Fulbright International Education Exchange – Fostering Science and Mutual Understanding between Nations and Cultures

Tatjana Ruskovska, PhD
Goce Delcev University, Stip
Republic of Macedonia
FULBRIGHT International Education Exchange

INTERNATIONAL EDUCATION EXCHANGE IS THE MOST SIGNIFICANT PROJECT DESIGNED TO CONTINUE THE PROCESS OF HUMANIZING MANKIND TO THE POINT, WE WOULD HOPE, THAT NATIONS CAN LEARN TO LIVE IN PEACE.

Senator J. William Fulbright (1905-1995)
REPUBLIC OF MACEDONIA

Journey through the centuries
SKOPJE – the Capital City
SKOPJE – the Old Bazaar

The largest bazaar in the Balkans, outside Istanbul
Protected national landmark

- 12th Century
- Rapidly developed during the Ottoman rule
SKOPJE – the Fortress

- First built in 6\textsuperscript{th} century, by Byzantine Emperor Justinian I
- Further constructed in 10\textsuperscript{th} and 11\textsuperscript{th} century
- Part of material originates from the Roman city Skupi, which was destroyed by the earthquake in 518
SKOPJE – Birthplace of Mother Teresa

Nobel Peace Prize
December 1979
OHRID – Pearl of the Balkans

OHRID LAKE
Maximum depth: 288 m (940 ft)
Mean depth: 155 m (508 ft)
Area: 358 km\(^2\) (138 sq mi)

More than 200 endemic species

UNESCO’s World Heritage Site

Salmo letnica
STIP – Goce Delcev University

27 March 2007 - Established by the Assembly of the Republic of Macedonia
28 June 2007 - The first Constitutive Assembly of the University Senate
I understand the world solely as a field for cultural competition among nations.

1872 - 1903
STIP – Goce Delcev University

**CAMPUS 2**
Faculty of Natural and Technical Sciences
Faculty of Agriculture
Faculty of Computer Science
Faculty of Electrical Engineering
Faculty of Technology
Faculty of Mechanical Engineering

**CAMPUS 3**
Faculty of Medical Sciences

**CAMPUS 4**
Faculty of Educational Sciences
Faculty of Economics
Faculty of Law
Faculty of Tourism and Business Logistics
Faculty of Philology
Music Academy
Art Academy
Film Academy

RECOGNISE YOUR FUTURE

16 000 students
ECTS
Faculty of Medical Sciences

### Academic Study Programs

**Integrated Studies of First and Second Cycle:**
- **GENERAL MEDICINE**
- **DENTAL MEDICINE**
- **PHARMACY**

Medical Specialization and/or PhD Program

**BIOMEDICINE**
- Translational Medicine
- Medical Biotechnology
- Regenerative Medicine
- Medical Physics

**NEUROSCIENCES**

**DENTAL MEDICINE**

### Occupational Study Programs

**Nurses**
- Physiotherapists
- Medical Laboratory Technicians
- Dental Technicians - Prosthodontics
- Midwives
- Optometrics and Eye Optics

Specialization
Current project: “Oxidized proteins in patients on hemodialysis – influence of the supplementation with vitamin C”


Ankyrin is the major oxidised protein in erythrocyte membranes from end-stage renal disease patients on chronic haemodialysis and oxidation is decreased by dialysis and vitamin C supplementation.

Ruskovska T, Bennett SJ, Brown CR, Dimitrov S, Kamcev N, Griffiths HR.

**COST CM1001 Action**
Interuniversity Cooperation

- Interuniversity Cooperation Center
  - International associations and networks
  - Bilateral agreements

- ERASMUS network
  - 15 FMS student exchanges
    - Italy
    - Bulgaria
    - Croatia
NAD – A REDISCOVERED ‘OLD’ MOLECULE

Focus on the white adipose tissue in obesity induced insulin resistance
Protein Carbonylation, Sirtuins and NAD

Protein carbonylation and sirtuins in the white adipocytes and their involvement in the pathogenesis of insulin resistance

- Protein carbonylation
- Protein acetylation
- Sirtuins – NAD dependent deacetylases / deacylases
- SIRT3 – mitochondrial deacetylase
- NAD – ‘rediscovery’ of this ‘old’ molecule
NAD – an ‘old’ molecule

![NAD molecule diagram](image)

**Reaction of NAD+ to NADH**

\[
\text{NAD}^+ + \text{H}^+ + \text{H}^+ \xrightarrow{2 \text{e}^-} \text{NADH} + \text{H}^+
\]

Hydrogen from an organic molecule

C. Ophardt, c. 2003
NAD – a rediscovered ‘old’ molecule

- **NAD – role in redox reactions: Warburg, 1930s**
  - NAD is repeatedly converted between its oxidized and reduced form, thus its levels remain constant
    - Balance of the cellular redox potential
    - ATP synthesis

- **NAD in non-redox reactions**
  - NAD molecule is utilized for some reactions and consequently its concentration decreases as a result of catalysis
  - To prevent depletion of the cellular pool of NAD, continuous re-synthesis, mainly via the Salvage Pathway is required
SIRTUINS

- Sirtuins – class III deacetylases /deacylases
  - 7 sirtuins with different subcellular localization

Di Stefano and Conforti, FEBS Journal (2013), 4711-4728
Salvage pathway

Nicotinamide phosphoribosyltransferase

Nicotinamide mononucleotide adenyllytransferase

Nmnat1 – nuclei
Nmnat2 – cytosol
Nmnat3 – mitochondria
NAMPT

- NAMPT – a molecule with diverse roles in physiology and pathophysiology
  - **Key enzyme** in NAD biosynthesis, ubiquitously expressed
  - **Rate limiting enzyme** in NAD biosynthesis
  - Highly regulated by NAD (feed-back) and ATP levels (stimulation)
  - Located both intracellularly (NAD biosynthesis) and extracellularly

PBEF: pre-B-cell colony-enhancing factor
VISFATIN
NAMPT is involved in TNF-α mediated insulin resistance via NAD/Sirt1/PTP1B pathway in 3T3-L1 adipocytes

3T3-L1 treated with TNF-α:
- ↓ intracellular NAMPT mRNA and protein
- ↓ NAD
- ↓ SIRT1 activity
- ↑ PTP1B (negative regulator of insulin signalling) mRNA and protein
ACKNOWLEDGMENTS

David Bernlohr
Ann Hertzel
Wendy Hahn
Rocio Foncea

Jovan Kuzmicic
Dalay Olson
Joel Burrill
Hongliang (Arthur) Xu
Amy Hauck
Kaylee Steen
Ajeetha Josephrajan
Cyrus Jahansouz
Ross Conn