Aquaculture continues to be the fastest growing animal food-producing sector in the world.
Rainbow trout is one of two major species of Polish aquaculture (the second is common carp), therefore it is important to improve its reproduction in order to facilitate production of this species. Furthermore, rainbow trout is one of the most widely studied of model fish species in many research areas including toxicology, comparative immunology, nutrition, physiology and reproduction.
A number of studies on fish semen proteins (proteome) have been performed, but most of them utilized the classical approach, which is based on the purification and the identification of single proteins. This approach was time-consuming, since the elaborated isolation protocols were multistep and different for each protein. The introduction of proteomic methods into fish semen analysis led to the large-scale characterization of the entire protein complement of seminal plasma and spermatozoa.
This proposal will identify important gaps in knowledge regarding proteomic characterization of rainbow trout semen, such as examination of dynamic changes in semen proteome and phosphoproteome during maturation and motility activation. The examination of sperm maturation in sex-reversed females will be an important step in the understanding of the phenomenon of sex reversal and the biochemical basis of sperm maturation. The examination of protein pattern of rainbow trout sperm during activation is important for better understanding of the mechanism of sperm motility initiation in salmonid fish, since there is no data regarding the influence of motility initiation on rainbow trout sperm proteome.
The proposed study will be also the first to examine the proteome of triploid rainbow trout testis to unravel the molecular mechanisms of triploidization (genetic manipulation which lead to the formation of an organism with three sets of homologous chromosomes), which can lead to elucidate the impact of the triploidization on the disturbances in male reproductive tract and the identification of the proteins responsible for the triploids sterility.
According to our knowledge, difference gel electrophoresis (2D DIGE) will be first time applied to the investigation of fish sperm maturation, motility activation and triploidization of salmonid fish.