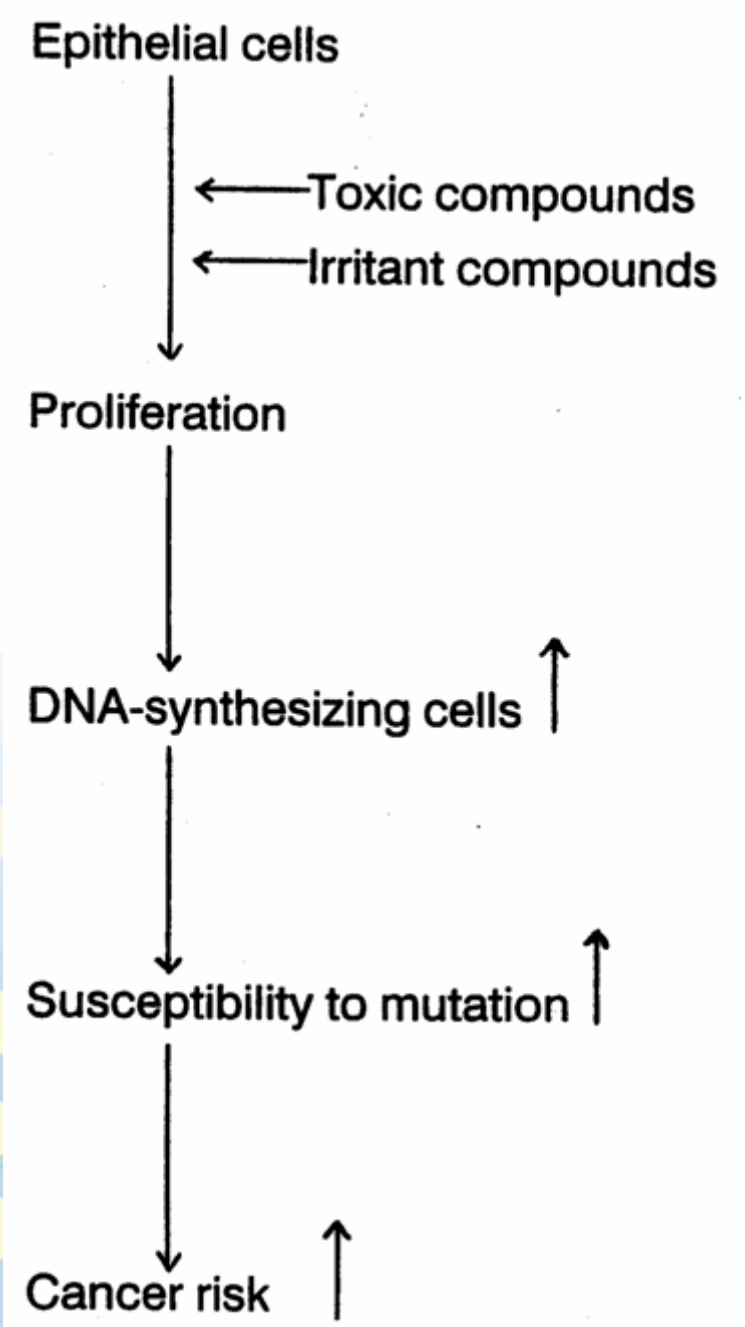
Saccharolytic activity of the intestinal flora

- Production lactic acid
- Production of short chain fatty acids
- Production of H2, CH4 and CO2
- Lowering of pH
- Inhibition of secondary bile acid formation

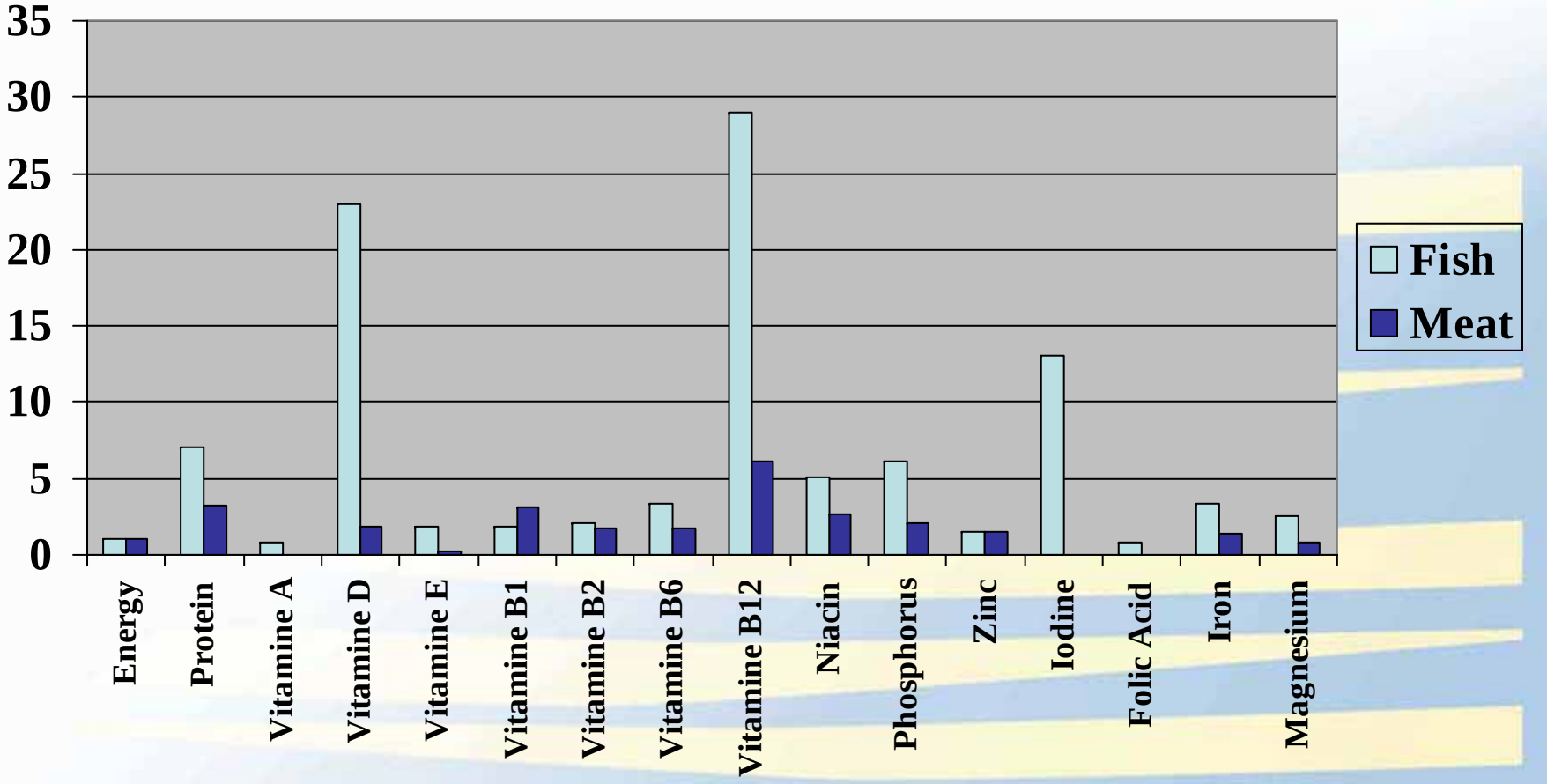
Proteolytic activity of the intestinal flora

- Formation of H_2S
- Formation of NH_4
- Formation of biogenic amines
- Formation of phenols and indoles

Exposure of epithelial cells to proteolytic activity of the microflora may enhance cancer risk



Nutrient density of fish and meat

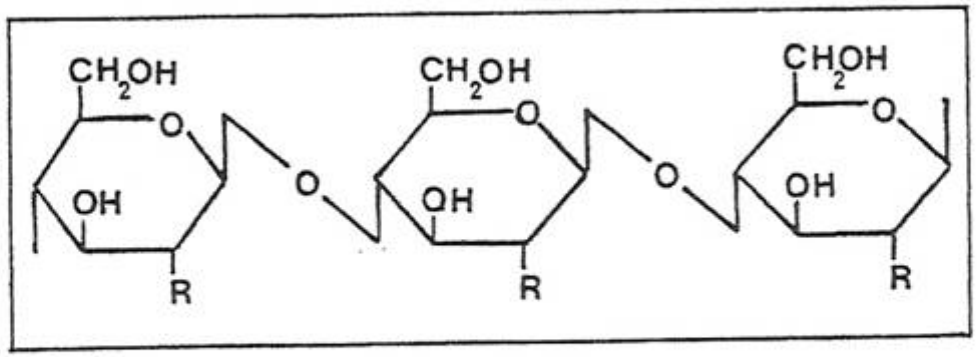


Dietary factors in gut health

	Relevance for seafood
• Dietary fibre	-
• Prebiotics	+
• Probiotics	-
• Fatty acids	+
• Threonine	+
• Immunoglobulins	-
• Lactoferrine	-
• Taurine	+
• Glutathione	+
• Protein digestibility	+
• Vitamin D	+
• Calcium	+
• Selenium	+

Chitin, chitosan and glucoseamin

- **Prebiotic (bifidogenic)**
- **Anti inflammatory**



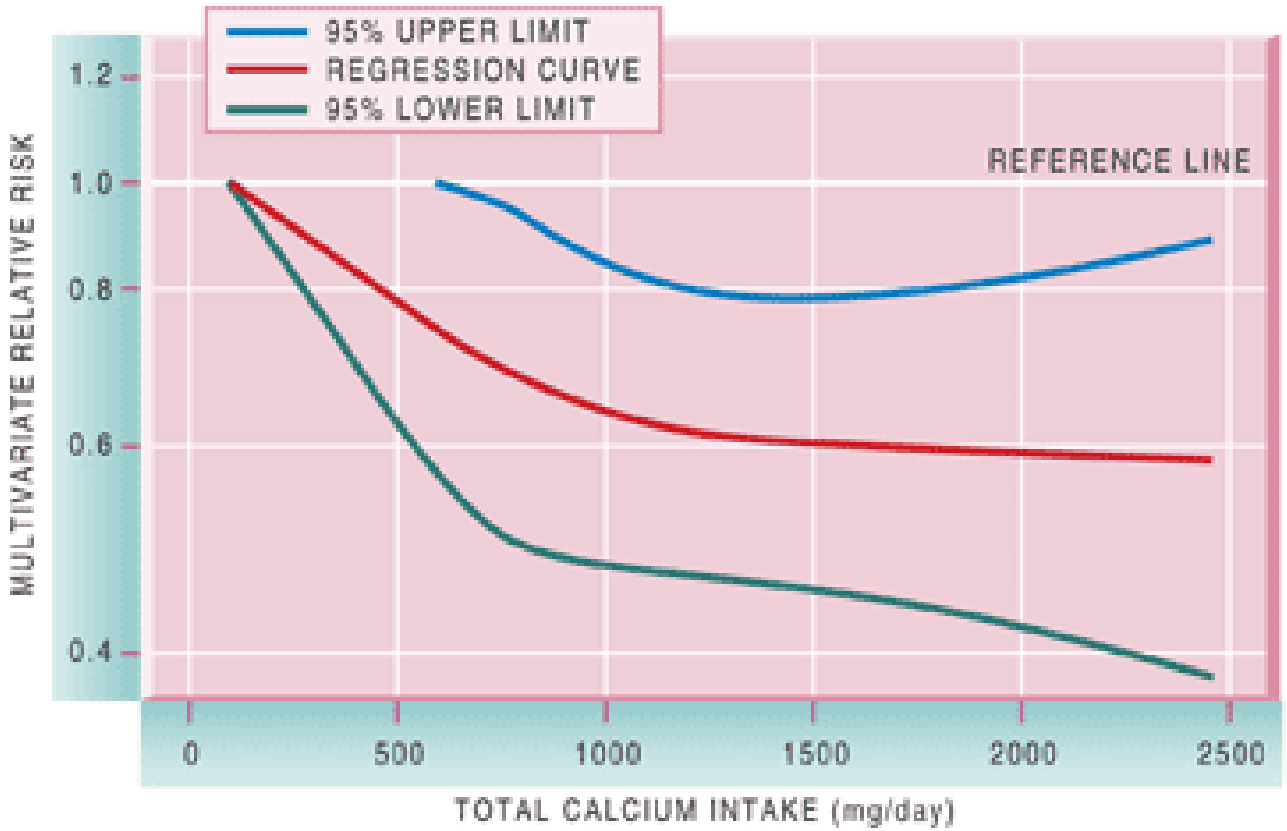
Cellulose: R = OH
Chitin: R = NH C O CH_3
Chitosan: R = NH_2

Calcium and vitamin D

- **Reduction of risk of colon cancer**

Dairy Foods, Calcium, and Colorectal Cancer: A Pooled Analysis of 10 Cohort Studies

Journal of the National Cancer Institute, Vol. 96, No. 13, July 7, 2004



http://www.nutritionmagazine.nl

Fish protein

- High digestibility (94%)
- High content of essential AA
- Bio-active amino acid sequences?

Digestibility of fish protein

- **High ileal digestibility will reduce formation of toxic compounds in the colon.**

Fish fatty acids (n-3 LCPFA)

- Cardiovascular benefits
- Anti inflammatory effects
- Immune system
- Diabetes type II prevention
- Adipose tissue metabolism
- Brain development and brain function
- Bone health promotion
- Colon cancer prevention

Fish and colon cancer risk

EPIC study:

Fish consumption (100 g/day) reduces colon cancer risk by 50%.

Journal of the National Cancer Institute 97 (2005) no 12.

Bioactive compounds important for gut health

- Threonine
- Glutathione
- Taurine
- Glutamine

Essential amino acids in cod protein

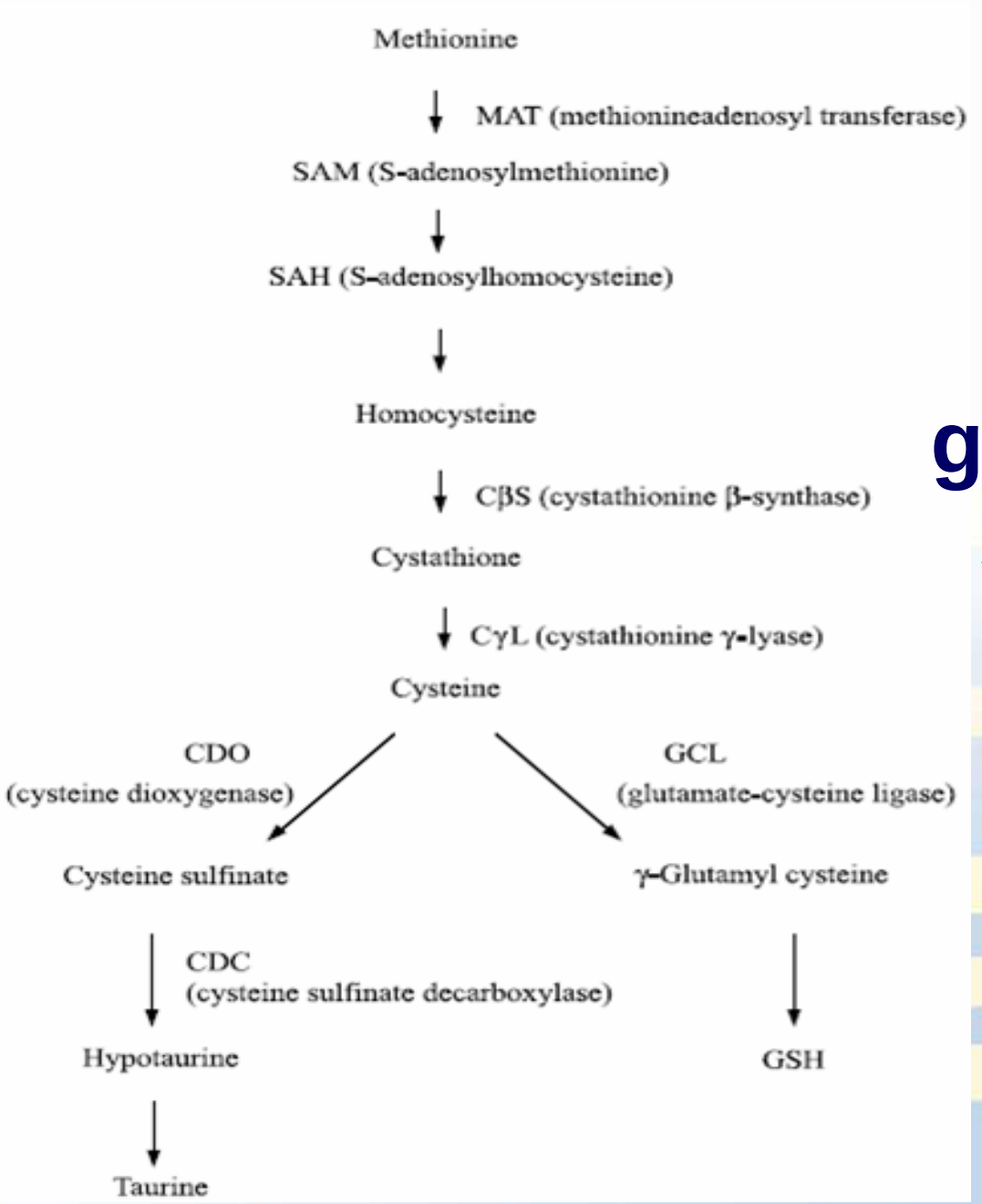
Table 3. Essential amino acids (mg/g protein) in cheese whey as compared to soy protein and to the FAO/WHO preschool child requirement pattern in mg/g crude protein (from Schaafsma and Steijns, 2000)

Amino acid	Whey	Soy	FAO/WHO	Cod
His	22	-	19	19
Ile	68	47	28	46
Leu	111	85	66	72
Lys	99	63	58	85
Met + Cys	48	24	25	38
Phe + Tyr	73	97	63	72
Thr	80	38	34	40
Trp	21	11	11	9
Val	68	49	35	51
Total (min. his)	569	414	320	413
Total BCAA (Ile, leu, val)	247	181	129	169

Threonine

- **The gut uses about 60% of dietary threonine for mucin synthesis**
- **In many diets the third limiting amino acid**

Synthesis of taurine and glutathione from S-amino acids



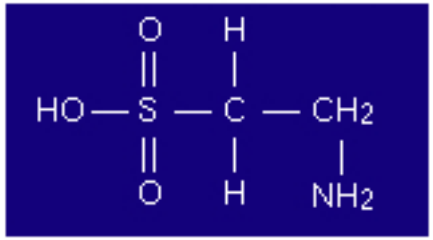
Glutathione (GSH)

- Important anti-oxidant in the body
- Synthesized from cysteine
- Se (in fish) cofactor of glutathione S-peroxidase
- Anti-inflammatory

Taurine

- Synthesized from cysteine
- Bile acid conjugation
- Detoxification
- Osmoregulation
- Membrane Stabilization
- Regulation of intracellular Ca2+ Homeostasis
- Antioxydant (anti-inflammatory)

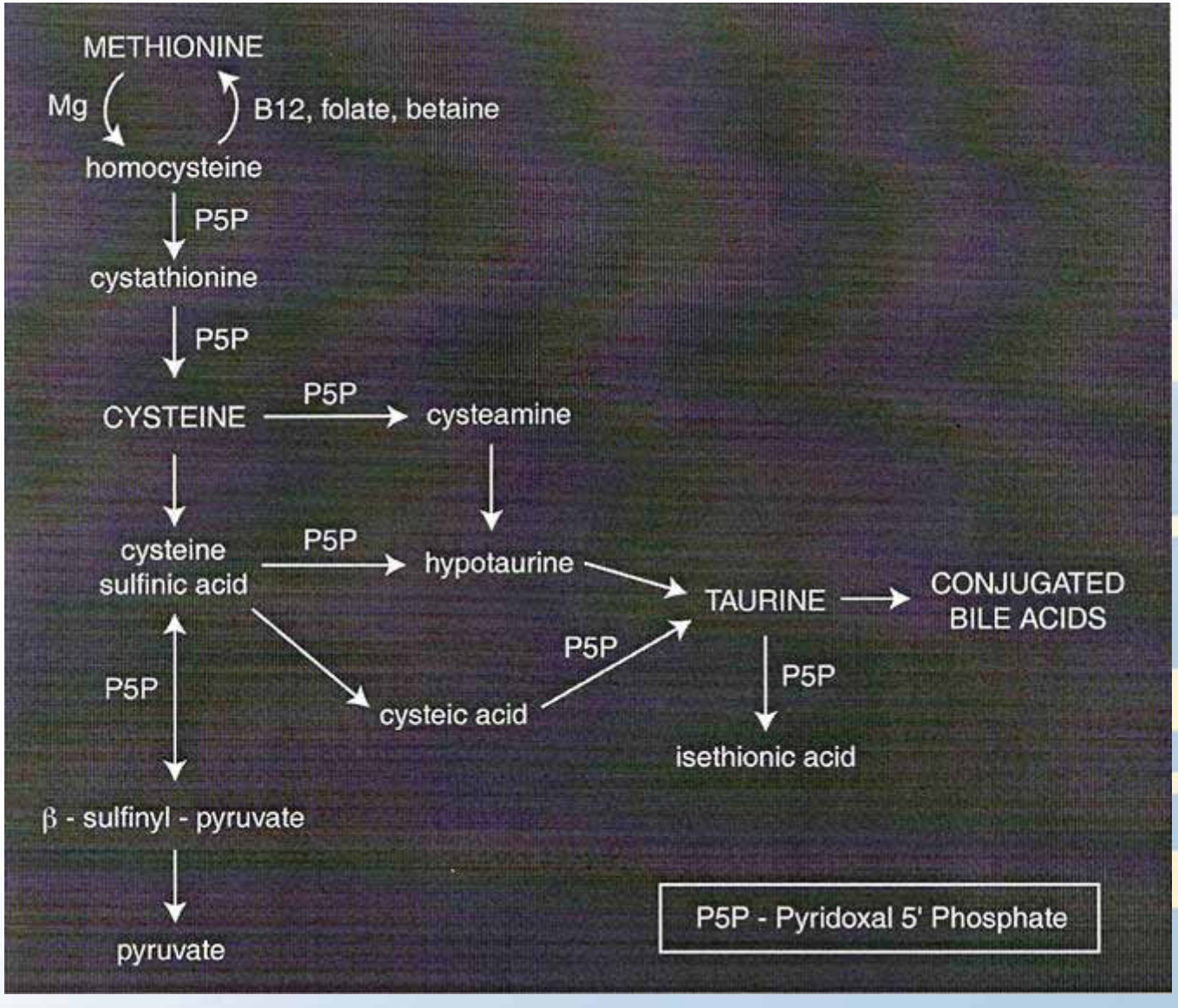
Figure 1. Structure of Taurine



Taurine in meat and fish (uncooked, mg/kg wet weight)

Beef	150 - 472
Lamb	446 - 510
Pork	394 - 690
Chicken	300 - 380
Cod	233 - 396
Oysters	390 - 1238
Clams	1450 - 3700

Synthesis of taurine



Glutamine

- **Important metabolic fuel for intestinal cells and immune cells**
- **BCAA may serve as precursors**

Conclusions on fish and gut health

1. Nutrient-dense food
2. Anti-inflammatory potential (n-3 fatty acids, taurine, glutathione)
3. Reduced risk of colon cancer

Thank you for your attention!!

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