

**Recruitment for the Poznań Doctoral School of the Institutes of the Polish Academy of Sciences  
at the Institute of Bioorganic Chemistry, PAS in Poznań  
Procedure no. 12/2024/ICHB/PSD**

INSTITUTION: Institute of Bioorganic Chemistry, PAS  
CITY: Poznań  
POSITION: PhD student  
POSITIONS AVAILABLE: 1 position  
SCIENTIFIC DISCIPLINE: biological and related sciences  
PUBLICATION DATE: 25.06.2024  
APPLICATION DEADLINE: 24.07.2024  
IBCH PAS WEBSITE: <https://portal.ichb.poznan.pl>  
PDS IPAS WEBSITE: <http://www.psd-ipan.ichb.poznan.pl>

**KEY WORDS:** RNA structure, thermodynamics of modified RNA, pseudouridine, N1-methylpseudouridine, chemical mapping of RNA structure, IVT mRNA vaccines, Nanopore RNA sequencing

**Principal Investigator:** Prof Ryszard Kierzek

**Research topic:** Impact of RNA modifications on structure and function of natural RNA and vaccine-type in vitro transcribed mRNA (IVT mRNA).

## I. Project description

Ribonucleic acids (RNA) are one of the most important biomolecules. The biological functions of RNA are very diverse and are largely related to their structure. In RNA, in addition to the canonical bases, there are over 140 modified nucleotides. The most common are N6-methyladenosine and pseudouridine. Modified nucleotides influence the structure and biological functions of RNA. The connections between the structure of RNA and its biological properties makes knowledge about the structure of RNAs containing modified nucleotides very desirable.

The project is important for many reasons. Thanks to RNA vaccines, the world has recovered from the pandemic caused by the SARS-CoV-2 virus. The most effective vaccines from Pfizer and Moderna contain spike protein mRNA in which all uridines have been replaced with N1-methylpseudouridine. Previous studies have shown that the introduction of N1-methylpseudouridine into vaccine RNAs increases mRNA expression and its stability in the cellular environment, and also shows very good immunological parameters. Other modified nucleotides that also gave very promising results were: pseudouridine, 5-methoxyuridine and 5-methylcytidine. This was also the reason for selecting the above-mentioned modified RNA nucleotides for research.

The research plan for the doctoral student includes the following stages: (1) chemical mapping of two large fragments of the 28S ribosomal RNA (rRNA) subunit from humans. Both model rRNAs contain 5 and 13 pseudouridine residues, respectively, and are selected from the rRNA region where the autocatalytic formation of a peptide bond on the ribosome takes place. Based on the results of chemical mapping, its secondary structure will be determined and compared with the structure generated using the modified RNAstructure program, (2) preparation of vaccine RNA based on segment 4 of influenza virus RNA (mRNA fragment encoding the surface protein - hemagglutinin, approximately 1,800 nt long) and all functional elements necessary for its "vaccine" activity, (3) testing the immunological properties of vaccine mRNA.

### **Additional information:**

1. Research and doctoral theses shall be carried out within the 2022/45/B/ST4/03586, entitled "Thermodynamics of modified RNAs. Impact of RNA modifications on structure and function of natural RNA and vaccine-type in vitro transcribed mRNA (IVT mRNA)", funded by National Science Center
2. PhD students shall receive a stipend in the gross amount of ca. 4 300 PLN (3 800 PLN net), for the period of 30 months with possible extension
3. PhD students shall be subject to social insurance, pursuant to article. 6 section 1 passage 7b of the act of October 13th, 1998 on the social insurance system (Journal of Laws of 2019, item 300, 303 and 730).

### **II. Requirements for the candidates:**

1. Master's degree in biology or related fields, or meeting the conditions indicated in Art. 186 sec. 2 of the Act of July 20, 2018. Law on Higher Education and Science (Journal of Laws of 2018, item 1668, as amended).
2. Experiences in laboratory work in the field of molecular biology. Experiences in the field of biology and biochemistry of nucleic acids are welcome.
3. Very good knowledge of the English language.
2. Knowledge of basic issues related to the research topic of the project.
3. High motivation for further development and the ability to work in a team.

### **III. Duties in project:**

- 1/ chemical mapping of two large fragments of the 28S ribosomal RNA (rRNA) subunit from humans. Both model rRNAs contain 5 and 13 pseudouridine residues, respectively, and are selected from the rRNA region where the autocatalytic formation of a peptide bond on the ribosome takes place. Based on the results of chemical mapping, its secondary structure will be determined and compared with the structure generated using the modified RNAstructure program,
- 2/ preparation of vaccine RNA based on segment 4 of influenza virus RNA (mRNA fragment encoding the surface protein - hemagglutinin, approximately 1,800 nt long) and all functional elements necessary for its "vaccine" activity,
- 3/ testing the immunological properties of vaccine mRNA.
- 4/ analysis of the results obtained and preparation of publications on the conducted research.

### **IV. Required documents:**

1. Application for admission to PDS IPAS along with the consent for processing personal data upon the recruitment procedure and a statement on having acknowledged the regulations of recruitment for PDS IPAS, using [http://www.psd-ipan.ibch.poznan.pl/wp-content/uploads/2021/10/ICHBAApplication\\_for\\_admission\\_202110.docx](http://www.psd-ipan.ibch.poznan.pl/wp-content/uploads/2021/10/ICHBAApplication_for_admission_202110.docx) form downloaded from
2. Certified copy of the diploma confirming graduation or a certificate confirming graduation (in the case of diplomas issued by foreign higher education schools, diploma stipulated in article 326, section 2, passage 2 or article 327, passage 2 of the act of July 20th, 2018 – Law on Higher Education and Science (Journal of Laws of 2018, item 1668, as amended), entitling to apply for conferment of a doctoral degree in the state in where such a certificate was issued by the relevant higher education school. In the event when the candidate is not in possession of the aforementioned documents, he/she is obliged to submit them prior to admission to PDS IPAS. Additional information on foreign school diplomas are available at: <https://nawa.gov.pl/en/recognition/recognition-for-academic-purposes/applying-for-admission-to-doctoral-studies>

3. Scientific CV encompassing track record of previous education and employment, information on involvement in scientific activities (participation in student research groups, attendance at scientific conferences, accomplished internships and training, awarded prizes and distinction) and list of publications.
4. Cover letter featuring a short description of research interests, achievements and justification for the intention to commence education at the doctoral school.
5. Certificates or other documents confirming the degree of proficiency in English, if the candidate is in possession of such materials.
6. Contact details of at least one, previous scientific supervisor or another researcher who is entitled to issue an opinion on the candidate.

V. Applications should be submitted via the eRecruiter portal at

<https://system.erecruiter.pl/FormTemplates/RecruitmentForm.aspx?WebID=185a49d1ab36441aa6a5ca7613c4b5f0>

VI. Submission deadline is **24.07.2024**

#### VII. Criteria for evaluation of candidates:

1. Candidate's research achievements, pursuant to the grades obtained in the course of studies, scientific publications, awarded scholarships and distinctions resulting from conducting scientific research or student activities or other achievements.
2. Candidate's scientific and professional experience, pursuant to participation in conferences, workshops, training sessions and internships, implementation of research and commercial projects, involvement in scientific trusts and societies, international and professional mobility, experience in other sectors, including industry.
3. Candidate's knowledge on the following discipline: molecular biology and related sciences.
4. Knowledge of the subject matter described in the recruitment advertisement.

VIII. The recruitment procedure shall be concluded no later than **30.08.2024**

IX. The description of the recruitment process is stipulated in the Regulations of Recruitment for PDS IPAS. Following the recruitment procedure, the unadmitted candidates shall be informed on the number of points obtained at both stages.

Incomplete applications will not be considered.

For additional information please contact the Principal Investigator: Prof Ryszard Kierzek, e-mail: [rkierzek@ibch.poznan.pl](mailto:rkierzek@ibch.poznan.pl)

#### Information clause:

*Pursuant to the stipulations of the regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation), further referred to as GDPR, we hereby inform that:*

- *The Institute of Bioorganic Chemistry, Polish Academy of Sciences, seated in Noskowskiego St. 12/14, 61-704 Poznan; REGON 000849327, NIP 777-00-02-062 is the administrator of the collected personal data (further referred to as the Institute).*
- *The Administrator appointed a Data Protection Officer, who can be contacted in writing, via traditional mail, by sending a letter to the following address: Z. Noskowskiego St. 12/14, 61-704 Poznan, or by sending an e-mail to: [dpo@ibch.poznan.pl](mailto:dpo@ibch.poznan.pl).*
- *The personal data of the candidates is processed for the purposes of fulfilling the tasks of the administrator, associated with conducting the recruitment procedure for a vacant position.*

- *The legal basis for processing personal data is the Act of 26 June 1974 – The Labor Code, Act of 30 April 2010 on the Polish Academy of Sciences or the consent of the person whose data shall be subjected to processing.*
- *Your personal data shall be subjected to processing for period of 3 months upon the date of decision of the recruitment committee. Following this period, the data will be irretrievably and effectively destroyed.*
- *The personal data of the candidates shall not be transferred to any third country.*
- *The person whose data shall be subjected to processing has the right to:*
  - *request access to his/her personal data, and to amend it or delete it, pursuant to articles 15-17 of GDPR;*
  - *limit data processing, in the events stipulated in article 18 of GDPR;*
  - *data transferring, pursuant to article 20 of GDPR;*
  - *withdraw consent at any moment, without influencing compliance with the law of the processing that was executed prior to consent withdrawal;*
  - *file a complaint to the Inspector General for Personal Data Protection.*

*Providing personal data in the scope stipulated in article 22 (1) of the Act of 26 June 1974 – The Labor Code is mandatory, whereas providing data in a broader scope is voluntary and requires consent for its processing.*