Alcohol is the most frequently used and abused psychoactive drug in the World. Although many of us consume alcohol in a controlled fashion with few, if any, adverse consequences, for some others, alcohol drinking becomes excessive, causing physical, emotional, and economic harm. An important issue in alcohol research, therefore, is to identify personality traits and underlying neurobiological mechanisms that predict the transition from controlled use to uncontrolled alcohol abuse. Identification of such traits could lead to the development of addiction-preventive strategies, novel therapeutic targets, and would allow better understanding of the aetiology and maintenance of alcohol abuse. Cognitive theories of addiction suggested that biases in cognitive processing could be critical factors determining individual vulnerability to the transition from controlled alcohol use to compulsive and uncontrolled alcohol abuse. Since this hypothesis is difficult to test in humans because it is unclear whether cognitive biases predate, or are the result of alcohol abuse, present project has been designed to validate this hypothesis in an animal model. What's important, we will also try to elucidate neuromolecular and physiological mechanisms that are potentially involved in mediation of cognitive bias and its effects on individual vulnerability of rats to alcohol abuse.

The abovementioned aims will be achieved in several research steps. First, using behavioural tests we will evaluate the valence of 3 different cognitive biases (sensitivity to positive feedback, sensitivity to negative feedback and optimism/pessimism) in 3 cohorts of rats. Based on these tests we will be able to classify animals from each cohort as: sensitive/insensitive to positive feedback (cohort 1), sensitive/insensitive to negative feedback (cohort 2) and, optimistic/pessimistic (cohort 3).

Subsequently, we will establish, using specialised behavioural protocols allowing assessment of the alcohol related behaviours in rats, if increased/decreased sensitivity to positive/negative feedback or traits pessimism/optimism could determine individual vulnerability of animals to alcohol abuse.

In the third step, using specialised molecular research techniques allowing assessment of expression and localisation of genes and proteins we will evaluate neuromolecular mechanisms possibly involved in biased cognition and its effects on alcohol drinking in rats.

Finally, by measuring levels of stress hormones, neuropeptides and cytokines in the blood of experimental animals we will establish, which physiological factors could be involved in mediation of cognitive bias and its effects on alcohol drinking in rats.

By combining sophisticated behavioural techniques with neuromolecular and physiological studies we will have a unique opportunity to perform research that for practical and logistic reasons cannot be performed in humans. Considering that the first successful attempts to modelling cognitive biases in animals have been made slightly over a decade ago and that, due to the level of difficulty, have been continued only by a handful of research groups in the world, the research included in this proposal can be considered as pioneering. Achievement of the aims of this project will advance our knowledge about the role of biased cognition in the aetiology of transition from controlled use to compulsive alcohol abuse and will drive innovative concepts about possible cognitive, physiological and molecular mechanisms involved in this psychopathology.

As characterisation of cognitive traits and neuromolecular mechanisms predicting vulnerability to switch from controlled alcohol use to uncontrolled alcohol abuse is critical for understanding aetiology of alcohol addiction and its treatment the results obtained at all stages of the project will be of general interest for the community of neurobiologists, psychopharmacologists, psychologists and psychiatrists. I expect that the wealth of new, potential avenues of research that will be generated after characterisation of interrelation between cognitive bias and compulsive alcohol seeking will ensure a range of opportunities for continuation of these fascinating experiments.