Similar to animals, plants are also being invaded by various pathogenic factors like viruses, bacteria or protists. Every year plant diseases cause severe crop yield losses reaching as much as 40%. In view of the importance of plants to humans, research is currently focused on finding the genetic sources of resistance and on developing new resistant varieties of crop plants. The main recurring problem is, however, that with time genetic resistance is broken down leading to a substantial yield loss. This major issue has been well recognized in the case of plant resistance against a pathogenic protist *Plasmodiophora brassicae,* responsible for causing a clubroot disease in agriculturally important Brassica species. The disease has been named after one of the symptoms characterized by the development of galls on the underground parts of the infected plants.

Clubroot infection constitutes a serious problem worldwide and in Poland. It mainly affects oilseed rape which is a considerable source of plant oil. Due to misconducted cultivation (too short crop rotation or no rotation at all) the clubroot disease is of particular concern and became an enormous issue in countries leading in oilseed rape cultivation. These countries include Poland and Canada, which were the first to introduce cultivation of oilseed rape for oil production. Until now it is known that some of the *P. brassicae* pathotypes have already overcome the resistance provided by genes present in most of the currently cultivated resistant high-yield varieties.
One of the major problem in the development of plants resistant to *P. brassicae* is that instead of fighting a single pathogen, in fact we are dealing with a group of genetically different pathogens. This results in an extreme threat to oilseed rape cultivation and constitutes a risk of high financial loss. One of the possible strategies which could contribute to alleviate the effect of breaking genetic resistance is the introduction of tolerant plants which would be only slightly affected or in which the pathogen could not proliferate. It seems that the best alternative is to introduce genetic resistance to the plants characterized by an increased tolerance towards the pathogen. Nevertheless, in order to do so, it is necessary to thoroughly investigate the disease progression in the plant as well as the molecular and physiological aspects of plant-pathogen interactions. Studies are available which precisely demonstrate the changes in gene expression and metabolic alterations in infected plants. Furthermore, developmental changes leading to the development of galls have been also well described. Recently it has been shown that hormones responsible for plant growth regulation (brassinosteroids) participate in the development of the giant cells in which the pathogen produces resting spores (Schuller et al., 2014). Apparently, preventing from formation of the giant cells could significantly reduce the number of spores produced or perhaps could even impede spore maturation. Clearly, this cannot be achieved by modification of the activity of plant hormones since they are implicated in many crucial biological processes in the plant and such alterations could result in pleiotropic effects. However, it is possible to modify the factors which allow the formation of the giant cells. These key factors certainly comprise proteins involved in cell wall remodeling.

Cell wall constitutes the most outer layer of plant cell. Its major component is cellulose which forms structures called microfibrils. The remaining elements of the primary cell wall include water, pectins, hemicellulose and proteins. In the course of cell maturation or differentiation of cells which perform specialized functions, cell wall is subjected to secondary modifications and thereby may contain substances like lignin or suberin. In order for the cell to grow, the cell wall must undergo remodeling or modifications ensuring elasticity upon increasing size of the protoplast. The processes of cell wall remodeling are regulated by proteins belonging to the group of cellulases and endotansglikosylases of xyloglucan, while cell elasticity by expansins.
Cell wall remodeling studies rely on the isolation of cell wall proteins following the removal of other cell components. Based on the fact that proteins differ in their mass and charge, it is possible to separate them by electrophoresis and after isolation determine their amino acid composition using mass spectrometry. In this project we aim to isolate and identify cell wall proteins which either emerge or disappear at the time of giant cell formation as well as upon cell disintegration during development of galls after *P. brassicae* infection. For better understanding of the role of regulation of these identified proteins in pathogenesis, we will use genetic engineering techniques allowing to modify the activity level of genes encoding the proteins of interest. The effects of these alterations will be then observed microscopically as well as in tests of infection capacity of developing resting spores of *P. brassicae.*