

INSECTICIDE CASE

SAFE & SUSTAINABLE INSECTICIDES AGAINST DISEASE-TRANSMITTING MOSQUITOES



CASE PROFILE

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Therapeutic area

Infections/Mosquito-borne disease

IPR

Patent application planned (2019)

Capital need

2019-2021: 9 million SEK will cover experiments to strengthen patent, additional non-target toxicity testing, genotoxicity testing, and activity on materials. We will also consult experts for evaluation and input on business approach, patents, and relevant legal aspects.

Team / Scientific advisors

Anna Linusson Jonsson
PhD, Prof. in Medicinal Chemistry
Fredrik Ekström
PhD, Biochemist
Sofie Knutsson
PhD, Medicinal Chemist
Luna Kamau
PhD, Entomologist

Partnerships & collaboration

We seek investors and industrial collaborators for strategic discussions to enhance the development process of a new vector control product that will protect people from mosquito-borne diseases.

Research background

The innovation is based on 6 years of research made by Anna Linusson and Fredrik Ekström at Umeå University. Linusson and Ekström have identified molecules that will be used to develop a new type of safe and selective insecticide with low environmental impact to stop diseases transmitted by mosquitoes.

Market need and potential

Malaria, dengue, chikungunya, and Zika are diseases spread from person to person by mosquitoes acting as vectors. It is estimated that every year 350 million people in Africa, the Americas, and Asia are infected by disease-transmitting mosquitos and 500 000 die from their disease.

Most vulnerable are young children, pregnant women, and people living with HIV or individuals living in the aftermath of humanitarian emergencies and natural disasters. Recently, climate change, globalization, and other factors have contributed to an increased risk for emerging mosquito-borne diseases also in Europe and regions previously spared from these diseases.

The prevention of mosquito-borne diseases relies on vector control using insecticides. However, insecticide-based strategies are rapidly becoming victims of their own success; high intensity usage has fuelled the development and spread of resistant mosquitoes to such an extent that resistant strains now exist against most of the insecticides recommended by the World Health Organization (WHO). In addition, currently used insecticides are unselective and have harmful effects on important insect pollinators and human health.

Business idea

We are developing safe and resistance-breaking molecules that target an enzyme essential for nerve signaling in mosquitoes via a new mode of action. In contrast to current insecticides, we have designed our molecules to specifically target mosquitoes, without affecting other organisms. The molecules can be applied on textile products as protection against adult mosquitoes. Potential products are bed nets, blankets, curtains, and clothes.

Our team is highly dedicated and want to make a difference. We have profound experience of developing biologically active molecules against our target and our unique combination of skills, obtained from both academia and the pharmaceutical industry, include computational chemistry, organic synthesis, biochemistry, structural biology, and also entomology as provided by our collaborators in Nairobi, Kenya.

Advantages

Our goal is to create a product with many key advantages and potential applications, based on:

- safe and effective protection against mosquito-borne diseases
- no, or very low, toxicity towards other organisms or the environment
- protection against insecticide-resistant mosquitoes

Competition

Mosquito control relies on insecticide-treated bed nets and indoor residual spraying (the spraying of walls and ceilings with insecticides). The effectiveness of the current methods is seriously threatened since mosquitoes have developed resistance to all four major classes of insecticides recommended by the WHO.

Research and development efforts in the field include identification and inhibition of new targets for insecticides but also biological control, e.g. the use of genetically modified mosquitoes or bacteria, which reduce the mosquitoes' ability to transmit diseases.

Current status

We have developed an insecticidal substance based on a completely new and patentable chemical structure with a novel mode of action. The active ingredient has been specifically designed for safe use in vector control; it exhibits a favorable mosquito-over-human selectivity and no alerts for general toxicity or mutagenicity. It also offers several benefits such as facile synthesis and purification, low molecular weight, easy handling, and stability.

Our chemical lead effectively kills mosquitoes. In our latest study, the lead compound exhibited comparable mortality on wild malaria-transmitting mosquitoes as currently used insecticides. Importantly, we have confirmed pollinator safety as our lead compounds exhibit no contact toxicity on honeybees. We are now taking the next step by including resistant mosquitoes.

Photos courtesy of Anna Linusson