

DOKTORSKÝ STUDIJNÍ PROGRAM/DOCTORAL STUDY PROGRAM**VYPSÁNÍ TÉMATU/LISTING OF TOPIC**

Studijní program/*Study Program*: **Agricultural Chemistry**

Katedra/*Department of*: **mikrobiologie, výživy a dietetiky**

Školitel, email/*Supervisor, email*: **havlik@af.czu.cz**

Konzultant, email/*Co-supervisor, email*:

Forma studia/*Form of Study*: **prezenční**

Téma/Topic: Interindividual Differences in the Metabolism and Bioefficacy of Dietary Polyphenolic Antioxidants

Hypotézy/Hypotheses: 1. The metabolism of dietary polyphenols varies substantially among individuals due to differences in gut microbiome composition, enzyme activity, and genetic polymorphisms affecting phase II metabolism; 2. Microbiome-mediated transformation of polyphenols into bioactive metabolites critically determines their systemic bioefficacy, antioxidant potential, and regulatory effects on host metabolic pathways.

Anotace/Summary: This Ph.D. project will investigate interindividual variability in the metabolism and physiological effects of dietary polyphenolic antioxidants. Polyphenols are key plant-derived compounds with antioxidant, anti-inflammatory, and signaling properties, yet their bioefficacy varies widely among individuals. This variability arises from differences in gut microbiota, as each person's microbial community transforms polyphenols into distinct bioactive metabolites—analogous to one microbiota being “adapted to apples” and another to “oranges.”

The project will employ *in vitro* gut fermentation models combined with advanced analytical and genomic approaches to elucidate how individual microbiomes modulate polyphenol metabolism. Using controlled batch fermentations inoculated with fecal microbiota from multiple donors, the candidate will analyze microbial conversion of representative flavonoids, phenolic acids, and tannins into low-molecular-weight catabolites. Metabolomic profiling (¹H NMR, LC-MS) and metagenomic sequencing will jointly reveal microbial taxa, metabolic pathways, and key metabolites responsible for differential bioactivity.

The biological significance of these metabolites will be assessed via antioxidant and signaling assays and correlated with microbiome functional traits. Integrating microbiome and metabolomic data will provide mechanistic insight into why some individuals benefit more from specific polyphenols. The project will advance personalized nutrition by linking microbiome composition to dietary response.

The applicant should show strong analytical skills, independence, and interest in microbiome/metabolite research. Basic competence in R and biostatistics, or motivation to develop them, is expected.

Podpis školitele/*Signature of the Supervisor:*

Podpis konzultanta/ *Signature of the Co-supervisor:*

Podpis vedoucího katedry/*Signature of the Head of the Department:*

Příloha/Attachement: Finanční plán u témat vypsanych pro prezenční formu studia/*Financial plan for topics listed for full-time study*

Finanční plán pro PHD téma na FAPPZ/Financial plan for PhD topic

Studijní program/Study program

Agricultural Chemistry

Katedra/Department of

Food Science

Téma/Topic

Interindividual Differences in the Metabolism and Bioefficacy of Dietary Polyphenolic Antioxidants

Školitel

Jaroslav Havlík

zdroje financování	zakázka	rok 1	rok 2	rok 3	rok 4
doktorské stipendium	x	17000	17000	17000	17000
mimořádné stipendium - SGS					
mimořádné stipendium					
DKRVO katedry					
stipendium z projektů					

jiný příjem					
jiný příjem - externí zaměstnavatel					
mzda - projekt		12001	12001	12001	12001
mzda - projekt					

suma (min. 300 000, 1.2 násobek minimální mzdy)

300000 300000 300000 300000

! Vkládají se měsíční částky. U jiných příjmů a mzdy se v sumě načítají jen 2/3 z vložené částky

celkem doktorské stipendium

816000

celkem ostatní (min. 336 000)

384000

celkem za 4 roky (minimálně 1,2 milionu)

1200000

poznámka/comment

projekt v roce 1 až 3

školitel:

Podpis/Signature

vedoucí katedry:

Podpis/Signature