



DISCOVERING HEALTH EFFECTS OF DAIRY AND DAIRY INGREDIENTS



ARLA
FOOD
FOR
HEALTH





POPULATION:

10 BILLION
IN 2050



1.9
BILLION

Adults, 18 years and
older, are overweight

>600
MILLION

of these are
obese

462
MILLION

Adults are underweight

>200
MILLION

<5 is stunted/wasted





RELEASING THE POTENTIAL OF DAIRY





CREATING VALUE FOR PEOPLE, SCIENCE AND BUSINESS THROUGH COLLABORATION





ARLA FOOD FOR HEALTH

A TRUE PUBLIC-PRIVATE PARTNERSHIP IN GLOBAL DAIRY NUTRITION RESEARCH



AARHUS UNIVERSITET



Arla Foods Ingredients
Discovering the wonders of whey 



PARTNERSHIP



EXCELLENCE



TALENT



SHARING

DISCOVERING
HEALTH EFFECTS
OF DAIRY
AND DAIRY
INGREDIENTS



THIS IS HOW WE ARE ORGANISED TO REALISE OUR VISION





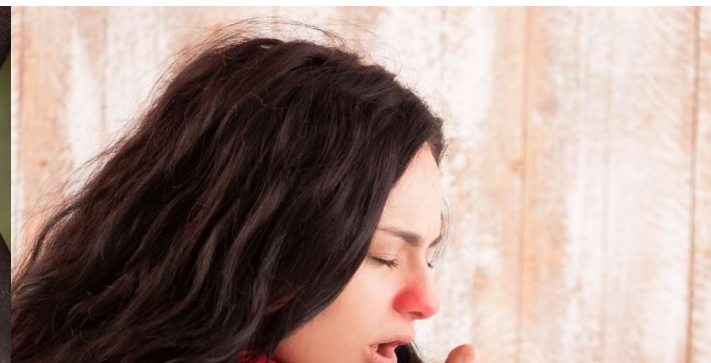
RESPONDING TO THREE RESEARCH NEEDS



METABOLIC SYNDROME



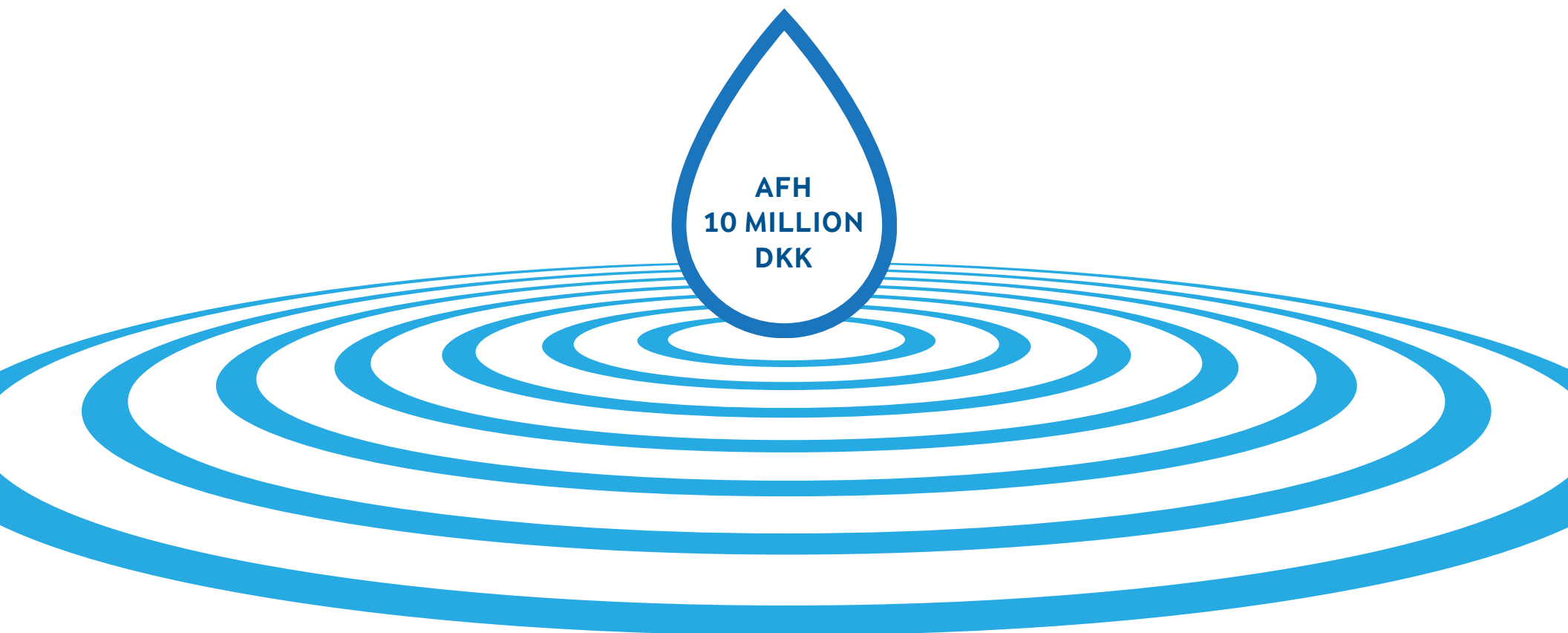
MALNUTRITION



IMMUNE DEFENSE

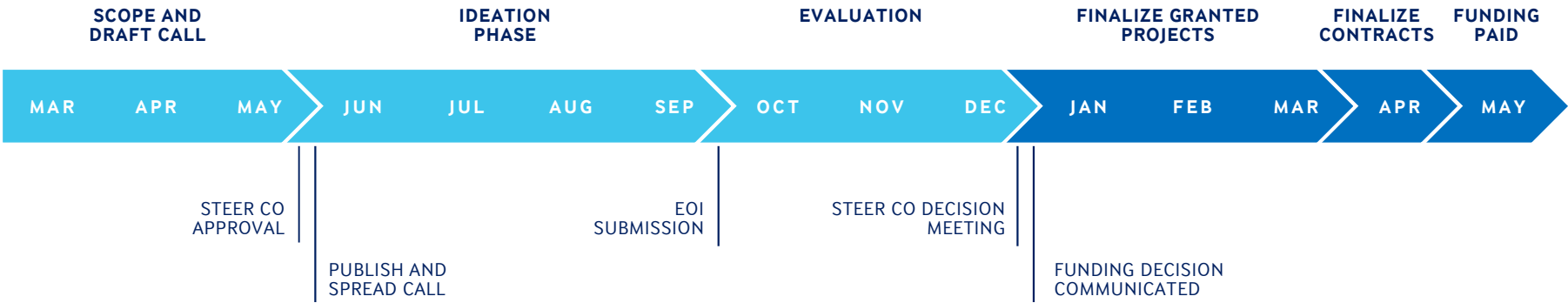


FUNDING INSPIRING FURTHER FUNDING





OPENING THE DOOR FOR TALENTED SCIENTISTS AND GREAT SCIENCE – CALLS, EVALUATION AND ACTIONS





SECURING TRANSPARENT AND INDEPENDENT RESEARCH





THE SCIENTIFIC ADVISORY BOARD

SCIENTIFIC QUALITY AND RELEVANCE



LINDSAY H. ALLEN



J. BRUCE GERMAN



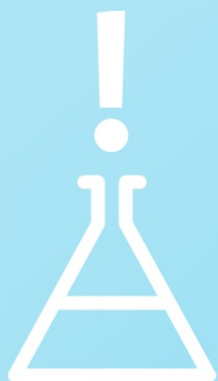
LUCA COCOLIN



ALAN KELLY



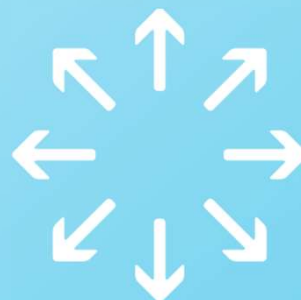
OUR CRITERIA FOR IDENTIFYING EXCELLENCE



**SCIENTIFIC
QUALITY AND
RELEVANCE**



INSIDE CALL



IMPACT



**RESEARCH
COLLABORATION**



WE ARE CURRENTLY SUPPORTING TEN EXCITING PROJECTS



InfantBRAIN

Valorisation of milk fat globule membrane enriched ingredients



DairyMat

Designing biofunctional dairy foods: matrix structure of dairy products in relation to lipaemia



OmniSam

A multimodal metric for predicting the satiating effects of real foods and drinks



EnMet

ENergy METabolism - the molecular mechanisms governing the beneficial effects of milk-derived proteins



MiPUAge

Milk Protein Utilisation and Age



Stimmune

Bioactive milk diet to stimulate gut immune defense in infants born with perinatal inflammation



CutDM

Cut down on carbohydrate usage in the diet of type 2 diabetes



TAKE

TAilor-made KEto-dairy nutrients to combat post-inflammatory protein and muscle waste



MAGMAM

Milk and Growth in Moderate Acute Malnutrition



D-pro

Effects of milk protein and vitamin D on children's growth and health



ARLA FOOD FOR HEALTH CONNECTS WITH THE ENTIRE WORLD





ARLA
FOOD
FOR
HEALTH

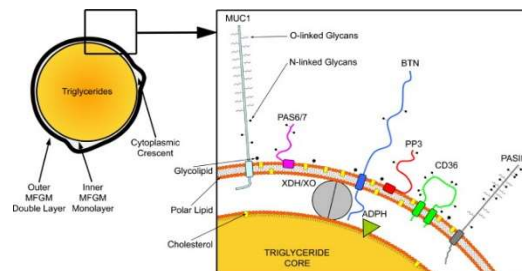


InfantBRAIN

Identify lipid fractions from milk that support infant brain development and cognitive function

The milk fat globule membrane (MFGM)

surrounds all fat globules in milk. It has recently received widespread attention as a value-added ingredient in e.g. infant formulas.



(Dewettinck et al., 2008)

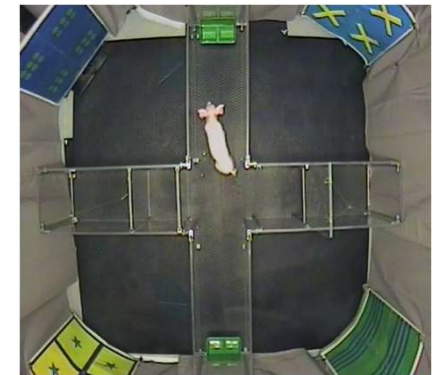
New types of
MFGM fractions



In-vitro and in-vivo trials:

- i) In-vitro digestion studies of Oil/Water emulsions
- i) Digestion studies in piglets
- ii) Cognition study in piglets

0





DairyMat

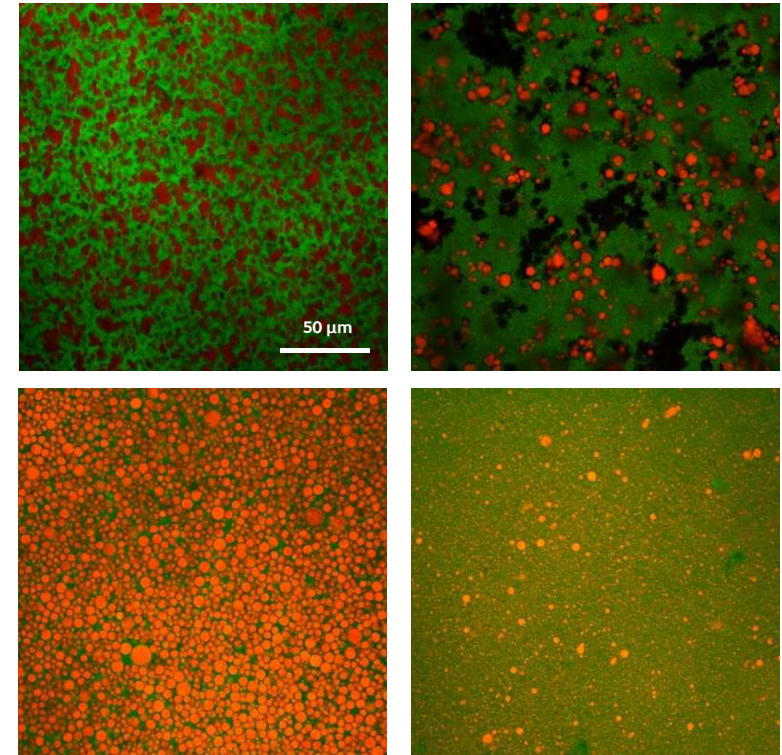
Designing biofunctional dairy foods: matrix structure of dairy products in relation to lipemia

Evidence has emerged that the postprandial response is fundamental for understanding how the diet contributes to development of lifestyle-related diseases such as the metabolic syndrome.

Structurally different dairy food matrices with identical nutrient composition of fat, protein, carbohydrate, and minerals are hypothesized to affect the postprandial lipemia. The project presents a novel and new interdisciplinary approach, where food structure and texture, *in vitro* digestibility, *in vivo* human postprandial response and metabolomics are combined to elucidate the correlation hypothesized.

Four dairy products representing solid to liquid textures, with native or homogenized milk fat globules, and with/without protein network structure are developed. A cross-over postprandial study with 25 participants (or 20 completers) offered these products is performed. Blood samples are analysed for response in triglyceride concentration, lipoproteins, free fatty acids, glucose, insulin, and metabolites.

We expect to gain knowledge of which structures of dairy matrices modulate the lipid uptake, and how these structures can be used strategically to change kinetics of the postprandial fat absorption.



Confocal Laser Scanning Micrographs of dairy structures;
green = protein, red = fat.



OmniSam: The Omnibus Satiety Metric

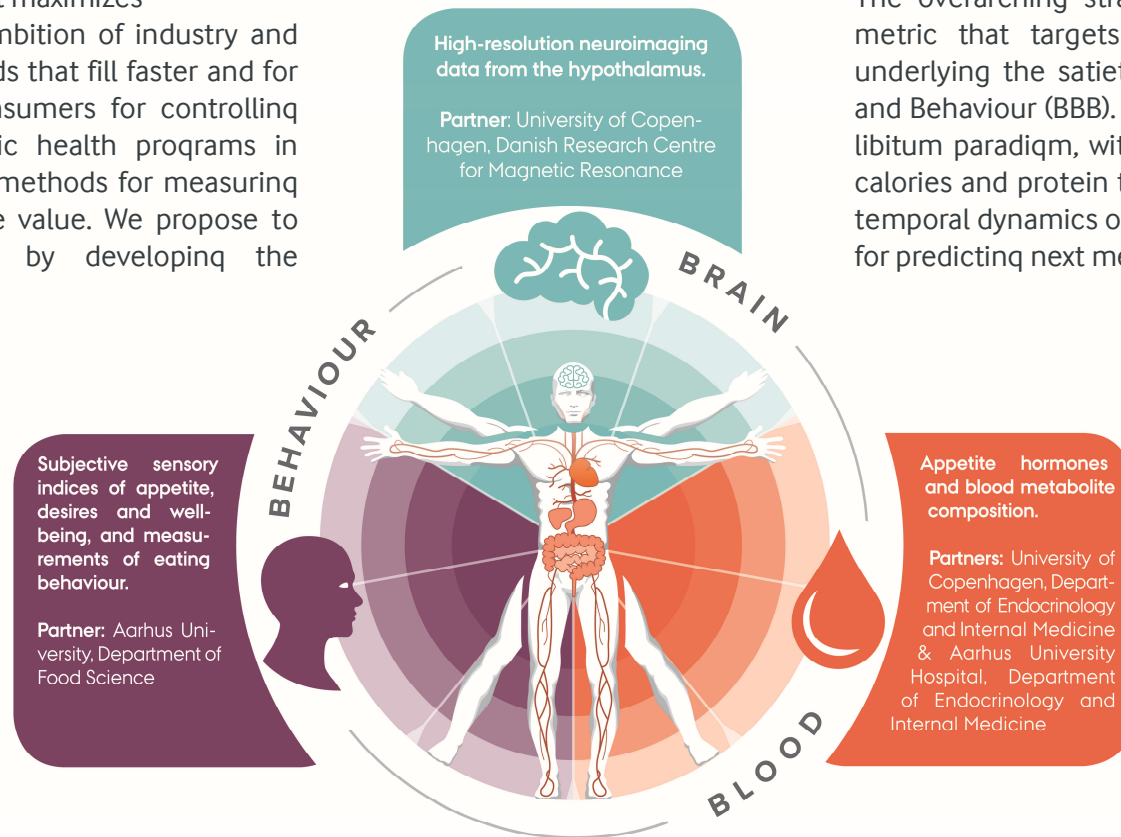
A multimodal metric for predicting the satiating effects of real foods and meals

BACKGROUND

Designing food and drink that maximizes satiety has long been an ambition of industry and public health programs. Foods that fill faster and for longer are desirable to consumers for controlling their weight, and for public health programs in obesity prevention. Current methods for measuring satiety have weak predictive value. We propose to overcome this deficiency by developing the Omnibus Satiety Metric.

PURPOSE

The overall purpose of the OmniSam project is to develop a proof-of-concept satiety metric that provides accurate predictions of the satiating effects of real foods and drinks.



STRATEGY

The overarching strategy is to develop a multi-modal metric that targets the full spectrum of processes underlying the satiety cascade composing Brain, Blood and Behaviour (BBB). Subjects will undergo a preload - ad libitum paradigm, with a 2-parameter factorial design of calories and protein to carbohydrate ratio. Extracting the temporal dynamics of BBB data, we will compute a metric for predicting next meal energy consumption.

CONTACT

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Website: www.omnisam.au.dk

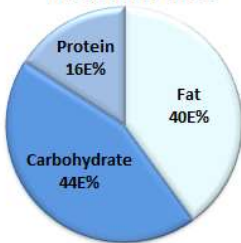


EnMet

Milk proteins as regulator of obesity through modification of ENergy METabolism and gut microbiota



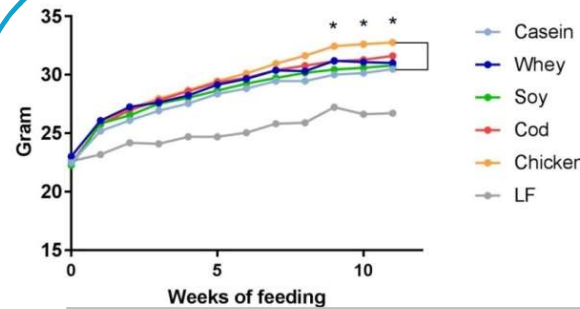
Western diet



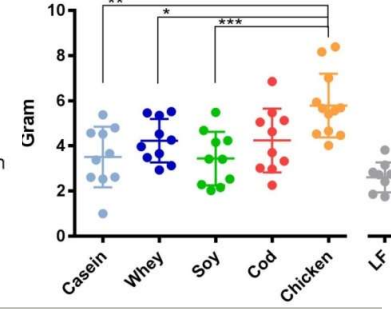
Mice were given a Western diet with either casein, whey, soy, cod or chicken as the only protein source to compare the obesogenic potential of different proteins ingested in normal amounts

Results

Average body weight



Fat mass

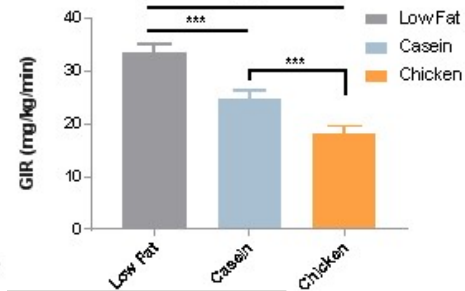


Chicken-fed mice gain more weight than casein-fed mice, and chicken-fed mice gain more fat mass than casein, whey or soy-fed mice

Hyperinsulinemic euglycemic clamp



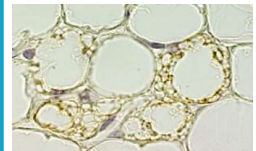
Glucose Infusion Rate



Even short-time feeding with a chicken-based Western diet decreases whole-body insulin sensitivity

Upcoming

Histology



RNA seq



Hyperpolarisation



And more



MiPUAge

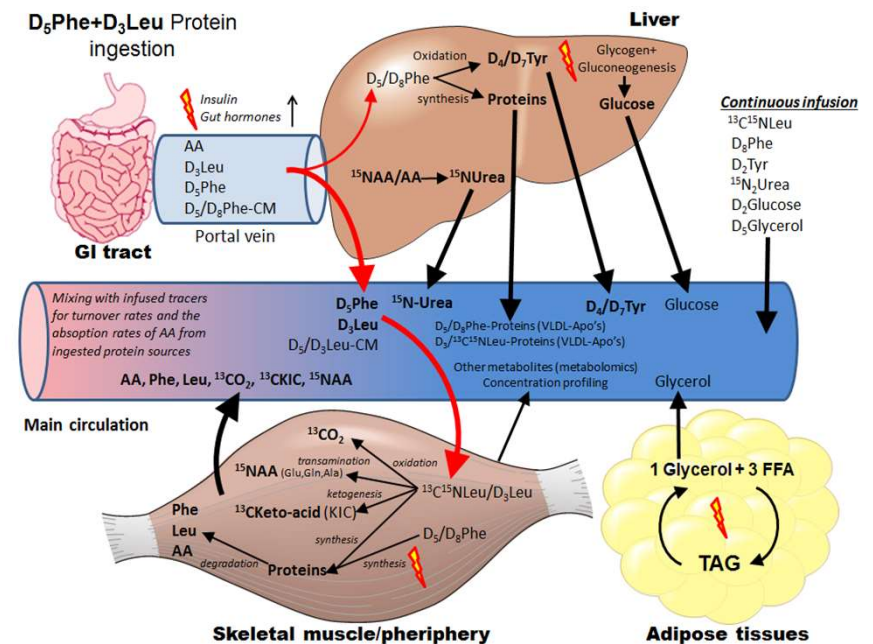
Whey and casein-derived protein ingredients: gastro-intestinal absorption, whole body utilization, and hormonal and metabolic regulation: a metabolomics approach

This project investigates how age affects the body's handling of differently characterized dietary milk-based protein ingredients in terms of digestion, respective amino acid absorption and the effect on whole body protein synthesis and degradation, hormones and metabolic regulation. State of the art stable isotope milk protein labelling and continuous infusion and mass-spectroscopy are employed to yield most precise results.

Therefore, in this project intrinsically stable isotope labeled milk-derived ingredients will be produced and used in the clinical trials with healthy young (19-25 years) and elderly (65+ years) individuals to determine *in vivo* digestion and metabolic rates.

Project leader:

Professor Gerrit van Hall
Biomedical Science, SUND, KU
gerrit.van.hall@regionh.dk

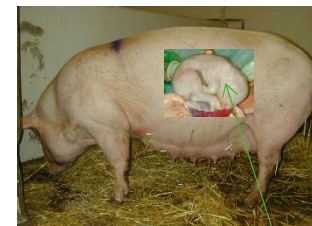




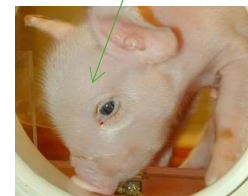
STIMMUNE

Bioactive milk diets to stimulate immune defense in neonates born with perinatal inflammation

- Establish two new animal (piglet) models of perinatal inflammation, just before and after birth
- Investigate the effects on host gut functions and immunity, including metabolomics analyses
- Use the models to test the immunomodulatory effects of bovine caseinoglycomacropeptide, osteopontin and colostrum
- Apply novel –omic techniques (proteomics, transcriptomics and microbiome) to elucidate mechanisms of perinatal inflammation-induced systemic and gut disorders
- Investigate if perinatal inflammation results in dysregulated gut/systemic immunity in infants



Inflammation just before or after birth



Bioactive milk

Gut and immunity maturation & health

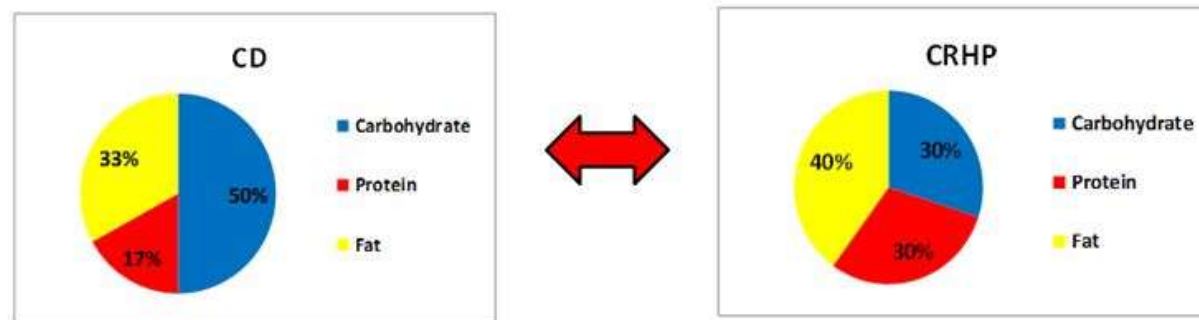
Normal feeding

Gut and immunity inflammatory disorder



CutDM

Establish if a carbohydrate-reduced high-protein diet has beneficial effects on people with type 2 diabetes



Aim and hypothesis

To examine whether a carbohydrate reduced high protein (CRHP) diet compared with a conventional (CD) diet will:

Improve metabolic control by

- reducing postprandial plasma glucose excursions
- reducing diurnal blood glucose excursions
- reducing HbA1c

Improve cardiovascular markers by

- increasing heart rate variability
- reducing diurnal blood pressure
- reducing fasting triglycerides



TAKE

Effect of protein type on combatting post-inflammatory protein and muscle waste

THE IDEA & "DISEASE" MODEL

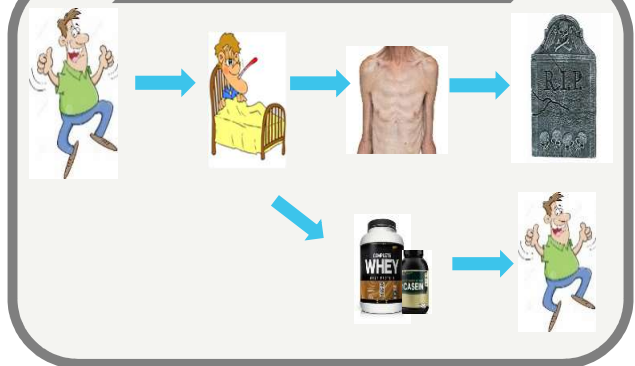
BACKGROUND: Loss of muscle protein during inflammatory disease and hospitalisation is a big problem, and is strongly associated with increased risk of death. Protein supplementation can reduce muscle loss. Especially leucine-rich supplements seem to be beneficial in performance sports. However, whether one protein type is superior to another during acute inflammatory disease needs further investigation.

RISK FACTORS FOR MUSCLE LOSS: Bed rest, decreased/no food intake and inflammation accelerates muscle loss.

NEW "DISEASE" MODEL: E. coli Lipopolysaccharide induced inflammation + 36-hour fast and bed rest mimics real inflammatory disease.

HYPOTHESIS: Leucine-enriched whey is superior to whey, which is superior to casein in maintaining muscle protein in the "New Disease Model".

DESIGN



INTERVENTIONS

1. Leucine-enriched whey
2. Whey
3. Casein

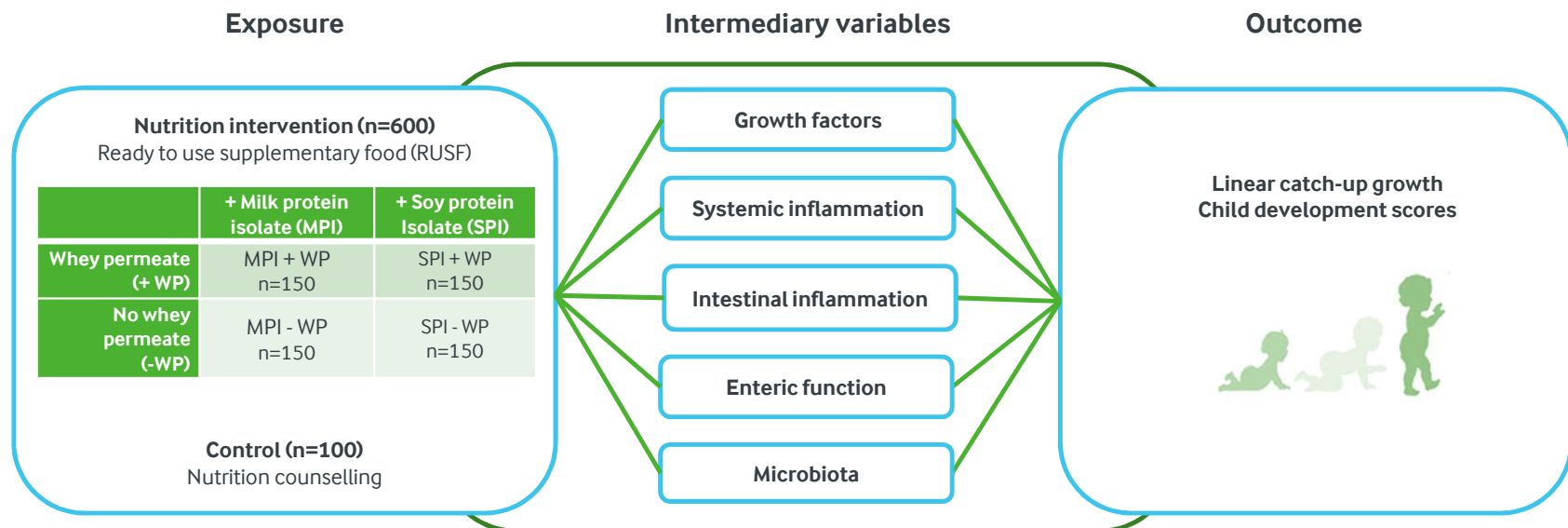


MAGMAM

Milk and growth in moderate acute malnutrition



Objective: To assess the effectiveness of milk or soy protein isolates with or without whey permeate in the management of moderate acute malnutrition in Ugandan children aged 24-59 months



D-pro

Background

Consumption of milk and milk proteins as well as vitamin D have been positively associated with bone health, growth, lean mass, muscle strength and cardiometabolic health. However, most randomized trials have been conducted in adults and we lack evidence in children.

Aim

To investigate the combined and separate effects of milk protein and vitamin D on bone health, growth, muscle strength, body composition and cardiometabolic health in 6-8 year-old children.

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