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CROSS-BORDER ITALY-SLOVENIA BIOMEDICAL RESEARCH:

ARE WE READY FOR HORIZON 2020?

The Cross-Border Cooperation Programme Italy-Slovenia 2007-2013 has funded 6 projects targeting biomedical research. For the first time, researchers from 44 project partners have met to share their results and future perspectives.

CONFERENCE PROCEEDINGS

WITH AN **ANALYSIS** OF INNOVATION
MANAGEMENT AND KNOWLEDGE
TRANSFER POTENTIAL FOR A
SMART SPECIALIZATION STRATEGY

ATTI DELLA CONFERENZA - ZBORNIK



2007-2013 cooperazione territoriale europea
programma per la cooperazione
transfrontaliera
Italia-Slovenia
evropsko teritorialno sodelovanje
program čezmejnega sodelovanja
Slovenija-Italija

TRIESTE 2014



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The content of the present publication is under the sole responsibility of the 6 projects involved in the initiative and does not necessarily reflect the opinion or position of the European Union.

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Il contenuto della presente pubblicazione è di esclusiva responsabilità dei 6 progetti coinvolti nell'iniziativa e non rispecchia necessariamente le posizioni ufficiali dell'Unione europea.

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FACT SHEET

The six biomedical research projects of the Cross-Border Cooperation Programme Italy-Slovenia 2007-2013

PROJECT	CALL	DURATION	LEAD PARTNER & COORDINATOR	N OF PARTNERS	BUDGET (€)
TRANS2CARE	01/2009	Apr 2011 Sep 2014	Università degli Studi di Trieste <i>Sabina Passamonti</i> www.trans2care.eu	13	2.611.118
PANGEA	02/2009	Oct 2011 Sep 2014	ZRS – Znanstveno raziskovalno središče - Univerza na Primorskem <i>Rado Pišot</i> www.pangeaeu.org	9	1.253.752
GLIOMA	02/2009	Nov 2011 Oct 2014	Morska biološka postaja Nacionalni inštitut za biologijo <i>Tamara Lah Turnšek</i> www.glioma.eu	5	1.320.000
SIGN	02/2009	Nov 2011 Oct 2014	Univerzitetni klinični center Ljubljana <i>Borut Peterlin</i> www.signgenetics.eu	8	1.285.441
MINA	03/2011	Oct 2012 Mar 2015	SISSA - Scuola Internazionale Superiore di Studi Avanzati <i>Stefano Gustincich</i> www.minaproject.eu	4	998.293
PROTEO	03/2011	Oct 2012 Apr 2015	Elettra - Sincrotrone Trieste S.C.p.A. <i>Paola Storicì</i> www.elettra.eu/Prj/PROTEO/	5	992.771
TOT				44	8.461.315

Il volume raccoglie gli atti della Conferenza Biomedica Transfrontaliera tenutasi all'Università di Trieste il 27 febbraio 2014.

L'opera è redatta in tre lingue: italiano, sloveno e inglese, avendo come scopo principale raggiungere una platea multiculturale e multidisciplinare più vasta possibile; fanno eccezione alcuni contributi a carattere prettamente specialistico.

Tre sezioni distinte seguono l'iniziale presentazione degli obiettivi e delle caratteristiche salienti della Conferenza.

La prima sezione raccoglie la descrizione dei cinque progetti biomedici finanziati dal Programma per la Cooperazione transfrontaliera Italia-Slovenia 2007-2013 – Trans2Care, Glioma, Mina, Pangea, Proteo e Sign, per mano dei rispettivi Coordinatori.

La seconda raccoglie i contributi tecnico-scientifici, a testimonianza dell'ampiezza e carattere d'avanguardia delle competenze presenti nell'Area transfrontaliera.

La terza parte raccoglie alcuni articoli che elaborano e approfondiscono i temi politici affrontati nella Conferenza.

La vivace discussione che ha caratterizzato la Conferenza ha riguardato la sentita necessità di unire le forze per migliorare la qualità delle ricerche, da una parte, e l'efficienza nell'acquisizione di fondi europei, dall'altra. È fortemente sentita pure l'esigenza che i decisori politici siano maggiormente consapevoli dell'enorme patrimonio di competenze umane, esperienza storica e infrastrutture materiali d'avanguardia presenti nell'Area Programma. Un patrimonio che dovrebbe essere sfruttato a fondo per contribuire in modo significativo alla crescita intelligente, sostenibile e solidale di queste Regioni.

Pričujoči zbornik Čezmejne biomedicinske konference, ki je potekala 27. februarja 2014 na Univerzi v Trstu, vsebuje prispevke udeležencev konference.

Knjiga je napisana v treh jezikih: italijanščini, slovenščini in angleščini. Cilj knjige je doseči ljudi iz različnih kultur in/ali strokovnega predznanja.

Izjema so le določeni prispevki, ki imajo posebne tehnične in znanstvene vloge.

Po uvodni predstavitvi namena konference sledijo trije različni tematski sklopi.

V I. delu so zbrani opisi petih biomedicinskih projektov, ki jih financira Program čezmejnega sodelovanja Slovenija-Italija 2007-2013, in sicer Trans2Care, Glioma, Mina, Pangea, Proteo in Sign.

Prispevke so napisali vodje posameznih projektovnih ekip.

V II. delu so dokumenti o tehničnih in znanstvenih temah, ki predstavljajo širino in znanstveno odličnost, ki je na voljo v Slovenija-Italija čezmejnem območju sodelovanja.

V III. delu je zbirka člankov, ki se nanaša na politična vprašanja, katerih se je vsebinsko dotaknila konferenca.

Ob zaključku konference je sledila intenzivna razprava o združitvi moči, da bi izboljšali kakovost raziskovalnega dela in stopnjo uspešnosti pri pridobivanju evropskih sredstev.

Udeleženci konference prav tako upajo, da se bodo politični odločevalci pričeli zavedati ogromne zaloge človeškega kapitala in raziskovalne infrastrukture, ki je na voljo na programskem območju.

To je potrebno ustrezno izkoristiti za pametno, trajnostno in vključujočo rast teh regij.

The current book Proceedings of the Cross-Border Biomedical Conference, held at the University of Trieste on 27th February 2014, collects the contributions from the conference participants.

The document is presented in three languages: Italian, Slovene and English. Its aim is to reach people from a wide range of cultures and/or backgrounds of expertise.

The only exceptions are some contributions which have specific technical and scientific elements.

Three distinct sections follow the initial presentation of the objectives and features of the Conference.

Part I collates the description of the five biomedical projects funded by the Cross-border Cooperation Programme Italy-Slovenia 2007-2013, i.e. Trans2Care, Glioma, Mina, Pangea, Proteo and Sign. The respective team managers wrote the contributions.

Part II collates the papers on technical and scientific topics, which give an idea of the breadth and cutting-edge character of the expertise available in the Italy-Slovenia cross-border cooperation area.

Part III is a collection of papers that elaborate on the political issues addressed by the Conference. An intense discussion at the end of the Conference addressed the urgent need to unite efforts to improve both the quality of our scientific work and to increase our capacity to attract European funds. The participants also expressed the hope that political decision makers become aware of the immense stock of human capital and research infrastructure available within the Programme Area. This should be properly exploited for a significant contribution to the smart, sustainable and inclusive growth of these Regions.



BTL-LIKE PROTEINS AS MOLECULAR MARKERS TO EVALUATE POLYPHENOL ACCUMULATION POTENTIAL AND MATURATION RATE IN GRAPE

Alberto Bertolini, Elisa Petrusa, Carlo Peresson, Antonio Filippi, Sonia Patui,
Angelo Vianello, Marco Zancani, Enrico Braidot

University of Udine, Dept. of Agricultural and Environmental Sciences, Plant Biology Unit

Abstract — Flavonoid accumulation is a phenomenon associated to grape maturation and could be ascribed to several active and passive mechanisms. A more detailed knowledge of these processes could provide outputs about to improve the nutritional values of grape and its derivatives. This goal will be obtained assessing an immunochemical detection device able to point out the expression level of membrane transporters in grape skin and, thus, to estimate the polyphenol accumulation potential. In addition, this innovative test could allow to determine the best time for grape harvest, following in the field the dynamics of flavonoid accumulation systems. This parameter will implement the usual parameters applied by agronomical techniques, which are based on sugar content and acidity measurement. The evaluation of the phenolic maturity represents an efficient tool for the assessment of grape quality, since it takes into account the concentration of secondary metabolites as fundamental antioxidant molecules.

Index Terms — TRANS2CARE, grape, flavonoid accumulation, membrane transporters, bilitranslocase-like proteins, maturation marker

1 BACKGROUND

In agronomic practices polyphenol content is one of the most critical characters to assess grape quality. The accumulation of these secondary metabolites (flavonoids) has a significant impact on fruit nutritional value, as a source of antioxidants for the diet and on the subsequent stages of wine processing. Polyphenol synthesis and accumulation in grape cells could positively affect their bio-availability in mammals, where the absorption into cells is ensured, among others, by bilitranslocase (BTL), localized at the intestinal and stomach level, in liver and kidney epithelia as well as in vascular endothelium.

2 OBJECTIVES

The aim of the present project was to study and understand which are the mechanisms underlying the accumulation of secondary metabolites in plant cells, such as polyphenols, particularly flavonoids. It has widely accepted that there are several mechanisms and transporters responsible for this process, either active or passive. The characterization of the transporters involved is essential to develop cultivation techniques, useful to maximize the content of flavonoids in grapes in the field. In addition, it will allow to choose the best time to harvest, when flavonoid accumulation is high and, simultaneously, sugar content has not reached its maximum level yet. This target is in agreement with the new market guidelines aiming at obtaining wine products with high nutritional quality, lowering sugar content and, consequently, alcohol production during winemaking.

3 APPROACH & METHODS

General approach

The application of a molecular approach is proposed, using antibodies produced against mammalian BTL to identify similar transporters of flavonoids in grape berry. The antibody was built against the transporter specific sequence involved in recognition and binding with the polyphenolic substrates.

Methods

ELISA test and immunochemical methods will be applied. A diagnostic kit will be developed to easily detect and possibly to quantify the presence of grape transporters in berry skin. The device will be developed in a stick format for ease-of-use.

4 RESULTS

The results obtained so far show that in grape berry skin there are at least five proteins able to cross-react with an Ab raised against a specific sequence (234-245) of mammalian BTL (Figure 1). All these proteins are potential candidates in interaction with flavonoids, since the BTL sequence is known to be involved in flavonoid binding and transport. In addition, a transport activity, measured with spectrophotometric assay, is detectable in grape and this process is inhibited by the addition of the anti-BTL Ab (Figure 2). Moreover, on the basis of ELISA assay, it is shown that the expression level of BTL-like proteins increases during berry maturation, exhibiting a pattern similar to that detectable for flavonoid accumulation (Figure 3).

5 POTENTIAL NEW PRODUCTS & SERVICES

The results will allow the realization of an immunochemical kit able to determine the presence of the carrier of flavonoids with a simple colorimetric assay performed on skin extracts. If the sequence recognized by the Ab would appear to be conserved in the plant kingdom, it could provide cross-reaction with other enzymes involved in active transport of polyphenols. Therefore, the method will

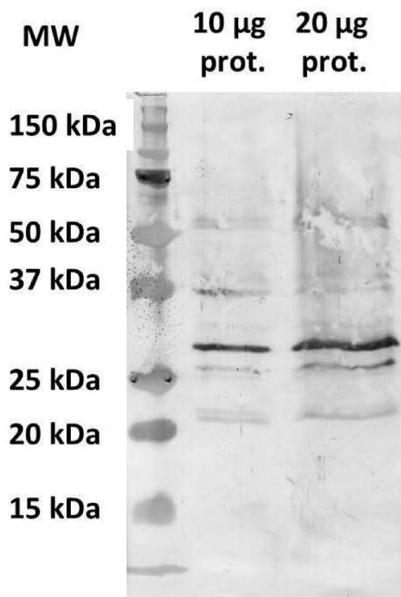


Figure 1: Immuno-chemical analysis of BTL-like proteins in microsomes from berry skins.

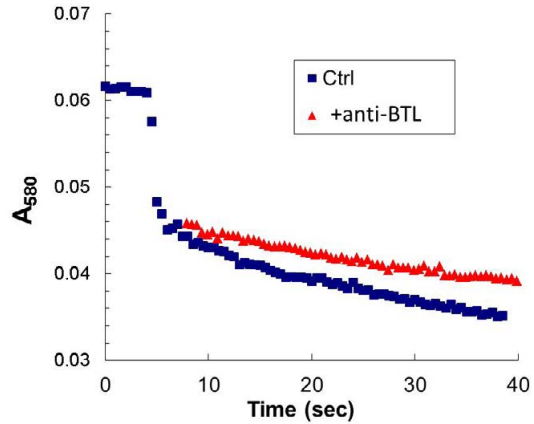


Figure 2: Spectrophotometric transport assay in microsomes from grape berry pulp. Inhibitory effect due to anti-BTL Ab addition.

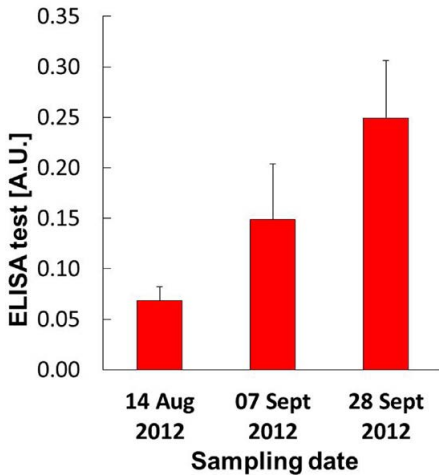


Figure 3: ELISA test performed on berry skin extracts obtained from berries at different developmental stages.

also provide an effective mean to assess the potential of phenolic metabolite production in grape cultivar. Such a determination would represent a useful application in genetic selection and breeding of new accessions, to identify the most promising clones to be propagated.

The main stakeholders of the project will be farmers and breeders, with whom the setup and development of the diagnostic kit would be necessarily performed.

6 CURRENT COLLABORATIONS

With other researchers: during these first steps the involvement of researchers from University of Trieste (Dept. Life Sciences - LP, Trans2Care) Nova Gorica University (Slovenia - PP3, Trans2Care), Agricultural Institute of Slovenia (Ljubljana, Slovenia), Dept. of Plant Physiology (SAS, Bratislava, Slovakia) and University of Hohenheim (Faculty of Natural Science, Germany) has been established.

With SMEs: it would be crucial the involvement of local farms to test the feasibility and operation of the project.

With hospitals: blood Transfusion Centre of Slovenia (Ljubljana, Slovenia - PP10, Trans2Care).

With associations: A close collaboration with professional associations (both agricultural and enological operators) is required to assess the prototype and develop field test. These contacts are partially already available ("Consortio Tutela Vini Collio e Carso" e "ZDRUŽENJE KONZORCIJ KRAŠKIH PRIDELOVALCEV TERANA").

7 CONTACT OR COLLABORATIONS NEEDED

A collaboration is needed with biotechnology laboratories to implement and develop the diagnostic kit.

8 COMMUNICATION TOOLS

Websites: Trans2care, ResearchGate, LinkedIn

9 FUNDS NEEDED

9.1 For basic research (investigation of biological mechanisms): 20.000 €

9.2 For applied research (solutions for real-world problems): 100.000 €

9.2 For pilot & demonstrator activities (to develop a prototype): 150.000 €

10 CONCLUSION

The development of large scale production of the innovation will require subsequent steps, since the current technology readiness corresponds to a laboratory level. The next implementation of the project will need the involvement of an enterprise with biotechnological competence, with the aim of producing a diagnostic kit developed in a stick format for ease-of-use.

This device could provide to winegrowers useful directions to plan the harvest time and to select accessions characterized by high polyphenol content.

ACKNOWLEDGEMENT

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