1st International Symposium for TCM and Integrative Medicine

Stip, 06.12.2017

Plant (Food) Bioactives: from Total Antioxidant Capacity to Gene Expression and Beyond

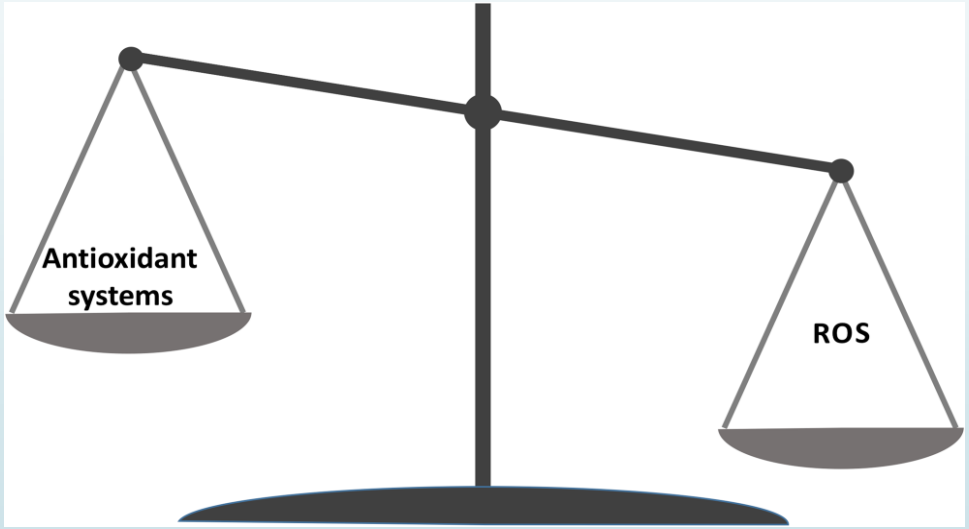
Prof. Dr. Tatjana Ruskovska

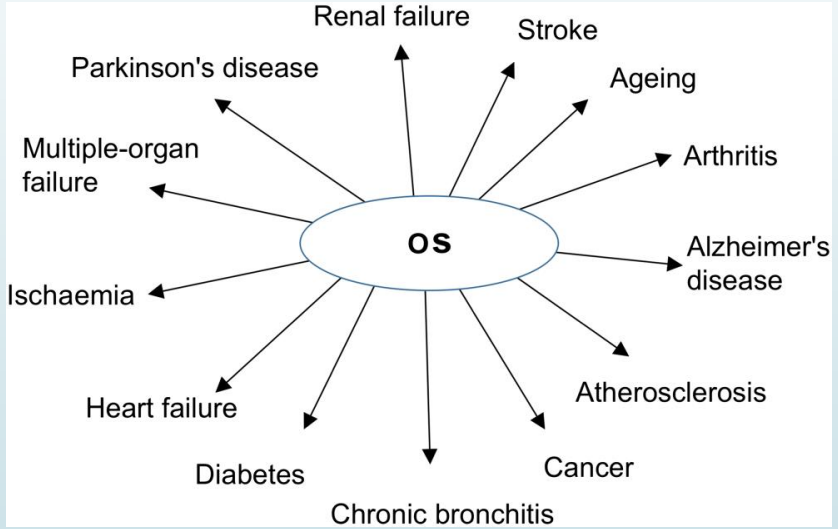
Faculty of Medical Sciences

Goce Delcev University - Stip

Oxidative Stress and Human Diseases

- Search term "oxidative stress" ≈175 000 papers on PubMed only, since 1970.





Br J Pharmacol. 2017 Jun;174(12):1784-1796.

Antioxidant Supplements

- Translation of knowledge to clinical practice.

  Free radicals are bad. Antioxidants are good.

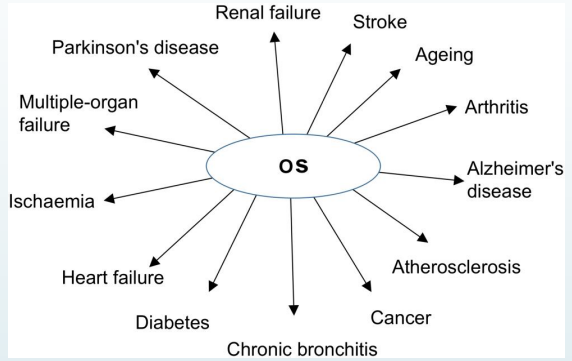
  Antioxidants, by scavenging ROS, will be beneficial in all the diseases…

Antioxidant Supplements

- There is no evidence to support antioxidant supplements for primary or secondary prevention.
- Vitamin A, beta-carotene, and vitamin E may increase mortality.
- Future randomized trials could evaluate the potential effects of vitamin C and selenium for primary and secondary prevention.

  Such trials should be closely monitored for potential harmful effects.
- Antioxidant supplements need to be considered medicinal products and should undergo sufficient evaluation before marketing.

Discussions, Issues and New Perspectives in Redox Biology

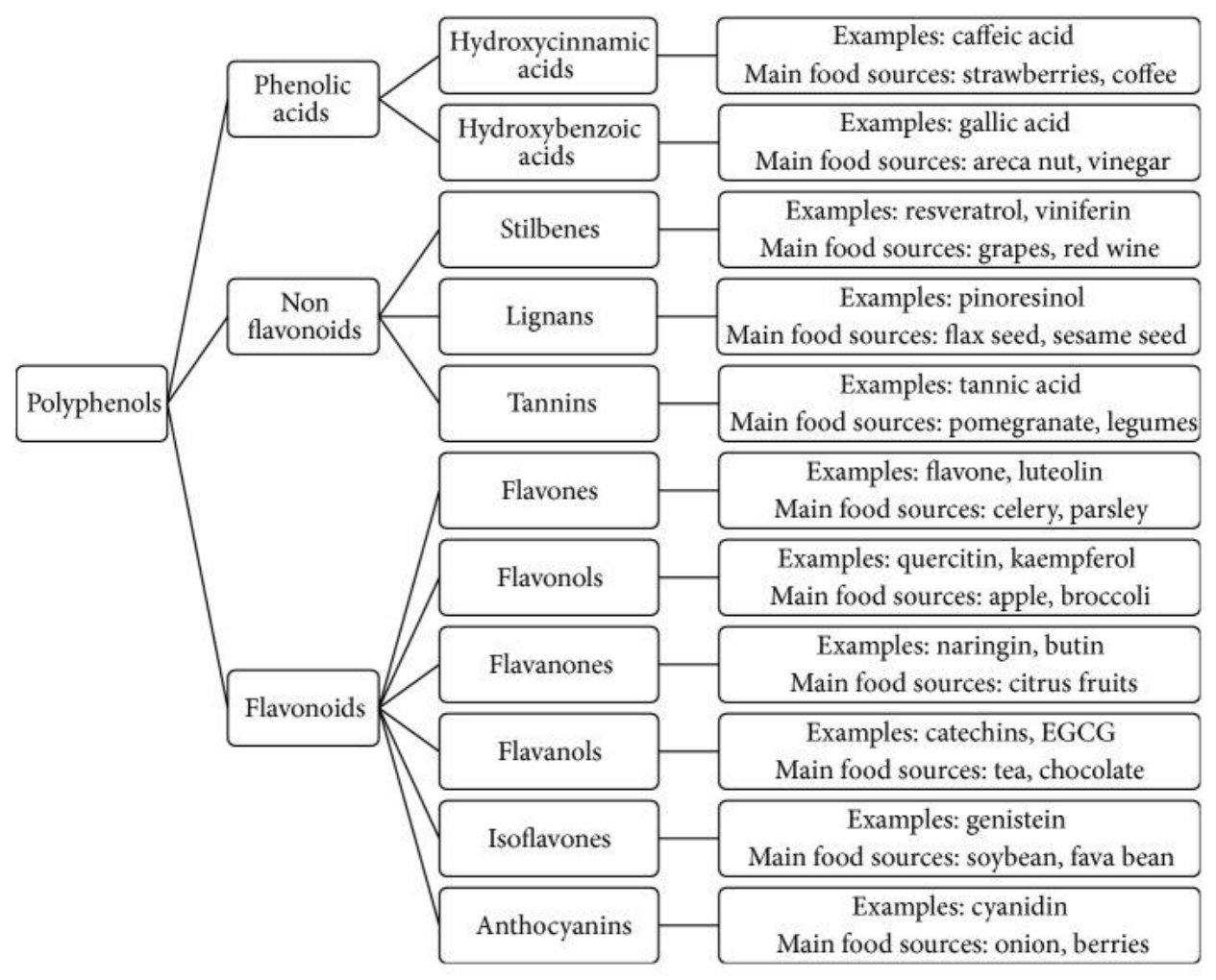


- Causality
  - an association does not necessarily mean causation
  - look for specific mechanisms, instead of scavenging all ROS
- The role of ROS and free radicals in cellular signaling
- Oversimplification that led to translational shortcut (an easy solution for a complex problem)
  - add complexity, integrate the current knowledge, with help of bioinformatics

Br J Pharmacol. 2017 Jun;174(12):1784-1796.

http://phenol-explorer.eu/

Plant (Food) Bioactives -they can have influence on health



-Highly abundant in our diet.
-Well studied and classified.

Oxid Med Cell Longev. 2015; 2015: 854015.

Epidemiological study

- **FLAVONOID INTAKE IS INVERSELY ASSOCIATED WITH MORTALITY FROM CORONARY HEART DISEASE.**

Lancet. 1993 Oct 23;342(8878):1007-11.

Dietary antioxidant flavonoids and risk of coronary heart disease: the Zutphen Elderly Study.

Hertog MG[1], Feskens EJ, Hollman PC, Katan MB, Kromhout D.

Author information

Abstract

Flavonoids are polyphenolic antioxidants naturally present in vegetables, fruits, and beverages such as tea and wine. In vitro, flavonoids inhibit oxidation of low-density lipoprotein and reduce thrombotic tendency, but their effects on atherosclerotic complications in human beings are unknown. We measured the content in various foods of the flavonoids quercetin, kaempferol, myricetin, apigenin, and luteolin. We then assessed the flavonoid intake of 805 men aged 65-84 years in 1985 by a cross-check dietary history; the men were then followed up for 5 years. Mean baseline flavonoid intake was 25.9 mg daily. The major sources of intake were tea (61%), onions (13%), and apples (10%). Between 1985 and 1990, 43 men died of coronary heart disease. Fatal or non-fatal myocardial infarction occurred in 38 of 693 men with no history of myocardial infarction at baseline. Flavonoid intake (analysed in tertiles) was significantly inversely associated with mortality from coronary heart disease (p for trend = 0.015) and showed an inverse relation with incidence of myocardial infarction, which was of borderline significance (p for trend = 0.08). The relative risk of coronary heart disease mortality in the highest versus the lowest tertile of flavonoid intake was 0.42 (95% CI 0.20-0.88). After adjustment for age, body-mass index, smoking, serum total and high-density-lipoprotein cholesterol, blood pressure, physical activity, coffee consumption, and intake of energy, vitamin C, vitamin E, beta-carotene, and dietary fibre, the risk was still significant (0.32 [0.15-0.71]). Intakes of tea, onions, and apples were also inversely related to coronary heart disease mortality, but these associations were weaker. Flavonoids in regularly consumed foods may reduce the risk of death from coronary heart disease in elderly men.

PMID: 8105262

[Indexed for MEDLINE]

ORAC – Oxygen Radical Absorbance

- ORAC
- TEAC
- DPPH
- FRAP

USDA Database for the Oxygen Radical Absorbance Capacity (ORAC) of Selected Foods, Release 2

USDA

Prepared by
David B. Haytowitz and Seema Bhagwat

Nutrient Data Laboratory
Beltsville Human Nutrition Research Center (BHNRC)
Agricultural Research Service (ARS)
U.S. Department of Agriculture (USDA)

May 2010

nature protocols

NATURE PROTOCOLS | PROTOCOL

Rapid measurement of total antioxidant capacity in plants

Kelly M Gillespie, June M Chae & Elizabeth A Ainsworth

Affiliations | Corresponding author

Nature Protocols **2**, 867–870 (2007) | doi:10.1038/nprot.2007.100
Published online 12 April 2007

How Do Nutritional Antioxidants Really Work?

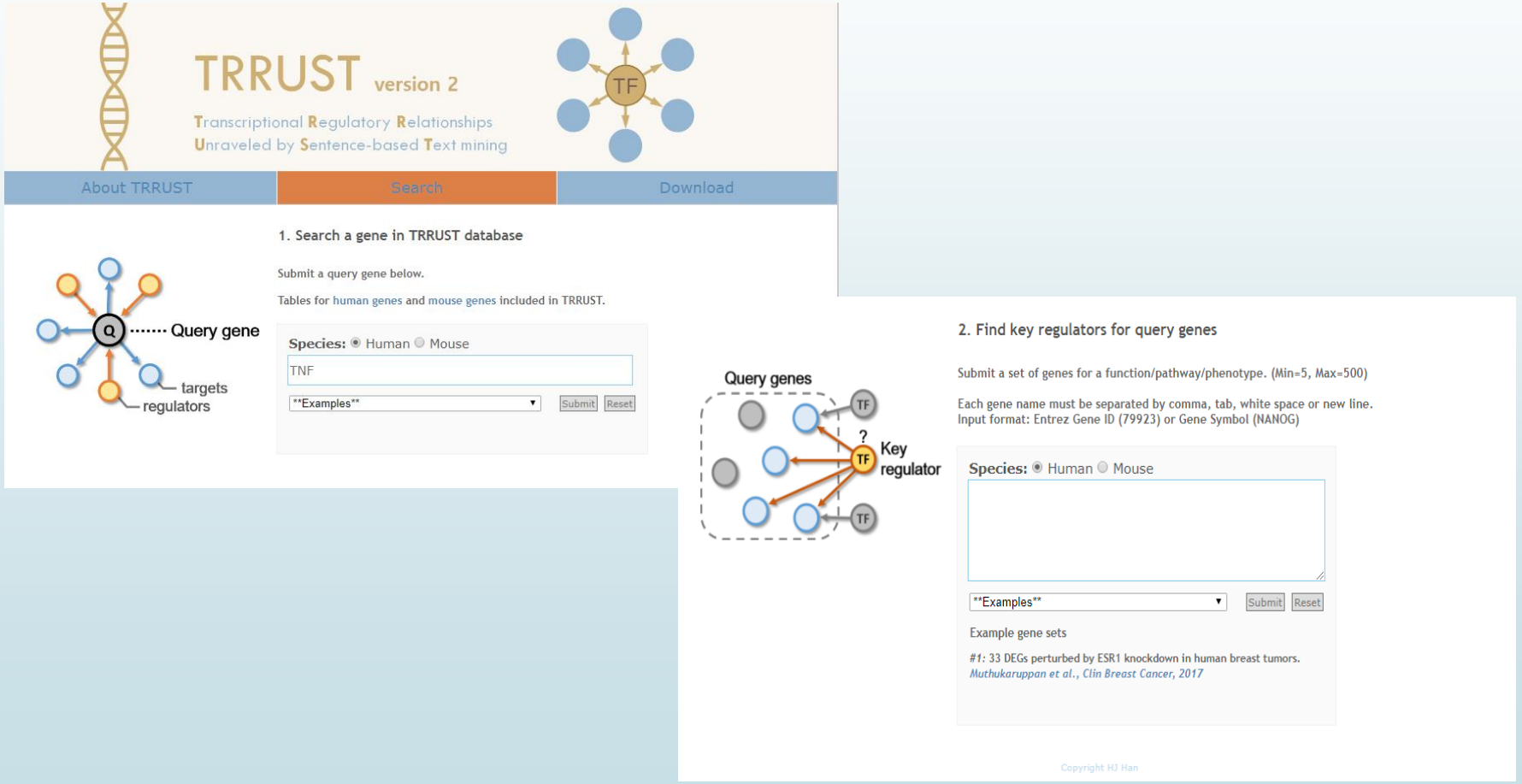
- **The ORAC list was withdrawn – *in vitro* TAOC is not a direct determinant of *in vivo* effects.**
  - **Low bioavailability – low concentrations in systemic circulation and tissues.**
  - **Extensive metabolism, which diminishes their free radical scavenging activity.**

Free Radic Biol Med. 2014 Jan;66:24-35

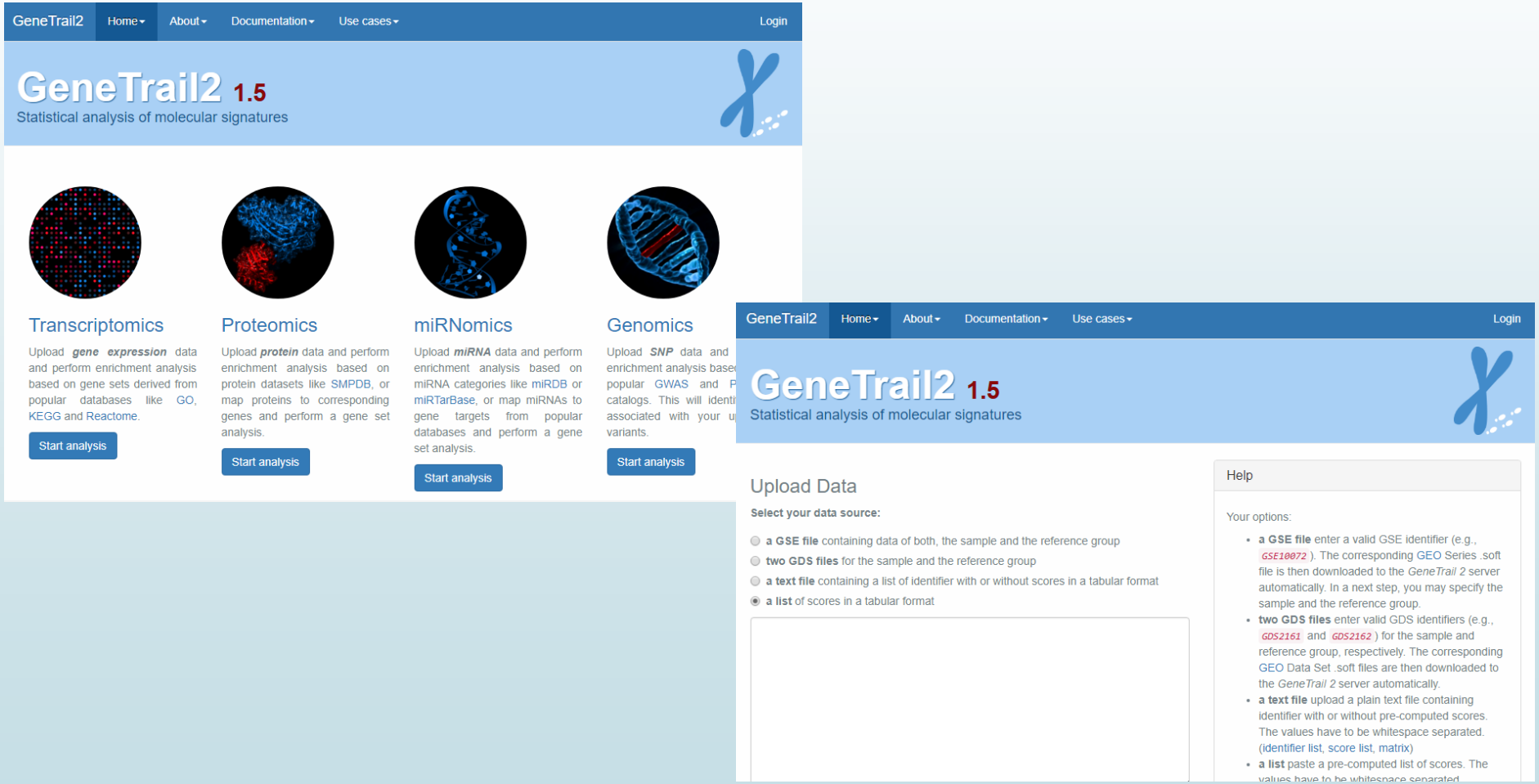
Cellular and Molecular Targets

- In vitro studies
- Animal studies
- Human studies

Analysis of transcription factors



Pathways analysis

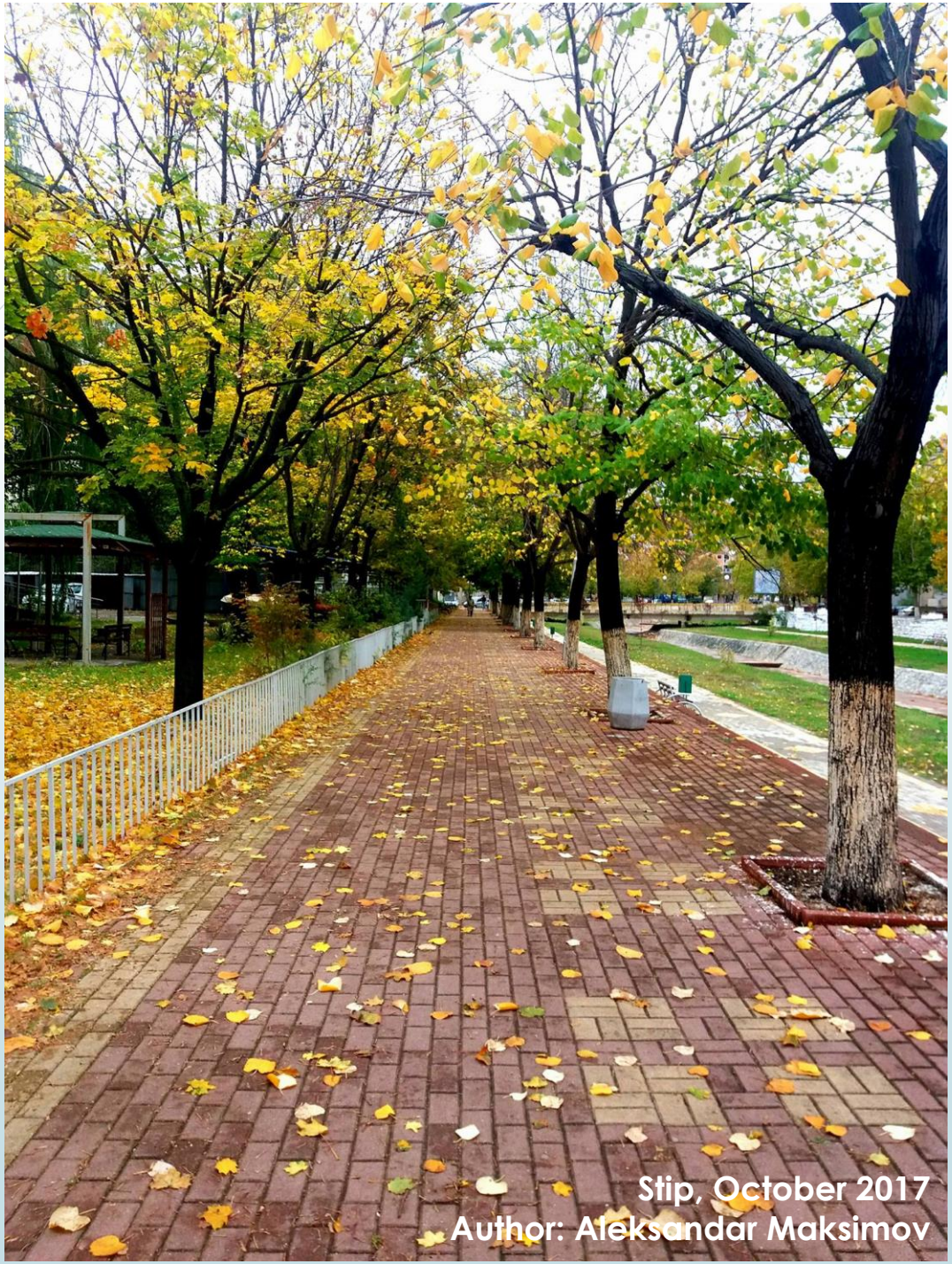


Functional links between proteins

- Differentially expressed genes were mapped via the STRING database.
- The STRING database takes a meta-analysis approach and identifies:
  - Protein-protein interactions and
  - Functional links between proteins.

Acknowledgements

Dr. Dragan Milenkovic
Dr. Marika Massaro
Irena Krga



Thank you for your attention!

Questions? Comments?