

Name and surname:	Witold Gładkowski
Academic Degree:	dr hab. inż. (DSc.)
Institute/Department:	Department of Food Chemistry and Biocatalysis
e-mail address:	witold.gladkowski@upwr.edu.pl
ORCID:	0000-0002-3271-779X
UPWr Base of Knowledge - link:	https://bazawiedzy.upwr.edu.pl/info.seam?id=UPWr993e480ebb5f4fb396256126b3c67ec1&affil=&lang=pl
Researchgate:	
Personal website / Working group website:	https://upwr.edu.pl/badania/wiodace-zespoly-badawcze/biokataliza-i-aktywnosc-biologiczna-bioactiv/zespol
Participation in projects in last 5 years (chronological; with distinction into PI (kierownik) and RF (wykonawca)):	Research project no. 2018/31/B/NZ9/00602 "Research on the physicochemical and biological properties of sterol glycerides and their products formed during thermal oxidation", financed by NCN, 2019-2022, nature of participation: RF
Do you plan to engage support of second supervisor or auxiliary supervisor?	YES
	Second supervisor (from other discipline, Polish or international research unit)
Name and surname:	Hanna Pruchnik
Academic Degree:	dr hab. (Dr. Sc.)
Faculty, Institute/Department:	Faculty of Biotechnology and Food Science, Department of Physics and Biophysics
e-mail address:	hanna.pruchnik@upwr.edu.pl
ORCID:	0000-0001-5229-4299
UPWr Base of Knowledge - link or most important publications from last 3 year (JCR) / patents from last 3 years (maximum 5):	https://bazawiedzy.upwr.edu.pl/info.seam?id=UPWrd78dba10f1b24194a536e010a6fd1890&affil=&lang=pl
Researchgate:	
Personal website / Working group website:	
Participation projects in last 5 years (chronological; with distinction into PI (kierownik) and RF (wykonawca)):	Research project no. 2018/31/B/NZ9/00602 "Research on the physicochemical and biological properties of sterol glycerides and their products formed during thermal oxidation", financed by NCN, 2019-2022, nature of participation: RF
PhD topic:	Design of esters of provitamin and vitamin from D group as cosmetic and food additives - chemoenzymatic synthesis and analysis of biophysical properties
Research discipline in Doctoral School:	Biotechnology
Short description of the research problem to be solved in the PhD (minimum 1000 characters):	<p>Research indicates the importance of vitamin D not only in bone metabolism, but also in immunological and anticancer processes. Its common deficiency is associated with serious health consequences, including increased mortality caused by autoimmune and cancer diseases. The basic source of vitamin D3 for humans is a production in the skin under the influence of ultraviolet radiation (UVB, 280-310 nm), which results in the isomerization of provitamin D3 (7-dehydrocholesterol, 7-DHC) to previtamin D3, which is further isomerized to vitamin D3. Vitamin D deficiency is becoming more and more common due to low exposure to the sun in winter, as well as the use of sunscreen creams protecting the skin against UV radiation, which reduces the endogenous production of this compound.</p> <p>As it was shown in the investigations on an animal model, most of provitamin D3 and vitamin D3 are present in the skin in the form of esters with fatty acids, which are gradually hydrolyzed in the presence of the transporting protein DBP. This protein binds the released vitamin D3 molecule in the blood serum and transports it to the liver, where it is hydroxylated at the C-25 carbon atom. The described mechanism of controlled release of the free vitamin slows down its metabolism, limits its toxicity by controlling the concentration in the body, and through its successive transformation into the active 25-hydroxy derivative prevents vitamin D deficiency, also in the periods of low availability of sunlight.</p> <p>The aim of this research will be the design and chemical and enzymatic synthesis of various ester derivatives of provitamins D3 (7-dehydrocholesterol) and D2 (ergosterol) as well as corresponding vitamins D3 and D2, including long-chain fatty acids esters, acylglycerols and phospholipids. The obtained compounds can be used as the additives to sunscreen creams (esters of provitamins - 7-dehydrocholesterol and ergosterol) or dietary supplements (esters of vitamins - cholecalciferol and ergocalciferol), prepared in the form of liposome formulations. They will be subjected to a wide range of tests using biophysical methods. Among others, the size, shape, stability and physicochemical properties of the analyzed lipid formulations will be determined. The susceptibility of the obtained conjugates to the lipase-catalyzed hydrolysis and the ability of provitamin esters to the transformation into esters of corresponding vitamins under the influence of UV radiation will also be tested. The ability of the obtained esters to bind to appropriate transport proteins will also be evaluated.</p>
Professional skills for PhD candidate (e.g. master program, specializations, softwares, language, analytical techniques, minimum 500 characters):	Knowledge of English on min. B2 level, basic knowledge of chromatographic and spectroscopic techniques and techniques for the synthesis and purification of organic compounds, basic knowledge of biology and biotechnology, ability to work with enzymes, ability to present results at scientific conferences, communication skills, availability.
a) Project title:	0
b) Agreement number:	0
c) Number of months in the project to support PhD student (in months; starting from 1st of October 2024):	0
Project website:	