



## HOW DO WE COMBAT MULTIDRUG RESISTANCE AND PREPARE FOR FUTURE PANDEMICS?

### Discovery and development of tomorrow's sustainable drugs

#### What are your interests in this area?

1: Infection, prevention of infection, bioavailability, raise awareness of what needed

2: New natural products identified on inhibitors of transporters in MDR bacteria, use of personalized plants instead of drugs, Develop more plants as crops plants.

Research between microbiota – micro-organisms population.

Bacteria/yeast for synthetic synthesis of antimicrobial peptides.

Antimicrobial peptides instead of antibiotics  
New drugs for AMR development.

3: Drug development for improving society  
Drug development/delivery

#### What are the challenges?

1: In vitro systems not good enough  
Great geographical differences (eg. north/south Europe)  
Reduce the use

Education (Clinicians and patients), regulation, social innovation  
Patents of no use in this area

How can drug design/bioavailability contribute to equal access?  
One health perspective  
(Co-)relation btw veterinary vs human resistance

2: Underdeveloped area – antimicrobial peptides  
Getting all stakeholders together

Post-pandemic world, unexpected, unknown, targeted treatment phages CRISP

Huge geographical, financial, social differences and incentives  
(1st vs 3rd world)  
New drugs for AMR development

3: Infectious diseases in general

#### What about funding?

2: Peptide – NP conjugates, H2020 sustainability, NNF, Public funded research required, Peptide-based plant protection

3: IMI, Repair – NNF, CARB-X

Project scope, scale of team, collaborating fields, resources, instrument EU/DK

#### Who are the necessary partners?

1: Social Science, Pharma, health, clinicians, patients and politicians

Knowledge sharing btw eg pharma-virology to formulate best collaboration

2: Stabilize peptides - collaboration – CRISPR

University fields, industry, policy, end users other

#### Yes! Let's talk more

#### Dialogue Meeting Conversation partners

*Information not included. Please contact Head of the network Dan Stærk (ds@sund.ku.dk) or coordinator Nanna Heinz (heinz@plen.ku.dk) for more information*





## HOW CAN WE ADVANCE SUSTAINABLE LIFESTYLE?

**Development of preventive and curative care systems for preventing, managing, and curing lifestyle diseases, e.g., obesity, type 2 diabetes, arthritis, cancer, etc.**

### What are your interests in this area?

1: Delivery systems, bioavailability, brain health, biodegradable excipients, functional excipients, drug uptake and excretion, wastewater treatment (to remove drug), degrade drug in the GI tract before excretion

2: Citizens and patient engagement in designing healthcare systems, commercial regulation (to reduce the push of the market), fortified goods, how to make pharmacists support patients better in preventing lifestyle problems, canter-later-effects managing, medicine use too heavy, balancing the different SDGs, medicalization – lifestyle qualify

### What are the challenges?

1: Education, medical overuse, market demands, industrial engagement needed, ideally prevention not medication

2: Lack of strategies, environmental engineering, social-clima-issues go hand-in-hand, difficult prioritization needed, also interspecies prioritization, difficult questions  
People involvement, the health system does not tackle socioeconomic determinants of health (strongly linked to lifestyle diseases), environmental and moral/ethical dilemmas, human health vs plant's health, regulate commercial interests more, inequality – gender issue, medication vs life quality

### What about funding?

Project scope, scale of team, collaborating fields, resources, instrument EU/DK

### Who are the necessary partners?

Greater social responsibility in industry needed  
Legal framework of better food, Patient organizations (can make skewed investments), philanthropic organizations

University fields, industry, policy, end users other

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## WHICH TECHNOLOGIES ARE NEEDED FOR SUSTAINABLE DRUG DISCOVERY?

**New technologies for sustainable drug discovery, development and manufacturing.**

### What are your interests in this area?

- 1: Lead Discovery -> Drug Discovery -> Drug Development -> Drug delivery-linked to lead discovery  
Social pharmacy - 50% of all sold meds are wasted  
Flora to Pharma  
How to: Make current production strains
- 2: Excipients, sustainable-inert substance  
Look for sidestreams stht made excipients, eg. Zerion (milk protein)
- 3: Bigger problem API leak, Foot prints of production - powder-tablet, personalized med- reduce use, in vitro-in vivo correlated - reduce need for in vivo studies-AI-consumer education-calculation capacity in vivo-vitro models

### What are the challenges?

- 1: How to make Sota more sustainable, increase drug bioavailability - use less, Eco(nomic challenge), Benign production: Mechano chemical + solvent free. On-demand production-decentralized - tons produced=tons wasted - Lotte
- 2: Increased bioavailability -> use less API, API in waster, biodegradable by design, biodegradable excipients->still functional. Carbon footprint: API production less organic solvent, Excipient production - less heat + mechanical energy
- 3: Build in detox system, better models, tablet right formulation, waste, consumer waster- product waste, degradation path, industrial contact limited, hormones detox, why patients waste medicine - societal science

### What about funding?

ITN, Horizon2020, Potato Foundation, food related calls, valorization of food steams, starch as experiment

Project scope, scale of team, collaborating fields, resources, instrument EU/DK

### Who are the necessary partners?

- 1: Pharma industry Patients (all ages, gender etc)  
Holistic institute-view  
- from discovery to society
- 2: Food industry, uni+food research, pharma industry, Arla food ingredients
- 3: Tox studies + environment, environment science, societal science, industry manufacturing on demand

University fields, industry, policy, end users other

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## HOW DO WE SUSTAINABLY DEVELOP NATURE'S TREASURE CHEST?

### Exploration of nature as a source of bioactive compounds for sustainable drug discovery

#### What are your interests in this area?

1: Photosynthesis based production systems, Foods that are healthy and favored by their flavor taster (improved healthy food), Work with nature – how are natural medicinal compounds produced, produce compounds in plants, Make food pyramid understood and “tasty”

2: Nature to promote health in public  
Natural products as sustainable excipients + benign-by-design drugs; Nature as resource for detoxification-molecules – detoxification-organism

3: Not only for new drugs, but also medicines  
Excipients for sustainable production, Flora to pharma-projects, Natural products, peptides and conjugates

#### What are the challenges?

1: Protect biodiversity, Science-based information for empowerment of user -> use nature's food (flavor) to prevent disease, Loss of traditional medicinal knowledge (also in DK), Cross-disciplinary research are difficult (but needed to solve challenges)

2: Environmental impact of excipients, Learning from extremophiles/rare organisms, Inspiration from nature – natural excipients -> small molecules -> biomolecules

3: Circular production, Use waste from agriculture, Production, More efficient uptake, Decentralized production, Reuse of solvents, Developing by combining productions, not synthesizing all the way – but combine with natural compounds, optimize production, Who owns the plants?, Natural products as resource -> synthetic production? algae? Improve properties of NFs by modification – solve problems with solubility

#### What about funding?

3: Nordea, Holistic approach to production, combine several, NNF  
Synergy: agro/farmer + circular production specialists + ecologists + pharmacists

Project scope, scale of team, collaborating fields, resources, instrument EU/DK

#### Who are the necessary partners?

3: Circular production – integrate with eg solar panels, Agriculture/farmers, Local harvesting, use of compounds available in agriculture, What's the huha about the Pura – thidsel, New Zealand (T Rades), Ownership of knowledge – legal/regulations - nagoya

University fields, industry, policy, end users other

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## OPEN

What are your interests in this area?

Environmental impact assessment of new medicinal products (EMA – integrate it on Regulation)

What are the challenges?

How to foresee (and sustainably react to) the next pandemic  
Develop new types of crop plants  
Vulnerability of only five plants providing the majority of our food  
Social sustainability to go hand in hand with environmental sustainability. Social engineering needed  
OBS: White privilege perspective

What about funding?

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