

The basics of chemical synthesis of oligonucleotides		
Institute of Bioorganic Chemistry of the Polish Academy of Sciences	Prof. dr. hab. Adam Kraszewski Dr. Karol Pasternak	Professor, working at the Institute of Bioorganic Chemistry PAS, Poznań – lectures and exam Dept. of Biomolecular NMR IBCH NMR Laboratory, Head of Laboratory - demonstration of machine assisted oligonucleotide synthesis

General information:

Type of activities	1) Lecture series: 12 x 45 min. and written exam (2 x 45 min.). 2) Demonstration of machine assisted oligonucleotide synthesis (2 groups x 2h)
Didactic cycle	Autumn-winter 2020/2021
Language	English
ECTS score	2

Objective of the course: The overview of development of synthesis of oligonucleotides within XX century with biological background that determined demands of molecular biology for synthetic oligonucleotides and their analogues. Chemistry of the most effective methods for internucleotide bond formation will be presented.

Lecture includes:

1. Historical overview of DNA structure discovery – the question of genetic code.
2. Phosphodiester method for synthesis of oligonucleotides
3. Phosphotriester method for synthesis of oligonucleotides
4. Synthetic oligonucleotides in development of genetic engineering
5. Synthesis of oligonucleotides on solid support
6. Synthesis of several type of oligonucleotide analogues
7. Short demonstration of machine assisted oligonucleotide synthesis

Effects of the course (in terms of knowledge, skills)

Ph.D. Student shall:

1. gain advanced subject and methodological knowledge regarding chemistry of components of nucleic acids,

master chemistry, methods and analytical techniques used in the synthesis of oligonucleotides and their analogues, be able to: (i) elaborate on the concept and strategy for synthesis of a target oligonucleotide. (ii) choose a proper method for oligonucleotide synthesis, (iii) to a considerable extent, determine cognitive and applicative goals for synthetic oligonucleotides. (iv) evaluate the economic aspects of a chosen synthetic approach, (v) critically evaluate papers of other researchers on chemistry and properties of synthetic oligonucleotides.

Exam: written with short talk

Literature constituting the course materials

- Series of papers: *Studies on polynucleotides* - H. G. Khorana et al., published within 1960 – 1976.
- Reese C. B. An approach to oligonucleotide synthesis by the phosphotriester method. *Phosphorus and Sulfur*, 1976, 245
- Reese C. B. The chemical synthesis of oligo- and poly-nucleotides: a personal commentary. *Tetrahedron* 2002, 58, 8893
- *Oligonucleotide synthesis: a practical approach*. M. Gait (red.). Oxford: Oxford University Press, 1984.
- *Oligonucleotides and Analogues. A Practical Approach*. F. Eckstein (red.). Oxford: Oxford University Press, 1991.
- *Protocols for Oligonucleotides and Analogues. Synthesis and Properties*. S. Agrawal (red.). Totowa: Humana Press, 1993.
- *Protocols for Oligonucleotide Conjugates. Synthesis and Analytical Techniques*. S. Agrawal (red.). Totowa: Humana Press, 1994.