NEWSLETTER
SPRING 2012

The Project, in a Nutshell

Full4Health – "Understanding food-gut-brain mechanisms across the lifespan in the regulation of hunger and satiety for health" brings together 19 multidisciplinary academic and industry collaborators from across Europe to investigate mechanisms of hunger, satiety and feeding behaviour, and how these change across the life course, effects of dietary components and food structure on these processes, and their possible exploitation in addressing obesity, chronic disease and under-nutrition.

1 project
5 years
11 million euros
15 partners
18 work packages
23 Principal Investigators
35 Early Stage Researchers
12 months completed
13 milestones achieved
16 publications
20 deliverables achieved on time
40 presentations
43 key stakeholders

Welcome from the project manager

Dr Gabi Wagner

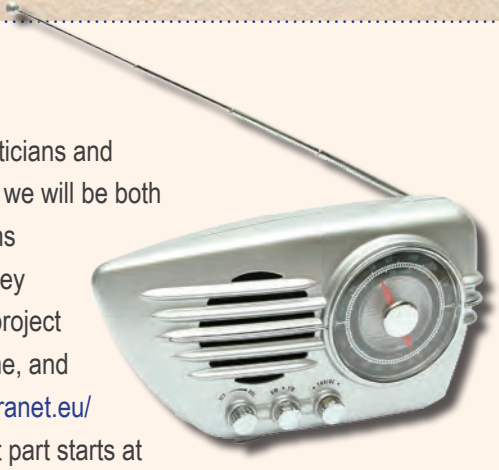
I am very pleased to welcome you to the second Full4Health Newsletter. The project has now been running for a year and work is underway in all the workpackages from clinical work with human volunteers, pre-clinical work based on rodent and pig models, and associated in vitro assays. Several partners have already collected substantive data and you can follow our research output on the Full4Health website (http://www.full4health.eu/publications). You can now also subscribe to the RSS feed to receive updates on our progress.

We are delighted that the essential foundations have been laid for the major research tasks planned for the remainder of the 5-year Full4Health programme. Over the last months the sites carrying out human intervention studies were granted crucial ethical approval, and the development of animal models and molecular, physiological and anatomical tools has advanced as planned.

Through this Newsletter we hope to provide you with a clear perspective on our research goals and progress while offering some deeper insight into the work going on in our partner laboratories. We welcome your comments on any aspect of this project.

www.full4health.eu/

Full4Health on air



The Full4Health project is committed to providing visibility to European citizens, politicians and stakeholders of how research funding is being used. In furtherance of this ambition, we will be both proactive in our engagement with the media to publicise important topical news items relating to Full4Health, and will take any unplanned engagement opportunities as they arise. A recent example of the latter was the European Radio Network interview of project coordinator Prof. Julian Mercer on January 11th 2012. You can follow the programme, and Prof Mercer's discussion of how EU-funded projects are constructed under www.euranet.eu/eng/programme/English-Programmes/Euranet-UK-11-Jan (The Full4Health relevant part starts at minutes 20:55).

Full4Health comes to London, UK

Body weight regulation - food, gut and brain signalling

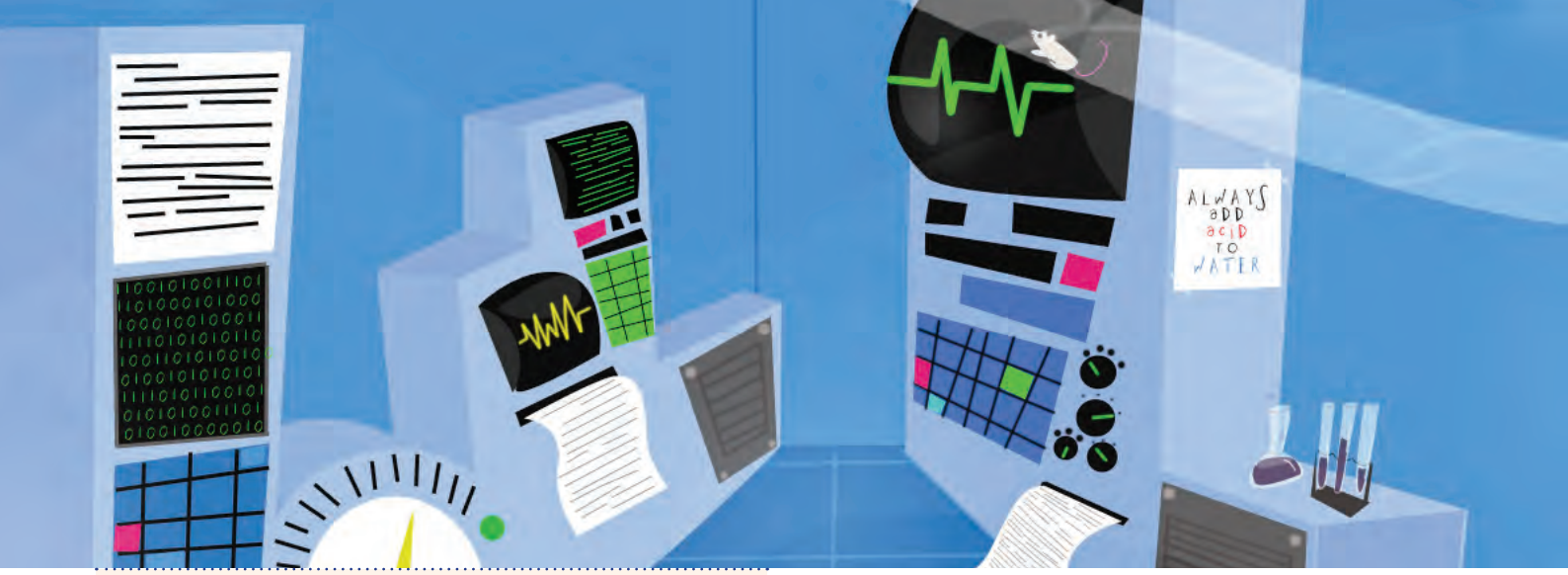
This was the topic of the 70th Anniversary Nutrition Society Winter Meeting at the prestigious Royal College of Physicians in London, UK, 6-7th December 2011. This cutting edge meeting brought together gut nutritionists, dieticians, policy makers, food industry representatives, enteroendocrinologists, physiologists,

Suzanne Dickson chairing a session

neuroendocrinologists and neuroscientists to foster new and closer links. The impressive list of oral presentations and posters provided an excellent overview of contemporary thinking in mechanistic aspects of body weight regulation. Four of the speakers, who presented their latest data and inspired animated discussions, are part of the Full4Health consortium. Prof. Roger Adan of the University of Utrecht (Netherlands) gave the opening

Paul Smeets talking at the conference

plenary on the role of the stomach derived hormone ghrelin in the anticipation of food. Professor Suzanne Dickson from the University of Gothenburg (Sweden) showed her group's latest findings on how ghrelin acts in the brain to regulate reward-seeking behaviour. Also from The University of Utrecht, Dr Paul Smeets, gave a most entertaining presentation on how the latest neuroimaging techniques can be combined with other techniques to advance our knowledge of how to change food preferences and eating habits, and how people cope with food temptations. Finally, Dr Fiona Gribble from the University of Cambridge gave an insight into the as yet little understood hormone release from intestinal cells. The attendance of 270 members and invited speakers broke records in the long history of Winter Meetings of The Nutrition Society and proved to be an excellent networking opportunity.



Meet the Scientist

Dr John Menzies, University of Edinburgh, UK

Dr. John Menzies is a postdoc in Gareth Leng's lab at the University of Edinburgh. In collaboration with Mike Shipston (Edinburgh) and Roger Adan (Utrecht), the group focuses on understanding the brain's energy-regulation and reward pathways and their influence on palatable food intake.

Tell us a bit about yourself and your lab?

I am a research scientist in the Centre for Integrative Physiology at the University of Edinburgh. We are interested in the brain regions underlying food choice, the anticipation of palatable food and termination of feeding. Our main aim is to further understand the brain pathways that control our innate preference for palatable foods.

What is it about your research that particularly interests you?

Until recently the influence of pleasure and reward in eating has been underappreciated. However, it is becoming clear that much of our eating behaviour is driven by pleasure and reward rather than by energy requirements. Modification of these brain reward pathways may be a route to improving health. The key to successful modulation of feeding behaviour likely lies in the signalling between the gut and the brain. The gut produces many peptide hormones that act in the brain and mimicking these may lead eventually to medicines that can suppress our desire to overeat.

John and his colleagues took their research to the public in Edinburgh last November at a "Science Live" event at the National Museum of Scotland

Why is eating so rewarding?

Dr John Menzies
University of Edinburgh

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What is the problem that this research is addressing?

Once we have accumulated fat stores, we do not need extra energy and should not overeat. However, the prevalence of obesity is high and rising worldwide. This must reflect a strong drive to eat despite the physiological systems that signal to our brain how much fat we already have. In addition to these homeostatic signals, it appears that the rewarding properties of palatable foods are extremely influential in determining how much we eat. Certain foods are preferred over others and our desire for these rewarding foods can easily overcome the physiological mechanisms that normally signal that we are 'full up' . This would be fine if palatable foods were nutritionally balanced but unfortunately the foods we find enjoyable tend to be high in sugar, fat, salt and calories. The outcome is almost inevitable - reward (or pleasure)-driven feeding encourages overeating, weight gain and obesity. It is becoming clear that modifying food intake therapeutically by targeting these homeostatic pathways may be futile in most cases of human obesity. Instead, it may be more valuable to understand and exploit brain pathways that are linked with hedonic (pleasure-driven) food intake.

What is already known?

Over fifty years ago it was shown that stimulation of regions of the brain associated with motivation, reward and pleasure caused animals to spend long periods continually self-stimulating. They did so at the expense of grooming, drinking, engaging in sexual behaviour or caring for their offspring, even enduring aversive stimuli to access the lever. It is clear that activation of this hedonic (pleasure) pathway can have profound and powerful effects on behaviour. A complex neural network radiating from these reward regions to many other parts of the brain has subsequently been shown to be active during the anticipation and consummation of pleasurable behaviours, including palatable food intake. The interconnected neural pathways activated by stimuli predicting food reward and by the psychological enjoyment associated with hedonic eating are becoming increasingly better characterised. Specific changes in these pathways have been noted in obese humans and in rodent models of obesity, indicating that this system may be a tractable target for anti-obesity therapy.

What research are you undertaking in Full4Health?

Gut-derived peptides like ghrelin (a stomach-derived hunger signal) and leptin (a fat cell-derived signal of energy stores) continually signal homeostatic information to the brain. These peptides also have a hedonic function, they can modify the pleasure and reward associated with food. However, little is known about which populations of reward-related neurones are peptide-sensitive, what neural circuits they form and how these networks evoke, inhibit or modify behaviours. We use optogenetic technology to control neuronal activity and, therefore, animals' behaviour. This is achieved by equipping neurons with a light-activated on/off-switch. By shining light on neurons with an in-dwelling light source we can study the neuronal networks that evoke complex feeding behaviour in living animals.

What do you hope will be the major outcomes?

Using an optogenetic approach in a rat model of hedonic food consumption we will determine how specific neural populations influence food anticipation, the motivation to commence eating, food choice and satiety. By activating or inhibiting these homeostatic and reward pathways we will obtain a greater understanding of the interconnectedness of these pathways and potential targets of therapeutic intervention