Dynamics of telomerase and telomeric DNA in rainbow trout with disturbed growth and impaired process of gonadal development

Description for the general public

The main goal of this proposal is to evaluate changes in the telomerase activity and in the length of the telomeric DNA in diploid and triploid rainbow trout at different physiological and developmental stages. In contrast to mammals, where telomerase activity in the adults is highly restricted, expression of telomerase in various fish species has been detected in many tissues irrespective of the fish age. Results of the research performed on the fish model species including zebrafish (*Danio rerio*) show high activity of telomerase is related to the fish growth, aging and regeneration abilities. Moreover, telomeres in fish do not shorten linearly like in the mammalian cells, instead their length increases and decreases through the fish ontogeny. In several zebrafish strains, length of the telomeres increases from larvae to adulthood stage and then drastically shortens in the aged specimens despite activity of telomerase that is reported even in the old fish

Lack of the information concerning telomerase activity and dynamics of telomeric DNA in somatic and germ cells of the salmonid fishes including specimens with impaired growth and sterile triploid individuals growing even during the reproduction season was the main reason to begin research concerning this scientific area. To fulfill the goal of the proposal rainbow trout from the broodstocks kept under aquaculture conditions will be used. Moreover, induced mitotic gynogenesis and triploidization will be applied to provide individuals with disturbed growth and sterile fish, respectively. The rate of dwarf fish among gynogenetic doubled haploids is significantly increased. Length of the telomeric DNA in sampled tissues/cells will be evaluated in normal fish, fish with impaired growth and in the triploid specimens. Somatic tissues sampled for the mentioned above research will originate from fish of different sex, stage of development and maturation. Telomerase activity will be also examined in the ovaries and testes from fish at different stages of the annual gonadal cycle including maturation and regeneration phases. Moreover, diploid and triploid fish will be histologically studied to provide key information concerning morphology of their gonads and stage of development.

Results provided within the project enable better understanding the molecular mechanisms that control growth, aging, maturation and gonadal regeneration in the salmonid fish species. Studies of telomerase activity and dynamics of the telomeric DNA in fish with impaired growth may extend our knowledge on biological basics of the growth-related diseases in vertebrates. It is not excluded that telomerase activity and telomere length assays may become useful for evaluation of the aging process or checking stage of the fish maturation.