



## CORPORATE PROFILE

<b>Summary</b>	Pherecydes Pharma SA is specialized in the research and development of lytic bacteriophages (or phages) for both therapeutic and diagnostic applications. The company provides innovative and adaptable solutions to combat multi-resistant bacteria, through developing mixtures of natural phages and their accelerated <i>in vitro</i> evolution. Pherecydes Pharma is the only company currently that have been able to harness this evolution technology, allowing a head start on any given bacterium.
<b>Creation</b>	Established at the end of 2007
<b>Workforce</b>	6 people
<b>Intellectual property</b>	3 patent applications filed
<b>Investment</b>	EUR 1,45 million : Fonds Sécurité and La Financière de Brienne (ACE Management) and Bio-Modeling Systems (founding shareholder and instigator of the 2 first patents)
<b>Collaborations</b>	University hospitals (Robert Debré, etc...); military hospitals (Percy, Bégin and Queen Astrid); CNRS laboratory in Marseilles (joint doctorate tutor); University of Paris-Sud; PHAGESPOIRS association
<b>State aids, subsidies</b>	EUR 500K from OSEO, French public-sector institution dedicated to economic development
<b>Networks</b>	Member of Medicen, Adebitech and LEEM
<b>Technology</b>	<p>Pherecydes Pharma is developing phages against three types of bacteria responsible for the majority of infections in industrialized countries: <i>Escherichia coli</i>, <i>Pseudomonas</i> and <i>Staphylococcus</i>. Among other things, the company possesses one of the world's largest collections against <i>Escherichia coli</i>.</p> <p>Its method for effecting the rapid evolution of phages to combat a new form of bacterial resistance is protected by three patented technologies:</p> <ul style="list-style-type: none"> <li>• <b>RIPh</b> halts the replication of phages and makes it possible to engineer their genomes;</li> <li>• <b>TAPE<sup>1</sup></b> performs the simultaneous and rapid introduction of random mutations in various selected regions of a protein, while preserving other regions;</li> <li>• <b>Ab-ACCUS</b> makes it possible to integrate this genetic diversity into a phage genome.</li> </ul> <p><sup>1</sup>TAPE is a targeted accelerated protein evolution process used in phages at the level of the proteins that recognize the host bacterium. The technique can be used for optimizing any type of protein: its efficacy has been demonstrated on monoclonal antibodies in collaboration with BAC BV Company.</p>
<b>Development strategy 2012 - 2013</b>	<p>In partnership with several public hospitals, Pherecydes Pharma plans to embark on clinical trials of its first two therapeutic products in 2013.</p> <p>The long-term objective is to develop several banks of the most varied bacteriophages possible in order to treat all forms of infections, especially those caused by strains that are multi-resistant to antibiotics, or by biofilms. Pherecydes Pharma aims to establish a standardised and certified industrial-scale phage development platform.</p> <p>The company is in the middle of a funding round. It plans to double its workforce in 2012 through the recruitment of a manufacturing team and a company pharmacist.</p>
<b>Areas of application</b>	<ul style="list-style-type: none"> <li>• Biomedicines</li> <li>• Biodefence and bioterrorism</li> <li>• Vaccines</li> <li>• Nanotechnologies</li> </ul>

<b>Scientific summary</b>	<p><b>Bacteriophages</b> (or phages) are natural predators against bacteria. They are present in the whole biosphere and the environment. A bacteriophage consists of a head containing a nucleic acid (DNA or RNA) and a caudal element that enables it to attach to the bacterium in order to infect it. It penetrates the interior of the germ, where it multiplies and is released, triggering bacterial lysis, which is to say the destruction of the bacterium. It is important to distinguish between lytic phages and tempered phages: the first destroys the targeted bacterium each time, while the second may remain dormant.</p> <p><b>Phagotherapy</b> entails the use of lytic bacteriophages for treating infectious diseases of bacterial origin. Due to the rapid spread of in-hospital infections and multi-resistant bacteria, and to the lack of effective antibiotics to combat them, renewed interest is being shown in bacteriophages.</p>
<b>Market</b>	<p>It is estimated that 25,000 people die from multi-resistant bacterial infections in Europe each year. These multi-resistant bacteria also accounted for more than 260,000 bloodstream infections, and over 370,000 extra days in hospital, at a cost of EUR 62 million, according to a recent study<sup>1</sup>. Resistance to antibiotics has become a major public health problem in Europe.</p> <p>According to the World Health Organization, infectious diseases are the second cause of death in the world. Three of them, <i>Escherichia coli</i>, <i>Staphylococcus aureus et epidermis</i> and <i>Pseudomonas aeruginosa</i>, alone account for over 50% of infections in industrialised countries.</p> <p>A dozen private-sector companies are working on bacteriophages around the world, and Pherecydes Pharma is the only one in France.</p> <p>In the field of multi-resistant infections, there are other innovative approaches, such as antibacterial peptides, therapeutic monoclonal antibodies, small RNAs and small anti-adhesin molecules. But these approaches all have the drawback of being static and not very adaptable to bacteria in perpetual mutation.</p> <p><sup>1</sup>De Kraker MEA, Davey PG, Grundmann H. Mortality and hospital stay associated with resistant <i>Staphylococcus aureus</i> and <i>Escherichia coli</i> bacteremia: estimating the burden of antibiotic resistance in Europe. "PLoS Medicine", 2011, 8(10) e1001104 8.</p>
<b>Assets of bacteriophages and phagotherapy</b>	<ul style="list-style-type: none"> <li>• Phages can be used to treat bacterial infections that no longer respond to antibiotics.</li> <li>• They have a rapid mode of action. They propagate at lightning speed so long as the target bacterium is still present.</li> <li>• They act in a similar fashion to a surgical strike. The phages are selected so as not to harm the useful bacteria found in intestinal flora, mucus and skin, unlike antibiotics.</li> <li>• There are no side effects in the treated organism. Furthermore, phages are only effective against bacteria; they have no effect on human, animal or vegetable cells, insects, algae or fungi.</li> <li>• The prospects for industrial-scale production of phages make them an attractive therapeutic option for developing countries.</li> </ul>
<b>Management</b>	<p><b>Jérôme Gabard, Chairman</b>, has 25 years' experience in various aspects of the life sciences and human health sector:</p> <ul style="list-style-type: none"> <li>• Departmental head at The MarkeTech Group (2005-2009): 20 employees, in charge of the development of a business unit and carrying out market research</li> <li>• CEO of Euroclide SA (2001-2004): six employees, drug candidate screening. Managed the merger with Faust Pharmaceuticals in 2004 (which became the Domain Therapeutics)</li> <li>• Business Developer at Qualicon (2000): 100 employees, agro-food diagnostics: PCR detection kit</li> <li>• Head of R&amp;D at DuPont de Nemours (1993-99): 10 staff. Wide international exposure.</li> <li>• Post Doc at DuPont de Nemours Inc., USA (1989-1993): Plant biotechnologies.</li> </ul> <p>Jérôme Gabard has extensive experience in the management of start-ups and the creation of value. He has been involved in most stages of the product design, development and marketing process.</p> <p><b>Flavie Pouillot, Research and Development Director</b>. Before joining Pherecydes Pharma, Flavie Pouillot headed a research program at the Institut Pasteur in Paris focusing on the highly sensitive area of protection against the <i>Yersinia pestis</i> species. This highly pathogenic agent is one of the principal threats associated with bioterrorism. Flavie Pouillot has a PhD in microbiology combined with expertise in molecular biology gained at the Institut Pasteur and Pierre &amp; Marie University in Paris. She has published numerous peer-reviewed papers in various international journals.</p>
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