

Theme 1: Antibiotic resistance and/or alternative antibiotics

1. 'Producing antibiotics using cell factories', DKK 60 million

Main applicant: Tilmann Weber, Senior Researcher, Novo Nordisk Foundation Center for Biosustainability, Technical University of Denmark

Co-applicants:

Sang Yup Lee, Professor, Department of Chemical and Biomolecular Engineering, Korea Advanced Institute for Science and Technology (KAIST), Daejeon, South Korea; and Novo Nordisk Foundation Center for Biosustainability, Technical University of Denmark

Bernhard O. Palsson, Professor, Department of Bioengineering, University of California, San Diego, United States; and CEO, Novo Nordisk Foundation Center for Biosustainability, Technical University of Denmark

Olga Genilloud, Scientific Director, Fundación MEDINA, Granada, Spain

Brief description:

Antibiotic resistance is increasing, and new antibiotics are desperately needed to combat infections. The project group will use innovative screening technologies to identify new potential antibiotics and the genes that code for their biosynthesis. These data will enable the bacteria to be used as cell factories to produce large quantities of antibiotics. The project will identify thousands of unknown genes that are involved in synthesizing antibiotics and will develop new biosynthetic production processes. Most important of all, the project will discover molecules that can potentially be developed into antibiotics.

“Our current antibiotics rapidly become ineffective, subjecting people to the risk of dying from even simple infections. We need to find new antibiotics now – and we need to optimize how we discover them,” says Tilmann Weber.

Novo Nordisk

2. 'A knowledge and technology platform for developing new antibiotics', DKK 60 million

Main applicant: Peter Eigil Nielsen, Professor, Department of Cellular and Molecular Medicine, University of Copenhagen

Co-applicants:

Anders Løbner-Olesen, Professor, Section for Functional Genomics, Department of Biology, University of Copenhagen

Anette Hammerum, Senior Researcher, Statens Serum Institut, Copenhagen

Henrik Franzyk, Associate Professor, Section for Natural Products and Peptides, Department of Drug Design and Pharmacology, University of Copenhagen

Brief description:

This project will use new strategies to develop specific antibiotics to combat the serious and growing threat to health arising from infections caused by multidrug-resistant bacteria. Specifically, the project will exploit and explore the ability of peptides to permeate the cell walls and cell membranes of bacteria, because these peptides may facilitate the development of genetically targeted antibiotics.

“Our vision is to establish a knowledge and technology platform for developing new antibiotics that will keep pace with the development of antibiotic resistance, thereby complementing and reinforcing the use of existing antibiotics,” says Peter Eigil Nielsen.

Statens Serum Institut

3. 'Global monitoring of antibiotic resistance', DKK 60 million

Main applicant: Frank Møller Aarestrup, Professor, National Food Institute, Technical University of Denmark

Co-applicants:

Thomas Sicheritz-Ponten, Professor, Center for Biological Sequence Analysis, Department of Bio and Health Informatics, Technical University of Denmark

Ole Lund, Professor, Center for Biological Sequence Analysis, Department of Bio and Health Informatics, Technical University of Denmark

Mark E.J. Woolhouse, Professor of Infectious Disease Epidemiology, Division of Infection and Pathway Medicine, University of Edinburgh, United Kingdom

Brief description:

Effectively reducing the prevalence of antibiotic resistance and using the best antibiotics requires knowledge based on continually monitoring the prevalence and spread of different types of antibiotic resistance globally. To increase this knowledge, the project will collect and analyse wastewater from cities throughout the world and make the results universally available, including for the public authorities, researchers and citizens. The project will use whole-genome sequencing, a technique that reveals the full DNA profile of bacteria. This will enable the prevalence of all known genes that produce antibiotic resistance to be determined in one operation.

Carlsberg
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Theme 2: Oral drug-delivery of biopharmaceuticals

1. 'From needles to capsules', DKK 60 million

Main applicant: Thomas Lars Andresen, Professor, Department of Micro- and Nanotechnology, Technical University of Denmark

Co-applicants:

Tomas Kirchhausen, Professor, Department of Cell Biology, Harvard Medical School, Boston, United States

Chris Porter, Professor, Faculty of Pharmacy and Pharmaceutical Sciences, Monash Institute of Pharmaceutical Sciences, Monash University, Australia

Nazila Kamaly, Associate Professor, Department of Micro- and Nanotechnology, Technical University of Denmark

Henrik Flyvbjerg, Associate Professor, Department of Micro- and Nanotechnology, Technical University of Denmark

Wayne Lencer, Professor, Department of Cell Biology, Harvard Medical School, Boston, United States

Brief description:

Insulin is a medicine that can only currently be administered by using syringes and needles. Injecting insulin causes great discomfort for many people, creates a risk of infection and often requires trained health personnel, which is expensive for society. Developing new methods that enable people to take drugs as capsules instead would be significant for the people using the medicine and for society. The greatest impediment to success is that many of the important drugs, especially proteins, are not absorbed by the intestines.

“We want to develop new methods in our new centre that can significantly increase the absorption of pharmaceutical proteins in the intestines so that these drugs can be administered to people as tablets or capsules,” says Thomas Lars Andresen.

Carlsberg
A.S.

2. 'New knowledge on transporting drugs in the body', DKK 60 million

Main applicant: Hanne Mørck Nielsen, Professor, Department of Pharmacy, University of Copenhagen, Denmark

Co-applicants:

Knud J. Jensen, Professor, Department of Chemistry, University of Copenhagen, Denmark

Jesper Glückstad, Professor, Department of Photonics Engineering, Technical University of Denmark

Urs O. Häfeli, Professor, Faculty of Pharmaceutical Sciences, University of British Columbia, Canada; and Department of Pharmacy, University of Copenhagen, Denmark

Brief description:

Many life-threatening diseases are controlled effectively by injecting peptide- and protein-based drugs known as biopharmaceuticals. Administering these drugs as tablets would be very advantageous, especially for people with chronic diseases and those who need to take the medicine frequently. However, the challenge is that these drugs are broken down in the intestines, and the amount absorbed by the intestines varies tremendously. Delivering the drugs throughout the body following oral administration is therefore enormously challenging, and there are still no general methods for solving this problem.

“The project focuses on solving the challenges of drug delivery by developing a better and more detailed understanding of how peptide- and protein-based drugs integrate with and are transported across the intestinal membrane and arrive at their target areas. To move towards achieving this ambitious target, the project will develop new unique drug-delivery concepts, technologies and methods. This major project involves advanced chemistry, nanorobots and visualizing the transport of drugs in the body. This will enable us to design and study systems for oral drug delivery of biopharmaceuticals,” says Hanne Mørck Nielsen.

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