**ELTE's program of excellence to increase the capacity in synthetic chemistry and biochemistry: Synthesis+**

The Latin word synthesis - assembling and uniting – is also a scientific terminus technicus referring to the production of more complex molecules or materials. Today, most of the 2,000 active compounds available in pharmacies in forms of various medications are synthetic. However, synthetic chemistry and biochemistry are much more than this; most of our clothing, equipment, vehicles, and other items of use are a cleverly assembled systems of synthetic materials. Therefore, the development and expansion of synthetic, analytical and technological knowledge and capacity is a top priority.

The **direct objective of the Synthesis+** excellence program is to develop and expand the synthetic capacity of ELTE TTK. The indirect goal of the program is to strengthen, coordinate and enhance the synergies between colleagues, working groups and communities related to synthetic works, so that we can be more effective in research and development, and bring focus to selected areas of innovation. Thus, in the forthcoming years, we plan to

- **strengthen, link and network** different synthetic and associated disciplines,

- introduce the practice of **cooperation and competition**,

- **catalyze specialty synergy,**

- promote collaboration between successful researchers and

- provide financial support for the best.

**Based on their size and chemical constitution**, we plan to begin with the development of four research areas : 1) organic small molecules, 2) oligo- and polypeptides, 3) proteins, and 4) biosimilars and bioassays. These four themes cover the major areas of domestic drug, fine chemicals and agrochemistry, requiring broad-profile cooperation.

1) In the context of the structure-activity relationship (QSAR), we start or continue to develop small organic molecules. We will work on the synthesis and cost-effective scale-up of naturally occurring bioactivity compounds, potential active agents, targeting their market exploitation. Furthermore, we will work on the design and synthesis of skeletal and fragment-based compounds.

2) We will develop amino acid, peptide, and protein fragment-based active substances as guiding (targeting?) peptides and bifunctional linker libraries for personalized medicine, producing a large number of specific and selective peptide conjugates. We will produce and test radiotherapy and diagnostic (PET, MRI) products in cooperation with external partner institutions (e.g. National Oncology Institute and SE). We will develop a new flow-chemistry method for the efficient and environmentally friendly synthesis of polypeptides.

3) Bacterial expression systems will be developed and optimized for fermentation to aid the production of isotopically labeled proteins. We will produce key proteins according to research and market needs, develop and analyze lead molecules related to certain diseases (e.g. type 2 diabetes, neurodegenerative diseases, oncogenic and muscle proteins, steroid-resistant kidney disease,..).

4) The development of biosimilar molecules (/materials?) and bioassays is a key economic challenge. Protein-based in vitro drug tests and in vivo disease models will be developed to test potential active ingredients, lead compounds etc. of section 3.

Many of the scientists, chemists and biologists involved in these projects are internationally well-known researchers. Excellent synthetic chemists and biochemists, spectroscopists, molecular modelers, applied quantum chemists, material scientists, biocompatible and bioactive molecule specialists as well as researchers of outstanding scientific indicators form the core team of this excellence program. They all have prestigious international connections and scientific networks and are members of important international panels, boards and committees.

In summary, we will catalyze, strengthen and make more efficient our current synthetic capacities exactly where our scientific community needs it the most. This excellence program will be developed, partly based on previous pilot studies (e.g. MedInProt / ELTE, HunProtExc / NKFIH, Research Groups / MTA-ELTE, etc.), alongside the development of established and proven structures. We also want to provide an opportunity

- to formulate and start **new research topics**,

- to stimulate **researcher mobility**,

- to enhance effective and efficient **cooperation**,

- to create a XXI. century synthetic **research environment**,

- to build bridges toward the industry.

Relying on the experience-pool of previous integration and cooperation projects, the aim of the Synthesis+ excellence program is the introduce synergy between researchers of synthetic chemistry and biology and thereby strengthen their integration so that we can be even more efficient, competitive and successful.