

Nutrition for Health and Wellness of the Brain



3rd European Futurists Conference

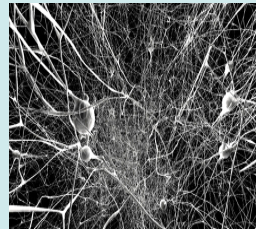
Lucerne – 19 November 2007

Werner Bauer

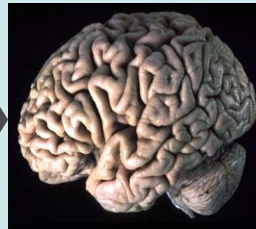


Try the fish. It's brain food

What is Brain Health ?



Neurons



Brain

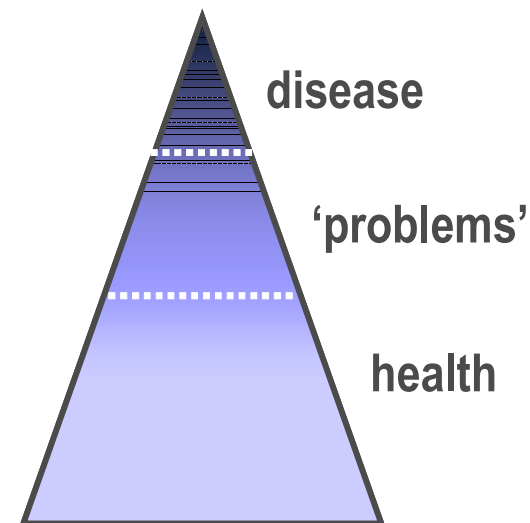
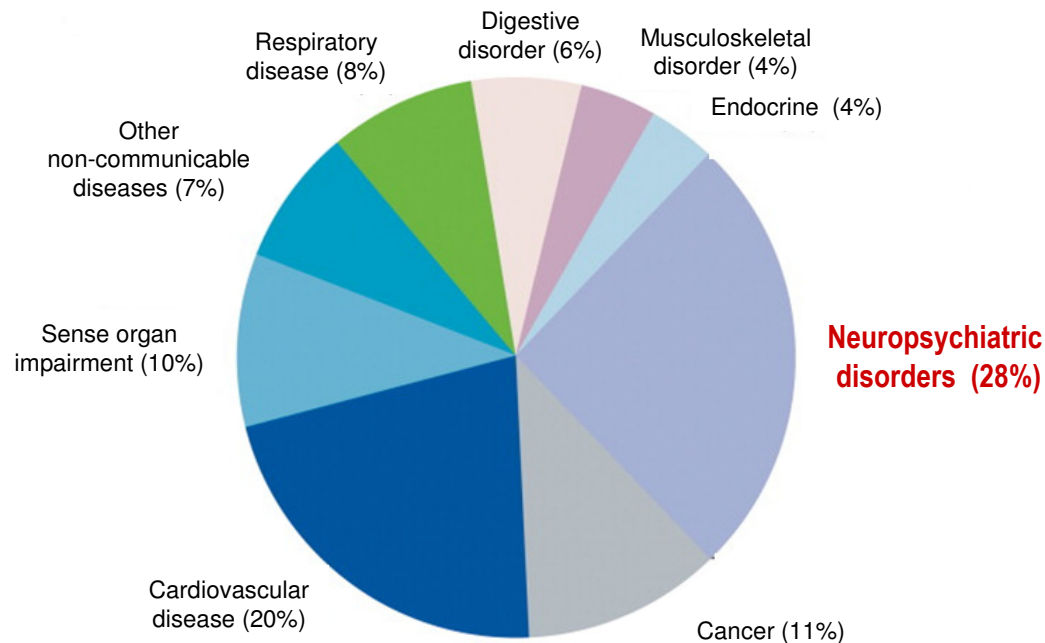
Cognition
Alertness
Mood
Stress
Motivation

Behaviour

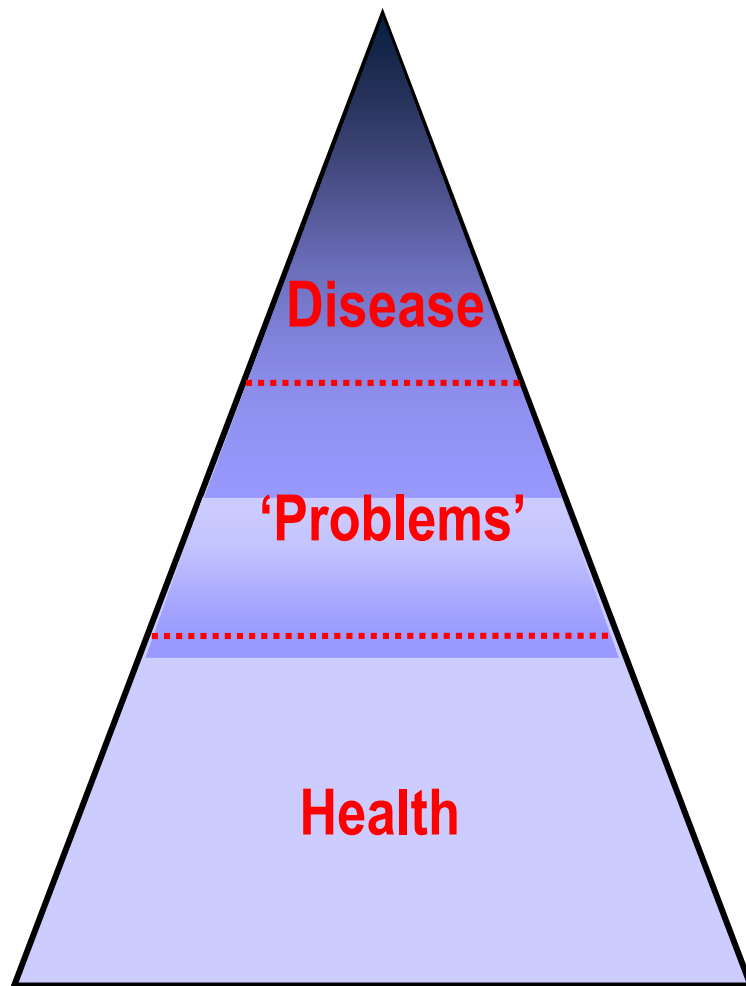
**MENTAL
HEALTH**

**Mental diseases contribute greatly
to the global burden of disease**

**Mental health is more than
the absence of disease**



Nutritional Approach to Mental Health

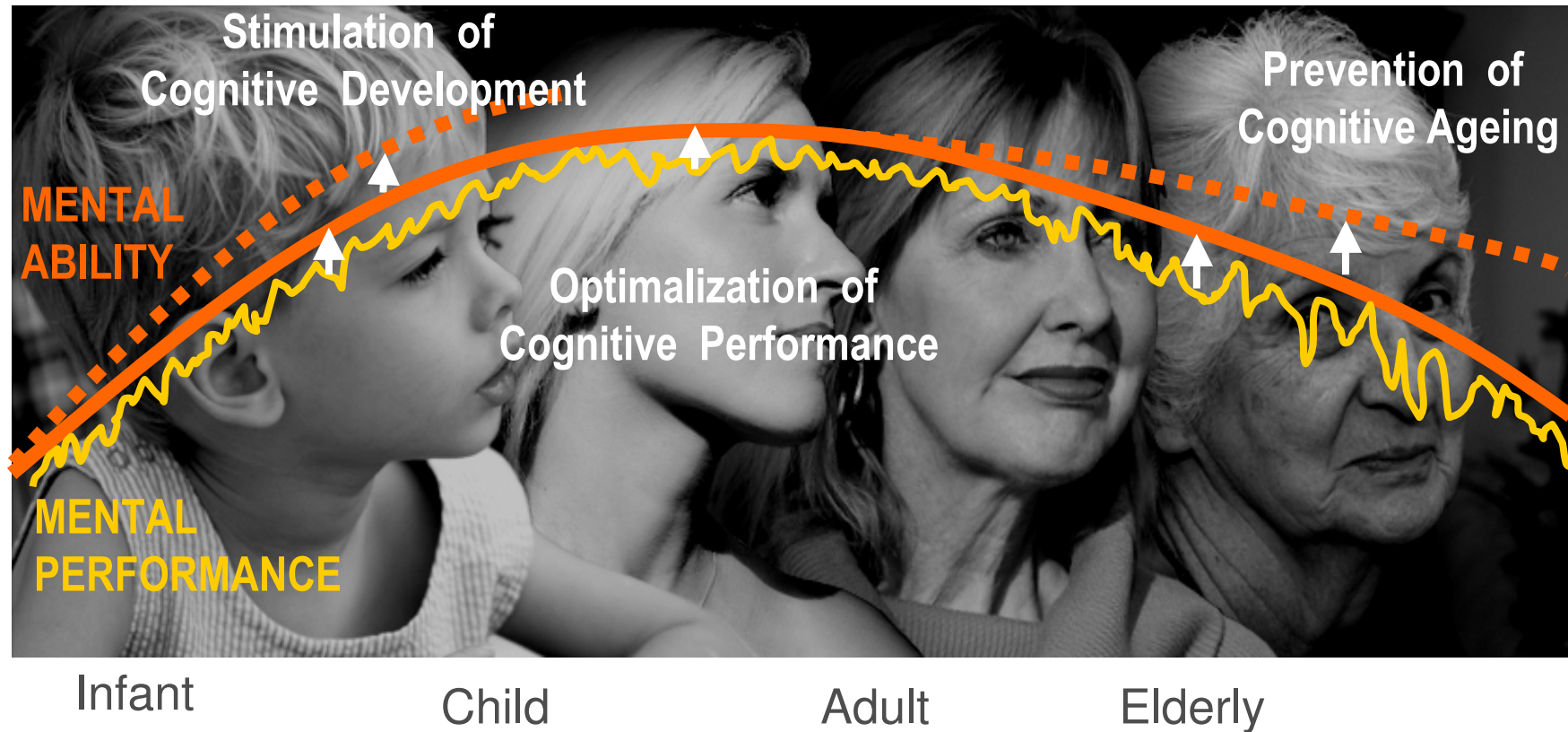


Symptomatic relief, secondary prevention, adjuvant therapy, counteracting nutritional problems in mental disease
e.g. Alzheimer's Disease

Restoring suboptimal mental states
e.g. stress reduction, sleep problems, fatigue, age-related cognitive decline

Primary prevention of mental health problems and diseases
e.g. neuroprotection

Nutrition to support Brain Health



- Optimal development in children
- Optimized performance throughout life
- Prevention of cognitive decline in elderly

Nutrition for the Growing Brain

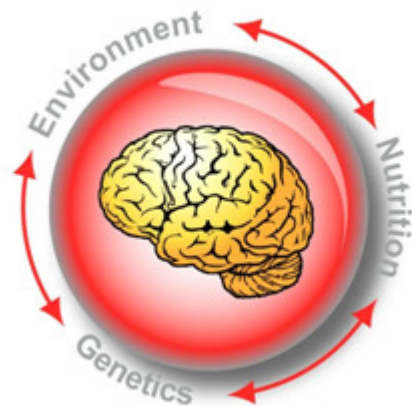


Infant

Child

Adult

Elderly

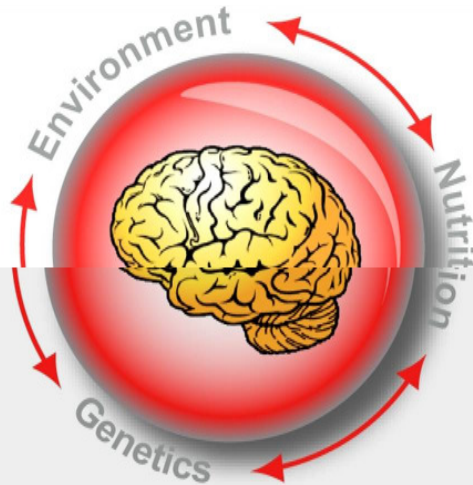


Brain development is the result of an intricate interplay between genetic and environmental factors, including nutrition

Our goal is to ensure that nutrition optimally supports brain development

'Help to create the right conditions to achieve a child's potential'

Nutrition for the Growing Brain: Basic needs

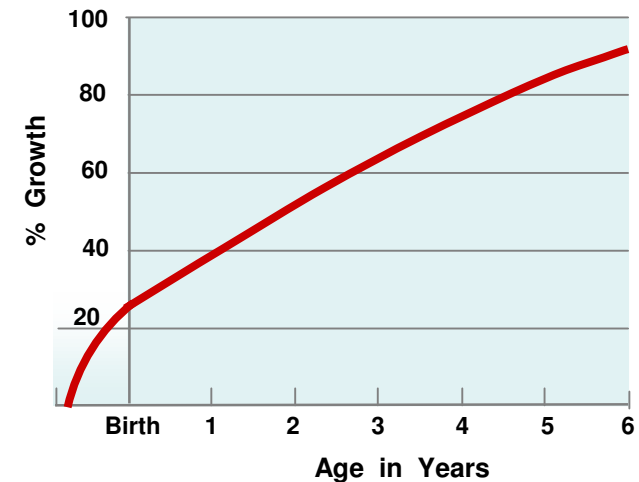


**STRUCTURAL BUILDING
BLOCKS**

**(MICRO-) NUTRIENTS
FOR KEY PROCESSES**

**ADEQUATE ENERGY
AVAILABILITY**

The rapidly growing brain requires an adequate supply of **building blocks**, including lipids and essential amino acids.

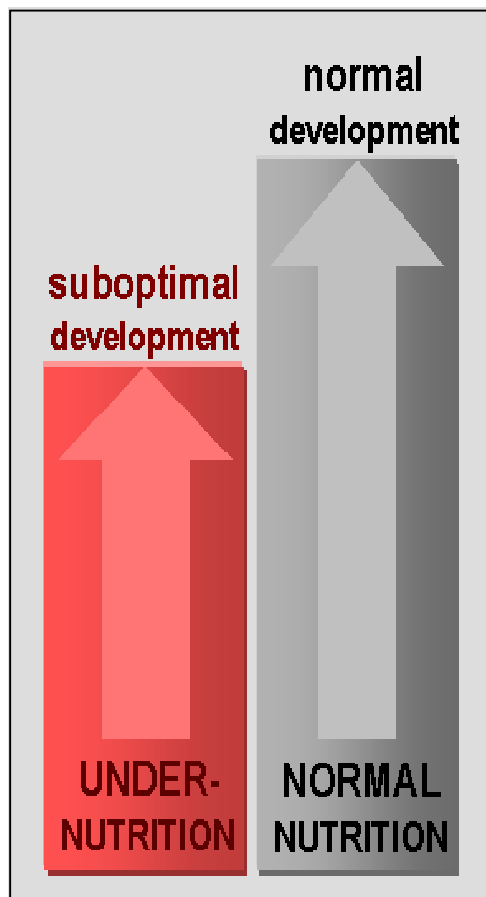


Bogin, B. Evolutionary hypotheses for human childhood.
Yrbk Physic. Anthropol. 1997; 40: 63-89

Micro-nutrients such as Iron, Iodine, B-vitamins and Zinc, are required for key metabolic and control processes in brain development.

Adequate glucose sources should be provided to meet the high energy demands of a developing child's brain (200-300% more energy required than that of an adult).

Preventing Undernutrition is Key



Currently there are 170 million underweight children globally. **In 2015, it is predicted that 113 million children will be underweight.** *(de Onis et al., 2004)*

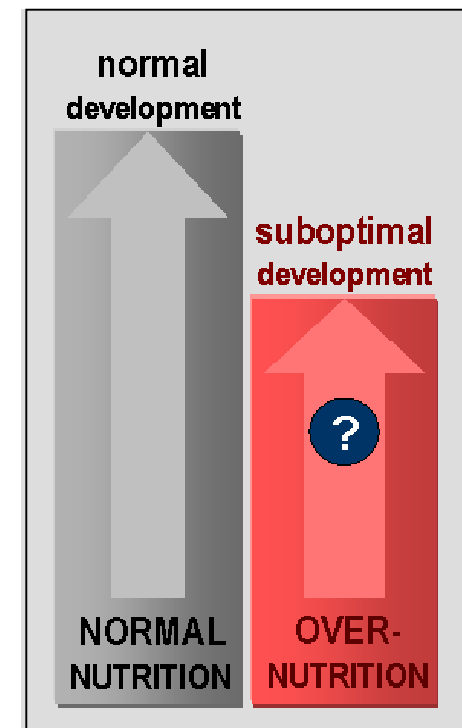
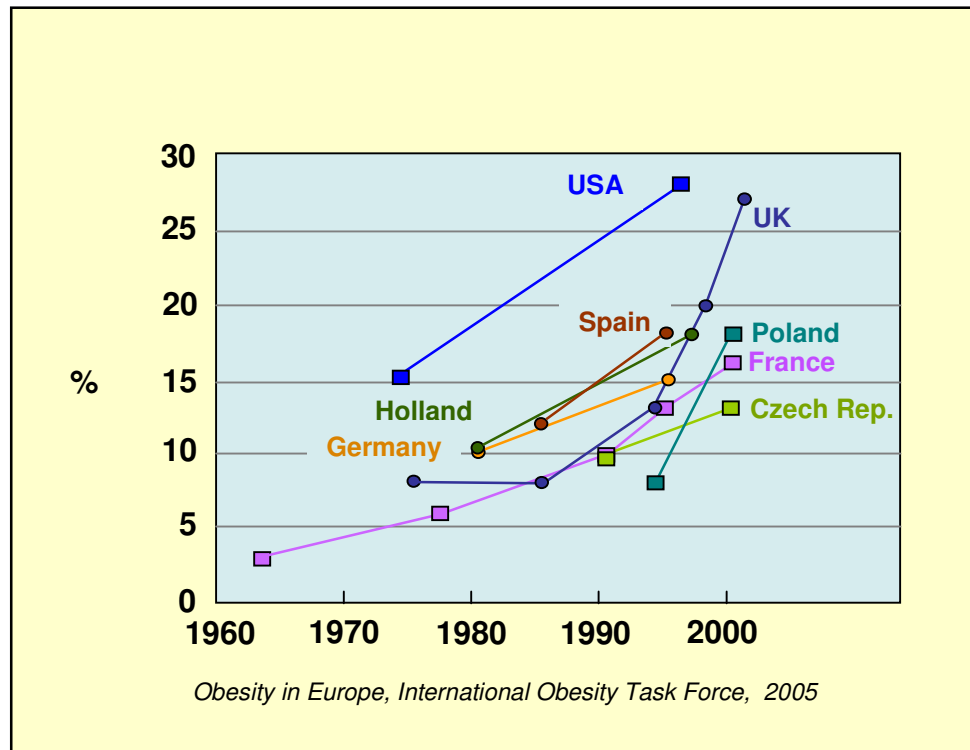
Iodine deficiency has been associated with a loss of 13.5 IQ points. *(Bleichrodt & Born 1994)*
Iodine intake in 47.8% (24.9 million) of European school children is insufficient. *(WHO, 2007)*

Iron deficiency leads to suboptimal brain development and function. *(Grantham-McGregor & Ani 2001)*
10-23% of European pre-school children are estimated to have iron deficiency anemia. *(Kraemer & Zimmerman, 2007)*

Overweight and the Developing Brain

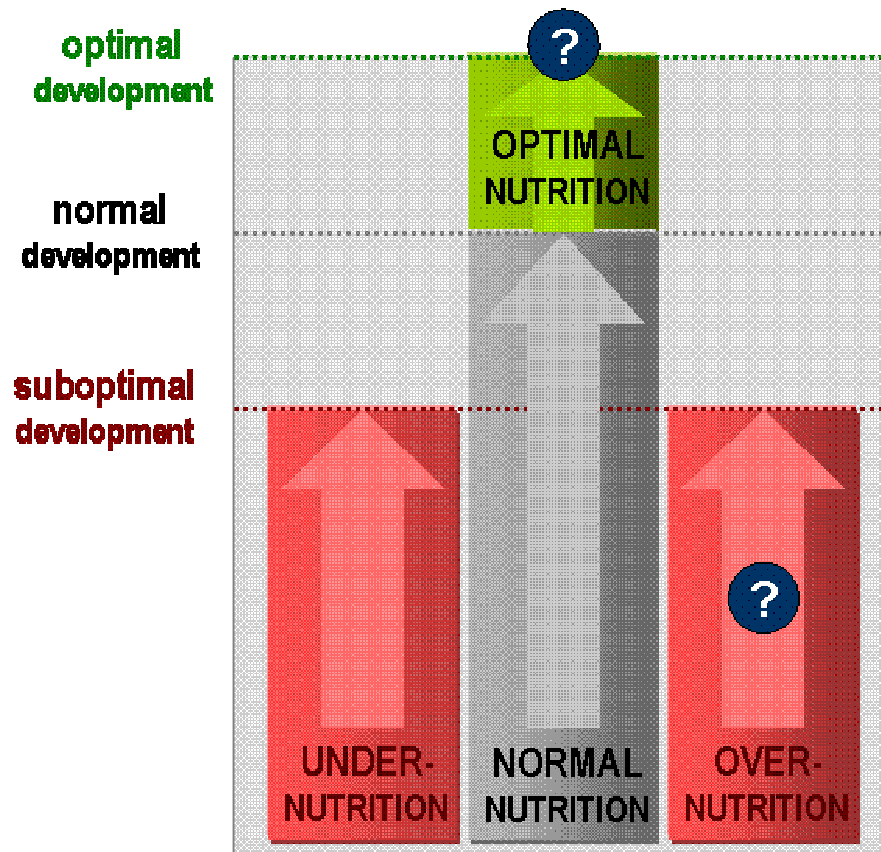


Overweight has been associated with poorer school achievement and behavioural problems, although causal role has not been established.



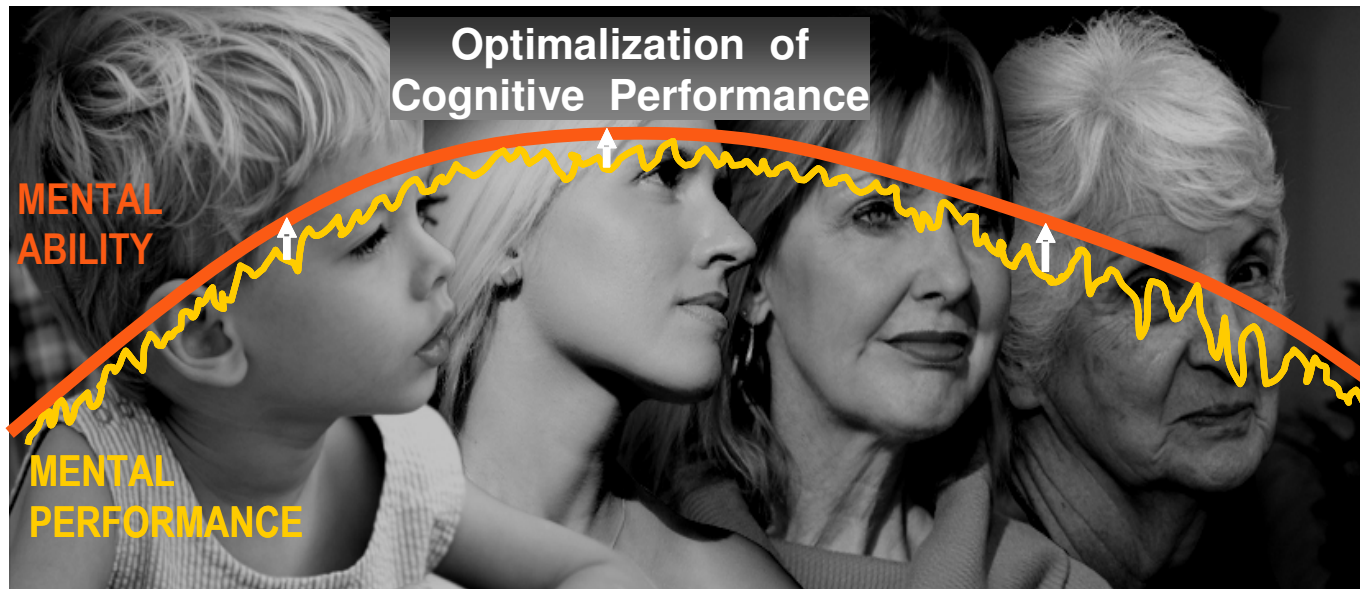
38-46% percent of American and European school children are estimated to be overweight by 2010 (Wang & Lobstein, 2006)

Nutrition and the Developing Brain



- What are the approaches to prevent situations of malnutrition?
- How can we restore effects of earlier malnutrition?
- What would be the temporal windows of opportunity?
- Can we enhance cognitive development when there are no overt nutritional abnormalities?
- Long lasting influences on future disease risk

Nutrition and Optimal Performance



Cognitive performance level can fluctuate considerably, from hour to hour and day by day.

Our goal is to develop products that help to achieve optimal performance levels and quality of life throughout the lifespan

Optimized Performance throughout Life



Cognitive performance level can fluctuate considerably, from hour to hour and day by day.

On the short(er) term, performance and quality of life can be diminished by many factors, including:



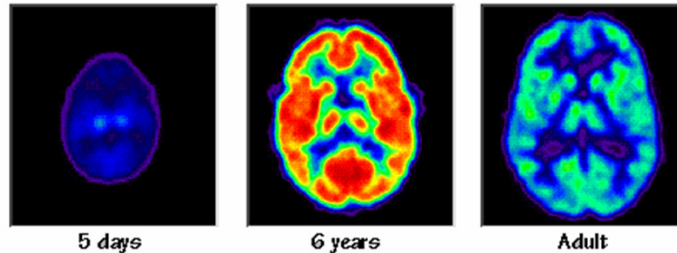
Some worrisome statistics

75% of 1,506 interviewed American adults report to have a symptom of a **sleep problem**. Many adults say they are often tired, fatigued or don't feel up to par *(2005 Sleep in America poll)*

30% of Europe's workers, more than 40 million people, report that they are affected by **stress at work** *(European Agency for Safety and Health at Work, 2002)*

59% of European Union workers reported exposure to **high-speed work** at least a quarter of the time, up from 50% in 2000. *(European Survey on Working Conditions, 2005)*

School Performance



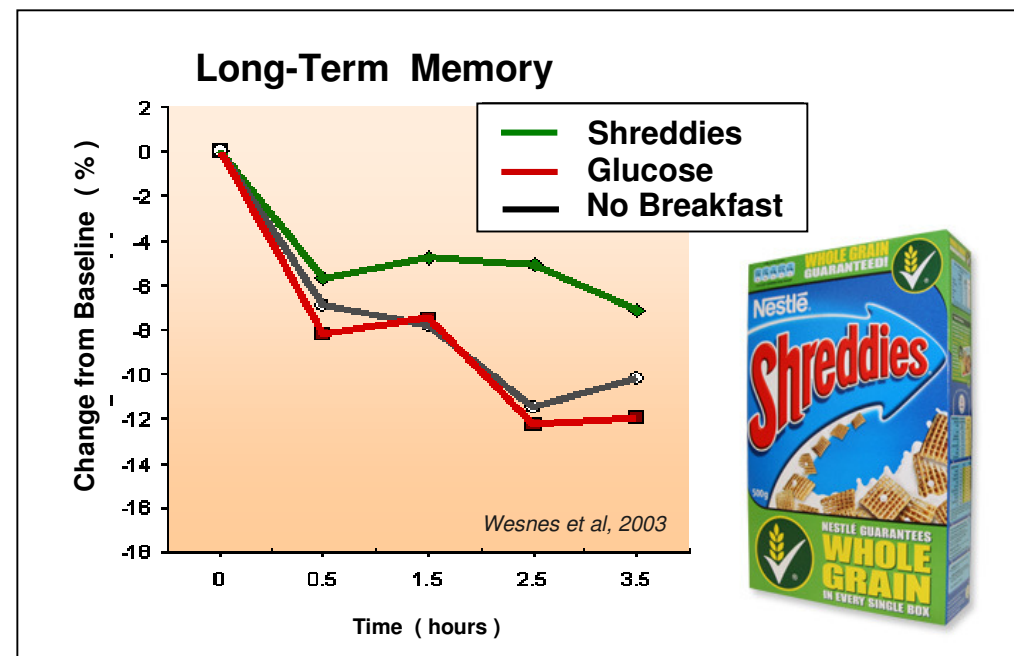
A child's brain has a high energy demand.
This energy is delivered by glucose from sugars, starches or other carbohydrates.

Having a breakfast generally improves school performance in children.

(Rampersaud et al, 2005)

What is the right breakfast composition to support school performance?

e.g. what is the optimal dose and types of carbohydrate sources (sugars, starches, fibers, other) for rapid and sustained brain energy?



Cognitive Performance in Athletes



Mental performance such as concentration, reaction speed, vigilance, perception is important in most if not all sports

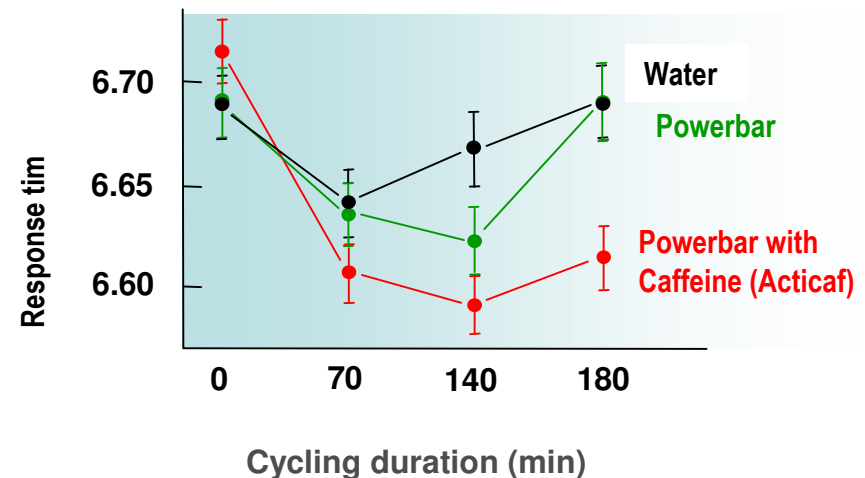
Fatigue-induced mental performance deficits can be alleviated by caffeine intake during exercise



Improved cognition

Powerbar with ActicaF improves **concentration**, **response speed** and **visual detection** during and after sustained cycling exercise

Concentration
(Stroop test)



Nutrition and Cognitive Ageing



By 2040, around 30 % of people in industrialized countries will be over 60. *(UN, world population prospects 2006)*

The vast majority of these elderly will experience cognitive decline.

By 2040, the number of persons suffering from dementia will more than triple

to 81.1 million, with the greatest increases in the developing countries.

(Ferri et al, 2005, Lancet)



The rate and magnitude of cognitive ageing differs greatly between individuals

Certain life events, illnesses, genetic factors, lifestyle and **nutrition** influences have already been associated with level of cognitive ageing

→ Cognitive ageing is (at least partly) modifiable

Selected factors associated with cognitive ageing

Genetics

(APOE4, Presenilin 1&2, APP)

Life events

(brain damage, neurotoxins, stress,...)

Presence of past illness

(psychiatric, systemic, cardiovascular,...)

Life style factors

(exercise, 'use it or lose it', smoking)

Diet

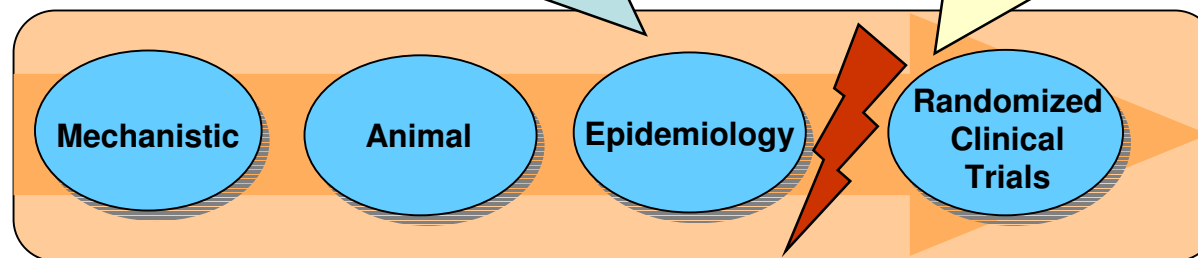
EPIDEMIOLOGY:

Intake / status associated with reduced risk of cognitive decline and/or dementia

- Fruit, vegetables
- B12, B6, folate
- Antioxidants
 - Vit A,C,E
 - polyphenols
- Unsaturated fat
- Omega-3 / 6 PUFA
- Red wine
- Caffeine

Randomised controlled trials have either not been conducted or produced disappointing results

Dietary role in preventing cognitive decline not easily confirmed



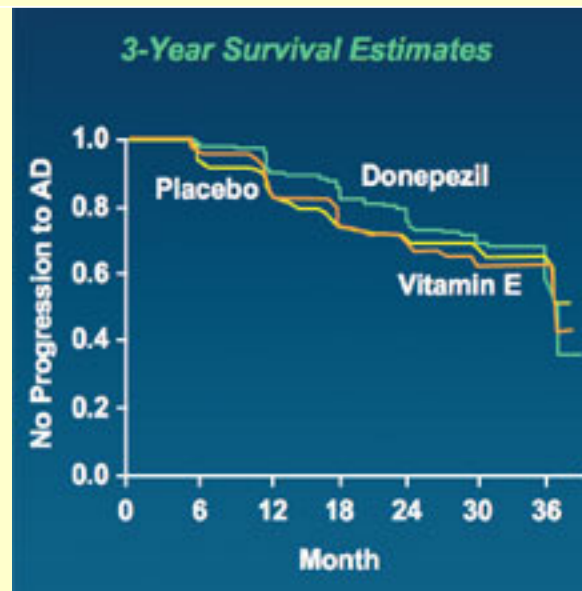
Evidence

Vitamin E and Alzheimer's Disease



Preventing MCI progression to AD

3-year randomised double-blind trial
in 769 MCI patients receiving 2000 mg vit E

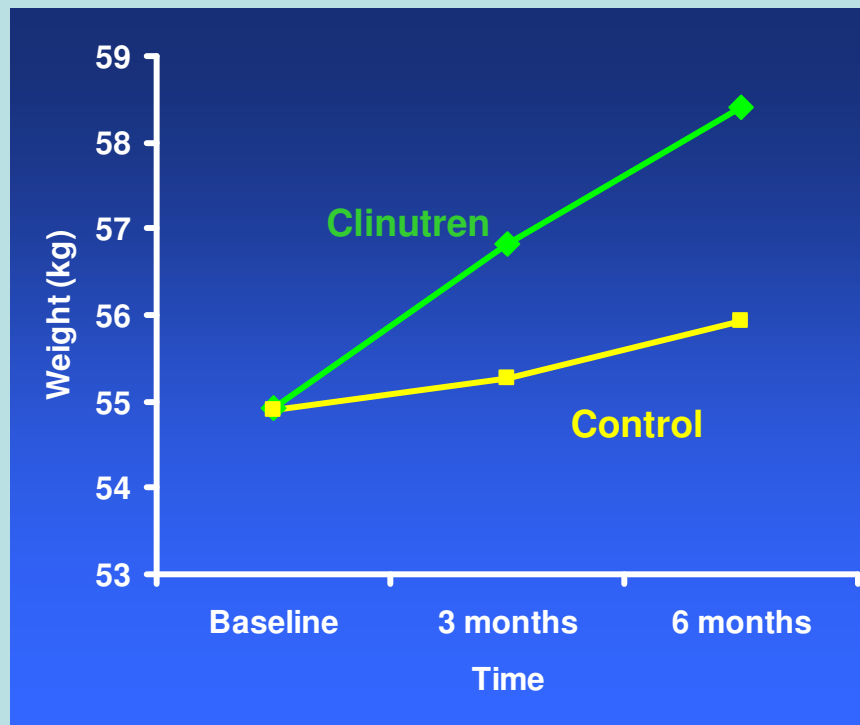


Vitamin E did not reduce progression to AD

The Nutritional Approach

Preventing Malnutrition in AD

AD patients received 3-months' oral supplementation (300-500kcal/day) in addition to normal food intake



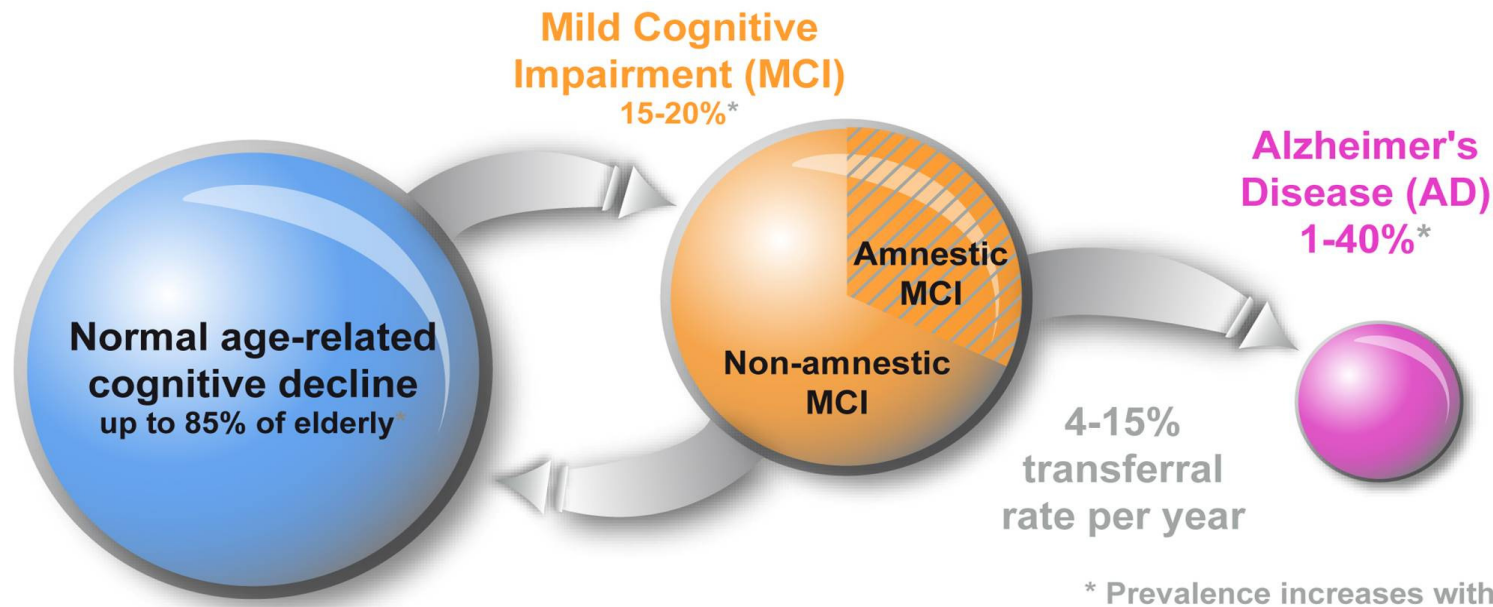
Supplementation improves body weight and nutritional status in AD

Lauque, et al. JAGS. 2004;1702-1707

**OS - Clinutren
(Nestlé Nutrition)
Enriched with
protein, vitamins,
minerals and high
energy**



Progression of Cognitive Decline



NUTRITION

- Prevent decline
- Delay progression
- Revert decline
- Symptomatic relief

Who
should we target?

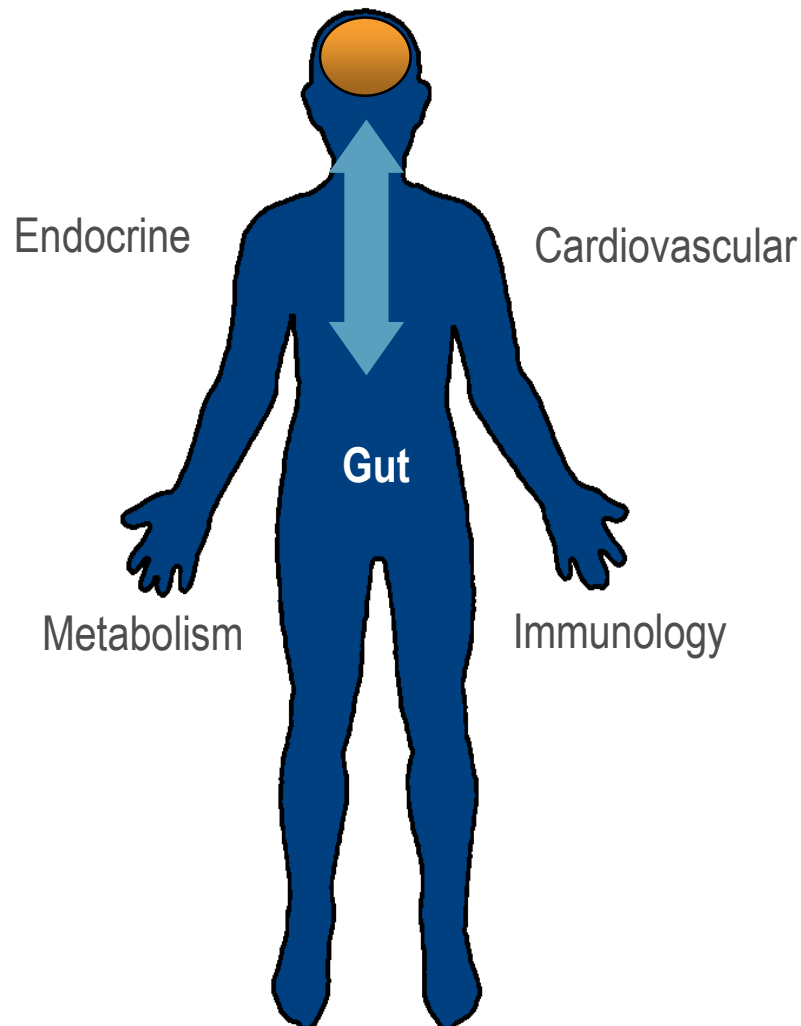
What
should we target?

How
should we intervene?

Expanding the Targets



The brain as part of the body



Brain health is intricately linked to overall health

Mental health is linked to physical condition

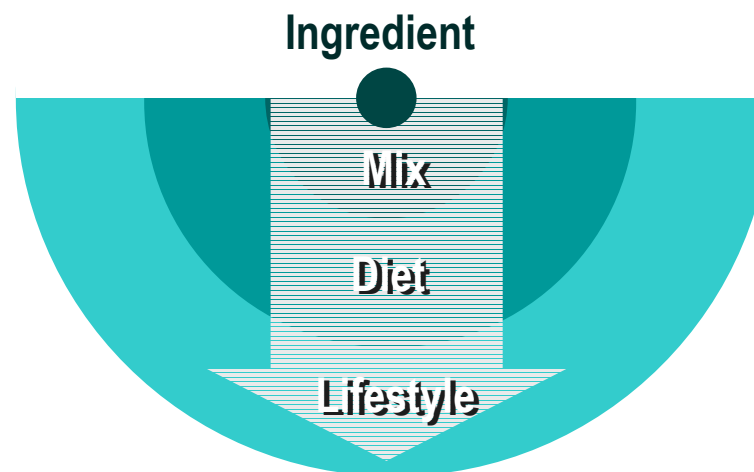
Physical health is influenced by mental state



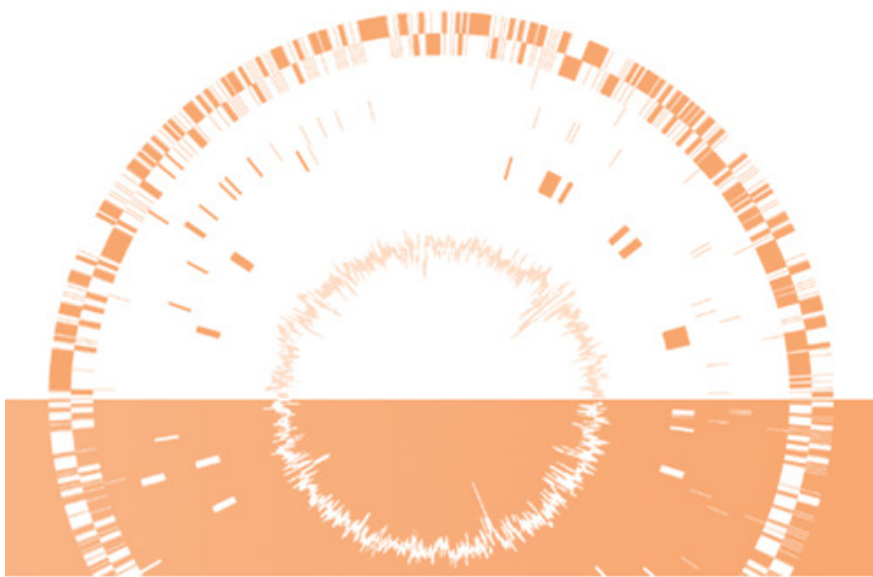
Interdisciplinary approach to brain health is required

**FOCUSING ON
THE NEEDS**

**BROADENING
THE SOLUTION**

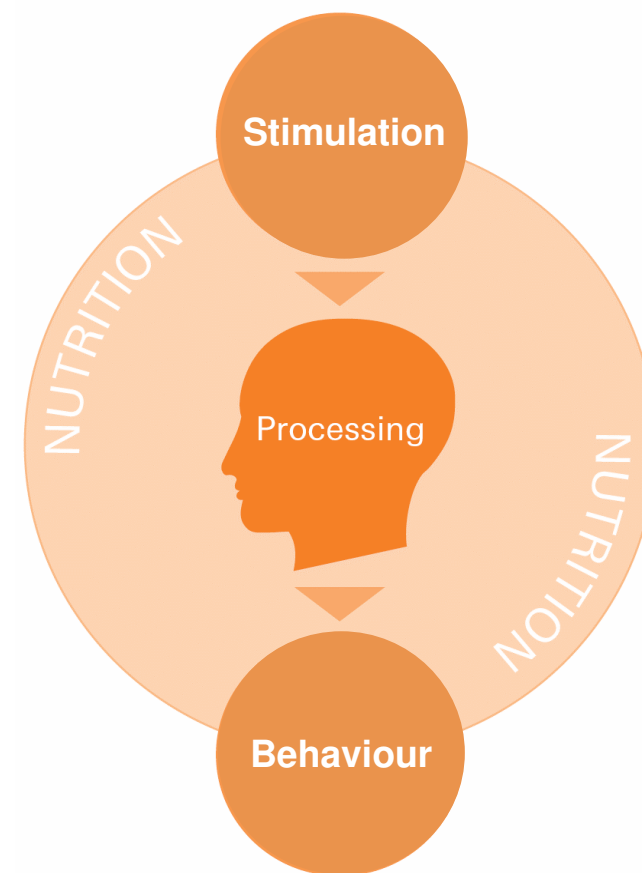


Ingredient based solutions working in synergy with
lifestyle solutions for individual needs



3rd International Nutrition Symposium

Nutrition and the Brain: Stimulation, Behavior and Disease



CHF 5 million a year for fundamental and applied research in the fields of

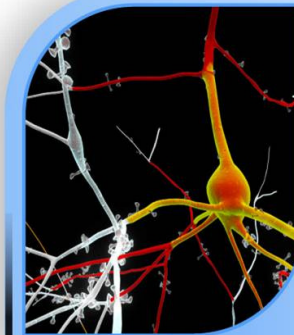
Neuro-degeneration

Understanding the potential role of nutrition in preventing cognitive function decline during ageing



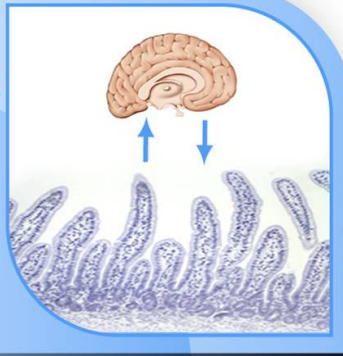
Neuro-development

Understanding the impact of specific nutrients on brain and cognitive development



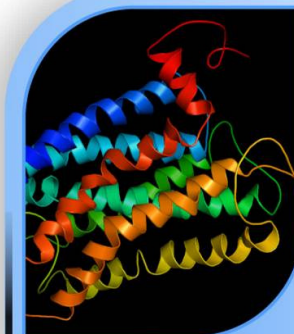
Gut-brain Interactions

Mapping the impact of specific food ingredients on mood and mental performance



Perception Physiology

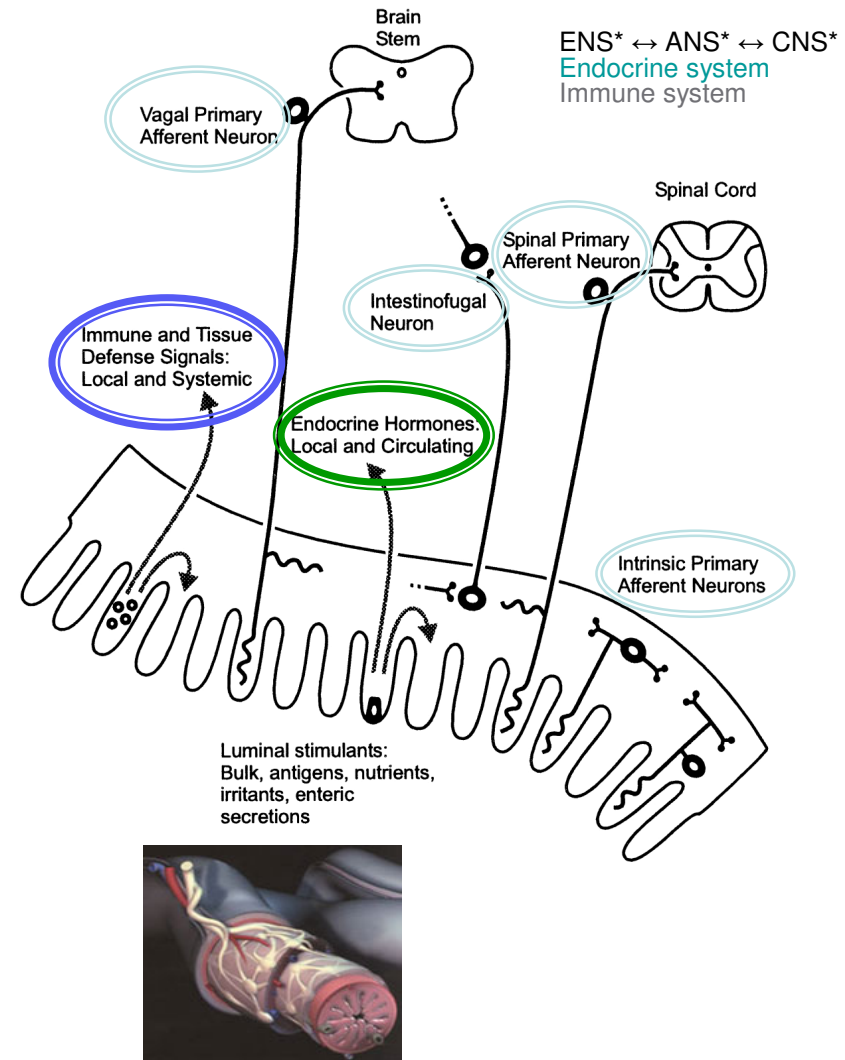
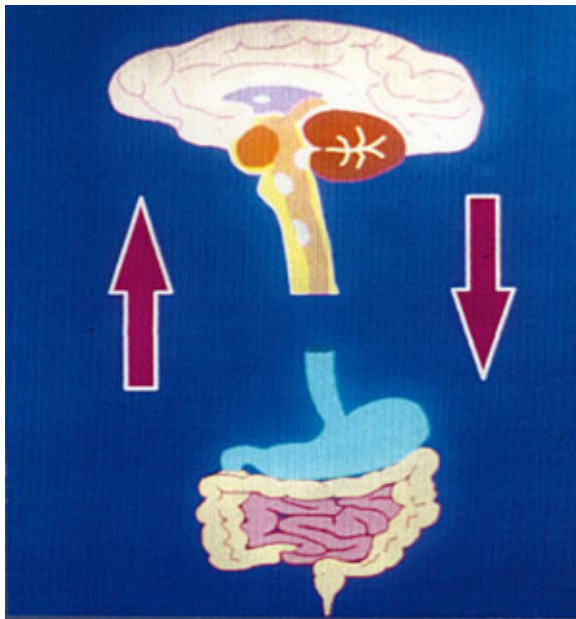
Improving the overall perception of food and maximizing the pleasure derived from food



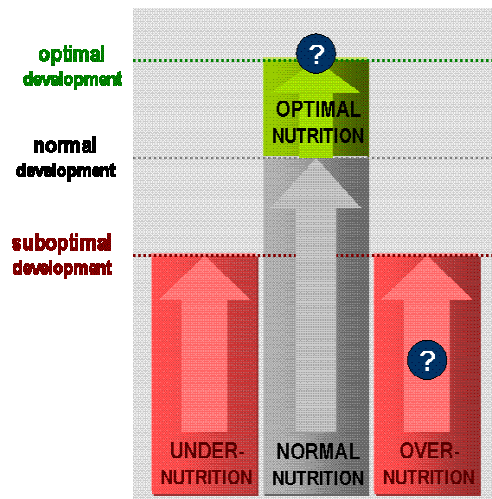
Body Brain Interactions: Gut-Brain Axis

Overall Goal

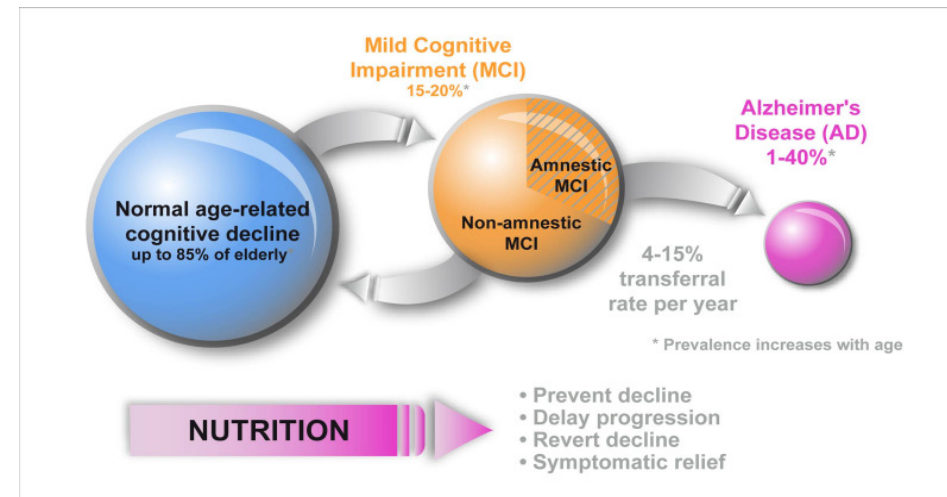
Determine the role of the diet on the gut neuroendocrine and neuroimmune systems and its impact on mood and cognition



Neurodevelopment



Neurodegeneration



- **Fundamental insight** in the processes and modulators of development and degeneration
- Identification of **novel targets** for nutritional interventions
- Development of **tools** (models, (bio)markers, measures) to investigate nutrition effects
- **Demonstrate** beneficial effects of nutritional interventions

Conclusions



Brain Health Throughout Lifespan



Can we enhance cognitive development /performance when there are no overt nutritional abnormalities?



Can we develop integrated metabolic solutions to prevent /revert cognitive ageing

Strong Commitment to Lifesciences



Health claims supported by strong science



Multidisciplinary teams of top researchers

Strong Commitment to Innovation



Basic nutritional profile



The right nutrient for the right needs



Lifestyle solutions for individual needs

The Brain: Such a Tough Nut to Crack !



Thank You