

## **ECOG Satellite RTD Workshop on New Technologies and Innovations to Tackle Obesity**

### **Future research needs / topics:**

#### **Session 3: Converging technologies, innovations to tackle obesity**

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1) Further understanding of the mechanisms of hunger and satiety in order to be able to create novel food products that promote satiety. This requires studying food-gut-brain interactions and food technology (e.g., food reformulation, nanotechnology (encapsulation of active compounds)).

Protein is the most satiating macronutrient, but it needs to be established why and how different types of protein affect satiety and homeostatic processes.

2) Combinations of lifestyle interventions (e.g., diet + exercise + support/therapy) have potential for prevention and treatment of obesity. However, such interventions need to be tailored to the individual. E.g., genotype can greatly affect the effectiveness of different types of weight-loss diets. Interactions between subject characteristics and different types of interventions need to be established in order to provide effective personalized interventions.

- Genotype-shaped diets in weight loss/ maintenance
- Moving away from the nutrition pyramid to something that is more suitable to individual traits

3) The gut microbiota is affected by weight loss. This needs to be further understood. In addition, targeting the gut microbiome could provide a way to enhance weight loss and/or health. Thus, the interactions between diet and gut health need to be addressed, preferably taking genotype into account. It needs to be defined what a 'healthy gut microbiome' is and how that can be achieved e.g. by changes in diet or ingestion of specific (functional) food products.

4) Specific groups of subjects should be investigated in order to find new treatment/intervention options. Particularly interesting groups include:

- Healthy obese subjects
- Healthy subjects with an 'unhealthy' diet/lifestyle.
- Successful dieters (post-obese subjects).
- Twins, in particular mono-zygotic twins with lean and obese counterparts.

5) Subjects or consumers may have resistance to interventions/treatment. This can hamper treatment or prevention strategies, e.g. changes in food choice, nutrition behaviour, media consumption, physical activity and related lifestyle factors. There is need for consumer research to better understand the barriers and facilitators of healthy lifestyles, especially in vulnerable groups (low SES, migrants).

6) Better understanding of food choice and how healthy food choice can be promoted. This requires state-of-the-art techniques like neuroimaging techniques (fMRI, EEG). The basic problem to be tackled here is that of 'delayed gratification': Healthy food choices pose a choice between immediate (food) reward and long term health benefits, i.e., rather abstract and delayed benefits. However, basic physiologic factors should not be disregarded. These include genetic variation in taste receptors and odor/taste perception.

7) Use neuroimaging in combination with more mainstream approaches to better understand formation of eating habits and food preferences and how these can be changed in individuals of different ages. This includes investigating which parenting strategies are most effective. This in turn requires knowledge on gene-environment interactions (e.g., neurobehavioral genotypes susceptible to specific types of intervention should be characterized)

8) Longitudinal epidemiological studies are needed to provide clues as to which factors drive obesity and health. In addition, selected, well-characterized subgroups need to be investigated in experimental studies.

9) Neuroimaging data should be better exploited by linking it with other measures and by developing and improving techniques for meta-analyses and data mining. This requires the pooling of (summarized) data in standardized databases. In addition, it is crucial to include additional data (phenotype, genotype). E.g., most genes related to obesity are supposed to be linked to brain functions. Their role should be (further) clarified by fMRI, e.g. by assessment of selected genotypes and/or analysis of multiple studies.

Sharing of data may be obliged for studies funded by public money. Retrospective as well as prospective data-sharing should be considered (cf. genetics). Proper regulations should be developed to address issues like ethics, intellectual property rights and commercial exploitation.

10) Research needs of the food industry that were put forward are:

a) Hypothesis-driven research, particularly as it relates to new technologies – there needs to be a clear rationale and demonstration that technologies are contributing towards developing practical solutions. b) Developing better experimental frameworks to understand the role of individual foods supporting weight management. c) Developing better experimental frameworks to understand the role of appetite control in weight management. d) Link research methodologies to health claim substantiation requirements, e) Food design (higher moisture but shelf-stable, low energy bulk ingredients but non-laxative), f) more focus solutions to enable weight maintenance to avoid next generation of obese people.

11) It needs to be established what exactly is the problem with increased fat mass / weight. Similarly, the beneficial effects of physical exercise need to be elucidated. There is a need for better biomarkers.

12) The effects of sleep (quality) and/ or chronodisruption on metabolic disorders and obesity (but also other health outcomes like cancer).

13) The use of E-mobile technologies like personal digital assistants (PDAs) or mobile phones, e.g. for assessment of food intake or physical activity, as part of prevention interventions as well as evaluation tools of intervention programmes.