Call for Applications to the IIET PAS Doctoral School through Special Admission Procedure No. 4/2026 for an NCN-Funded Research Project

The admission procedure is conducted in accordance with the Act on Higher Education and Science of 20 July 2018, the Regulations of the Doctoral School of the Institute of Immunology and Experimental Therapy of the Polish Academy of Sciences (IIET PAS), and the Admission Regulations for the IIET PAS Doctoral School.

Admission information

Date of call: 25.08.2026

Application submission deadline: 15.09.2026

Date of interview: 23-29.09.2026

Admission results: by 30.09.2026

Start of doctoral studies: 01.10.2026

Discipline: Biological Sciences

Number of places: 1

IIET PAS website: hirszfeld.pl

IIET PAS Doctoral School website: szkoladoktorska.hirszfeld.pl

If no formally correct applications are received by the specified deadline, the application period may be extended.

Information about the NCN research project within which the doctoral work will be conducted

Grant title: Study of the mechanisms leading to dysfunction of peripheral immune cells and disregulation of innate and acquired immune responses in women and men in the development of cognitive deficits and Alzheimer's disease

Brief description: Alzheimer’s disease (AD) is a progressive neurodegenerative disorder that currently cannot be effectively prevented or cured, while the number of people living with dementia worldwide, currently exceeding 57 million, is expected to increase substantially in the coming decades. Growing evidence indicates that, in addition to the classical neuropathological changes, dysregulation of immune responses, chronic inflammation, and potentially infectious

agents play important roles in the development and progression of AD. The project, involving 200 participants over 55 years of age - including cognitively healthy individuals, individuals with mild cognitive impairment (MCI), and patients with AD - aims to elucidate the mechanisms underlying peripheral immune cell dysfunction and to determine sex-related differences in these processes. Particular attention will be given to alterations in the innate antiviral immune response, including interferon signaling pathways, through the analysis of cytokines, chemokines, and the expression of genes involved in the regulation of immune responses. The phenotype and function of T cells, including markers of T-cell exhaustion, will also be assessed to determine whether immune exhaustion increases with cognitive decline and AD progression. Elucidating the relationships between chronic inflammation, infections, immune cell dysfunction and exhaustion, and cognitive decline may identify novel therapeutic targets and facilitate the development of personalized, sex-specific immunotherapeutic strategies. In the future, interventions aimed at restoring appropriate peripheral immune function may contribute to slowing cognitive decline, improving patients' quality of life, and reducing the social and economic burden associated with Alzheimer's disease.

Grant supervisor: Marta Sochocka, PhD, DSc, Prof. HIIET PAS

Doctoral project to be undertaken by the doctoral student

Subject/Title of the doctoral dissertation: Dysregulation of innate and adaptive immune responses in women and men in the development of cognitive impairment and Alzheimer's disease

Brief description of the tasks planned to be carried out as part of the doctoral project:

Stage 1. Recruitment of the study cohort and establishment of the study database
Months 1–30
The study will include cognitively healthy individuals, individuals with mild cognitive impairment (MCI), and patients with Alzheimer's disease (AD). The collected clinical and neuropsychological data will be organized in a database enabling their integration with the results of immunological and molecular analyses and subsequent statistical analyses.
Stage 2. Evaluation of the innate antiviral immune response of peripheral blood mononuclear cells *ex vivo*
Months 1–32
Peripheral blood mononuclear cells (PBMCs) will be isolated from study participants, and their innate antiviral immune response will be evaluated using a vesicular stomatitis virus (VSV) infection model. The ability of VSV to replicate in PBMCs will be assessed, and viral titers will be determined based on the $TCID_{50}$ value. C-reactive protein (CRP) levels will also be measured in each participant as a basic marker of systemic inflammation. Biological material obtained from cultures of uninfected and VSV-infected PBMCs will be collected and stored for further immunological and molecular analyses.
Stage 3. Assessment of cytokine and chemokine secretion associated with the innate antiviral immune response
Months 7–32

The concentrations of immune mediators will be measured in supernatants from cultures of uninfected and VSV-infected PBMCs. The analysis will include IFN-α, IFN-β, IFN-γ, TNF-α, IL-1β, IL-6, IL-8, IL-10, IL-12, RANTES, and granzyme B (GzmB). The results will allow the assessment of alterations in the PBMC secretory profile associated with cognitive impairment and AD, as well as the identification of sex-related differences.

Stage 4. Analysis of gene expression associated with the innate antiviral immune response

Months 10–35

The expression of genes encoding cytokines and key components of viral recognition and interferon signaling pathways will be assessed in uninfected and VSV-infected PBMCs. The analysis will include, among others, *IFNA, IFNB, IFNG, TNF, IL1B, IL6, IL8, IL10, IL12, RANTES, GZMB, RIG-I, MDA-5, IFITM-3, MxA, OAS2, tetherin, IFNAR1, IFNAR2, STAT1, STAT2, ISGF3, IRF-3, IRF-7*, and *IRF-9*. Comparison of transcriptional responses will enable the identification of potential alterations in antiviral and interferon signaling pathways associated with the progression of cognitive impairment.

Stage 5. Phenotypic characterization of CD4+ and CD8+ T cells, with particular emphasis on exhaustion markers

Months 11–36

The phenotype of CD4+ and CD8+ T cells will be assessed in freshly isolated PBMCs and in uninfected and VSV-infected PBMCs following 18 hours of culture. Markers associated with T-cell activation, differentiation, and functional exhaustion will be analyzed, including CTLA-4, PD-1, TIM-3, LAG-3, 2B4 (CD244), CD160, TIGIT, BTLA, VISTA, TOX, Eomes, T-bet, TCF1, CD127, CD62L, CD44, CD69, CD38, Ly108, and CXCR5. This analysis will allow us to determine the relationship between the extent of T-cell exhaustion and the severity of cognitive impairment and to identify potential differences between women and men.

Stage 6. Functional assessment of CD4+ and CD8+ T cells – analysis of intracellular cytokine and chemokine expression

Months 11–36

The capacity of phenotypically defined CD4+ and CD8+ T cells to produce immune mediators will be evaluated. The analysis will include intracellular expression of IFN-α, IFN-β, IFN-γ, TNF-α, IL-1β, IL-6, IL-8, IL-10, IL-12, IL-2, RANTES, and GzmB in freshly isolated PBMCs as well as in uninfected and VSV-infected PBMCs following cell culture. The results will be used to determine the relationship between the T-cell exhaustion phenotype and T-cell functional activity.

Stage 7. Characterization of T-cell heterogeneity using single-cell RNA sequencing

Months 25–36

An in-depth characterization of CD4+ and CD8+ T-cell heterogeneity will be performed using single-cell RNA sequencing (scRNA-seq). The analysis will be conducted in a selected representative subgroup of participants based on the results obtained in the preceding stages of the study. Transcriptomic analysis will enable the identification of T-cell subpopulations, their functional states, and gene expression profiles associated with activation, differentiation, and exhaustion. Appropriate bioinformatic approaches will be applied for multidimensional data analysis, including principal component analysis (PCA) and tools specifically designed for scRNA-seq data analysis, such as Seurat.

Stage 8. Integration of results, statistical analysis, and preparation of the doctoral dissertation

Months 30–48

Clinical, neuropsychological, virological, immunological, molecular, and transcriptomic data will be integrated and subjected to comprehensive statistical analyses. Particular attention will be paid to the relationships between the severity of cognitive impairment and alterations in peripheral immune responses, as well as to the identification of mechanisms underlying differences between women and men. The final stage will include interpretation of the results in the context of the pathogenesis and progression of Alzheimer's disease, preparation of scientific publications, and completion of the doctoral dissertation.

Location of the doctoral project: Laboratory of Virology, HIIET PAS

Supervisor: Marta Sochocka, PhD, DSc, Prof. HIIET PAS

Applicant requirements

Essential requirements:

- Master's degree (MSc) in biology, biotechnology, or a related field;
- experience in laboratory work with biological material, particularly human-derived samples;
- knowledge of basic molecular biology techniques and methods for the analysis of blood samples;
- ability to independently plan, organize, and conduct experimental work;
- very good communication skills and the ability to work effectively as part of a research team;
- advanced proficiency in English, enabling the candidate to independently read and understand scientific literature, prepare scientific publications, and present research findings.

Additional assets:

- experience working in a virology laboratory and conducting research involving viruses;
- experience in cell culture techniques;
- experience working with peripheral blood mononuclear cells (PBMCs) or other human-derived biological material;
- knowledge and practical experience in immunoenzymatic methods, particularly ELISA;
- experience in multiplex analysis of cytokines, chemokines, and other immune mediators, particularly using Luminex technology;
- previous scientific achievements, including scientific publications, participation in national and international conferences, oral or poster presentations, and other forms of scientific activity.

Doctoral scholarship

The doctoral scholarship will be awarded for 48 months at the following rates:

a) before the mid-term evaluation (Years I and II) – PLN 3,570.50 gross/month;

b) after the mid-term evaluation (Years III and IV) – PLN 5,500.50 gross/month.

Additionally, for a period of 24 months, until the mid-term evaluation, NCN research scholarship will be paid in an amount of not less than PLN 1,000 gross per month.

Doctoral student responsibilities

Laboratory research activities

- isolation of peripheral blood mononuclear cells (PBMCs) from blood samples collected from study participants;
- culture of PBMCs and their infection/activation using vesicular stomatitis virus (VSV);
- appropriate processing, storage, and documentation of blood samples, cells, and cell culture supernatants;
- maintenance of cell cultures, preparation of culture media and reagents, and preparation of cell cultures in 96-well plates;
- propagation of VSV, preparation of viral stocks, and monitoring and determination of viral titers;
- measurement of immune response mediators, including pro- and anti-inflammatory cytokines and chemokines, using multiplex assays, including Luminex technology;
- isolation of biological material for molecular analyses and participation in the assessment of gene expression associated with the innate antiviral immune response;
- participation in the phenotypic and functional characterization of CD4+ and CD8+ T cells, with particular emphasis on markers of T-cell activation and exhaustion, as well as intracellular expression of immune mediators;
- participation in the development, optimization, and standardization of experimental procedures and protocols;
- troubleshooting methodological and experimental issues arising during the course of the research, in consultation with the doctoral supervisor when necessary;
- conducting laboratory work in accordance with Good Laboratory Practice principles and applicable biosafety procedures.

Data collection and analysis

- systematic collection, organization, and documentation of experimental results and maintenance of laboratory records;
- creation and regular updating of databases containing research data;
- quality control of the generated data, including identification and verification of results requiring repetition or additional analysis;
- preparation of data for statistical analyses and participation in the analysis and interpretation of the results;
- integration of laboratory findings with available clinical and neuropsychological data from study participants.

Doctoral research and collaboration with the doctoral supervisor

- regular collaboration with the doctoral supervisor, including planning subsequent stages of the research, establishing research schedules, and discussing and interpreting the results;
- regular reporting of research progress and preparation of periodic summaries of the work performed;
- systematic review and analysis of current scientific literature relevant to the research project and doctoral dissertation;
- implementation of the Individual Research Plan in accordance with the established schedule and objectives of the doctoral dissertation.

Dissemination of research findings

- presentation and discussion of research findings during project team meetings;
- participation in the preparation of conference abstracts and presentation of research findings at scientific conferences;
- participation in the preparation of scientific manuscripts and publication of research findings in international peer-reviewed journals.

Required application documents

1. Application form (szkoladoktorska.hirszfeld.pl/en/doctoral-school/recruitment/)

2. Documents listed in §1(8) of the Admission Regulations

(szkoladoktorska.hirszfeld.pl/en/doctoral-school/recruitment/admission-regulations/). In

particular, the following are essential:

- diploma of completion of Master's studies or equivalent, with a supplement (for diplomas issued outside the European Union, legalisation of the diploma and supplement is required);

- proof of English proficiency at B2 level or higher, either as a certificate, a note in the diploma supplement confirming completion of an English course during studies, or a statement that English was the language of instruction in the programme; proof is not required for citizens of countries where English is an official language;

- motivation letter containing a brief description of interests and justification for undertaking studies at the doctoral school and carrying out the selected doctoral project;

- declaration stating that, if admitted to the IIET PAS Doctoral School, it will be the only doctoral school the applicant attends;

- statement from the project supervisor confirming that the applicant meets the basic project requirements.

Application submission procedure

Applications must be submitted:

1. by e-mail to sd.iitd@hirszfeld.pl (preferred method), with the note "Admission 4/2026"; originals of selected documents must be provided before the start of studies;

2. in person at the Main Secretariat of the Institute of Immunology and Experimental Therapy PAS, ul. Weigla 12, Wrocław, between 9:00 a.m. and 3:00 p.m.

Additional information

For enquiries regarding the admission procedure and the functioning of the IIET PAS Doctoral School, contact: sd.iitd@hirszfeld.pl

For enquiries regarding the doctoral project, contact: marta.sochocka@hirszfeld.pl