SONORAN UNIVERSITY
OF HEALTH SCIENCES

Ric Scalzo Institute for Botanical Research: Innovation & Advanced Discoveries in Botanical Research

October 6, 2022

The Role of the Ric Scalzo Institute in the Natural Products Arena

Presented by: Jeffery Langland, PhD
Contact email: j.langland@sonoran.edu

Notes: _____

In Vitro Characterization of Cellular Responses Associated with a Therapeutic Bovine Milk Product

Presented by: Laurell Matthews, ND, and Susan Trapp, PhD
Contact email: laurellmatthews@apothecacompany.com, s.trapp@sonoran.edu

A brief lecture description:

One of the primary proteins found in dairy products is whey protein, which is a by-product of the cheese-making process. Whey protein is a complete protein source and is commonly used by athletes for strength training to improve athletic performance. There is a significant body of research supporting the health benefits of whey protein for exercise training, nutritional deficiencies, personal care (skin, wound healing and cosmetics) and allergies. The global whey protein market was estimated to be 8.7 billion in 2019 and expected to expand exponentially from 2022 to 2027; a key factor for this rise is the adoption of higher protein-rich diets for lifestyles related to the rise of chronic diseases and improved personal care.

During this presentation, we will discuss the research we performed in collaboration with Grato Holdings to evaluate the potential therapeutic value of their proprietary bovine whey concentrate on skin care, immune system and regulation of inflammation. We evaluated the whey concentrate for it's novel active proteins profile, in particular transforming growth factor beta (TGF-beta) and insulin-like growth factor (IGF). This study measured the cellular gene expression using RNAseq Next Gen sequencing technology to evaluate the effect of the whey concentrate to regulate the gene expression and to identify specific genes and pathways involved in the inflammatory response and skin care anti-aging and wounding. For skin care results, the treatment with human IGF1/TGFB2 on Hs27 cells (human dermal fibroblasts) lead to significant increase in Collagen 1A1, suggesting that the bovine IGF1/TGFB2 (found in the proprietary concentrate) may be responsible for the effect. We also analyzed the gene

expression utilizing bioinformatic tools including KEGG pathway database and found that the IL-17 pathway had several genes involved in mediating inflammatory response to be significantly repressed in Hs27 cells; suggesting, the whey concentrate could potentially reduce the skin inflammatory response. We also examined the effect of the whey concentrate on the immune system and inflammatory response on differentiated THP1 cells (macrophages) examining gene expression. The results suggest that the whey concentrate may act to stimulate macrophages leading to the secretion of various cytokines involved in general/systemic inflammatory. Utilizing several bioinformatic tools we demonstrated that several cytokines typically upregulated in Crohn's disease (CD), were shown to be repressed following treatment with whey protein concentrate, suggesting that they could possibly have a therapeutic effect for CD. For both set of cell lines, protein expression and ELISA were also measured and generally support the gene expression results.

Talk objectives:

- Understand the history in brief of the health benefits of dairy-derived whey protein concentrate products.
- Understand the history of the clinical observations and case studies of the proprietary Whey protein concentrate.
- Understand the potential cellular targets (by examining the gene expression) of proprietary whey protein concentrate for skin care and aging (collagen, versican), immune system and anti-inflammation.

Statement of relevance to medical practice:

There is a significant body of research supporting the health benefits of dairy-derived products, such as colostrum and whey protein powders. The clinical potential of the proprietary whey protein concentrate was evaluated for its novel profile of active proteins, including transforming growth factor beta and insulin-like growth factor. Clinical observations of this novel protein blend have demonstrated its potential usage in supporting connective tissue and reducing discomfort and inflammation. Building on these clinical observations, this research study revealed that the blend stimulates collagen formation and modulates inflammation in cell cultures. This research will be combined with other work on botanicals to develop potential topical products for safely addressing common clinical challenges involving pain and inflammation. Other avenues of exploration will include topical applications for burn healing and youthful skin appearance.

A brief bio for Dr. Laurell Matthews, ND

Dr. Laurell Matthews, ND, has a bachelor's degree in biochemistry from University of Kansas and received her doctorate in Naturopathic Medicine from Bastyr University in 2010. She has a life-long interest in the underlying mechanisms behind homeopathy, as well as a passion for helping her patients understand how to be healthier using dietary and lifestyle changes along with other natural medicine modalities like botanical medicine. In addition to her private practice where she specializes in digestive and women's health, she has over 20 years of experience in the natural products industry. A uniquely qualified formulator, she combines her industry

knowledge with a chemistry background and extensive clinical experience treating patients across multiple healing modalities. Currently, she designs homeopathic, herbal, and nutritional products for Energique, an employee-owned company supplying natural remedies to holistic practitioners, additionally lending her versatile expertise to the company's herbal and homeopathic consumer brands, Bold Botanica and Liddell Laboratories.

A brief bio for Dr. Susan Trapp, PhD

Dr. Susan Trapp, PhD. received her doctorate degree in Biochemistry from the University of Maryland, College Park. Dr Trapp's doctoral thesis focused on examining the horizontal gene transfer of a biosynthetic pathway of a fungal sesquiterpenoid from the Fusarium and Myrothecium fungi to a the Brazilian Baccharis plant. She continued to study the molecular evolution of natural products utilizing terpenes as a model system during her post-doctoral training at the Institute of Biological Chemistry at Washington University State in Pullman WA. and remains one of her main research areas today. Prior to graduate school Dr Trapp was a research assistant at the esteemed institutes of Marine Biological Laboratory, USDA (Peoria, IL) and National Institutes of Health NIH). In the later, she had the privilege to work directly with Dr. Craig Venter on the Human Genome Project, during the DOE pilot. Dr. Trapp's passion for genomics, molecular biology, biotechnology, computational biology and plants has guided her to research and directorship positions within Industry and Academia including InforMax, University of Colorado Boulder | Denver, Solix Biofuels, Array BioPharma. Sunrise Genetics and most recently several entrepreneurial startups within the medical device and ancillary hemp/cannabis industries. Dr Trapp is passionate about teaching within and outside of academic including General Biology | Chemistry, Organic Chemistry, Microarray Technology, Terpenes Basics as well as swim coach, sea kayaking guide, disabled skiing and yoga instructor. Dr. Trapp joined the Ric Scalzo Institute of Botanical Research in February of 2021. She is currently involved in a variety of botanical projects characterizing biological activity (specifically gene expression) and/or mechanism of action toward their immune, anti-inflammation, anti-anxiety, anti-aging and skin care properties; and, she is developing methodologies for state-of-the-art biotechnology instrumentation.

A statement summarizing speaker's qualifications:

Dr. Matthews has been practicing naturopathic medicine for 12 years, utilizing a teaching approach to help her patients understand how to achieve greater wellness. She has given hundreds of presentations to the public and other health professionals on topics such as herbal medicine, homeopathy, and digestive health. She currently coordinates educational resources including webinars for other practitioners for Energique.

Dr. Trapp has been a research scientist studying natural products, plants, and genomics for over twenty years both in industry, academia, and start-ups. She has presented her research at national and international conferences and has over 15 plus publications in peer-reviewed journal, and other non-peer reviewed magazines. Dr. Trapp has been an invited guest speaker at conferences, panels, and Podcast appearances in the cannabis industry as terpene subject expert.

Notes: _____

Antimicrobial Activity of Volatile Terpenes from Various Essential Oils

Presented by: Mareshah Dunning, NMD
Contact email: m.dunning@Sonoran.edu

A brief lecture description:

Essential oils are volatile and lipophilic liquid extracts made from plants by steam distillation. The use of essential oils dates back to the Egyptians and ancient Chinese. Essential oils have widely been used as a fragrance and for their therapeutic benefits. During the time of the great plague, essential oils were used to fumigate spaces and were found to protect individuals exposed to the plague. Previously, our lab has completed research on which essential oils have activity against various microbes. This research has been deepened to look at the specific constituents of some of the most active essential oils' antimicrobial activity and potential synergy against streptococcus pyogenes, a common bacteria in respiratory infections. This work provides scientific backing to anecdotal evidence with relevant applications to modern day infections. Medical implications for this work may be related to the use of aromatic essential oils for respiratory infections.

Objectives:

- This presentation will provide:
- Description and general history of essential oils.
- Comparison of antimicrobial activity of various terpenes present in high antimicrobial
- essential oils against S. pyogenes
- Comparison synergism of terpenes with essential oils.

Relevance:

Essential oils provide a natural alternative to the use of antibiotics. This is especially important for bacteria that have developed antibiotic resistance. Understanding the role of the individual terpenes present in essential oils may lead to targeted treatment applications.

Biography:

Dr. Mareshah Dunning is a second-year resident at the Neil Riordan Center for Regenerative Medicine and faculty lead for the Regenerative Medicine Honor's Track. She graduated at the top of her medical school class at Sonoran University of Health Sciences (formerly known as Southwest College of Naturopathic Medicine & Health Sciences) in the Regenerative Medicine Honors track and continues to strive for professional excellence in her field. She treats pain and musculoskeletal conditions using physical and regenerative medicine techniques, products, and devices. One of her professional hobbies is essential oil research which she began as a first-year medical student. She has since presented at multiple conferences including the AANP on her now published research on essential oils and continues to research essential oils and isolated terpenes and their effect on respiratory infections.

Speaker's Qualifications:

Dr. Mareshah Dunning graduated with a Bachelor of Science in Foods and Nutrition from Appalachian State University and a medical degree from Sonoran University of Health Sciences (formerly known as Southwest College of Naturopathic Medicine & Health Sciences). Currently, she is a second-year resident at the Neil Riordan Center for Regenerative Medicine. She is a published author in a scientific journal on her research on the antimicrobial activity of volatile substances from essential oils. She has previously presented her work at Sonoran University of Health Sciences (formerly known as Southwest College of Naturopathic Medicine & Health Sciences) research night, IFT Supplier's Night, and the AANP. She has also been involved with wine, nutrition, and exercise science research in the past.

Notes: _____

Bioassay guided fractionation of novel antibacterial compounds from *Larrea tridentata*

Presented by: Bobby Baravati, PhD
Contact email: b.baravati@Sonoran.edu

A brief lecture description:

This lecture will summarize the current progress in the bioassay guided fractionation of novel antibacterial compounds from *Larrea tridentata*. *L. tridentata* (creosote bush) is widespread and native to the Sonoran Desert, containing an array of secondary metabolites such as lignans, flavonoids, glycosylated flavonoids, saponins, sterols, tannins, and terpenes. A hydroethanolic extract of *L. tridentata* exhibiting antibacterial activity against S. aureus was fractionated using liquid-liquid extraction, LH-20 and reverse phase chromatography and thin layer chromatography (TLC), with the fractions assayed for antibacterial activity at each step to guide further separation. Application of TLC bioautography in conjunction with preparative TLC was used to rapidly isolate antibacterial compounds, followed by LC-MS and NMR spectroscopy for identification of the active compounds.

Talk objectives:

- Demonstrate the need for novel antibiotics, particularly against multi-drug resistant bacteria
- Summarize current progress in the bioassay guided fractionation of novel antibacterial compounds from *Larrea tridentata* against S. aureus
- Provide a description of the techniques applied in the isolation and identification of active compounds from *Larrea tridentata* hydroethanolic extract

Statement of relevance to medical practice:

Antibiotic resistance is becoming increasingly problematic in medicine, driving the search for novel antibiotics having different mechanisms of actions, as well as cofactors potentiating the activity of existing antibiotics. This research aims to find novel antibacterial compounds from *L. tridentata* to provide treatments for multi-drug resistant bacteria, which continue to claim over a million lives worldwide annually.

A brief bio for *Dr. Bobby Baravati, Ph.D.*:

Dr. Baravati received his Bachelor's degree from the University of California, Los Angeles, and Doctorate degree from Arizona State University in Chemistry. His doctorate research was on structure and dynamics of viral membrane proteins using nuclear magnetic resonance (NMR) spectroscopy. His research areas at the Ric Scalzo Institute for Botanical Research are natural products isolation and structure determination of novel compounds using NMR spectroscopy. He is currently involved in isolation of antiviral compounds from *Artemisia annua* and isolation of antibacterial compounds from *Larrea tridentata*.

A statement summarizing speaker's qualifications:

Dr. Baravati has over 10 years of research experience utilizing chromatography and nuclear magnetic resonance (NMR) spectroscopy in various research areas. He has been published in peer-reviewed journals and has presented his research at international conferences.

Notes: _____

Direct Anti-rhinovirus and Anti-influenza Virus Activity Associated *Echinacea purpurea* Extracts

Presented by: Keely Puchalski, ND
Contact email: k.puchalski@Sonoran.edu

A brief lecture description:

Rhinovirus and influenza virus are common infections in the respiratory tract. *Echinacea purpurea* has historically been used as a therapy for these viral infections, but results from clinical studies have been controversial. *Echinacea* root extracts are often used as a therapy, but are many times prepared with different solvents including water or ethanol. Our research investigated the direct antiviral effects of *Echinacea purpurea* root extracts. Results demonstrated that the different extraction process had varying effects on viral replication. The mechanism of action and potential active constituents will be discussed. These results may support the administration of specific *Echinacea purpurea* extracts dependent upon the type of viral infection.

Objectives:

- Understand the historical use of *Echinacea purpurea* as a therapy for respiratory viral infection.
- Understand the varying effects of plant parts and extraction processes on biological activity.
- Understand the effect of different *Echinacea purpurea* root extracts on virus replication
- Understand the role of specific compounds in *Echinacea purpurea* extracts related to antiviral activity

Relevance to medical practice:

Rhinovirus and influenza virus infections account for millions of infections every year. Limited therapeutics that directly target viral replication of either of these viruses have been developed. *Echinacea purpurea* has historically been used as a therapy for rhinovirus and influenza infections, but results from clinical studies have been controversial. *Echinacea* root extracts are often used as a therapy, many times being prepared using a variety of solvents. Our research has demonstrated that *Echinacea purpurea* root extracts can directly inhibit the replication of rhinovirus and influenza virus. These results may suggest that the administration of an *Echinacea purpurea* root extracts may be an effective therapy for rhinovirus in influenza virus infections.

Biography:

Dr. Keely Puchalski, ND, received her doctorate in naturopathic medicine from Sonoran University of Health Sciences (formerly known as Southwest College of Naturopathic Medicine & Health Sciences) in December 2020. She received her Bachelor of Arts from Bethel University in St. Paul, Minnesota. She has been conducting botanical research through the University, and now the Ric Scalzo Institute, for the past five years, with an acute interest in plants that regulate the immune and nervous systems. She regularly pursues continuing education through conferences and field studies to deepen her knowledge of plants both in nature and in the lab. She also assists in teaching acupuncture, phlebotomy, and microbiology research skills to naturopathic medical students.

Qualifications:

Dr. Puchalski is a naturopathic physician and an assistant research scientist at the Ric Scalzo Institute for Botanical Research at Sonoran University of Health Sciences. She has been conducting research under the mentorship of Dr. Langland, Ph.D. for the past five years, primarily focusing on the antiviral and antimicrobial activities of botanicals. Her work has been published in several peer-reviewed journals and she has presented at national and international conferences.

Notes: _____

Notes: