

NucSys Project



Fig:1

NucSys is a FP6-funded Marie Curie Research Training Network that started in 2006. The 16 partners focus on how the nuclear receptor network generates the responses to nutritional signals that are so important in human health and disease.

Nuclear receptors constitute a large diet-sensing network in many human cells. This systemic sensor of energetic status detects lipids, carbohydrates and cholesterol compounds and, in response, governs a multitude of network responses, including cell growth, metabolic rate and homeostasis. It is a characteristic of Life that these responses are subtle and integrated to deliver what is best for human function. The optimal relationships between sensor network and response network are disrupted in many diseases. Novel insights and understanding have significant potential to promote human health.

The unique approach of the NucSys consortium stems from its intersectorial structure, which unites basic and clinical scientists, working in both academic and commercial settings. This is coupled with an interdisciplinary approach to biomedical research by combining molecular, cellular and developmental biologists, pharmacologists, physiologists, mathematicians and bioinformaticians. The galvanisation of this powerful consortium allows the utilization of excellence in diverse areas of research to deliver excellence in training. In this first stage of consortium development, 18 early stage researchers (Fig. 1) have been successfully appointed, each for 36 months, who receive research and course training in mathematical and biological theory and in experimental approaches.

NucSys is a network of young researchers projecting onto the molecular network that they study, as shown in the picture. Signals entering or produced in the cell, bind to carrier proteins that may move to the nucleus and its DNA (Fig. 2). There the signals activate proteins that bind to the DNA and activate gene expression. The various signaling routes engage in thorough conversations. Thus the response to a change in one of the cell's conditions results in a signal output that depends on all other conditions and on the state of the cell. Quite similarly, the various young researchers are positioned strategically in the molecular network, in the sense of the particular subnetworks and molecules that they study. They also engage in thorough conversations, at meetings and by modeling their own part of the network, and then connecting their model to the models of the other researchers. In this way they are generating the beginning of a comprehensive understanding of the entire nuclear receptor network (Fig. 3). This dual networking is without precedent in the history of biology, and perhaps only rivalled by the collaborations that nuclear particle physicists engage in.

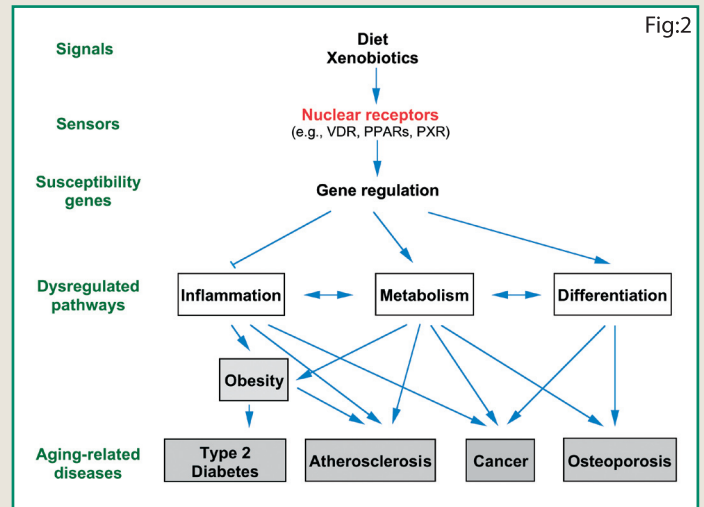


Fig:2

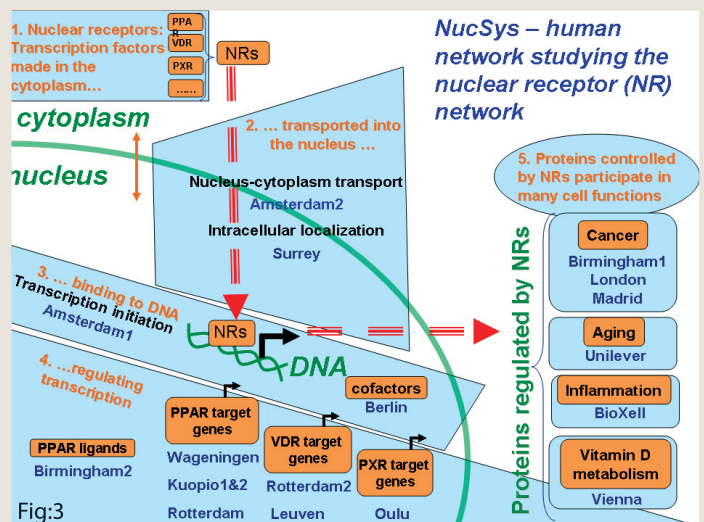


Fig:3

Ultimately this network aims to generate a personalized, predictive and preventative paradigm for the effect of diet upon key aspects of health. It will catalyze commercial realization from this understanding. This synergistic group of research and training

activities enables NucSys to nurture and develop a unique cadre of researchers, who will become the next generation of leading scientists and, through their training, experience and knowledge, will act as levers to bring about the realization of the European Research Area.