

## Conference Report

### 13<sup>th</sup> European Nutrition Conference: Malnutrition in an obese world

Tuesday, 15<sup>th</sup> of October 2019 – Friday, 18<sup>th</sup> of October 2019

The Convention Centre Dublin, Ireland

#### Tuesday 15<sup>th</sup>

##### **1 | Introduction by Julie Lovegrove- President of the Nutrition Society (NS)**

NS has 5 journals and is launching a new one: “The Gut Microbiome”

We are living in a world where nutritional professionals are distrusted in their advice to the public and where, **via social media, anyone can say anything about nutrition**. A big question to address during this conference was how to realign the public's knowledge of nutrition with the scientific findings.

##### **2 | Keynote speaker – Dr Joao Breda– some introducing remarks on the obesity epidemic, focussed on Europe**

Obesity and non-communicable disease is everywhere nowadays. These conditions place an enormous financial and sociological burden on our society.

Also, Nutrition plays an important role in reaching our sustainability goals.

Actions towards health and sustainability need to be faster!

Important ideas:

- Measures related to **price, availability and labelling** to reduce adverse health impact have worked before on other parameters than food. Why are we not using these to combat non-communicable diseases?
- In Europe, progress could still be made in reducing **salt consumption**, as a risk parameter for cardiovascular disease. This could still save lives! Only 6 European countries are making efforts on this at the moment
- Complementary **baby food products** are horrendous with regards to their composition, even though many of them are marketing health claims. Their sugar and salt levels are too high, their vitamin contents are too low, etc.
- **Health professionals** need to have more attention for nutrition!

##### **3 | Oral Communication: diet index based on UKBiobank**

##### **4 | Oral Communication: Vegan, Vegetarian, Pescetarian diet & supplement use**

Observational study comparing people with different diets on their supplement use and micronutrient deficiencies.

Findings:

- Vegetarians always had the lowest micronutrient deficiencies
- Dietary supplement users have lower occurrence of deficiencies over all diet-groups

##### **5 | Oral Communication: Mediterranean diet & cardiovascular risk & gut microbiota**

Iso-caloric dietary intervention study in 82 individuals with an unhealthy lifestyle

- 2 groups: one eating their usual diet, one eating an isocaloric mediterranean diet (MedD)

- Individuals were not supposed to lose weight. Goal was to study the effect of the COMPOSITION of the diet on health parameters. Thus, the amount of fruit, vegetables, nuts and seeds and fish were increased in the people's diets.
- Samples: faeces, blood, urine.

#### Findings:

- People on the MedD increased their intake of fiber & protein and carnitine (coming from meat) went down
- **Total cholesterol decreased** on the MedD (both LDL and HDL)
- Higher adherence to MedD induced larger decreases in cholesterol
- **Microbiota:** MedD increased **fiber degraders** like Faecalibacterium and Roseburia
- People who improved their C-reactive protein levels (measure of inflammation in blood) also showed higher diversity indices, which related to their consumption of more diverse foods.
- Urolithin secretion in urine, following nut consumption, was related to Egerthellaceae family in gut bacteria.
- The MedD treatment also changed individuals levels of **bile acid secretion and butyrate levels.**

#### 6 | Symposium: Metabolic obesity

This symposium mostly handled the topic of liver diseases and diabetes in relation to unhealthy diets.

Important messages:

- Levels of diabetes have decreased over the last years, but prediabetes, characterized by elevated insulin levels, has increased in prevalence.
- Overfeeding is no replacing alcohol abuse as a reason for liver transplants.
- **Large fractions of the population have prediabetes without elevated BMI!** This phenotype comes with high health risks.
- This phenotype is also confirmed by comparing MRI-scans of the torso with waist circumference as a proxy for visceral fat (a risk factor for metabolic diseases). This comparison makes clear that even people with a small waist circumference (healthy weight individuals), may carry more visceral fat than expected. **Body composition differs between people with the same waist circumference and a low/healthy waist circumference isn't automatically safe!**
- There are also individuals which are overweight or obese, but who do not have (pre)diabetes. This raises the question: **does metabolically healthy obesity exist?** No consensus exists here yet.
- **Fat composition matters:** liver fat is not the same in everyone. Unsaturated fat in the liver is considered healthier than saturated fat. Increases in Polyunsaturated fat rich foods have shown to result in increases in PUFA in the liver.

#### 7 | Symposium: Emotional eating in adults

A: Emotional eating: definition and relations

- Emotional eating is defined as eating induced by negative emotions, like anger or sadness. Eating can either IN- or DEcrease in response to negative emotions.
- Eating can lead to short term increases in mood.
- Factors that will characterize emotional eating: 1) the person, 2) the emotion that is felt, 3) the available foods.
- Usually high fat, high sugar, easy to obtain and easy to prepare foods are chosen when eating out of emotion. There are also gender differences in which food products are chosen when emotional eating.

- Emotional eating is highly related to **weight problems**, either because of eating too little or too much => obesity.
- The stress of dieting can also cause emotional eating, which may hamper the weight loss goal of the diet.
- Depression and obesity are also related and most likely bidirectionally. Emotional eating can be the mechanism here.
- **Sleep** is an important factor! Sufficient sleep regulates emotions. The link between depressive feelings and emotional eating and weight gain is especially present in people who sleep less

#### Stress and emotional eating

- Stress, f.i. from exams, is related with emotional eating under the form of snacking. Increased stress levels are also defined by increased levels of cortisol, which may alter other systems in the body. F.i. hormone regulation of hunger and satiety or the gut microbiota. This way, people who were more stressed, had less diverse gut MO and happier people had a stronger share of good bacteria in their gut, independent of their diet. The mechanism in this relations is unclear. Did stressed people alter what they ate and did this affect their gut MO? Or did the internal systemic stress response affect the gut bacteria?
- This also leads to the question: can the gut bacteria influence what we eat? Pathways to investigate which could be influence by the gut bacteria are 1) appetite regulation, 2) the dopamin system, 3) the stress response system/hormones and 4) our taste of sweet and fat.

#### Eating disordered eating

- Some people eat MORE when stressed, some people eat less
- Anorexic and boulemic people eat more disordered when in a stressful situation. I.e. anorexic people will stop eating when stressed and boulemics will binge.
- Note: also positive feeling may lead to overeating.

### **8 | Symposium: Nuts, insulin resistance and diabetes**

Nuts are considered a health food and are largely **underrated or mistrusted**, because of their high calory content, but...

#### *A: Nut consumption and diabetes*

- Nuts contain **healthy fats, protein, minerals and vitamins and fiber**
- Nut consumption has been related to lower CVD incidence, has been proven to improve insulin resistance and glucose control and could improve diabetic parameters in diabetic patients.
- The **PREDIMED-trial** - large cohort study, that studied the impact of consumption of the mediteranean diet on health parameters- has shown that the mediteranean diet led to 50% reduction in T2D prevalence.

#### *B: Nuts and appetite*

- **Nuts are neutral for body weight!**
  - o They increase satiety
  - o Their energy is inefficiently absorbed – sturdy cell walls! – energy content of faeces is higher when more nuts are consumed – about 70% of their energy actually absorbed.
  - o May increase resting metabolic rate, but no consensus exists here yet.

- Interestingly, no relationship has been found between the amount of energy absorbed (or excreted) and the texture of the nut. So softer nut texture did not lead to higher amounts of energy absorbed...

*C: Nut consumption and the gut microbiota: an RCT - society for nut and dried fruit consumption*

The influence of an extra portion of 30g/d of nuts on **cognition** and the gut microbiota was tested in a double blind randomized cross over trial.

Parameters for mood and cognition showed incoherent enhancing effects of the extra portion of nuts. Only on the picture recognition test, nuts enhanced the results in some individuals (responders) Gut Microbiota showed **no difference in diversity, evenness or overall taxological composition** after extra nut consumption. Only the family of the **Lachnospiraceae** increased significantly after nut consumption and more so in the cognitive responders. Some changes in the urinary metabolome were also detected.

Wednesday 16<sup>th</sup>

### **9| Plenary speaker: Anne Astrup: which weight loss diet for which diabetic?**

Main message: Perfect weight loss diet for an obese person may depend on their insulin resistance status.

- For healthy people, a low carb, high fat diet may not necessarily be beneficial (OR bad). But for (pre)diabetics, lowering the carb-fraction of their diet (high carb, low fat diet) proved beneficial for their health status and their weight loss. It was stated that the more a person is insulin resistant, the more the fraction of carbs should be reduced in their weight loss diet.

The importance of **whole foods** consumption was also proven for disease reduction:

- The **DIOGENES** and **SHOPUS**-trial involved two set-ups in which weight loss was the goal and in which foods were supplied for free in a university food shop. In the diogenes trial, the foods were directed towards a lower glycaemic index by incorporation of more whole foods. In the shopus trial, the focus lay on the New Nordic diet and thus, which focussed on increasing consumption of fruits, vegetables, nuts and whole grains. People on the low glycaemic diets, containing more whole foods were able to sustain their weight loss for the trial period and do so without thinking about it, but by just choosing different foods.

The effectiveness of weight loss diets may also depend on other inherent physiological characteristics

- Prevotella enterotype people tend to lose weight more easily on a high fiber diet than people carrying a Bacteroides enterotype
- People with higher copynumbers of amylase-genes tend to lose weight more difficultly than people with less copynumbers.
  - o Lower amylase activity => less digestion of starches in food => less absorption of food energy.

### **10| Symposium: ILSI: LPS and metabolic inflammation in obesity**

Postprandially, fat molecules from food are taken up in the blood. With it, LPS (produced by gut bacteria) can be absorbed.

Endoxemia: high LPS-levels in the blood. Is related to metabolic inflammation and in this way metabolic disease.

In obese/diabetic patients, the gut barrier may be impaired, leading to endotoxemia.

- In obese men, higher fat contents in the meals caused higher postprandial endotoxemia. In normal weight men, this was not the case.
- Tricellulin – a tight junction protein- was less abundant in obese people's guts.

Structure and type of fats also play a role in fat uptake and metabolism

- Emulsified fats (vs solid fats) were more rapidly absorbed in the blood, but also stayed there longer. Emulsified fats appeared also to be rather beta-oxidised than stored.

**Emulsifiers** have been linked to increased levels of inflammation, stemming from the gut, this together with breached gut barriers.

**(Lecomte et al) Milk phospholipids**, on the other hand, have not been related to gut barrier problems. These compounds seem to increase some beneficial bacteria, end up in faeces (sphingomyelin and breakdown products) and are being related to decreased cholesterol absorption (human trials).

Increased amounts of bacteroidetes in the gut seem to be related to higher levels of endotoxemia.

### **11 | Oral communication: Circadian Rythm**

Main idea's:

- Each cell in our body contains an inner clock/clock genes.
- Disruption of our circadian rhythm – by shift- or night work, in airport personel, by reduced sleep duration, irregular mealtimes – has strong health implications.

### **12 | Oral communication: Gut Microbiome's Role in Obesity – Jens Walter**

- The gut microbiome is the densest microbial ecosystem on earth.
- It is an accepted idea that the gut microbiome is different in composition & functionality in obese vs normal weight people.
- Hypotheses of the mechanism by which the gut microbiota might contribute to the obesity phenotype: 1) increased energy-absorption, 2) gut barrier dysfunction and increase in (systemic) inflammation.
- Research communication by P. Cani in Microbiome: butyrate can prompt gut lining cells to consume O<sub>2</sub>, which limits its transport into the gut lumen. Limiting O<sub>2</sub> in the gut lumen prevents outgrowth of opportunistic pathogens of f.ex. the enterobacteriaceae family.
- Therapeutics researched and used today to solve obesity via the gut microbiota:
  - o Pre- and probiotics
    - Majority of the effects observed from these interventions are really small and insufficient.
  - o Drugs and interventions, f.i. fecal transplants
  - o Diet adjustment
- Western diets disrupt the homeostasis at the gut lining interface and increased levels of dietary fiber improve the gut barrier.

By now we seem to know mostly what causes problems in the gut or in what conditions the gut is impaired. Right now, research should focus on the mechanisms behind the effects.

### **13 | Oral communication: Personalized nutrition for Health**

*A: Precision Nutrition for prevention and management of cardiometabolic diseases: Hype or hope?*

- Examples of Personalized nutrition that already exist: lactose or gluten intolerance, phenylalanin allergy, alcohol flush syndrome...
- Nowadays, new techniques can be used to assess the effectiveness of or the tolerance for different diets in different people.
  - o F.i. metabolic signature of mediteranean diet in blood can be determined, which can then be used to predict CVD risk.
- Metabolomics can show you the response of a person to a diet and could then be used to predict risks for multiple diseases.

*B: Personalized nutrition for the metagenome – Hannelore Daniel*

This woman placed some critical notes on all currently running microbiome research

**Hiatuses in current microbiota research:**

- Nobody seems to look at the actual **VOLUME and MASS of the microbiota** when analysing effects and relationships to disease. Actual numbers of bacteria are important!

- Volume of microbiota estimated at 150-200 ml. Total amount of bacteria measured at 59-100 g!
- **Stool volume** is never considered: are we diluting bacteria when stool volume is higher?
- **Energy is excreted** in stool and is almost never measured.
- It is unknown whether the gut microbiota are a **net sink or source of energy**. Gut microbiota replacement may take 200-250 kcal by itself! (calculated from a stool weight of 150 g and 60-80g of bacteria excreted per day)
- **Transit time** is an important determinant of alpha-diversity, gut MO mass and excreted energy!
- In diabetics, gastric retention is different and transit time is different. This may explain more about the decreased alpha diversity, than other biomarkers of the disease.

Conclusion: we need to take account of basic GI-tract physiology when studying Nutrition-Health relationships!

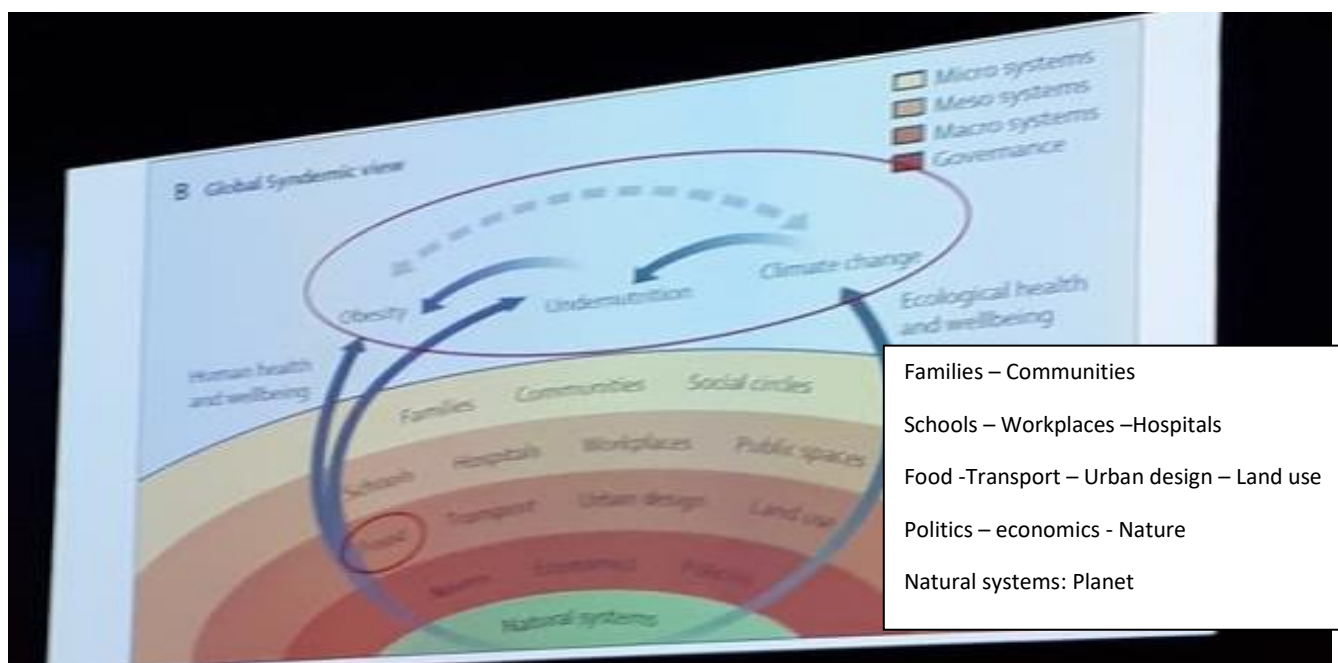
*C: Precision nutrition to improve health: insights from biomarker approaches*

**Metabolomics, genomics and microbiota data** can all be used to devise a personalized diet for a person, based on their inherent response to certain (combinations of) foods.

#### **14 | Symposium: Planetary health: The great food transformation.**

A: the great food transformation: why, how and who?

The food system consists of different layers:



How Do we make people eat better?

- We KNOW what needs to change. Implementation is the problem
- From the narrators standpoint, changing policies is now the next most important step.

Integration of planetary health, together with social health is crucial!

B: Planetary health and food systems: considering nutrition on a rapidly changing planet.

Over last century, the impact of humanity on planet earth has increased tremendously. We've drastically increased our energy usage and are changing N-, C- and O-cycles in nature.

Today's challenge: increase food production while reducing our environmental impact.

Global warming is having some drastic effects on our current food systems:

- higher CO<sub>2</sub>-levels in the air can alter the nutritional value of our foodstuffs: field studies of 41 cultivars on 3 continents now show sign. Decreases in Fe, Zn and protein contents of plant crops. This fact is calculated to give the highest risks for nutrient deficiencies in developing countries around the equator in Asia and Africa.
- Pollinators are declining and they pollinate our most nutrient-dense food sources: fruits, veg, nuts and seeds. Decreases in pollinators could lead to increased deficiencies in vitA and Folate.
- Fishery stocks are declining FAST and the fastest around the equators. As it happens, this is also where the most fish dependent people live! Also, for many people, B12, VitD and w3-fatty acids mostly come from fish!

**Conclusion: Global warming may affect our currently existing food system into higher risks for micronutrient deficiencies!**

C: Food systems and climate change: latest IPCC and GSDR report

Jean-Pascal van Ypersele: Belgian professor in Physics and climatology

**Skepticalscience.com**



Thursday 17<sup>th</sup>

**15 | Plenary Speaker: Ellen Blaak: Current metabolomic perspectives on malnutrition and obesity**

- Insulin resistance in different organs is related to different gene expressions!
- People with different main locations of insulin resistance (liver vs muscle) also respond better to different weight loss diets
  - o Mostly liver IR => low carb/high fat diet
  - o Mostly muscle IR => mediterranean diet
- Acetate infusion (in gut) for treatment of obese individuals? => different impacts in different parts of the gut.
  - o When infused in the proximal colon => no effect
  - o When infused in the distal colon => increased fat oxidation

**16 | Symposium: Ultra-processed foods – potential health impacts**

A: **Jean-Claude Moubarac**: what are ultraprocessed foods and how have they changed the quality of diets in Europe and worldwide?

- A healthy diet is low in ultra-processed foods.
- Cooking and consuming food together is also important in a healthy food culture.

B: Ultra-processed foods and health: an epidemiological approach.

The NOVA classification system categorizes food products according to level (and purpose) of processing. 4 categories are defined, with the highest level of processing named 'ultra-processed foods'.

This NOVA system has been used in epidemiological research and in this way, overconsumption of ultraprocessed foods has been related to several parameters of metabolic syndrome.

Nutritnet Santé = 10 year cohort:

- 39% of energy consumption came from ultra-processed foods
- Diverse set of people overate on ultra-processed foods.
- People that consumed too many ultra-processed foods were also more likely to smoke, enjoyed less physical activity and were in general younger.
- **Overconsumption of ultraprocessed foods was related to 1) increased mortality risk, 2) increased risk for CVD and increased risk for cancers.**

C: w3-Polyunsaturated FA & brain disease

**Omega 3 fatty acid (especially EPA and DHA) consumption has been linked to brain health and amelioration of mood and anxiety. Insufficient w3 consumption has been related to anxiety and depression.**

- The brain is rich in w3 and w6 fatty acids. Neurons are also rich in these compounds under normal circumstances.
- Decreased intake of these fatty acids via the diet has been related to decreased levels in the brain.

Plausible mechanism?

- EPA and DHA are important precursors for endocannabinoid production, which regulate synaptic plasticity => important for emotion regulation.

However: one mouse trail showed that

- YES: increased w3- fatty acid consumption could lead to decreased anxiety behavior in mice
- BUT: the endocannabinoid system was not concluded to be the mechanism.

Conclusion: w3 consumption is beneficial, if not crucial, for brain health. But the mechanism of its benefits is not known yet.

### **17| Plenary speaker: Lauren Lissner: Food environments and the obesity epidemic: lessons learned and future research challenges**

Another talk on what needs to be done/considered when trying to change the food environment to tackle the obesity epidemic.

- Socio-economics need to be considered: healthy food needs to be affordable
- Sleep & screentime is related to obesity in children.
- Tv-marketing of unhealthy foods to children has been limited by regulations, but now marketing can happen via social media, which is still poorly regulated!

Taxes and food labelling may be good strategies to try and change consumer behavior.

### **18| Food based dietary guidelines: a framework for human and planetary health**

Friday 18<sup>th</sup>

### **18 | Chrononutrition: The evidence for why you are when you eat.**

A: Epidemiological evidence of meal timing on health

The timepoint and the regularity with which you have your meals may be of importance with respect to weight gain.

- **Strong evidence from both mouse and human trials exists that eating later in the day/ at night can lead to more weight gain than when the same calories (and the same diet composition) are consumed earlier in the day.**
- Also irregularity in meals has in some studies been related to increase BMI, even when less calories were consumed, but these results aren't conclusive yet.
- Night shift work has been related to chronic diseases and weight gain
- Studies have also shown that people that eat later are more prone to show other unhealthy behavior: low physical activity, smoking,

Some evidence is starting to build up for the existence of **chronotypes**:

- 25% of people tend to be morning people and another 25% tend to be evening types. This means a shift in the timeframe in which these people perform best.
- Unfortunately, society isn't tailored to these interindividual differences and especially evening types run the risk of being branded as lazy. When trying to fit into society tends to lead to following problems:
  - o They tend to show more unhealthy behaviors in terms of eating, smoking and physical activity.
  - o They tend to eat later
  - o Their eating is more irregular: during weekends, when they CAN sleep later, they do so, which is in stark contrast with what they do during the week.

B: Circadian metabolism in humans and its regulation by meal timing

As it turns out, **human body's are littered with circadian clocks** (and clock genes)

- There is a central clock in the brain, right under the hypothalamus, called the suprachiasmatic nucleus
- All organs and even all cells carry peripheral internal clocks

A protocol has been devised to measure the circadian variance in bodily functions, by erasing external circadian cues. This protocol is carried out in **the constant routine protocol lab**

- People are held in dim light 24/7,
- Are fed a glucose snack every hour, to eliminate day/night variation in calory intake
- Are moving as little as possible, by laying in a bed all day.

Studies in these labs (and other studies) have shown that **most bodily functions show a circadian pattern**: temperature, blood melatonin, blood triglycerides, blood levels of insulin and glucose, etc. All show a circadian pattern, irrespective of external cues. In fact, **15-20% of blood metabolites show circadian rythms.**

Fat oxidation is also higher in the morning and plasma triglycerides go up at night.

These internal clocks are highly important for the healthy functioning of our body:

- Genetically disrupting the peripheral clock of one type of tissue (in mice) has shown that this has consequences for the whole body's physiology. F.i. disrupt the pancreas internal clock and insulin secretion becomes impaired and glucose levels skyrocket.
- Eating meals misaligned with our normal circadian rhythm has been shown to lead to higher glucose responses and alterations in insulin secretions.

Our internal clocks get/need cues from the outside (light variance, meal times, environmental temperature,...) to align, to synchronize. By understanding these cues, we may help the synchronization ourselves to, f.i. overcome jetlag.

- Our central clock reacts mostly to light and temperature cues.
- Our peripheral clock tends to respond more to meal time cues. F.i. one study found that delaying meal timing with 5 hours could alter gene expression in fat tissue.
- This leads to the idea that we can sort of tune our own clock with our mealtimes., But.... (vide infra)

A great hype: **time restricted feeding**: are there benefits?

- In mouse studies, time restricted feeding (i.e. taking in your calories in a window of 8 hours only) has shown to reduce body weight and to mildly improve insulin resistance
- Human study: compression of eating window by 3 hours leads to weight loss, but perhaps not necessarily by the fact that the time window was compressed. It simply led to lower calory consumption, naturally, without any dietary recommendations. This in itself is a good technique for weight loss of course, but it gives no evidence for a possible benefit of eating the same amount of calories in a shorter window of time.

C: Reciprocal connections between timing of food intake and the circadian clock: **molecular/genetic work**

The molecular basis of our bodies clocks lies in a feedback system in our genes (CK1  $\epsilon/\delta$ ), working with transcribed genes and factors and receptors.

Just like 5-20% of blood metabolites, also 5-20% of our tissue gene expression shows circadian patterns. These genes were always identified as genes crucial for the functioning of the tissue in question.

**Conclusions:**

- **Human bodies function according to internal clocks**
- **To a certain extent, these clocks can be realigned by meal timing, but...**
- **Chronotypes exist. Some people function better in the morning, some better in the evening.**