Overcoming anticoagulant resistance

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Team

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Financial Need

- For the lead identification synthesis, formulation and in-vivo screening: **1.2 Mill Euros** (14 months)
- Further regulatory required studies excluding field studies: **800 tsd** Euros (8 months).
- Total need: **2 Mill Euros**

Highlights

- Full global patent coverage for all anti-coagulants outside the Vit K inhibition pathway.
- Lead compounds without FtO have already been used in clinics or are on the markets for human therapy

Objective

Bringing new environmentally-friendly anticoagulant rodenticides to the market overcoming the strong growing resistance against today's anticoagulants.

Problem

- Rodents cause huge agricultural damage, destroying between 10% to 25% of the worldwide food production each year. Moreover, they transmit a large variety of diseases, particularly in regions with poor medical infrastructure.
- Genetic selection has created up to 100% resistance to oral anticoagulant-based rodenticides (coumarin- and indandione-type, including 2nd generation rodenticides) currently available on the market.
- Current 2nd generation rodenticides are highly persistent, environmentally toxic, non-species selective and have therefore only a temporarily approval until a better rodenticide is available.
- **Thus, there is an urgent need for a novel, broadly active, species-selective, environmentally save rodenticide to overcome the growing resistance.**

Solution

- A 3rd generation rodenticide created through the repurposing of already known anticoagulants used in human therapy that are not acting as vitamin K inhibitors (as is the case for coumarin- and indandione-type anticoagulants like marcumar and warfarin).

Advantages

- The third generation of novel anticoagulant-based compounds are based on small molecules that can be made synthetically for a reasonable cost.
- The first suitable lead compounds, including thrombin inhibitors, Factor Xa and further anticoagulant compounds with freedom-to-operate ("FTO") have been identified.
- Due to extensive preclinical investigation for human therapeutic use, major preclinical data (pK, $t_{1/2}$ in rodents, LD50/LD90, MED, etc.) are already known.
- The registration for market approval in EU and FDA can be obtained in a reasonable time-frame and for a moderate cost.
- Patents are newly applied for and will provide market protection until 2034, without taking SPC's and further new patent applications into account.

Market

- Rodents are a major economic threat for the growing human population and their accumulation in large urban environments. Estimates of the WHO are that between 10 – 25% of the world's food production is destroyed each year by rodents.
- In some regions, more than 40% of the rat population are resistant to the current Vit K anticoagulant pathway biocides, based on coumarins (like warfarin and marcumar, 1st generation) and the 'super-warfarins' (2nd generation) as well as indandione-type anticoagulants.
- Anticoagulants are the rodenticides of choice, as they support the repeated food uptake that prevents other rodents of the colony to draw their suspicion to the bait.
- In 2013, rodenticide sales were at 750 million Euros, and are expected to grow by 2020 to exceed 1 billion Euros.

Competition

- Because of rodents protective behavioral traits, direct poisons like arsenic, bromthalidin, strychnine, or Zyklon B and others will not be able to substitute for the classical anticoagulant-type rodenticides.
- The second generation biocides (eg. Brodifacoum in Ratron™ or Difenacoum in Frunax™) belong to the same coumarin- type anticoagulants that are also affected by resistance development.
- **Thus, the only way to overcome the existing resistance problem is to stop-using the coumarin-based anticoagulant Vitamin K inhibition pathway and replace it with the 3rd generation of anticoagulant rodenticides.**

Intellectual Properties

The application of the new rodenticides circumventing the resistant Coumadin pathway are duly claimed in the German patent application 10 2014 108 210.9, which will be internationalized as a PCT application in December 2016.

Despite the existing patent protection of the above mentioned compounds for its medical use, it should be noted that the application as rodenticide has not been covered in other patents and therefore under our patent we can offer freedom-to-operate according to our best knowledge.

Revenue Projections

The projected retail peak sales of the new class of rodenticides are expected to be reached 5 years after first launch allowing for a premium pricing (retail price of 40 Euros per child proof unit) with a market penetration of 20%. Under this scenario, **retail revenues of 130 million Euros to 200 million Euros are reasonably expected.** This does not include certain scenarios that would push initial need of pest control, e.g. in the event of rodent transmitted pandemic events. It should also be reasonably considered that current approvals of 2nd generation rodenticides are not unlikely to be discontinued once an environmentally safer rodenticide becomes available