## Description for the general public

Surpassed only by cellulose, chitin is the second most abundant polysaccharide on earth. It occurs in insect exoskeleton, crustacean shells, nematode cysts and the cell wall of fungi and algae. For many microorganisms chitin is a major source of carbon and/or nitrogen. In fact, marine and soil-dwelling bacteria develop a synergistic enzyme system comprising various chitinases and chitin binding proteins which can hydrolyze chitin to its oligo- and monomeric components. Indeed, chitinases produced by ubiquitous *Bacillus cereus sensu lato* (*B. cereus s.l.*), whose main reservoir is soil, are extremely efficient tools for chitin degradation. The composition and quality of bacterial chitinases differ among the soil types, indicating that a soil type is the key factor in bacterial evolution. However, little is known about ecological adaptation among environmental *B. cereus s.l.* The main assumption of this project is that natural environment affects the bacteria what may be manifested in their genome and phenotype. Altogether 120 *B. cereus, B. thuringiensis,* and *B. mycoides* from (i) mineral soil samples (farm in Jasienowka), (ii) organic soil samples (a strict reserve of Bialowieża National Park, and Biebrza National Park), and (iii) clinical samples (reference strains from international collection) will be considered in the proposed project. Experimental methodology, including molecular biology and biochemistry techniques, will enable to determine the relation between the environment and chitinolytic activity of *B. cereus s.l.* First, chitinolytic and antifungal activity of crude enzymes will be determined. The polymorphism of chitinase coding genes will be verified by gene sequencing and hybridization. Next, selected genes encoding chitinases will be cloned and expressed in *Escherichia coli* competent cells. Finally, enzyme properties at various ranges of temperature and pH, as well as antifungal activity of purified enzymes will be examined. The proposed studies will help to explain the basis of ecological adaptation to chitin utilization of *B. cereus s.l.* originating from different environments and indicate important points in the evolution of this group. Furthermore, chitinases have various industrial applications, such as in the preparation of chitin oligosaccharides in food and pharmaceutical industry; as bioagents for crop protection against fungal phytopathogens and insects in agriculture; or in bioconversion of chitin materials to ethanol in energy industry. Therefore, hydrolytic enzymes that specifically degrade chitin are gaining much attention worldwide. Discoveries of new enzymes that function in the extreme environment are especially important for this purpose. Thus, testing the antifungal activity and enzyme properties of chitinases synthesized by *B. cereus s.l.* may be the basis for the development of research on practical applications in the future. Such a multi-level assessment has not been previously conducted.