The increase in the prevalence of overweight/obese people worldwide has reached a qualified epidemic stage with more than one billion overweight and at least 400 million clinically obese patients. The WHO projects that by 2015, approximately 2.3 billion adults will be overweight and more than 700 million will be obese. Europe still has one of the highest average body mass indices (BMI) of all WHO regions, totaling to almost 400 million overweight adults and 130 million severely obese patients. As obesity is the cause of secondary co-morbidities such as cancer, cardiovascular complications and type 2 diabetes this development severely affects life quality and expectancy of the population.

Obesity is defined by an expansion of adipose tissue mass. However in recent years it has become evident that not only the mass, but also the type (quality) of adipose tissue is important. Thus adipose tissue can be subdivided into two distinct types, namely white and brown fat. White fat is specialized in the storage of lipids. However, under obese conditions it transforms into a diseased and injured tissue which contributes to the development of obesity and associated co-morbidities. In contrast, brown fat releases energy in the form of heat through uncoupling of the energy production of the cell, in a process called “thermogenesis”. This uncoupling leads to an enhanced basal energy expenditure and therefore could be used to induce weight loss in obese patients. Indeed it has been shown in numerous studies that in obese humans brown fat is virtually absent, suggesting that the amount of brown fat present in a human, determines the propensity of an individual to become obese. Interestingly, in the general population the amount of brown adipose tissue varies greatly, suggesting that similar to obesity a strong genetic component exists which determines the amount of brown fat. As it has been shown that in individuals which have high amounts of brown fat, cold induction can induce a significant weight loss in a very short time, the aim of this multi-disciplinary consortium therefore is to:

1) Develop a method for non-invasive analysis and quantification of brown fat mass and activity.

2) Identify surrogate markers for brown fat mass activity and test the response of such markers to lifestyle changes (i.e. caloric restriction, exercise, diet).
3) Establish a link between brown fat activation and cancer cachexia, to identify systemic factors that regulate brown fat formation and activation.

4) Analyze extreme lean & obese phenotypes in individuals and families to identify candidate genes responsible for brown fat mass and activity.

The proposal with its broad and multi-disciplinary approach towards obesity treatment will have multiple key outcomes. First of all, we will hopefully be able to establish novel reliable methods for brown fat measurement and thereby generate essential tools to address pertinent questions of personalized medicine, such as i) what predicts brown fat mass and activity in individuals, ii) can genetic markers be identified that predict brown fat formation and activation, iii) what lifestyle intervention improve maintenance activity of brown fat, iv) which individuals benefit the most from interventions (pharmacological or lifestyle) in terms of brown fat formation and activation and v) what factors predispose towards cancer cachexia? Based on these findings we not only hope to develop personalized therapies for weight loss and cancer cachexia, but also to identify novel molecular pathways that can be used to induce brown fat by novel intervention strategies, to combat the progression in obesity development.