

Nosopharm renews its partnership with Inra

This second screening campaign aims to discover new classes of antimicrobial agents for treating multi-resistant infections

Lyon, France, May 30, 2018 – Nosopharm, a company dedicated to the research and development of new anti-infective drugs, today announces that it has renewed its partnership with the French National Institute of Agricultural Research (Inra). This partnership with Inra's Diversity, Genomes and Insects-Microorganisms Interactions laboratory ([DGIMI](#)) aims to develop new classes of antimicrobial agents for treating multi-drug resistant hospital-acquired infections. These new classes of antimicrobials will then be the subject of patent applications and scientific publications.

Under the terms of the partnership, Inra grants Nosopharm exclusive access to around 100 unique strains of *Photorhabdus* and *Xenorhabdus*. The DGIMI laboratory has the most extensive collection in the world of strains for these two genera of bacteria. When applying its innovative, proprietary methods to the strains in order to discover new bioactive compounds, Nosopharm will capitalize on experience gathered during the first screening campaign.

The aim of this campaign is to discover a new and innovative systemic antimicrobial agent targeting gram-negative pathogens, including *Pseudomonas aeruginosa*, as well as a new systemic novel antifungal agent targeting *Candida spp* pathogens.

Led by Nosopharm, the first screening campaign on a collection of unique strains of the bacterial genera *Photorhabdus* and *Xenorhabdus* belonging to Inra's DGIMI laboratory, resulted in:

- Three patent applications covering three new classes of antimicrobials (EP2468718, WO2012085177, WO2016046409)
- Three articles published in peer-reviewed journals ([Molecular Cell, 2018](#), [Genome Announcements, 2014](#), [The Journal of Antibiotics, 2013](#))
- An oral presentation at the 54th Interscience Conference on Antimicrobial Agents and Chemotherapy (ICAAC)
- The discovery of a new class of antibiotics – odilorhabdins – now at the preclinical stage for the treatment of multidrug-resistant *Enterobacteriaceae* infections. This new class has been selected to be part of the European ND4BB ENABLE consortium.

"We are delighted to be working with Inra again to discover new classes of antimicrobial agents. The exclusivity we have been granted gives us a major competitive advantage," said Philippe Villain-Guillot, CEO of Nosopharm. "With this second screening campaign, we are aiming to discover a new antibacterial molecule against *Pseudomonas aeruginosa*, as well as a novel antifungal agent. In the longer term, the microbial agents discovered during this partnership could be co-developed with biotechnology firms or pharmaceutical laboratories."

"Bacteria of the genera *Xenorhabdus* and *Photorhabdus* are insect pathogens and nematode symbionts; today they are also recognized for their marked ability to produce many bioactive molecules with antimicrobial activity (antibacterial and antifungal). Since the 1980s, our laboratory (DGIMI-UMR Inra-UM1333) has nurtured a collection of these bacteria, which now comprise 650 strains, originating over the five continents. Since 2016, this collection has been associated with the 'environment' pillar of the center RARe – [Agronomic Resources for Research](#)," said Alain Givaudan, deputy director of Inra's DGIMI unit. "With Nosopharm, we are prioritizing research into small molecules of natural origin. The molecules are biosynthesized within the bacteria thanks to large enzyme complexes (called '*nonribosomal peptide synthetases*' or '*NRPS*'), which are true biological microfactories with unusually long genes by design and are prominent in the *Xenorhabdus* and *Photorhabdus* genomes."

Multi-antibiotic resistant hospital pathogens are the cause of at least 380,000 infections and directly responsible for [25,000 deaths each year](#) in Europe. The associated annual treatment and social costs are estimated at €1.5 billion (\$1.75bn). At the global level, antibiotic resistance could kill 10 million people worldwide each year between now and 2050, at a total cost of [€94 trillion](#) (\$110tn). In February 2017, the WHO published a list of bacteria '[priority pathogens](#)' for the development of new antibiotics. The pathogen *Pseudomonas aeruginosa* sits at the top of this list, with a critical priority level. *P. aeruginosa* is a factor in [10% of hospital-acquired infections](#) in the European Union and the United States, with a high incidence in cases of pneumonia. In 2016, in Europe, the rate of combined resistance (resistance to three or more classes of antibiotics from among piperacillin ± tazobactam, ceftazidime, fluoroquinolones, aminoglycosides and carbapenems) in *P. aeruginosa* was 10%. The rate of resistance to carbapenems – antibiotics of last resort – was [15%](#). The main hospital fungal pathogens are the *Candida* species, which are a factor in around 6% of hospital-acquired infections in the European Union and the United States. Very few antifungal drug classes exist for treating these infections: azoles, echinocandins, polyenes and flucytosine. Even more concerning is the fact that multi-resistant species of *Candida*, such as *Candida glabrata* and *Candida auris*, are [rapidly emerging](#).

About Inra

Inra is Europe's top agricultural research institute with 8,042 permanent researchers, engineers and technicians. It is the world's number two center for the agricultural sciences. Inra contributes to the creation of knowledge and innovation in food, agriculture, and the



environment. The institute deploys its research strategy by mobilizing its 13 scientific departments and drawing from a unique network in Europe that boasts over 184 research units and 45 experimental units located across 17 regional centers. Its global ambition is to contribute to ensuring healthy and high-quality food, competitive and sustainable agriculture, and a protected and valued environment.

<http://institut.inra.fr/en>

About Nosopharm

Nosopharm is a biotechnology company specialized in the research and development of new antimicrobial molecules. Nosopharm discovered and developed NOSO-502, a first-in-class antibiotic for the treatment of multidrug-resistant hospital-acquired infections. It has developed a unique expertise in the discovery of natural bioactive products stemming from the *Xenorhabdus* and *Photorhabdus* microbial genera and in the medicinal chemistry of Odilorhabdins, the new class of antibiotics to which NOSO-502 belongs. Founded in 2009, Nosopharm is based in Lyon, France, and has a staff of eight. To date, the company has raised a total of €4.3M (\$5.2M) in private equity and received €3.8M (\$4.6M) in grants from Bpifrance, IMI, DGA, Region Languedoc-Roussillon and FEDER.

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