

Laboratorija na čipu bazirana na imunoglobulinima za bolju dijagnostiku neurodegenerativnih bolesti (PoC 5062)

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(IMmunoglobulin - based microfluidic lab-on-chip for better diAGnostics of NEurodegenerative Diseases – IMAGINED (coord Pavle R. Andjus))

In a number of neurodegenerative diseases (NDs) the production of the anti-neuronal immunoglobulin G (IgG) is a significant feature of the inflammatory process. It was shown that human IgGs may induce diverse physiological effects not only on neurons but also on glial cells of animal origin.

Our vision: IgGs will be used for *in vitro* diagnostics of NDs by **robust multipurpose processing of a single sample (patient's IgGs)** on seeded normal cells that can give a complex information based on *already known* cellular signaling responses recorded by fluorescent markers with **microfluidics and automated microscopy** towards *point-of-care personalized diagnostics*.

Proof of principle: 1) Development of procedures based on lab-on-a-chip microfluidic systems with biophysical intracellular light sensors. 2) Defining standardized *in vitro* personalized diagnostic protocols. 3) Design of a small-scale pilot platform based on automated/miniaturized fluorescence microscopy. Most of these principles has already **been tested though a H2020 MSCA RISE project**.

Interdisciplinary research: Cellular neurophysiology, Biophysics of intracellular fluorescent indicators, Video microscopy of intracellular molecular signaling, Microfluidics and biochip design, Advanced custom-made optics for automated microscopy and Machine learning for signal analysis.

The designed personalized diagnostics technology will be applicable for a variety of NDs for **sustained health care system**.

U velikom broju neurodegenerativnih bolesti (ND), proizvodnja anti-neuronskog imunoglobulina G (IgG) je značajna karakteristika inflamatornog procesa. Pokazano je da humani IgG mogu da indukuju različite fiziološke efekte ne samo na neuronima već i na ćelijama glije životinjskog porekla.

Naša vizija: IgG će se koristiti za *in vitro* dijagnostiku ND robusnom višenamenskom obradom pojedinačnih uzorka (IgG pacijenta) na zasejanim normalnim ćelijama koji mogu dati složene informacije na osnovu već poznatih ćelijskih signalnih odgovora zabeleženih fluorescentnim markerima uz pomoć mikrofluidike i automatizovane mikroskopije, a u cilju personalizovane dijagnostike.

Dokaz koncepta: 1) Razvoj postupaka zasnovanih na mikrofluidičkim sistemima u laboratoriji na čipu sa unutarćelijskim biofizičkim senzorima svetlosti. 2) Definisane standardizovanih *in vitro* personalizovanih dijagnostičkih protokola. 3) Dizajn male pilot platforme zasnovane na automatizovanoj / minijaturizovanoj fluorescentnoj mikroskopiji. Većina ovih principa je već testirana kroz projekat H2020 MSCA RISE.

Interdisciplinarna istraživanja: Ćelijska neurofiziologija, Biofizika unutarćelijskih fluorescentnih indikatora, Video mikroskopija unutarćelijske molekularne signalizacije, Mikrofluidika i dizajn biočipa, Napredna optika prilagođena za automatizovanu mikroskopiju i Mašinsko učenje za analizu signala.

Dizajnirana tehnologija personalizovane dijagnostike biće primenljiva za razne ND za održivi sistem zdravstvene zaštite.

Bio-repelenti protiv puževa razvijeni uz pomoć mahovina (PoC 5714)

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ENGLISH

Molluscs are organisms living in or often invading vegetable gardens and green houses. Snails and slugs are especially problem since they can propagate easy and it is hard to dispose of. Since the early developmental phases they feed on vegetable plants and cause significant quality and economical damage. This leads to application of chemical treatments that are harmful for humans, animals and that damage the soils under the vegetable cultures. Many human illnesses and even lethal cases are recorded every year around the globe. To avoid chemical implementation on vegetable production and soil damages, as well as to improve food quality and production economy, we want to test whether the moss extracts can serve as bio-repellents in vegetable production against snails and slugs. Since mosses are rarely harmed by different organisms in nature and do not serve as food for animals they can be good biological agency against harmful organisms. They are known to have interesting chemical content, and the idea is to use these natural green factories which can give product(s) that can serve as bio-repellent. Additionally, these products can be applied many times during the season since they do not harmful neither plants nor substrate soils.

SERBIAN

Puževi su životinje koje često nastanjuju i napadaju kulture povrtnjaka i staklenika. Puževi i puževi golači predstavljaju veliki problem jer se lako razmnožavaju i teško ih je ukloniti. Već od ranih stadijuma razvića puževi se hrane povrćem i na taj način uzrokuju veliku ekonomsku štetu. Stoga se za njihovo uništavanje koriste različiti hemijski preparati koji su opasni po zdravlje ljudi i životinja i štetni su za zemljište ispod ciljanih useva. Upotreba ovih preparata može dovesti do narušavanja zdravlja ljudi, pa čak i do smrtnih ishoda. U cilju izbegavanja upotrebe raznih hemijskih sredstava štetnih za zemljište i uzgoj povrća, kao i u cilju poboljšanja kvaliteta hrane, testiraćemo efekat ekstrakata mahovina i njihovo korišćenje kao bio-repelenata u borbi protiv puževa i puževa golača u uzgoju povrća. Mahovine mogu biti dobar izbor kao biološki agens protiv štetnih organizama jer njih u prirodi retko jedu ili napadaju drugi organizmi. Poznato je da mahovine sadrže različite grupe hemijskih jedinjenja, pa je naša ideja da se one koriste kao prirodne zelene fabrike koje pružaju proizvod(e) koji mogu imati funkciju bio-repelenata protiv puževa. Pored toga, ovi prirodni proizvodi mogu da se upotrebljavaju više puta u toku sezone obzirom da nisu štetni ni za biljke ni za zemljište.

Prirodni sirup kao aromatičan funkcionalni preliv(PoC 5711)

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The growing awareness of a healthy diet developed a trend of increasing the consumption of natural products. This led to greater usage of functional foods and required higher product diversity on the market. Considering this, the purpose of this project is to estimate the dietary potential of formulated syrup prototype as a natural, flavoured dressing with the goal to achieve its transformation from a promising candidate to the product on the shelf-markets. This preparation of aromatic hogweed roots is designed in the line with modern lifestyle and it contains only the elements from nature. The plan is to establish the syrup as a delicate, health-promoting food, by confirming its beneficial effects on the human body. The proto-syrup will be subjected to chromatographic chemical analyses and

determination of its biological potential (antioxidant, antimicrobial, anti-inflammatory, cytotoxic and enzyme inhibitory activities). It will be performed by assays that previously confirmed valuable properties of the plant, in addition to several new *in vitro* methods. Overall, the obtained results could prove and define the commercial aspect of this sweet and aromatic product with its unique composition and potentially, healthy characteristics.