Theme 1: How Dietary Factors Affect the Human Microbiome

1. **'PRIMA – towards Personalized dietary Recommendations based on the Interaction between diet, Microbiome and Abiotic conditions in the gut', DKK 60 million**

   Main applicant: Tine Rask Licht, Professor, National Food Institute, Technical University of Denmark

   Co-applicants:
   Thue W. Schwartz, Professor, The Novo Nordisk Foundation Center for Basic Metabolic Research, University of Copenhagen, Denmark

   Lars Ove Dragsted, Head of section, Professor, Department of Nutrition, Exercise and Sports, University of Copenhagen, Denmark

   Jeroen Raes, Professor, Faculty of Medicine, Katholieke Universiteit Leuven, Belgium

   Brief description:
   You are what you eat, but why don't we all react to foods in the same way? Our guts contain a large community of microbes, and when we eat something and our microbes digest the food, they create products called microbial metabolites. These metabolites affect our immune system, our hormone balance, our health and possibly even our mood. When looking at dietary advice, there is no good 'one-size fits-all' solution. In PRIMA, we want to explore the effect of diet from a different perspective, namely from your gut. We believe we can predict an individual's response to a given diet based on fundamental factors such as pH and transit time in the gut, which govern the microbial responses. This way, we will develop better dietary advice tailored to a given person.

Theme 2: Modern Plant Science – Towards a Sustainable World

1. **'NovoCrops: Accelerated domestication of resilient climate-change friendly plant species', DKK 59.948.972 million**

   Main applicant: Michael Broberg Palmgren, Professor, Department of Plant and Environmental Sciences, University of Copenhagen, Denmark

   Co-applicants:
   Henrik Brinch-Pedersen, Professor with Special Responsibilities, Department of Molecular Biology and Genetics, Aarhus University, Denmark

   Caixia Gao, Institute of Genetics and Developmental Biology, Chinese Academy of Sciences. Affiliated Professor at Department of Plant and Environmental Sciences, University of Copenhagen, Denmark

   Brief description:
   Plant production is facing unprecedented challenges. A growing human population will increase the demand for staple crops and livestock by 60% in 2050, while climate change is predicted to drastically limit plant production due to new and increased environmental stress factors, such as heat, drought and flooding. Modern crops have high yields, but are sensitive to environmental challenges. By contrast, wild relatives of modern crops are more resilient, but produce low yields.The NovoCrops project aims to lay the foundation for the next, sustainable green revolution that focuses on developing new sustainable crops adapted to challenging environments and capable of meeting future agricultural production demands. This will be achieved by domesticating wild, resilient plants and developing them into future crops.

2. **'NovoCrops: Accelerated domestication of resilient climate-change friendly plant species', DKK 59.996.360 million**

   Main applicant: Hans Thordal-Christensen, Professor, Department of Plant and Environmental Sciences, University of Copenhagen, Denmark

   Co-applicants:
   Roger Innes, Indiana University, USA

   Mogens Støvring Hovmøller, Aarhus University, Denmark

   Ralph Panstruga, Rheinisch-Westfälische Technische Hochschule,+ Aachen University, Germany

   Brief description:
   Plant diseases are highly problematic in crop production, and pathogen control using agrochemicals is costly and environmentally damaging. For many years, plant breeders have introduced resistance (R)-genes into cultivars. However, these are normally only useful for a few years as pathogens easily overcome them. In the project, we will work on barley and wheat attacked by the serious powdery mildew and yellow rust diseases. From the interaction of these pathogens and plants, we will exploit our recent insight on plant immunity processes for generating durable disease resistance, and we intend to uncover essential molecular details that will be useful for this. Here we will study why the distantly related Arabidopsis plant cannot be invaded by these pathogens and modify barley and wheat according to this. Also, we will identify barley and wheat components that make them susceptible to powdery mildew and yellow rust. Eliminating such components should provide durable resistance.

Theme 3: Emerging Infectious Diseases

1. **'Viral and host factors of zoonotic and pandemic influenza A viruses (FLUZOOMARK)', DKK 59.935.340 million**

   Main applicant: Lars Erik Larsen, Professor, Department of Veterinary and Animal Sciences, University of Copenhagen, Denmark

   Co-applicants:
   Ramona Trebbien, Researcher, Statens Serum Institut, Denmark

   Kerstin Skovgaard, Senior Researcher, Department of Biotechnology and Biomedicine, Technical University of Denmark

   Richard Webby, PhD, Infectious Diseases Department, St Jude Children Hospital, USA

   Brief description:
   Influenza A virus is a severe pathogen of human and animals, which continues to kill millions of people. There is a constant exchange of influenza viruses between human and pigs, which lead to new viruses with pandemic potential. Pigs are regarded as a melting pot for new influenza virus, and the most recent pandemic in 2009 was caused by a swine virus. Denmark produces more than 30 million pigs yearly, and thousands of people are in daily close contact with swine. This makes Denmark a hotspot for evolution of new influenza viruses, and provides a perfect setting for the study of the exchange of viruses. This project will combine leading researchers with unique access to influenza isolates, laboratory techniques and data. Human and animal viruses will be characterized, with the aim of identifying both viral and host factors needed to cross the species barrier. The project outputs are groundbreaking new tools for prevention of future influenza pandemics and design of improved vaccines.

2. **'Persistent bacterial infections (PERFECTION) ', DKK 60 million**

Main applicant: Helle Krogh Johansen, Professor, Department of Clinical Microbiology, University Hospital of Copenhagen, Denmark

Co-applicants:
Manuel Amieva, Professor, Department of Pediatrics – Division of Infectious Diseases, Stanford University, USA

Thomas Bjarnsholt, Professor, Costerton Biofilm Centre, University of Copenhagen, Denmark

Kim Bak Jensen, Associate Professor, Biotech Research & Innovation Centre, University of Copenhagen, Denmark

Brief description:
Bacterial infections, that persist despite the use of antibiotic therapy, constitute a serious and growing health care problem. In our project we will address the following questions: why do some infections persist, can markers for persistent infections be identified, and can treatment be improved? Three types of persistent infections will be investigated: gastric ulcers, airway infections and wounds. For the bacterial infection studies, we will use newly developed epithelial spheroids, which are able to self-organise into miniature organs and also biofilm models which both mimic as much as possible the relevant human condition. In these models' persistent infections can be studied and treated in 'almost' natural environments. We expect to get important insight about early bacterial persistence mechanisms and how bacteria escape therapy. This knowledge will be groundbreaking in development of diagnostic tools and for detection of persistence markers and treatment.