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18.2 Productos LGAC Biotecnología Alimentaria

Profesor	Otro profesor	LGAC	Revista / libro/evento	Nombre Articulo/ponencia	Año	Tipo
Blanca Rosa Aguilar Uscanga		Biotecnología Alimentaria	IX Workshop SEPYP 2018	Probiotic bacteria in human mulk after spry-dried	2018	Artículo
Blanca Rosa Aguilar Uscanga		Biotecnología Alimentaria	VII Congreso Internacional	Obtención de bacteriocinas, aplcación e importancia en la industria de los alimentos	2012	Conferencia
Blanca Rosa Aguilar Uscanga		Biotecnología Alimentaria	V Congreso CIIA	Plasma Frio: Avances para aplicaciones en la industria de alimentos	2018	Congreso
Blanca Rosa Aguilar Uscanga	Casas Junco, Ragazzo Sanchez, Luna Solano	Biotecnología Alimentaria	31st EFFoST International Conference	Inactivation of Aspergillus spp. Spores and detoxification of Ochratoxin A in roasted coffee by cold plasma	2017	Congreso
Blanca Rosa Aguilar Uscanga	Fonseca Cantabrana, Calderon Santoyo, Ragazzo Sanchez	Biotecnología Alimentaria	31st EFFoST International Conference	Pretreatment with high hydrostatic pressure (HHP) in the safety of human milk dehydrated by aspersion	2017	Congreso
Blanca Rosa Aguilar Uscanga		Biotecnología Alimentaria	International Congress on Engineering and Food	Isolation and identification of lactic acid bacteria from human milk with potential probiotic role	2015	Congreso
Blanca Rosa Aguilar Uscanga		Biotecnología Alimentaria	International Congress on Engineering and Food	Retention of immunoglobulins (IgA, IgG, IgM) during spray-drying and freeze-drying of human milk	2015	Congreso
Blanca Rosa Aguilar Uscanga		Biotecnología Alimentaria	International Congress on Engineering and Food	Evaluation and partial purification of bacteriocin from lactobacillus rhamnosus HN001	2015	Congreso
Blanca Rosa Aguilar Uscanga	Cavazos Gaduño, Serrano Niño	Biotecnología Alimentaria	XIX Congreso Internacional Inocuidad de Alimentos	Efecto del secado de leche humana sobre la calidad microbiológica y nutrimental	2017	Congreso
Blanca Rosa Aguilar Uscanga	Cavazos Gaduño, Serrano Niño	Biotecnología Alimentaria	XIX Congreso Internacional Inocuidad de Alimentos	Aislamiento y selección de cepas de Streptomyces con potencial para producción de antibióticos	2017	Congreso
Blanca Rosa Aguilar Uscanga		Biotecnología Alimentaria	7th Food Science Biotechnology and Safety Meeting	Human Milk Conservation: Functional Food for the Newborn	2016	Congreso
Blanca Rosa Aguilar Uscanga		Biotecnología Alimentaria	7th Food Science Biotechnology and Safety Meeting	Biosynthesis of Silver Nanoparticles Using plant extracts and microwave	2016	Congreso
Blanca Rosa Aguilar Uscanga		Biotecnología Alimentaria	7th Food Science Biotechnology and Safety Meeting	Assessment of Gacteriocin Application Isolated from Lactobacillus rhamnosus HN001 in Beef	2016	Congreso
Blanca Rosa Aguilar Uscanga		Biotecnología Alimentaria	1er Foro internacional de Talento Mexicano	Leche humana en polvo: alimento esencial para el recien nacido	2016	Congreso
Blanca Rosa Aguilar Uscanga		Biotecnología Alimentaria	2do Foro internacional de Talento Mexicano	Aplicación biotecnológica de polisacáridos contenidos en la pared celular de levaduras tequileras	2017	Congreso
Blanca Rosa Aguilar Uscanga		Biotecnología Alimentaria	Tecnologico Nacional de México	Importancia de la pared celular en levaduras	2015	Conferencia
Blanca Rosa Aguilar Uscanga		Biotecnología Alimentaria	Universidad de El Salvador	Alimentos funcionales	2017	Conferencia
Blanca Rosa Aguilar Uscanga		Biotecnología Alimentaria	Universidad de El Salvador	Conservación de alimentos	2017	Conferencia
Blanca Rosa Aguilar Uscanga	Monserrath Santana,Julio Serrano	Biotecnología Alimentaria	Tierra Latinoamericana	Ability of Phanerochaete chrysosporium and trametes versicolor to remove Zn, Cr, Pb, metal ions	2015	Artículo
Blanca Rosa Aguilar Uscanga	Monique Lacroix, Eusebio Angulo	Biotecnología Alimentaria	Journal of Food and nutrition research	Assessment of the Biological Activiti in Human Mulk Power Treated with Different Processes for their conservation	2018	Artículo
Blanca Rosa Aguilar Uscanga	Olivier Fortin, Khanh Dang Vu, Stephane Salmieri	Biotecnología Alimentaria	Nutrition and cancer	Cancer Chemopreventive, Antiproliferative, and superoxide Anion cavenging Properties of Kluyveromyces marxianus and Saccharomyces cerevisiae var. Boulardii Cell wall componentes	2017	Artículo
Blanca Rosa Aguilar Uscanga	Peter Knauth, Lopez Zaira, Lacroix Monique	Biotecnología Alimentaria	Microbiology Research International	Differences in the amount of B-glucan and mannan in strains of Saccharomyces cerevisiae and Meyerozyma guilliermondii isolated from agave must used in tequila production	2014	Artículo
Blanca Rosa Aguilar Uscanga	Olivier Fortin, Khanh Dang Vu, Stephane Salmieri	Biotecnología Alimentaria	Journal of Nutraceuticals and Food Science	Chemo-preventive Properties of Essential Oils Obtained from Boswellia carterii and B. sacra in combination with insoluble B-glucan	2017	Artículo

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Blanca Rosa Aguilar Uscanga	Peña Eguiluz	Biotecnología Alimentaria	Journal of Microbiology, Biotechnology and Food Sciences	Effect and mechanism of action of non-thermal plasma in the survival of Escherichia coli, Staphylococus aureus and Saccharomyces cerevisiae	2017	Artículo
Blanca Rosa Aguilar Uscanga	Cavazos garduño, Serrano Niño	Biotecnología Alimentaria	Journal of Food and nutrition research	Effect of pasteurization, Freeze-drying and Spray Drying of the fat globule and Lipid Profile of Human Milk	2016	Artículo
Blanca Rosa Aguilar Uscanga	Itza Carmina Salazar, Griselda Macias	Biotecnología Alimentaria	Nutrición hospitalaria	Impacto de la pasteurización/liofilización en el contenido disponible de inmunoglobulinas en leche humana madura. Estudio de aplicacón en bancos de leche humana en hospitales	2016	Artículo
Blanca Rosa Aguilar Uscanga		Biotecnología Alimentaria	Water Science & Technology	Evaluation of nutrients removal (NO3-N, NH3-N and PO4-P) with Chlorella vulgaris, Pseudomonas putida, bacilus cereus and a consortium of these micoorganisms in the treatment of wastewater effluents	2017	Artículo
Blanca Rosa Aguilar Uscanga	Castañon Rodriguez, Portillo arias	Biotecnología Alimentaria	Food Sci Biotechnol	Effects of Oxygen and Nutrients on Xylitol and Ethanol Production in Sugarcane Bagasse Hydrolyzates	2015	Artículo
Blanca Rosa Aguilar Uscanga	Khanh Dang, Stephane Salmieri, Monique Lacroix	Biotecnología Alimentaria	Journal of Microbiology, Biotechnology and Food Sciences	Evaluation of bioconversion conditions on reuterin production using response surface methodology and listeria monocytogenes as target bacteria	2017	Artículo
Blanca Rosa Aguilar Uscanga	Frederic Calon, Isabelle St-Amour, Lainda Saucier	Biotecnología Alimentaria	Drying Technology	Spray and freeze drying of human milk on the retention of immunoglobulins	2016	Artículo
Josue Raymundo Solis Pacheco	Navarro Hernandez, Salazar Quiñonez, Barrera De León	Biotecnología Alimentaria	Nutrición hospitalaria	Impacto de la pasteurización/liofilización en el contenido disponible de inmunoglobulinas en leche humana madura. Estudio de aplicacón en bancos de leche humana en hospitales	2016	Artículo
Josue Raymundo Solis Pacheco	Gallegos Arreola, Zuñiga Gonzalez, Arnauld López	Biotecnología Alimentaria	Asia Pac J Clin Nutr	Association between the Xba I polymorphism of APOB gene and plasma lipid level in Mexican Patient with coronary artery disease	2012	Artículo
Josue Raymundo Solis Pacheco	Cavazos garduño, Serrano Niño	Biotecnología Alimentaria	Journal of Food and nutrition research	Effect of Pasteurization, Freeze drying and Spray Drying on the Fat Globule and Lipid Profile of Human Milk	2016	Artículo
Josue Raymundo Solis Pacheco	Jimenez Magaña,	Biotecnología Alimentaria	Water Science & Technology	Evaluation of nutrients removal (NO3-N, NH3-N and PO4-P) with Chlorella vulgaris, Pseudomonas putida, bacilus cereus and a consortium of these micoorganisms in the treatment of wastewater effluents	2017	Artículo
Josue Raymundo Solis Pacheco	Frederic Calon, Isabelle St-Amour, Lainda Saucier	Biotecnología Alimentaria	Drying Technology	Spray and Freeze drying of human milk on the retention of immunoglobulins (IgA, IgC, IgM)	2016	Artículo
López Naranjo Edgar José	Alí Gómez Acosta, Zaira Barquera Bibiano, José Luis Reyes Araiza, Gerardo Torres Delgado	Biotecnología Alimentaria	Hindawi Publishing Corporation	Morphology Effect of Silver Nanostructures on the Performance of a P3HT: Graphene: AgNs-Based Active Layer Obtained via Dip Coating	2016	Artículo
López Naranjo Edgar José	Liliana M. Alzate Gaviria, Galdy Hernández Zarate, Javier Reyes Trujeque, Ricardo H. Cruz Estrada	Biotecnología Alimentaria	Journal of Thermoplastic Composite Materials	Termite resistance of wood-plastic composites trated with zinc borate and borax	2016	Artículo
López Naranjo Edgar José	Luis J. Gonzalez Ortíz, Luis M. Apátiga, Eric M. Rivera Muñoz, Alejandro Manzano Ramírez	Biotecnología Alimentaria	Hindawi Publishing Corporation	Transparent Electrodes: A Review of the Use of Carbón Based Nanomaterials	2016	Artículo
López Naranjo Edgar José	I.P. Hernández Rosales, A.Y. Bueno Durán, M.L. Martínez Aguilar, L.J. González Ortíz, A.A. Pérez Fonseca	Biotecnología Alimentaria	Elsevier	Biosynthesis of silver nanoparticles using a natural extract obtained from an agroindustrial residue of the tequila industry	2018	Artículo
López Naranjo Edgar José		Biotecnología Alimentaria	Consejo Superior de Investigaciones Científicas, Madrid, España	Estancia de Investigación	2018	Estancia

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López Naranjo Edgar José	Aida Alejandra Pérez Fonseca, Ricardo Manriquez González, Denis Rodriguez, Jorge Ramón Robledo Ortíz	Biotecnología Alimentaria	AMIDIQ 2018	Efecto de la modificación química de fibras de agave en la absorción de agua de biocompositos de poliácido láctico	2018	Congreso
López Naranjo Edgar José	Aía Alejandra Pérez Fonseca, Jorge Ramón Robledo Ortíz, Ruben González Núñez, María Judith Sánchez Peña	Biotecnología Alimentaria	MACROMEX 2017	Biosynthesis of silver nanoparticles using agave tequilana weber Var. Azul fibers as template	2017	Congreso
López Naranjo Edgar José	Marco Antonio Ponce Villalobos, Aida Alejandra Pérez Fonseca, Jorge Ramón Robledo Ortíz, Alejandro Manzano Rodriguez	Biotecnología Alimentaria	MACROMEX 2017	Influence of Reaction Parameters on the morphology of Biosynthesized silver Nanoparticles	2017	Congreso
López Naranjo Edgar José	Raúl Enrique de Jesús Pérez Parra, Aida Alejandra Pérez Fonseca, Rubén González Nuñez, Milton Vázquez Lepe	Biotecnología Alimentaria	MACROMEX 2017	Effect Of Molecular Weight And Reactión Parameters in the Synthesis Of Metallic Nanoparticles Using Pva As Reducing-Stabilizing Agent	2017	Congreso
López Naranjo Edgar José	Paz Hernández Rosales, Adela Yolanda Bueno Durán, Mirna Martínez Aguilar, Alejandro Manzano Rodriguez	Biotecnología Alimentaria	AMIDIQ 2017	Síntesis y evaluación de la actividad bactericida de Nanopartículas de plata obtenidas utilizando extracto de Agave tequilana Weber azul como bioreductor	2017	Congreso
López Naranjo Edgar José	Damaris Velázquez Páez, Alejandro Manzano Ramirez, Luis J González Ortíz	Biotecnología Alimentaria	12° Congreso Internacional de Ingeniería	Synthesis pf silver nanoparticles using agave tequilana weber cultivar azul extract as stabilizing agent	2016	Congreso
López Naranjo Edgar José	Zayra Estrada Huerta, Luis J. González Ortíz, Alejandro Manzano Ramirez	Biotecnología Alimentaria	12° Congreso Internacional de Ingeniería	Polypol synthesis of silver nanoparticles: The use of a less environmental toxic salt as Ag+ precursor	2016	Congreso

ABILITY OF *Phanerochaete chrysosporium* AND *Trametes versicolor* TO REMOVE Zn^{2+}, Cr^{3+}, Pb^{2+} METAL IONS

Habilidad de *Phanerochaete chrysosporium* y *Trametes versicolor* para Remover Iones Metálicos Zn^{2+}, Cr^{3+}, Pb^{2+}

Josué Solís Pacheco[1], Monserrath Santana[1], María Guadalupe Aguilar Uscanga[2], Adriana Cavazos Garduño[1], Julio Serrano Niño[1], Héctor Gómez[1], and Blanca Aguilar Uscanga[1‡]

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SUMMARY

The use of fungal biomass as an alternative for removing heavy metals has become increasingly important in recent years, replacing conventional methods based on chemical physical processes. In this study, we evaluated the biosorption of Zn^{2+}, Cr^{3+} and Pb^{2+}, which were analyzed to determine their effect on growth kinetic parameters of *Phanerochaete chrysosporium* strain ATCC 32629 and *Trametes versicolor* ATCC 1267. Growth kinetics were performed in four liquid culture media: 1) Yeast Nitrogen Base (YNB) used as control, 2) YNB medium plus Pb^{2+} (0.25, 1 and 2 mg L^{-1}), 3) YNB medium plus Zn^{2+} (5, 10 and 20 mg L^{-1}) and 4) YNB medium plus Cr^{3+} (0.5, 1 and 2 mg L^{-1}). The flasks were incubated at 25 °C with shaking at 150 rpm. Metal concentrations were determined by inductively coupled plasma atomic emission spectroscopy (ICP-AES) with prior acid digestion of the sample. The results demonstrated that *Phanerochaete chrysosporium* ATCC 32629 and *Trametes versicolor* ATCC 12679 are able to grow in the culture medium with Pb^{2+}, Zn^{2+} and Cr^{3+} ions at different concentrations. However, *P. chrysosporium* ATCC 32629 showed greater adaptability and ability to adsorb Cr^{3+} in the culture medium at concentrations of 0.5 and 1 mg L^{-1}, whereas *T. versicolor* ATCC 12679 was capable of Pb^{2+} biosorption at concentrations of 0.25, 1 and 2 mg L^{-1}.

Index words: *fungal biomass; biosorption; bioremediation; growth parameters; heavy metals.*

RESUMEN

El uso de la biomasa fúngica como una alternativa para eliminar metales pesados se ha vuelto cada vez más importante en los últimos años, en comparación con los métodos convencionales que se basan en procesos físico-químicos. En este estudio se evaluó la biosorción de Zn^{2+}, Cr^{3+} y Pb^{2+} y se analizó su efecto sobre los parámetros de crecimiento cinéticos de la cepa *Phanerochaete chrysosporium* ATCC 32629 y *Trametes versicolor* ATCC 1267. Las cinéticas de crecimiento se realizaron en cuatro medios de cultivo líquidos: 1) Base nitrogenada para levadura (YNB) utilizado como control, 2) medio YNB más Pb^{2+} (0.25, 1 y 2 mg L^{-1}), 3) medio YNB más Zn^{2+} (5, 10 y 20 mg L^{-1}) y 4) medio YNB más Cr^{3+} (0.5, 1 y 2 mg L^{-1}). Los matraces se incubaron a 25 °C con agitación a 150 rpm. La concentración de metales se determinó por Espectrometría de Emisión Atómica de plasma acoplado inductivamente (EEA-PAI) con previa digestión ácida de la muestra. Los resultados obtenidos demostraron que *Phanerochaete chrysosporium* ATCC 32629 y *Trametes versicolor* ATCC 12679 son capaces de crecer en los medios de cultivo con los iones Pb^{2+}, Zn^{2+} y Cr^{3+} a diferentes concentraciones. Sin embargo, *P. chrysosporium* ATCC 32629 mostró una mayor adaptabilidad y capacidad de adsorción de Cr^{3+} en el medio de cultivo a concentraciones de 0.5 y 1 mg L^{-1}, mientras que *T. versicolor* ATCC 12679 fue capaz de la biosorción de Pb^{2+} en concentraciones de 0.25, 1 y 2 mg L^{-1}.

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Assessment of the Biological Activity in Human Milk Power Treated with Different Processes for Their Conservation

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Abstract Human milk is the best food for newborns and infants for its combination of nutrients and biological complexity that allows the healthy grows and development of the infant. These components could be affected by thermic treatments of conservation as heat pasteurization, used in Human Milk Banks. The aim of this study was to evaluate the effects of different treatments applied to human milk in its biological activity (antiradical scavenging and anticancer properties). Human milk was heat pasteurized, also submitted high pressure and after it was spray-dried. Moreover, of UV-C or γ- irradiation was applied on spray dried human milk. HT-29 cell line was used for testing antiproliferative assay. The results of this essay showed that 1.25 mg/mL of human milk treated with high pressures and spray dried can attain CI_{50}. Human milk powder treated with γ-irradiation showed the highest inhibition activity of HT-29 cell line, and the pasteurized and spray dried human milk presents the lowest inhibition activity ($p \leq 0.05$). The highest percentage of scavenging activity against the superoxide anion was in spray-drying treated with γ-irradiation, showing significantly higher activity against the O_2 anion as compared to all other treatments tested ($p \leq 0.05$), followed by human milk powder treated by UV-C irradiation, high pressure and heat pasteurization. Human milk powder treated by High pressure showed higher antioxidant activity, however, the value was not significantly higher as compared to the other pasteurization treatments evaluated ($p > 0.05$). Spray-dried human milk treated with high pressure, UV-C and γ- irradiation conserved its biological activity, thus it's could be possible to apply this technology in Human Milk Banks for conserving it.

Keywords: *human milk, high pressures, UV irradiation, antiproliferative, antioxidant*

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1. Introduction

Scientific studies have demonstrated the superiority of breast milk because it provides health benefits for newborn infants and, due to its nutritional qualities, it is considered the ideal irreplaceable food during the first six months of life, with subsequent addition of complementary foods for 2 years or more [1,2,3].

According to the World Health Organization [4], human milk reduces infant mortality and has health benefits even in adulthood. It recommends exclusive breastfeeding during the first six months of life, without other food or drinks, and after this period, and up to two years, to reinforce it with complementary foods. It suggests initiating breastfeeding during the first hour of life and thereafter when the child demands it, either day or night without using bottles, teats or pacifiers. The benefits of breastfeeding for the mother and child are biological, psycho-affective, economic and social. In addition, it has been found that there are differences between newborn infants fed breastmilk and formula; it has been documented that children fed with human milk have a higher Intelligent Quotient compared to those fed cow's milk, it offers protection against respiratory and gastrointestinal infections, and there is a

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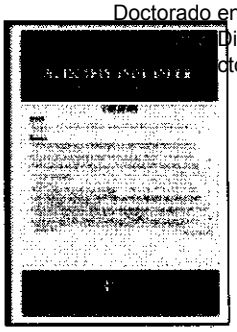

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Cancer Chemopreventive, Antiproliferative, and Superoxide Anion Scavenging Properties of Kluyveromyces marxianus and Saccharomyces cerevisiae var. boulardii Cell Wall Components

Olivier Fortin, Blanca Aguilar-Uscanga, Khanh Dang Vu, Stephane Salmieri & Monique Lacroix

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Full Length Research Paper

Differences in the amount of β-glucan and mannan in strains of *Saccharomyces cerevisiae* and *Meyerozyma guilliermondii* isolated from agave must used in tequila production

Solís-Pacheco Josué[1], Peter Knauth[2], López Zaira[2], González-Reynoso Orfil[1], Macías-Rodríguez María Ester[1], González-Álvarez Víctor[1], Lacroix Monique[3] and Aguilar-Uscanga Blanca Rosa[1]*

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ABSTRACT

The increasing commercial and biotechnological interest in yeast cell wall components has brought about the search of low cost sources. One potential source may be the yeast cultures obtained from fermentation processes and particularly, those that are usually discarded afterwards. In this contribution, we isolated five yeast strains from the agave must and found, next to *Saccharomyces cerevisiae* (CTGM, CTSA) and *Meyerozyma guilliermondii* (CT15, CT25, CT35), which has not been reported to be involved in the tequila production before. All strains were grown non shaken in agave must with 30 gL^{-1} of sugars and 5 gL^{-1} of $(NH_4)_2SO_4$. It was found that the cell wall composition was more variable among the strains than between the species and highly depended on the growth phases. In the stationary phase, only two strains (CT15 and CT25) had a high β-glucan content in the cell wall (~30 mg g^{-1}) while the others yielded only 3 to 18 mg g^{-1}, also the control bakery yeast strain. This indicates that the specific selection of the strain and the strong influence of the agave juice may promote a variation in the synthesis of polysaccharides in the cell wall. Results showed that, under the great diversity of the yeasts used in the tequila industry, additional studies must be carried out to find the most suitable and productive yeast strains for isolation of β-glucans and mannans.

Keywords: *Saccharomyces cerevisiae, Meyerozyma guilliermondii*, cell wall, tequila, agave.

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INTRODUCTION

Tequila is the traditional Mexican alcoholic beverage distilled from the fermented juice of cooked *Agave tequilana* Weber (blue variety). The elaboration process of the beverage involves five main steps: harvest of the agave and removal of the leaves, cooking of the heart (better known as *piña*), extraction of the must, fermentation and finally, a double distillation process (that is, stripping and rectification) (Cedeño, 1995). In some tequila distilleries, the fermentation occur spontaneously while in others, the agave must is inoculated with commercial or indigenous yeast cultures, most often *Saccharomyces* cerevisiae (Cedeño, 1995). Non-

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Chemo-preventive Properties of Essential Oils Obtained from *Boswellia carterii* and *B. sacra* in Combination with Insoluble β-Glucan

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Abstract

Background: *B. carterii* (Frankincense) and *B. sacra* (Sacred) essential oils (EOs) have been used for many centuries in several medicinal applications. More recently, those EOs were investigated for their anticancer properties and used in combination with other natural compounds resulting in enhanced biological activities. To that extend, yeast-derived β-glucan have shown remarkable anticancer and chemo-preventive potential in the past decades whether tested alone or in combination. In this context, the *in vitro* chemo-preventive, antiradical and antiproliferative effects of *B. carterii* (Frankincense) and *B. sacra* (Sacred) EOs used alone and in combination with Insoluble β-glucan from *Saccharomyces boulardii* on colorectal cancer (CRC) were investigated.

Methods and findings: Essential oils and insoluble β-glucan from *Saccharomyces boulardii* cell wall were assayed for their capacity to increase the specific activity of NAD(P)H: quinone reductase (QR), scavenge radicals and inhibit growth of human CRC cells (CHO-K1 and HT-29 cells). Results demonstrated that *B. carterii* (Frankincense) and *B. sacra* (Sacred) scavenged superoxide anions and similarly inhibited growth of two human CRC cell lines. This study also reported the increase of QR activity as a novel mechanism of action of these EOs in cancer prevention and demonstrated that insoluble β-glucan from *S. boulardii* cell wall enhanced the capacity of *B. carterii* (Frankincense) EO to increase QR specific activity as oppose to Sacred oil. Finally, Sacred oil efficiently scavenged superoxide anions and expressed cancerous cell-specific cytotoxicity when opposed to *B. carterii* (Frankincense) EO.

Conclusion: Results obtained in this study represents the first evidence that *Boswellia* EOs can enhance QR activity when used alone or in combination with insoluble β-glucan from *S. boulardii* cell wall, hence suggesting a novel combination to investigate in future investigations. Complete characterization of *Boswellia* EOs and further biological analyses will be required to identify component(s) that potentially responsible for such chemoprevention activities.

Keywords: *Boswellia* essential oils; Chemoprevention; Anti-radical; Anti-proliferative; NAD(P)H: Quinone reductase; β-glucan; Apoptosis

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Abbreviations

EOs: Essential Oils; 5-FU: 5-Fluorouracil; CRC: Colorectal Cancer; MTT:3-(4,5dimethylthiazol-2-Yl)-2,5-Diphenyltetrazolium Bromide; NADP: Nicotinamide Adenine Dinucleotide Phosphate; QR: NAD(P)H: Quinone Reductase; X/XO: Xanthine/Xanthine Oxidase; DPPH: A,A-Diphenylβ-Picrylhydrazyl; PI: Propidium Iodide; CI: Combination Index; IC50: Concentration that Inhibits 50% of the Cellular Growth; SC50: Concentration that Scavenges 50% of Formed Radicals.

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EFFECT AND MECHANISM OF ACTION OF NON-THERMAL PLASMA IN THE SURVIVAL OF *Escherichia coli*, *Staphylococcus aureus* AND *Saccharomyces cerevisiae*

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ABSTRACT

Non-thermal plasma (NTP) is an emerging technology of great interest because the elimination of pathogens and spoilage microorganisms and their probable use in various industrial sectors such as food and health. In this study was to evaluate the inactivation of non-thermal plasma on the survival of *Escherichia coli* ATCC 25922, *Staphylococcus aureus* ATCC 51811 and *Saccharomyces cerevisiae*. Treatments of different microorganisms were conducted with cells exposed NTP generated dielectric barrier reactor (DBD) able to produce atmospheric pressure plasmas. These devices operate at 13.56 MHz and are driven by a specifically built radio frequency (RF) resonant converter. The reactors, which operate at atmospheric pressure in a He-air gas mixture at a 1.5 L min^{-1} flow rate, applying a 850 V voltage at different exposure times (10, 20, 40, 60, 80, 100 and 120 s). All the strains showed a reduction in viability of < 0.001 log CFU mL^{-1} after to exposed to plasma. The cells showed membrane damage, these effects being the main cause for microbial inactivation, caused by the action of Non-thermal plasma, which leads to membrane and/or cell wall breakdown with consecutive DNA denaturation, these being the main factors inducing microorganism death.

Keywords: Non-thermal plasma, DNA damage, cell wall, membrane, microorganisms, food safety

INTRODUCTION

The non-thermal plasma is an emerging technology that is drawing attention in different sectors of process such as food (**Bermúdez *et al.*, 2013; Yong, H. I. *et al.* 2015**) and health (**Fridman, G. *et al. 2008*)**, for the removal of microorganisms that degrades substrate, causing diseases and economic losses for the industry; in this sense, the control and elimination is an important challenge (**Van Houdt 2010; Skandamis 2012**). The impact of modern technologies leading to the production of minimally processed foods, both safe and of nutritional quality after the process is relevant to the food industry (**Floros 2010**). That is why in recent years new technologies have been developed to replace physical methods characterized by using heat as a primary mode to inactivate or kill microorganisms (**Knorr 2011**).

In physical sciences, "plasma" refers to the forth state of matter. The plasma permits a flux of various active uncharged species of atoms and molecules as well as UV. These active uncharged species generated in plasma will typically include ozone (O_3), NO, OH radicals, etc. These charges may consist of both electrons as well as positive and negative ions. specifications permit the disinfection or sterilization of thermosensitive materials and allow in vivo applications, opening a new and larger spectrum of possible applications. The first devices developed have already proven their bactericidal properties in vitro, ex vivo, and in vivo (**Klämpfl *et al.* 2012**). **Akishev *et al.* (2008)** worked on Atmospheric Pressure Cold Plasma APCP/ NTP sterilization and they studied *Escherichia coli* and *Serratia marcenses*, classified as prokaryote Gram (-) bacteria as well as Gram (+) bacteria *Bacillus subtilis*. They also studied the eukaryotic fungi *Candida lypolitica* and *Aspergillus niger*. They explain that the elucidation of the most probable inactivation mechanisms is dependent on several considerations: 1) NTP active agents (O, OH, O_3) are not obstructed in their action on any one particular cell by other cells present in the colony; 2) cell damage is due to active plasma agents inflicting chemical injury on cell structure; 3) damage to one cell implies no lethal consequences, but amassed injury may inactivate the cell at the time of NTP or later on; 4) mathematical analysis describing NTP microorganism inactivation points to cell wall and membrane disruption by NTP leading to DNA and cell content destruction; and finally 5) gas pressure plays a crucial role in total cell inactivation.

The effectiveness of non-thermal plasma to eliminate different pathogens has been studied by **Perni (2008)**, who used non-thermal plasma decontamination on mango (*Mangifera indica*) peels and melon (*Cucumis melo L.*) shells, reducing 3 log $CFUcm^{-2}$ *Pantoea agglomerans* and *Gluconoacetobacter liquefaciens*strains after 2.5 s of treatment, while to eliminate *Escherichia coli*, it was necessary to apply plasma treatment for 5 s; for *Saccharomyces cerevisiae*, treatment was longer (10 and 30 s for its inactivation on mango peel and melon shell, respectively).

Niemira and Sites (2008) studied inactivation of *Salmonella* and *Escherichia coli* O157: H7 in Golden apples and oranges. They inoculated 100 µL (~10^8 CFU) *Escherichia coli* on the surface of the apples and *Salmonella* on orange surfaces, observing that a 3 min treatment with plasma reduces the *Salmonella* population from 3.7 to 2.9 log CFU mL^{-1} and from 3.6 to 3.4 log CFU mL^{-1} for *Escherichia coli* O157:H7. Similarly, **Gallagher *et al.* (2007)** investigated the effect of non-thermal plasma on air decontamination, obtaining up to 5 Log mL^{-1} reduction of *Escherichia coli* (strain K-12). A similar result was obtained by **Vaze *et al.* (2010)** who observed up to a 5 Log mL^{-1} reduction of *Escherichia coli* in an air flow after 10 sec of exposure to plasma.

Other researchers, **Dobrynin *et al.* (2010)** subjected *Bacillus cereus* and *Bacillus anthracis* to a non-thermal plasma treatment, observing 5 Log mL^{-1} inactivation of these strains after a 1 min treatment. **Moissan et al. (2011)** made theoretical references about the action mechanisms of microorganism-killing non-thermal plasma. They postulated that non-thermal plasma may cause damage to the membrane and cell wall, with consequent damage to DNA caused by UV light and the free radicals generated by the interaction of plasma with ambient air at the time of exposition. **Dobrynin *et al.* (2011)** demonstrated that there was a transport of charged molecules into the cell, such as hydrogen peroxide ($OH-(H_2O)n$ and $H_3O^+(H_2O)n$) and that the efficiency of these radicals to promote microorganism death is much greater than free ions, such as O_3, N_3 and argon ions.

Although microorganism decontamination caused by NTP exists There are studies that suppose the mechanism of destruction of the cell. For this reason, the aim of this study was to evaluate the effect of non-thermal plasma on the viability of *Escherichia coli* ATCC 25922, *Staphylococcus aureus* ATCC 51811 and

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Effect of Pasteurization, Freeze-drying and Spray Drying on the Fat Globule and Lipid Profile of Human Milk

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Abstract Human milk is the ideal food to nourish newborn babies; it contains important nutrients: proteins, carbohydrates, fat, vitamins and minerals, which are needed to provide agood health to the infants. Milk fat provides about 50% of energy to infants and its fatty acids are essential for brain and retina development. Therefore, analysis of the lipid fraction of human milk is an important task, especially when this milk is processed. The objective of this research was to study the effect of pasteurization, freeze-drying and spray drying on some characteristics of human milk fat. The fatty acid profile was analyzed by HPLC and gas chromatography. Fat content, globule size and distribution were measured. The HPLC method for the analysis of fatty acids showed accuracy, precision and linearity in the concentration range studied. Non-significant differences in fat content between the different processes were found; however, there was a decrease of 23% in the fat content of spray dried milk. The fat mean globule size decreased considerably in all treatments, varying from 2138 to 529 nm. The size distribution of fat globules increased during pasteurization and drying from 0.24 in raw milk to 0.78 in pasteurized milk. With respect to the fatty acid profile, we found that human milk samples had an elevated content of palmitic (27%), and oleic (30%) acids and significant variations were observed in the pasteurized samples for oleic and linoleic acid. Preservation processes applied to human milk caused a decrease on the fat globule diameter; the change in size increased the surface area and could improve the bioavailability of the fat components. This is the first report of human milk drying as a preservation method.

Keywords: *human milk fat, fatty acids, pasteurization, lyophilization, spray drying*

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1. Introduction

Human milk is recognized as a nutritional and immunologically important food, appropriate for newborn babies. It reduces the risk of disease and death, and containins nutritional components such as lactose, lipids, proteins, vitamins, immunoglobulins, hormones, growth factors, enzymes and protective agents, which are in suitable concentrations to contribute to the correct growth and development of the newborn ([1,2]).

Water is the major constituent of human milk (90%), that contains ca. 10% of solids; of which, the main components are lactose (6.7 to 7.8 g/dL), fat (3.2 to 3.6 g/dL) and protein (0.9 to 1.2 g/dL). This composition may be modified by factors such as, individual characteristics of the mother, lactation cycle, diet, number and length of gestation, seasonal and geographic factors ([3,4]). The most variable component is fat, which provides nearly 50% of the energy, and facilitates the transport and absorption of fat-soluble vitamins to the infant ([4,5]).

Fat in human milk comes from fat depots of the mother as well as from endogenous synthesis by the mammary gland [6]. Milk fat is found in form of globules as part of a colloidal system, which is formed in the mammary gland by a biological mechanism of assembly of intracellular lipid droplets through the plasma membrane of the epithelial cells ([7,8]).

The fat globule in human milk has a size distribution ranging from 1 to 4 μm, It is formed by a triacylglycerol core covered by a trilayer membrane composed of phospholipids, proteins, sphingolipids, cholesterol, glycoproteins and enzymes ([8,9]). The triacylglycerols present in the fat globule contain fatty acids involved in brain development and visual acuity. It is also important in the process of synthesis of prostaglandins and eicosanoids and in the calcium absorption process, which is necessary for infant development [10]. Palmitic and oleic acids are found in greater proportion in human milk. Saturated fatty acids

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Trabajo Original

Epidemiología y dietética

Impacto de la pasteurización/liofilización en el contenido disponible de inmunoglobulinas en leche humana madura. Estudio de aplicación en bancos de leche humana en hospitales

Impact of pasteurization/freeze-drying on available immunoglobulin content of the mature human milk. Use in human milk banking of hospitals

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Resumen

Introducción: este estudio analiza el efecto sobre el contenido de inmunoglobulinas y complemento C3 de la liofilización posterior a la pasteurización por tres métodos diferentes en leche humana madura (LHM).

Objetivo: la liofilización es propuesta como método complementario para el mantenimiento de las propiedades terapéuticas de la LHM con mayor vigencia.

Métodos: estudio descriptivo en el que se obtuvieron muestras de LHM. Alícuotas de las muestras obtenidas se pasteurizaron por tres métodos: 62,5 °C/30 minutos, 72 °C/15 minutos 85 °C/5 minutos, seguido de un enfriamiento rápido a 5 °C. Después, volúmenes de 30 ml de muestra pasteurizada fueron liofilizados durante un periodo de 36 horas. La determinación de proteínas totales fue realizada por el método Lowry. Las concentraciones de inmunoglobulinas A, G y M y el complemento C3 fueron determinadas por nefelometría convencional, siguiendo las instrucciones del fabricante. La significancia estadística se definió como $p < 0,05$.

Resultados: el método de pasteurización de LHM con mayor retención de proteína e inmunoglobulinas fue a la temperatura de 62,5 °C, sin embargo, la pasteurización a 72 °C antes de la liofilización mostró mayor retención de inmunoglobulinas.

Conclusiones: nuestros resultados sugieren que la liofilización de LHM pasteurizada es un método eficiente para la conservación en bancos de leche humana. Tanto la composición nutricional como la extensión de su vida útil y la aplicación de los dos procesos juntos proporcionan la ventaja de mantener las propiedades terapéuticas de la leche humana para mejorar la salud del recién nacido en estado vulnerable, desmedro o inmunosuprimido.

Palabras clave:

Inmunoglobulinas. Leche humana. Pasteurización. Liofilización. Bancos de leche.

Abstract

Introduction: This study analyzes the effect on the content of immunoglobulins and C3 complement of freeze drying after pasteurization by three different methods in mature human milk (MHM).

Objective: Freeze drying is proposed as a complementary method for the maintenance of MHM therapeutic properties with greater validity.

Methods: This was a descriptive study in which MHM samples were obtained. Next, aliquots of the samples obtained were pasteurized by three methods: 62.5 °C/30 minutes, 72 °C/15 minutes, 85 °C/5 minutes, followed by a rapid cooling at 5 °C. Then, 30 ml volumes of pasteurized sample were freeze-dried over a period of 36 hours. Total protein determination was performed by the Lowry method. The concentrations of immunoglobulins A, G and M, and complement C3, were determined by conventional nephelometric technique following the manufacturer's instructions. Statistical significance was defined as $p < 0.05$.

Results: The method of pasteurization of MHM with increased protein and immunoglobulin retention was at 62.5 °C, however, pasteurization at 72 °C before freeze-drying showed better retention of immunoglobulins.

Conclusions: Our results suggest that the freeze-drying of pasteurized MHM is a suitable method for the conservation in human milk banks. Both the nutritional composition and the extension of its validity and the application of the two processes together provide the advantage of maintaining the therapeutic properties of human milk to improve the health of the newborn in a vulnerable, impaired or immunosuppressed state.

Key words:

Immunoglobulins. Human milk. Pasteurization. Freeze drying. Milk banks.

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Evaluation of nutrients removal (NO_3-N, NH_3-N and PO_4-P) with *Chlorella vulgaris*, *Pseudomonas putida*, *Bacillus cereus* and a consortium of these microorganisms in the treatment of wastewater effluents

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ABSTRACT

In this research removal of NH_3-N, NO_3-N and PO_4-P nutrients from municipal wastewater was studied, using *Chlorella vulgaris*, *Pseudomonas putida*, *Bacillus cereus* and an artificial consortium of them. The objective is to analyze the performance of these microorganisms and their consortium, which has not been previously studied for nutrient removal in municipal wastewater. A model wastewater was prepared simulating the physicochemical characteristics found at the wastewater plant in Chapala, Mexico. Experiments were carried out without adding an external carbon source. Results indicate that nutrient removal with *Chlorella vulgaris* was the most efficient with a removal of 24.03% of NO_3-N, 80.62% of NH_3-N and 4.30% of PO_4-P. With *Bacillus cereus* the results were 8.40% of NO_3-N, 28.80% of NH_3-N and 3.80% of PO_4-P. The removals with *Pseudomonas putida* were 2.50% of NO_3-N, 41.80 of NH_3-N and 4.30% of PO_4-P. The consortium of *Chlorella vulgaris–Bacillus cereus–Pseudomonas putida* removed 29.40% of NO_3-N, 4.2% of NH_3-N and 8.4% of PO_4-P. The highest biomass production was with *Bacillus cereus* (450 mg/l) followed by *Pseudomonas putida* (444 mg/l), the consortium (205 mg/l) and *Chlorella vulgaris* (88.9 mg/l). This study highlights the utility of these microorganisms for nutrient removal in wastewater treatments.

Key words | *Bacillus cereus*, *Chlorella vulgaris*, consortium, nutrient removal, *Pseudomonas putida*, wastewater treatment

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INTRODUCTION

Environmental issues are becoming profound problems because of the possible risk of pollution of ecosystems, due to the increasing population, urbanization and industrialization (Rawat *et al.* 2011). The most profound issues include the excessive generation of wastewater and the release of this water into freshwater resources, which are giving serious challenges to the scientific community, in terms of sustainability of our planet and global warming, for the present and the future generations. Therefore, the mixing of untreated wastewater in aquatic bodies is one of the major issues that are changing the stability of ecosystems (Renuka *et al.* 2014). Further, the presence of excess

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RESEARCH ARTICLE

Effects of Oxygen and Nutrients on Xylitol and Ethanol Production in Sugarcane Bagasse Hydrolyzates

Juan Francisco Castañón-Rodríguez, José Antonio Portilla-Arias, Blanca R. Aguilar-Uscanga, and María Guadalupe Aguilar-Uscanga

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Abstract The influence of oxygen and nutrient supplementation on xylitol and ethanol production in a synthetic medium and sugarcane bagasse hydrolyzates using *Candida tropicalis* IEC5-ITV and *Saccharomyces cerevisiae* ITV01-RD was investigated for evaluation of bioconversion of pentoses and hexoses present in the lignocellulosic biomass. The best oxygen transfer rate (56.05 mg of O_2/L/h) and xylitol and ethanol yields (0.67 and 0.47 g/g, respectively) were obtained in a synthetic medium. A yeast extract had a positive effect on xylitol and ethanol production (0.64 and 0.44 g/g, respectively) at a concentration of 1 g/L. *C. tropicalis* and *S. cerevisiae* exhibited not previously observed morphological changes depending on the nutrient composition. Use of sugarcane bagasse hydrolyzates requires a good supply of oxygen and addition of a yeast extract to improve xylitol and ethanol production.

Keywords: xylitol, ethanol, nutrient, sugarcane, bagasse

Introduction

In order to enhance the competitiveness of cellulosic ethanol, use of process integration has been proposed to reduce the cost associated with bioethanol production. One promising approach that may be effective is use of xylose-rich hemicellulose hydrolyzates for production of value-added chemicals, like xylitol, that contribute to the overall economy of the process (1). One of the most effective ethanol-producing microorganisms for hexose is *Saccharomyces cerevisiae*, yeast with a high ethanol productivity and tolerance to ethanol and to inhibitory compounds present in hydrolyzates of the lignocellulose biomass (2). A high fermentation performance using this yeast has been achieved, determined based on medium composition and operating parameters, including, substrate and vitamin feeding strategy, oxygen level, and temperature (3). Although *S. cerevisiae* can grow well even at a relatively low pH, which prevents bacterial contamination, strains of *S. cerevisiae* are unable to use xylose for growth or fermentation (4). Due to this metabolic restriction, *S. cerevisiae* can produce neither ethanol nor xylitol using the xylose present in lignocellulose material hydrolyzates. On the other hand, use of respiratory deficient mutants has not been studied for lignocellulosic hydrolyzates.

Biotechnological production of xylitol using crude hemicellulose hydrolyzates instead of pure xylose could be of economic interest due to a reduction in production costs (5). *Candida* sp. is recognized as the best yeast xylitol producer (6). Huang *et al.* (7) listed several strains of *Candida tropicalis* that have been used for fermentation of xylose-rich hydrolyzates from lignocellulose materials for production of xylitol, with maximum yields varying widely from 0.11 to 0.71 g/g depending on the efficacy of the detoxification process, hydrolyzate composition, and oxygen availability. The key enzymes for xylose assimilation in xylitol-producing yeasts are xylose reductase (XR), which catalyses xylose reduction to xylitol and requires NADPH as the main cofactor, and NAD^+-dependent xylitol dehydrogenase (XDH), which catalyses xylitol conversion to xylulose that is then phosphorylated and incorporated

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EVALUATION OF BIOCONVERSION CONDITIONS ON REUTERIN PRODUCTION USING RESPONSE SURFACE METHODOLOGY AND *LISTERIA MONOCYTOGENES* AS TARGET BACTERIA

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ABSTRACT

The objective of this study was to evaluate the effect of bioconversion conditions on reuterin production by *Lactobacillus reuteri* using response surface methodology (RSM). A central composite design consisted of three independent factors at 5 levels: concentration of *Lactococcus reuteri* (log CFU/ml), glycerol concentration (mM), and incubation time (h) was set up and consisted of 18 experimental runs. The dependant factor was the relative reuterin concentration expressed through its antibacterial activity (Units reuterin per ml, U/ml) against *L. monocytogenes* using microbroth dilution assay. A polynomial equation for prediction of reuterin production (U/ml) produced by *L. reuteri* was created based on obtained data. Results showed that incubation time, bacterial and glycerol concentrations had linear positive effects on reuterin production. The quadratic effect of incubation time had negative effect on reuterin production in which at a fixed bacterial concentration of *L. reuteri*, a longer incubation time with low concentration of glycerol will cause the reduction in relative reuterin concentration. It was found that approximately 450 U/ml can be produced by *L. reuteri* with glycerol concentration ranging from 320 to 340 mM mM, *L. reuteri* concentration of 9.4 log CFU/ml and 2 h of incubation. Results demonstrated that applying suitable conditions for glycerol bioconversion into reuterin by *L. reuteri*, a high relative reuterin concentration could be obtained and used for food preservation against *L. monocytogenes*.

Keywords: Antibacterial activity, Reuterin, *Lactobacillus reuteri*, *Listeria monocytogenes*, response surface methodology

INTRODUCTION

Lactobacillus reuteri is a member of gastrointestinal bacteria of healthy human and animals. It has been demonstrated as a potential probiotic bacterium in biodetoxification and health stimulation, (**van Niel *et al.*, 2012**) and in immunomodulation (**Mechoud *et al.*, 2012**). Further, *L. reuteri* is well-known as a producer of 3-hydroxypropionaldehyde (3-HPA) or reuterin during anaerobic metabolism of glycerol (**Axelsson *et al.*, 1989; Chung *et al.*, 1989**). Glycerol is converted to reuterin by a coenzyme B_{12}-dependent dehydratase (**Talarico and Dobrogosz, 1990**). Reuterin can be further reduced by NADH to form 1,3-propanediol which is catalyzed by 1,3-propanediol: NAD oxidoreductase (**Talarico *et al.*, 1990**). Reuterin can inhibit the growth of yeast, protozoa, and many bacteria, both Gram-negative and Gram-positive (**Axelsson *et al.*, 1989; Chung *et al.*, 1989**).

Reuterin is water soluble compound, and it is active in a wide range of pH. It is also resistance to proteolytic and lipolytic enzymes (**El-Ziney *et al.*, 2000; Vollenweider and Lacroix 2004**). Therefore, potential of using reuterin for preservation of food products are of great interest (**El-Ziney and Debevere 1998; Arqués *et al.*, 2004; Montiel *et al.*,, 2014**). Reuterin could inhibit the growth of pathogenic bacteria such as *Listeria monocytogenes*, and *Escherichia coli* O157: H7 in milk and cottage cheese (El-Ziney and Debevere 1998), *L. monocytogenes* in cold-smoked salmon (**Montiel *et al.*, 2014**). A synergistic effect of reuterin plus nisin against *L. monocytogenes* and *Staphylococcus aureus* was obtained in refrigerated milk at the end of storage of 12 days (**Arqués *et al.*, 2004**).

It has been found that *L. monocytogenes* was more resistant to reuterin than some other bacteria. For example, reuterin at the same activity (8 U/ml) was more effective in eliminating *Staphylococcus aureus* than *L. monocytogenes* at 37 °C in milk (**Arqués *et al.*, 2004**). Similarly, it has been observed that *E. coli* strains were sensitive to reuterin than *Listeria* strains including *L. monocytogenes* (**El-Ziney *et al.*, 2000**). Thus, it is important to find suitable conditions so that *L. reuteri* can produce high reuterin concentration to eliminate *L. monocytogenes* in food products.

It has been demonstrated that several factors such as the glycerol and biomass concentrations, incubation time, temperature and pH can influence on reuterin production produced by *L. reuteri* (**Lüthi-Peng *et al.*, 2002a,b; Tobajas *et al.*, 2007**). However, most of studies focused on evaluation of varying effect of a single factor while other factors were fixed on reuterin activity and therefore, the possible interactive effects among different factors on reuterin production by *L. reuteri* could not be established.

Response surface methodology (RSM) is known as a combination of mathematical and statistical techniques for optimization of a process where dependent factors are affected by several independent factors. This method can be used to determine the possible interactive effects among different independent factors on the dependent factors in an experimental design (**Adjalle *et al.*, 2011; Khan *et al.*, 2014**).

Thus, the aim of this study was to evaluate the interactive effects of bioconversion condition on reuterin activity against *L. monocytogenes* using RSM. A central composite consisting of three independent factors (glycerol concentration, *L. reuteri* concentration and incubation time) at 5 levels was designed. The design formed 18 experimental bioconversion conditions. Reuterin production or relative reuterin concentration expressed through its activity (Units per ml, U/ml) against *L. monocytogenes* was determined using microbroth dilution method.

MATERIALS AND METHODS

Bacterial and growth conditions

Lactobacillus reuteri ATCC 53608 was used in this study. The stock culture of *L. reuteri* in MRS broth containing 10 % glycerol was preserved as aliquot of 1 ml in cryovial tubes at -80 °C. Before each experiment, one ml of stock culture was inoculated into test tube containing 9 ml of MRS broth, incubated at 37°C for

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irecto
os LGAC Biotecnología Alimentaria

Drying Technology
An International Journal

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Spray and freeze drying of human milk on the retention of immunoglobulins (IgA, IgG, IgM)

Jorge Castro-Albarrán, Blanca Rosa Aguilar-Uscanga, Frédéric Calon, Isabelle St-Amour, Josué Solís-Pacheco, Linda Saucier & Cristina Ratti

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UNIVERSIDAD DE EL SALVADOR

Ciudad Universitaria, 18 de septiembre 2017

Dra. Blanca Rosa Aguilar Uscanga
Profesor Investigador
CUCEI-UdG

Por la presente queremos agradecer su **estancia de investigación** realizada del **04 al 16 de Septiembre** del año en curso, así como su participación como profesor huésped, en la formación de los estudiantes de la **Maestría en Inocuidad de Alimentos** de la Facultad de Química y Farmacia de la **Universidad del Salvador**.

Cabe señalar que su estancia nos permitió iniciar un lazo de colaboración, mediante la formación de recursos humanos, contribuyendo a la posibilidad de que los estudiantes egresados de nuestra maestría, se interesen por la obtención del grado de doctor, o bien que desarrollen proyectos de investigación en la Universidad de Guadalajara.

Sin otro particular, le enviamos un cordial y afectuoso saludo

ATENTAMENTE

MSc. Corália de los Angeles González
Coordinadora Maestría
Microbiología e Inocuidad de Alimentos

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Facultad de Química y Farmacia
MAESTRÍA EN MICROBIOLOGÍA
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Le 3 février 2015

Madame Blanca Rosa Aguilar Uscanga
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Col. Olimpica
CP 44430, Guadalajara, Jalisco
Mexico

Madame,

Pour faire suite à une recommandation de l'assemblée des professeurs du Centre INRS–Institut Armand-Frappier ainsi que de son directeur, il me fait plaisir de vous confirmer votre nomination à titre de professeure invitée à ce centre jusqu'au 31 mai 2017.

Je suis confiant que cette nomination assurera des contacts utiles et fructueux pour l'Institut.

Je vous prie d'agréer mes salutations distinguées.

Le directeur de l'administration et des finances
Responsable des affaires professorales,

Claude Arbour

CA/ab

c.c. M. Charles Dozois, directeur, Centre INRS–Institut Armand-Frappier

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2. Résolution de l'assemblée des professeurs;
3. Fiche de demande de statut de professeur honoraire ou invité ou associé;
4. Curriculum vitae complet du candidat.

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OBJECTIFS RECHERCHÉS PAR L'OBTENTION DU STATUT DE CHERCHEUR OU PROFESSEUR ASSOCIÉ OU INVITÉ OU HONORAIRE :

CONTRIBUTION AU CENTRE

RECHERCHE : Collaboration et développement des projets de recherche sur les domaines de la microbiologie et science des aliments. Participation en l'élaboration, comme co-auteur, en articles scientifiques indexes d'impact international.

ENCADREMENT : Microbiologie alimentaire et science des aliments (technologie et biotechnologie).

ENSEIGNEMENT : Participation comme co-directeur des étudiants de maîtrise et doctorat.
Capacité d'impartir courses de microbiologie et aliments fonctionnelles.

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Signature du directeur scientifique : Claude Antoun **Date :** 3/02/2015

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COORDINACIÓN DE LIC. EN QUÍMICO FARMACÉUTICO BIÓLOGO/
LIC. EN QUIMICO FARMACOBIÓLOGO

Otorgan la presente constancia al

Dra. Blanca Rosa Aguilar Uscanga

Por la presentación de su ponencia

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Expuesta el día lunes 7 de Mayo del 2018
dentro de la XXIV Semana Científico Cultural del QFB "Dra. Ruth Padilla Muñoz"
Guadalajara, Jalisco al 11 de Mayo de 2018

M. en E. Susana Olivia Guerra Martínez
Coordinadora de la Licenciatura en QFB del Centro Universitario de Ciencias Exactas e Ingenierías

Dra. Ma. Refugio Torres Vitela
Jefa del Departamento de Farmacobiología del Centro Universitario de Ciencias Exactas e Ingenierías

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"El QFB y su papel en el desarrollo Sustentable"

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2° Foro Internacional de Talento Mexicano

CDMX

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JOSUÉ RAYMUNDO, SOLÍS PACHECO, JULIO C. SERRANO NIÑO, ADRIANA CAVAZOS GARDUÑO, JUAN MANUEL VIVEROS PAREDES

Por su valiosa participación como Ponente con el trabajo titulado:

Aplicación Biotecnológica De Polisacáridos Contenidos En La Pared Celular De Levaduras Tequileras

En el Segundo Foro Internacional de Talento Mexicano Innovación Match Mx
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Dr. Eduardo A. Ramírez Gonzalez
COORDINADOR GENERAL DE IMMX

Dr. Hegel Cortés Miranda
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1er Foro Internacional de
Talento Mexicano

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Reconocimiento

a:

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Solís Pacheco, Josué Raymundo.
Carrazco Gardaño, Adriana.
Serrano Niño, Julio Cesar.

Ruggazzo Sánchez, Juan Arturo.
Serur Villanueva, Héctor.

por su valiosa participación como Ponente con el trabajo titulado **LECHE HUMANA EN POLVO: alimento esencial para el recién nacido** en el Primer Foro Internacional de Talento Mexicano **Innovation Match MX** que se llevó a cabo los días 06, 07 y 08 de Abril de 2016 en Guadalajara, Jalisco, México.

Abril de 2016, Guadalajara, Jalisco, México

Dr. Eduardo A. Ramírez González
Coordinador General Innovation Match Mx

Dra. Laura Hernández
Representante de la Red de Talentos
en Innovation Match Mx

DESARROLLANDO EMPRESAS GLOBALES

Latin Food 2016

IAFP's 5th Latin American Symposium in Food Safety
7th Food Science, Biotechnology and Safety Meeting

AMEPAL A.C.

August 15, 2016

Dear authors, we are pleased to inform you that your abstract

Assessment of Bacteriocin Application Isolated from *Lactobacillus rhamnosus* HN001 in Beef

AUTHORS: Hernández, N. H., Cavazos-Garduño, A., Aguilar-Uscanga, B., Serrano-Niño, J.C. and Solís-Pacheco, J.

Contribution ID XI094

has been ACCEPTED as

Poster Presentation

to be presented at the Latin Food 2016 meeting, which includes the IAFP's 5th Latin American Symposium in Food Safety, and the 7th Food Science, Biotechnology and Safety Meeting, to be held in Cancun, November 9-11th,

Please revise the final program of the meeting to find the date of your presentation at the Cancún Center, Conventions & Exhibitons, Cancún, México. If you wish, you can submit an extended abstract, with a maximum length of 5 pages, to be published in a CD format, together with the accepted summaries. Deadline for *in extenso* is September 30. Selected full texts will be published after the congress as a special edition book.

Best regards,

Latin Food 2016
Scientific Committee

AMEPAL A.C.

Latin Food 2016

IAFP´s 5th Latin American Symposium in Food Safety

7th Food Science, Biotechnology and Safety Meeting

AMECA

CERTIFICATE OF PARTICIPATION

This is to certify that the presentation entitled:

Biosynthesis of Silver Nanoparticles Using Plant Extracts and Microwave.

Authored by:

Cavazos-Garduño, A., Zamudio-Ojeda, A., Serrano-Niño, J.C, Velazquez-Juarez G., Aguilar-Uscanga, B.

Was presented in Latin Food 2016, held in Cancun Q. Roo, México. November 9 - 11, 2016.

Dr. José Santos García Alvarado
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This is to certify that the presentation entitled:

Human Milk Conservation: Functional Food for the Newborn.

Authored by:

Aguilar Uscanga B. R, Solís Pacheco J. R, Serrano Niño J. C, Gutiérrez Padilla J.A, González Reynoso O, and Cavazos Garduño A.

Was presented in Latin Food 2016, held in Cancun Q. Roo, México. November 9 - 11, 2016.

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XIX Congreso Internacional Inocuidad de Alimentos

XXXIV Reunión Nacional de Microbiología, Higiene y Toxicología de los Alimentos

2, 3 y 4 de noviembre 2017, Nuevo Vallarta, Nayarit, México.

La Universidad de Guadalajara otorga la presente

CONSTANCIA

A: Solís-Pacheco J.R., Ramírez-Robles J.D., Alatorre-Álvarez M.N., Cavazos Garduño A., Serrano Niño J.C., Aguilar-Uscanga B.R.

por su participación como:

Autores del trabajo libre presentado en modalidad cartel

"Aislamiento y selección de cepas de *Streptomyces* con potencial para producción de antibióticos."

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XXXIV Reunión Nacional de Microbiología, Higiene y Toxicología de los Alimentos

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A: Aguilar-Uscanga B.R., Cavazos Garduño A., Rodríguez-Arreola Ariana., Amézcua-López J.A., Serrano Niño J.C., Gutiérrez-Padilla J.A., Solís Pacheco J.R.

por su participación como:

Autores del trabajo libre presentado en modalidad oral

"Efecto del secado de leche humana sobre la calidad microbiológica y nutrimental."

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Dr. Oscar Blanco Alonso
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Québec City, Canada, June 14 -18, 2015

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We hereby confirm that

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Presented

Inactivation of *Aspergillus* spp. spores and detoxification of Ochratoxin A in roasted coffee by cold plasma

At the 31st EFFoST International Conference
13th-16th November 2017, Sitges, Spain

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Fecha: 28 de junio de 2018
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Josué Solís Pacheco
Universidad de Guadalajara
Blanca Aguilar Uscanga
Universidad de Guadalajara

Asunto: Presentación del trabajo al "V Congreso CIIA y VI Foro Centroamericano de Agroindustria

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Nos complace comunicarles que su trabajo: **PLASMA FRÍO: AVANCES PARA APLICACIONES EN LA INDUSTRIA DE ALIMENTOS** ha sido aprobado para presentarlo en la modalidad *POSTER*, en el V Congreso Internacional de Ingeniería Agroindustrial, a realizarse en el Centro de Transferencia Tecnológica y Educación Continua (CTEC), en la Sede Regional San Carlos del Tecnológico de Costa Rica, del 22 al 27 de octubre del 2018.

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COLEGIO MEXICANO DE INGENIEROS BIOQUÍMICOS, A.C.

EXTIENDE LA PRESENTE

Constancia

A:

Dra. Blanca Rosa Aguilar Uscanga

POR SU VALIOSA PARTICIPACIÓN EN LA PRESENTACIÓN DE LA CONFERENCIA MAGISTRAL

"Obtención de bacteriocinas, aplicación e importancia en la industria de los alimentos"

DURANTE EL:

VII CONGRESO INTERNACIONAL
INTERNATIONAL CONGRESS

XVIII CONGRESO NACIONAL DE INGENIERÍA BIOQUÍMICA
NATIONAL CONGRESS OF BIOCHEMICAL ENGINEERING

X JORNADAS CIENTÍFICAS DE BIOMEDICINA Y BIOTECNOLOGÍA MOLECULAR
BIOMEDICINE AND MOLECULAR BIOTECHNOLOGY SCIENTIFIC MEETING

IXTAPA ZIHUATANEJO,
GUERRERO, MEXICO
28. 29 Y 30 de MARZO 2012

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Coordinación de la Carrera en Químico Farmacobiólogo

OTORGAN EL PRESENTE

RECONOCIMIENTO

a: *Dra. Blanca Rosa Aguilar Uscanga*

Conferencia: "Bacteriosinas, Importancia Biotecnológica"

Por su valiosa participación como ponente en la

XIX SEMANA CIENTÍFICO-CULTURAL
DEL QUÍMICO FARMACOBIÓLOGO
"Q.F.B. MARGARITA CÁRDENAS LAZARENO"

Guadalajara, Jal., a 10 de mayo de 2013

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CUCEI

LICENCIATURA EN NUTRICIÓN

EL

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OTORGA EL PRESENTE

RECONOCIMIENTO

A LA DRA.

BLANCA ROSA
AGUILAR USCANGA

POR SU BRILLANTE
CONFERENCIA
SOBRE EL TEMA:

"CONSERVACIÓN DE LA LECHE MATERNA"

QUE SE IMPARTIÓ EN:

XVI Congreso
UNEDL IVEDL
VINCULACIÓN E INNOVACIÓN

GUADALAJARA JALISCO, 07 NOVIEMBRE DE 2014

MTRA. CLAUDIA ROBLES MORALES
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DIVISIÓN DE INGENIERÍAS

OTORGA LA PRESENTE

CONSTANCIA

a la: *Dra. Blanca Rosa Aguilar Uscanga*

Por su participación como **PONENTE** en los Seminarios de Investigación en Ingeniería Química de la Maestría y Doctorado en Ciencias en Ingeniería Química, con el tema:
«Alimentos funcionales y obtención de compuestos bioactivos».

Guadalajara, Jal., 11 de mayo de 2018.

Atentamente
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Dr. César Octavio Monzón
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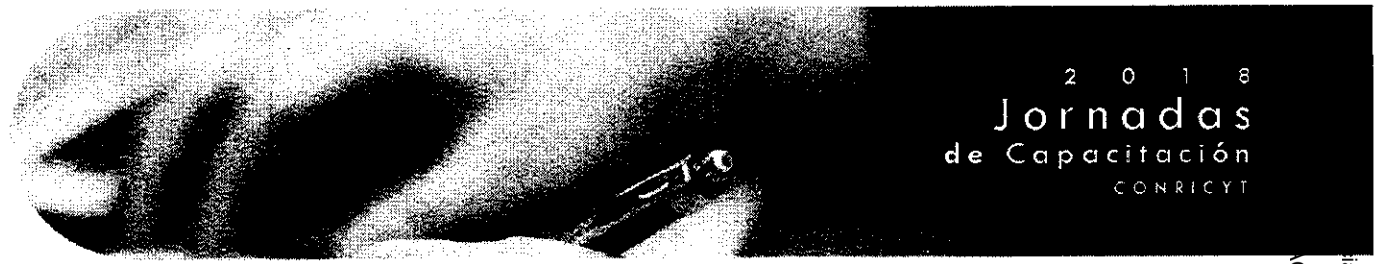

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Por su participación en el Taller para Autores-Investigadores
en el Campo de Biología, Química y Biotecnología y Ciencias Agropecuarias de las
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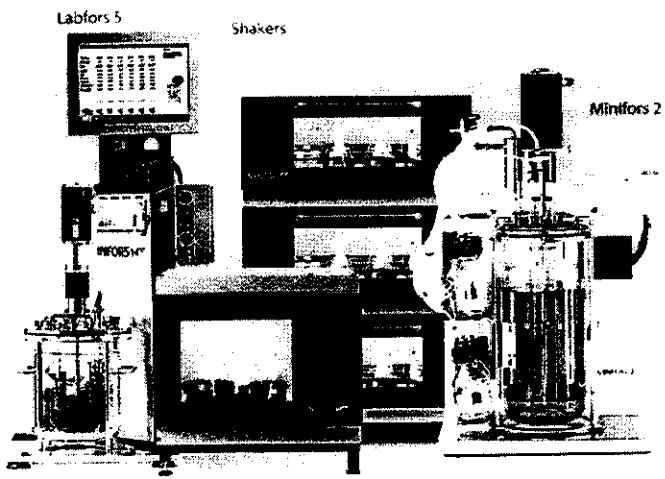

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Doctora Blanca Rosa Aguilar Uscanga

Por haber impartido el curso

ALIMENTOS FUNCIONALES

A PROFESORES DE LA UNIVERSIDAD DE EL SALVADOR

Dado en la Universidad de El Salvador del 12 al 14 de Septiembre de 2017

FACULTAD DE QUIMICA Y FARMACIA
VICE-DECANATO
UNIVERSIDAD DE EL SALVADOR

Licda. María Concepción Odette Rauda Acevedo
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Facultad de Química y Farmacia
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Diploma a

Doctora Blanca Rosa Aguilar Uscanga

Por haber impartido el curso

CONSERVACION DE ALIMENTOS

EN LA MAESTRÍA DE MICROBIOLOGÍA E INOCUIDAD DE ALIMENTOS

Dado en la Universidad de El Salvador del 5 al 16 de Septiembre de 2017

MSc Coralia de los Angeles González

Coordinadora Maestría Microbiología e Inocuidad de Alimentos

UNIVERSIDAD DE EL SALVADOR
Facultad de Química y Farmacia
MAESTRÍA EN MICROBIOLOGÍA
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Nutr Hosp. 2017; 34(4):910-917 ISSN 0212-1611 - CODEN NUHOEO S.V.R. 318

Nutrición Hospitalaria

Trabajo Original

Epidemiología y dietética

Impacto de la pasteurización/liofilización en el contenido disponible de inmunoglobulinas en leche humana madura. Estudio de aplicación en bancos de leche humana en hospitales

Impact of pasteurization/freeze-drying on available immunoglobulins content of the mature human milk. Study to using into human milk banking of hospitals

Jorge Castro-Albarrán[1,4], Rosa Elena Navarro-Hernández[2,3], Josué Solís-Pacheco[1,2], Itza Carmina Salazar-Quiñones[5], Griselda Macías-López[2], Juan Carlos Barrera-De León[4] y Blanca Rosa Aguilar-Uscanga[1,2]

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Resumen

Introducción: este estudio analiza el efecto sobre el contenido de inmunoglobulinas y complemento C3 de la liofilización posterior a la pasteurización por tres métodos diferentes en leche humana madura (LHM).

Objetivo: la liofilización es propuesta como método complementario para el mantenimiento de las propiedades terapéuticas de la LHM con mayor vigencia.

Métodos: estudio descriptivo en el que se obtuvieron muestras de LHM. Alícuotas de las muestras obtenidas se pasteurizaron por tres métodos: 62,5 °C/30 minutos, 72 °C/15 minutos 85 °C/5 minutos, seguido de un enfriamiento rápido a 5 °C. Después, volúmenes de 30 ml de muestra pasteurizada fueron liofilizados durante un periodo de 36 horas. La determinación de proteínas totales fue realizada por el método Lowry. Las concentraciones de inmunoglobulinas A, G y M y el complemento C3 fueron determinadas por nefelometría convencional, siguiendo las instrucciones del fabricante. La significancia estadística se definió como $p < 0,05$.

Resultados: el método de pasteurización de LHM con mayor retención de proteína e inmunoglobulinas fue a la temperatura de 62,5 °C, sin embargo, la pasteurización a 72 °C antes de la liofilización mostró mayor retención de inmunoglobulinas.

Conclusiones: nuestros resultados sugieren que la liofilización de LHM pasteurizada es un método eficiente para la conservación en bancos de leche humana. Tanto la composición nutricional como la extensión de su vida útil y la aplicación de los dos procesos juntos proporcionan la ventaja de mantener las propiedades terapéuticas de la leche humana para mejorar la salud del recién nacido en estado vulnerable, desmedro o inmunosuprimido.

Palabras clave:

Inmunoglobulinas. Leche humana. Pasteurización. Liofilización. Bancos de leche.

Abstract

Introduction: This study analyzes the effect on the content of immunoglobulins and C3 complement of freeze drying after pasteurization by three different methods in mature human milk (MHM).

Objective: Freeze drying is proposed as a complementary method for the maintenance of MHM therapeutic properties with greater validity.

Methods: This was a descriptive study in which MHM samples were obtained. Next, aliquots of the samples obtained were pasteurized by three methods: 62.5 °C/30 minutes, 72 °C/15 minutes, 85 °C/5 minutes, followed by a rapid cooling at 5 °C. Then, 30 ml volumes of pasteurized sample were freeze-dried over a period of 36 hours. Total protein determination was performed by the Lowry method. The concentrations of immunoglobulins A, G and M, and complement C3, were determined by conventional nephelometric technique following the manufacturer's instructions. Statistical significance was defined as $p < 0.05$.

Results: The method of pasteurization of MHM with increased protein and immunoglobulin retention was at 62.5 °C, however, pasteurization at 72 °C before freeze-drying showed better retention of immunoglobulins.

Conclusions: Our results suggest that the freeze-drying of pasteurized MHM is a suitable method for the conservation in human milk banks. Both the nutritional composition and the extension of its validity and the application of the two processes together provide the advantage of maintaining the therapeutic properties of human milk to improve the health of the newborn in a vulnerable, impaired or immunosuppressed state.

Key words:

Immunoglobulins. Human milk. Pasteurization. Freeze drying. Milk banks.

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Doctorado en Ciencias en Procesos Biotecnológicos
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Original Article

Association between the *Xba* I polymorphism of *APOB* gene and plasma lipid level in Mexican patients with coronary artery disease

Martha P. Gallegos-Arreola PhD[1], Yadira Valdez MS[1], Marco Zúñiga-Corona MD[2], Luis E. Figuera PhD, MD[3], Lisette Arnaud-López PhD, MD[4], José A. Robles-Cervantes PhD, MD[4], Manuel González-Ortiz PhD, MD[5,6], Esperanza Martínez-Abundis PhD, MD[5,6], Ana M. Puebla-Pérez PhD[7], Guillermo M. Zúñiga-González PhD [1]

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Some studies, that consider polymorphisms of the apolipoprotein B (*APOB*) gene as risk factors for coronary artery disease (CAD), have reported discordant results. The aim of the present study was to search for associations between plasma lipid profiles with the DNA *Xba* I polymorphism of the *APOB* gene in CAD patients diagnosed by angiography (CAD+). In the present study we compared 114 Mexican patients (80 men and 34 women) with CAD+ and 132 control patients (59 men and 73 women) without evidence of ischemia or arterial damage (CAD-). The frequency of *X+/X+* genotype of *Xba* I polymorphism, in CAD+ group, was 23% (26/114) compared with 8% (11/132) in the CAD- (OR 3.25, $p = 0.002$). The patients with *X+/X+* for the *Xba* I genotype *APOB* gene had higher concentration of triglycerides (TG) and VLDL in plasma than CAD- ($p < 0.05$). The genotype *X+/X+* in the CAD had an effect increasing the TG and VLDL plasma levels when compared with individuals with *X-/X-* and *X-/X+* genotypes. The present study indicated that the *X+X+* genotype of *Xba* I polymorphism is associated with CAD+ patients and high plasma levels of TG and VLDL, in the Mexican population.

Key Words: apolipoprotein B, cholesterol, polymorphism, plasma lipids, Mexican

INTRODUCTION

The constituent lipids of the human body are mainly phospholipids, cholesterol, triglycerides (TG) and cholesteryl esters; they are transported through blood forming lipoprotein complexes of lipids and one or more proteins, called apolipoproteins, and are under a continuous synthesis/degradation turnover. Low density lipoprotein (LDL) is the product of metabolism of very low density lipoprotein (VLDL), and LDL is built by 75% lipid (cholesteryl esters and cholesterol) and remaining 25% protein. Increased LDL levels are associated with cardiovascular disease.[1] It is known that dyslipidemia results from interactions between genetics and environmental (particularity diet, exercise and tobacco smoking) factors, in different populations. The biological, genetics and diet risk factors, may explain the differences in the coronary artery disease (CAD) risk in several populations. It has been observed that there exist factors in the diet that can be altering the lipids concentrations such as: high concentration of lipids, low ingest of vegetables and fruits.[2]

APOB is essential in the maintenance of cholesterol homeostasis, and is the major protein element of LDL. It serves as the ligand for the recognition and catabolism of plasma LDL by LDL-receptor.[3] Elevated levels of serum APOB are associated with an increased risk of premature atherosclerosis.[4] APOB circulates in two distinct forms (apoB100 and apoB48), encoded by a single gene

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Science & Education Publishing

Effect of Pasteurization, Freeze-drying and Spray Drying on the Fat Globule and Lipid Profile of Human Milk

A. Cavazos-Garduño[1], J.C. Serrano-Niño[1], J.R. Solís-Pacheco[1], J.A Gutierrez-Padilla[2], O. González-Reynoso[1], H.S. García[2], B.R. Aguilar-Uscanga[1,*]

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Abstract Human milk is the ideal food to nourish newborn babies; it contains important nutrients: proteins, carbohydrates, fat, vitamins and minerals, which are needed to provide agood health to the infants. Milk fat provides about 50% of energy to infants and its fatty acids are essential for brain and retina development. Therefore, analysis of the lipid fraction of human milk is an important task, especially when this milk is processed. The objective of this research was to study the effect of pasteurization, freeze-drying and spray drying on some characteristics of human milk fat. The fatty acid profile was analyzed by HPLC and gas chromatography. Fat content, globule size and distribution were measured. The HPLC method for the analysis of fatty acids showed accuracy, precision and linearity in the concentration range studied. Non-significant differences in fat content between the different processes were found; however, there was a decrease of 23% in the fat content of spray dried milk. The fat mean globule size decreased considerably in all treatments, varying from 2138 to 529 nm. The size distribution of fat globules increased during pasteurization and drying from 0.24 in raw milk to 0.78 in pasteurized milk. With respect to the fatty acid profile, we found that human milk samples had an elevated content of palmitic (27%), and oleic (30%) acids and significant variations were observed in the pasteurized samples for oleic and linoleic acid. Preservation processes applied to human milk caused a decrease on the fat globule diameter; the change in size increased the surface area and could improve the bioavailability of the fat components. This is the first report of human milk drying as a preservation method.

Keywords: *human milk fat, fatty acids, pasteurization, lyophilization, spray drying*

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1. Introduction

Human milk is recognized as a nutritional and immunologically important food, appropriate for newborn babies. It reduces the risk of disease and death, and containins nutritional components such as lactose, lipids, proteins, vitamins, immunoglobulins, hormones, growth factors, enzymes and protective agents, which are in suitable concentrations to contribute to the correct growth and development of the newborn ([1,2]).

Water is the major constituent of human milk (90%), that contains ca. 10% of solids; of which, the main components are lactose (6.7 to 7.8 g/dL), fat (3.2 to 3.6 g/dL) and protein (0.9 to 1.2 g/dL). This composition may be modified by factors such as, individual characteristics of the mother, lactation cycle, diet, number and length of gestation, seasonal and geographic factors ([3,4]). The most variable component is fat, which provides nearly 50% of the energy, and facilitates the transport and absorption of fat-soluble vitamins to the infant ([4,5]).

Fat in human milk comes from fat depots of the mother as well as from endogenous synthesis by the mammary gland [6]. Milk fat is found in form of globules as part of a colloidal system, which is formed in the mammary gland by a biological mechanism of assembly of intracellular lipid droplets through the plasma membrane of the epithelial cells ([7,8]).

The fat globule in human milk has a size distribution ranging from 1 to 4 μm, It is formed by a triacylglycerol core covered by a trilayer membrane composed of phospholipids, proteins, sphingolipids, cholesterol, glycoproteins and enzymes ([8,9]). The triacylglycerols present in the fat globule contain fatty acids involved in brain development and visual acuity. It is also important in the process of synthesis of prostaglandins and eicosanoids and in the calcium absorption process, which is necessary for infant development [10]. Palmitic and oleic acids are found in greater proportion in human milk. Saturated fatty acids

Evaluation of nutrients removal (NO_3-N, NH_3-N and PO_4-P) with *Chlorella vulgaris*, *Pseudomonas putida*, *Bacillus cereus* and a consortium of these microorganisms in the treatment of wastewater effluents

Abril Gómez-Guzmán, Sergio Jiménez-Magaña, A. Suggey Guerra-Rentería, César Gómez-Hermosillo, F. Javier Parra-Rodríguez, Sergio Velázquez, Blanca Rosa Aguilar-Uscanga, Josue Solis-Pacheco and Orfil González-Reynoso

ABSTRACT

In this research removal of NH_3-N, NO_3-N and PO_4-P nutrients from municipal wastewater was studied, using *Chlorella vulgaris*, *Pseudomonas putida*, *Bacillus cereus* and an artificial consortium of them. The objective is to analyze the performance of these microorganisms and their consortium, which has not been previously studied for nutrient removal in municipal wastewater. A model wastewater was prepared simulating the physicochemical characteristics found at the wastewater plant in Chapala, Mexico. Experiments were carried out without adding an external carbon source. Results indicate that nutrient removal with *Chlorella vulgaris* was the most efficient with a removal of 24.03% of NO_3-N, 80.62% of NH_3-N and 4.30% of PO_4-P. With *Bacillus cereus* the results were 8.40% of NO_3-N, 28.80% of NH_3-N and 3.80% of PO_4-P. The removals with *Pseudomonas putida* were 2.50% of NO_3-N, 41.80 of NH_3-N and 4.30% of PO_4-P. The consortium of *Chlorella vulgaris–Bacillus cereus–Pseudomonas putida* removed 29.40% of NO_3-N, 4.2% of NH_3-N and 8.4% of PO_4-P. The highest biomass production was with *Bacillus cereus* (450 mg/l) followed by *Pseudomonas putida* (444 mg/l), the consortium (205 mg/l) and *Chlorella vulgaris* (88.9 mg/l). This study highlights the utility of these microorganisms for nutrient removal in wastewater treatments.

Key words | *Bacillus cereus*, *Chlorella vulgaris*, consortium, nutrient removal, *Pseudomonas putida*, wastewater treatment

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INTRODUCTION

Environmental issues are becoming profound problems because of the possible risk of pollution of ecosystems, due to the increasing population, urbanization and industrialization (Rawat *et al.* 2011). The most profound issues include the excessive generation of wastewater and the release of this water into freshwater resources, which are giving serious challenges to the scientific community, in terms of sustainability of our planet and global warming, for the present and the future generations. Therefore, the mixing of untreated wastewater in aquatic bodies is one of the major issues that are changing the stability of ecosystems (Renuka *et al.* 2014). Further, the presence of excess

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Spray and freeze drying of human milk on the retention of immunoglobulins (IgA, IgG, IgM)

Jorge Castro-Albarrán, Blanca Rosa Aguilar-Uscanga, Frédéric Calon, Isabelle St-Amour, Josué Solís-Pacheco, Linda Saucier & Cristina Ratti

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Research Article

Morphology Effect of Silver Nanostructures on the Performance of a P3HT:Graphene:AgNs-Based Active Layer Obtained via Dip Coating

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We report the effect of the use of different silver nanostructures (AgNs) layers deposited via dip coating onto a poly(3-hexylthiophene) (P3HT) and solution processable functionalized graphene (SPFGraphene) composite film intended to be used as active layer in BHJ devices. SPFGraphene was added to P3HT in a ratio of 1.5 wt%. The best results were achieved when a layer of silver nano-pseudospheres (AgNPSs) obtained after 10 immersion cycles was used as coating; in this case the highest light trapping and efficiency percent (η = 0.23%) were achieved. This means an increase of ~11.3% in comparison with the efficiency of the noncoated P3HT:SPFGraphene composite. Results also indicate that graphene was successfully functionalized in order to obtain appropriate dispersion in P3HT and that such conjugated polymer remained unaltered after the addition of SPFGraphene. Finally, it can be concluded that the electrical properties of the as-synthesized films are dependent on the shape and concentration of the AgNs deposited via dip coating.

1. Introduction

Organic solar cells (OSCs) have become an attractive and promising technology to gather solar energy. In the bulk heterojunction (BHJ) organic solar cells, the conformation of the active layer is important to achieve high efficiencies [1]; as a result semiconducting or metallic nanostructures (Ns) incorporated into the active layer have shown to be the most efficient light trapping strategy since this offers local surface plasmon resonance (SPR). Among the metallic Ns, AgNs and AuNs are reported to be the most promising for light trapping, since they have intense plasmonic resonances that lie within the UV-vis region of the solar spectrum [2, 3]. In recent years, several BHJ devices have been made using polymer composites blends, being the combination of poly(3-hexylthiophene) (P3HT) with [6,6]-phenyl-C_{61}-butyric acid methyl ester (PCBM) the most widely used. However, the efficiency of the BHJ devices using such polymer blend is limited by inefficient hopping charge transport. One way to overcome this limitation consists in replacing PCBM with

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Termite resistance of wood–plastic composites treated with zinc borate and borax

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Abstract

It has been reported that pinewood residue/recycled high density polyethylene composites with 40 wt% of wood were attacked by termites native to the Yucatan Peninsula (*Nasutitermes nigriceps*). Thus, this article gives account of how effective environmentally friendly borates are (i.e. borax and zinc borate) to protect this kind of composites. Before biotic exposure, composites' samples were subjected to 1000 and 2000 h of accelerated weathering, using a ultraviolet-type accelerated tester equipped with UVA-340 fluorescent lamps and respectively impregnated with 1, 2, and 3% aqueous solutions of both borates, following the ASTM D 1413 standard test method as reference. A reduction in the treated samples' weight loss was observed, which indicated that they increased their resistance to termite attack. No weight losses occurred when the solutions with 3% of both borates were respectively used. Additionally, scanning electron microscopy revealed that these solutions did not damage the composites' surface. The results show that both borates experimented with have the potential to be used as termiticides for wood–plastic composites without damaging the environment.

Keywords

Wood–plastic composites, environmentally friendly termiticides, degradation, recycling, aging

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Review Article

Transparent Electrodes: A Review of the Use of Carbon-Based Nanomaterials

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Transparent conducting electrodes (TCE) are extensively applied in a great range of optoelectronic and photovoltaic equipment (e.g., solar cells, touch panels, and flexible devices). Carbon-based nanomaterials are considered as suitable replacements to substitute traditional materials to manufacture TCE due to their remarkable characteristics, for example, high optical transmittance and outstanding electrical properties. In comparison with traditional indium tin oxide electrodes, carbon-based electrodes show good mechanical properties, chemical stability, and low cost. Nevertheless, major issues related to the development of good quality manufacture methods to produce carbon-based nanomaterials have to be overcome to meet massive market requirements. Hence, the development of alternative TCE materials as well as appropriate large production techniques that meet the requirements of a proper sheet resistance along with a high optical transparency is a priority. Therefore, in this work, we summarize and discuss novel production and synthesis methods, chemical treatments, and hybrid materials developed to satisfy the worldwide request for carbon-based nanomaterials.

1. Introduction

Carbon-based nanomaterials [i.e., carbon nanotubes (CNT) and graphene] show excellent physical and electrical characteristics, including an elevated conductivity and mobility [1–3]. Due to their high optical transmittance this type of materials is particularly appealing to be used as transparent conducting electrodes (TCE) in photovoltaic and display applications. Up until now, ITO (indium tin oxide) is the most used TCE material in organic electronic devices. ITO is a transparent material that exhibits remarkable optoelectronic properties, high transmittance (90%), and sheet resistance of ~10 Ω/sq. Nevertheless, it presents some major drawbacks, including high costs, scarcity of indium, and brittleness, making it impossible to adapt to future applications. Additionally, ITO presents a relatively high refraction index (~2.0) that could produce unwanted reflections if it is used on a substrate with lower refraction index [4–7]. As a consequence, the development of alternative TCE materials that fulfill the main requirements of a high optical transparency and a proper sheet resistance is a priority [8]. Graphene and CNT films represent suitable alternatives to substitute ITO and meet the required specifications to be used as TCE [9–11].

Therefore, the present review is intended to summarize and analyze the different synthesis and production methods, as well as the new carbon-based nanomaterials developed in order to satisfy the requirements for the fabrication of TCE.

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Biosynthesis of silver nanoparticles using a natural extract obtained from an agroindustrial residue of the tequila industry

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ABSTRACT

The biosynthesis of silver nanoparticles (AgNPs) using an aqueous extract of an agroindustrial residue of the tequila industry [i.e. leaves of *Agave tequilana* Weber var. *azul* (AT)], and silver nitrate or silver acetate as precursor salts is reported. The presence of AgNPs was confirmed by color change, scanning electron microscopy, ultraviolet visible spectroscopy and X-ray diffraction. AgNPs were tested against clinically important bacteria. The effect of extract concentration and the reaction temperature was investigated. Results revealed that, the concentration of AgNPs increases as temperature and extract concentration increase. AgNPs were found to be mainly spherical shaped and showed antibacterial activity against *Staphylococcus aureus*, *Escherichia coli* and *Pseudomonas aeruginosa*. Results demonstrate the possibility of using a natural extract obtained from an abundant agroindustrial residue for the sustainable synthesis of AgNPs.

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1. Introduction

Due to the unique set of properties of silver nanoparticles (AgNPs) their use continues to increase, which leads to a wide range of industrial applications. Chemical reduction still is the most common method used to obtain AgNPs, despite it involves the use of toxic compounds. The integration of green chemistry principles into nanotechnology is essential to promote both, efficiency and safety in the production process. Therefore, synthesis routes where biological entities like microorganisms, plant extracts or plant biomass are used, have received vast attention, since they are considered cost-effective and environmentally friendly alternatives to synthesize AgNPs [1,2].

Although a wide variety of plants extracts have been used to synthesize AgNPs [2,3], the use of agroindustrial residues is not common. *Agave tequilana* Weber var. *azul* (AT) is the most widely cultivated agave species in Mexico, its cultivation and industrialization to produce tequila represents an important economic source; but also a serious environmental issue. For tequila production, only the agave head-plant is commercially important, whereas the leaves constitute an agroindustrial residue, despite their high total reducing sugars content (i.e. 13.1–16.1%) [4,5]. Reducing sugars have been demonstrated to efficiently reduce silver ions [6].

On the other hand, silver nitrate ($AgNO_3$) is the most widely used silver precursor in the synthesis of AgNPs as demonstrated by the number of publications [7,8]. However, $AgNO_3$ is a very toxic compound associated with several health issues. According to previous reports, $AgNO_3$ is twice toxic than silver acetate (CH_3-COOAg), which can also be used as precursor salt [9,10]. Thus, it results relevant to evaluate the performance of less toxic Ag^0 precursor in the biosynthesis of AgNPs.

Therefore, in the present work, we demonstrate the biosynthesis of silver nanoparticles via the reduction in aqueous solutions of $AgNO_3$ or CH_3COOAg using *Agave tequilana* Weber var. *azul* extract (ATE) as reducing agent as well as the antibacterial activity of the synthesized AgNPs.

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Por medio de la presente deseo manifestar que el Dr. Edgar José López Naranjo realizó una estancia en el Instituto de Ciencia y Tecnología de Polímeros (ICTP) del Consejo Superior de Investigaciones Científicas (CSIC) en Madrid, España entre el 1 de junio y el 15 de junio de 2018. Durante dicha estancia tuvimos la oportunidad de revisar posibles temas de colaboración conjunta para posibles proyectos en el futuro.

Agradezco la atención que sirva prestar a la presente.

ATENTAMENTE

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Por la presentación del trabajo:

EFECTO DE LA MODIFICACIÓN QUÍMICA DE FIBRAS DE AGAVE EN LA ABSORCIÓN DE AGUA DE BIOCOMPOSITOS DE POLIÁCIDO LÁCTICO

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SÍNTESIS Y EVALUACIÓN DE LA ACTIVIDAD BACTERICIDA DE NANOPARTÍCULAS DE PLATA OBTENIDAS UTILIZANDO EXTRACTO DE Agave tequilana Weber azul COMO BIOREDUCTOR

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Synthesis of silver nanoparticles using Agave tequilana Weber cultivar azul extract as stabilizing agent

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Polyol synthesis of silver nanoparticles: The use of a less environmental toxic salt as Ag+ precursor

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