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10 años

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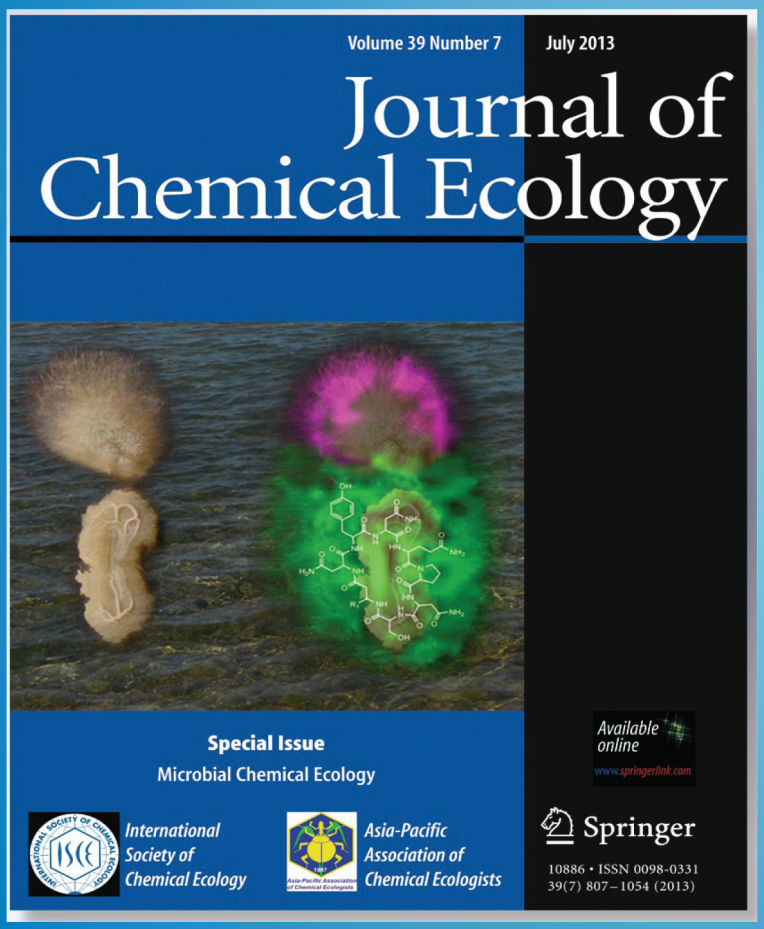

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INDICASAT AIP
INSTITUTO DE INVESTIGACIONES CIENTÍFICAS Y SERVICIOS DE ALTA TECNOLOGÍA

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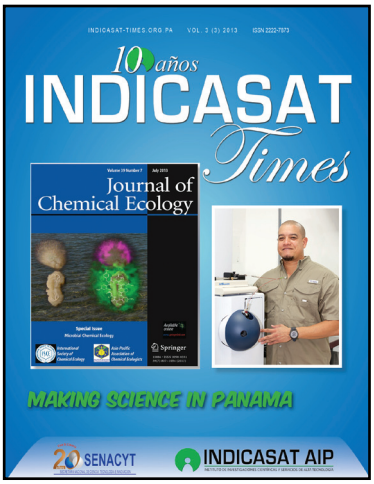

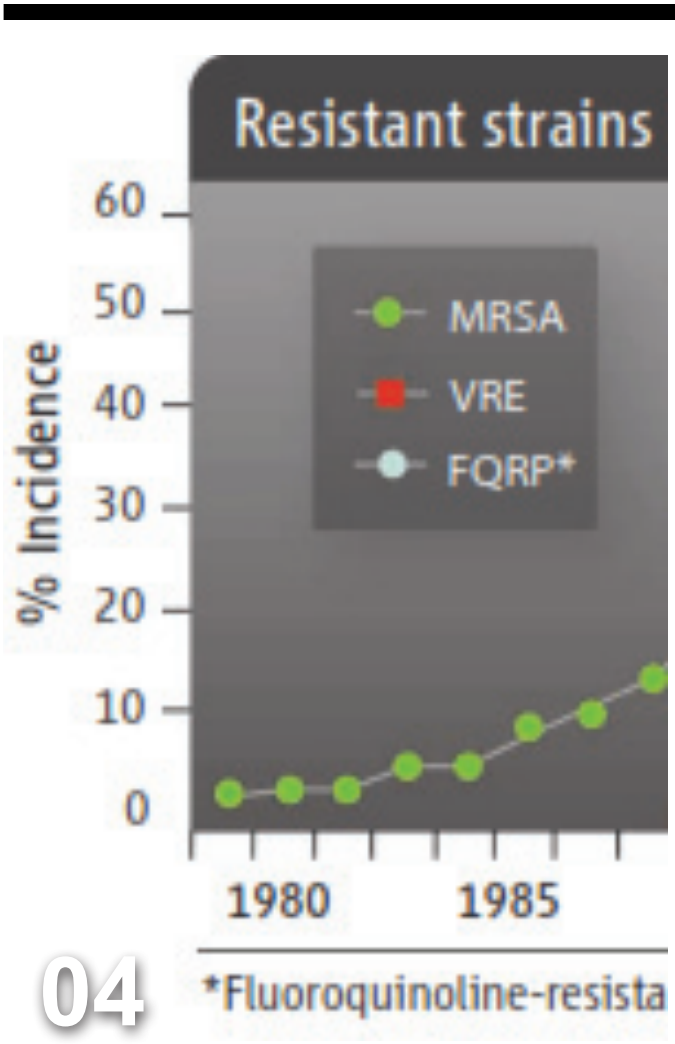

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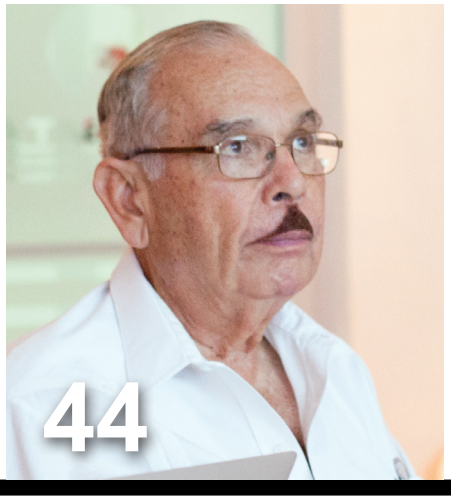

En la Portada / *Dr. Marcelino Gutierrez junto a la portada de la Journal of Chemical Ecology, que muestra una publicación del Dr. Gutierrez y su equipo de trabajo en INDICASAT AIP.* / Fotografía y Edición por Rita Marissa Giovani.

Prospección de antibióticos en la biodiversidad de Panamá

Marcelino Gutiérrez G. Ph.D.
Centro de Biodiversidad y descubrimiento de Drogas
INDICASAT AIP

La resistencia bacteriana a los antibióticos de uso clínico es un creciente problema de salud pública a nivel mundial. La situación es tan alarmante que algunas revistas como Nature Reviews Microbiology han publicado comentarios que hablan de la "era post antibióticos" (Kahrström, 2013). Según datos de la Organización Mundial de la Salud (OMS) sólo en *Mycobacterium tuberculosis* multiresistente (MDR-TB) se reportan un total de 440,000 nuevos casos anuales, causando al menos 150,000 muertes. Además del MDR-TB existen otros grupos de patógenos resistentes que están emergiendo como graves amenazas a la salud pública. Entre estos, el llamado grupo ESKAPE *(Enterococcus faecium, Staphylococcus aureus, Klebsiella pneumoniae, Acinetobacter*

baumannii, Pseudomonas aeruginosa y especies del género *Enterobacter*) que han mostrado resistencia a todas las clases de antibióticos usados comúnmente para tratar infecciones causadas por bacterias Gram negativas (Wright 2012, Fishbach y Walsh, 2009). En la figura 1 se muestra una curva con la incidencia y proyecciones de infecciones por bacterias resistentes publicado en la revista Science en el 2008 (Taubes, 2008).

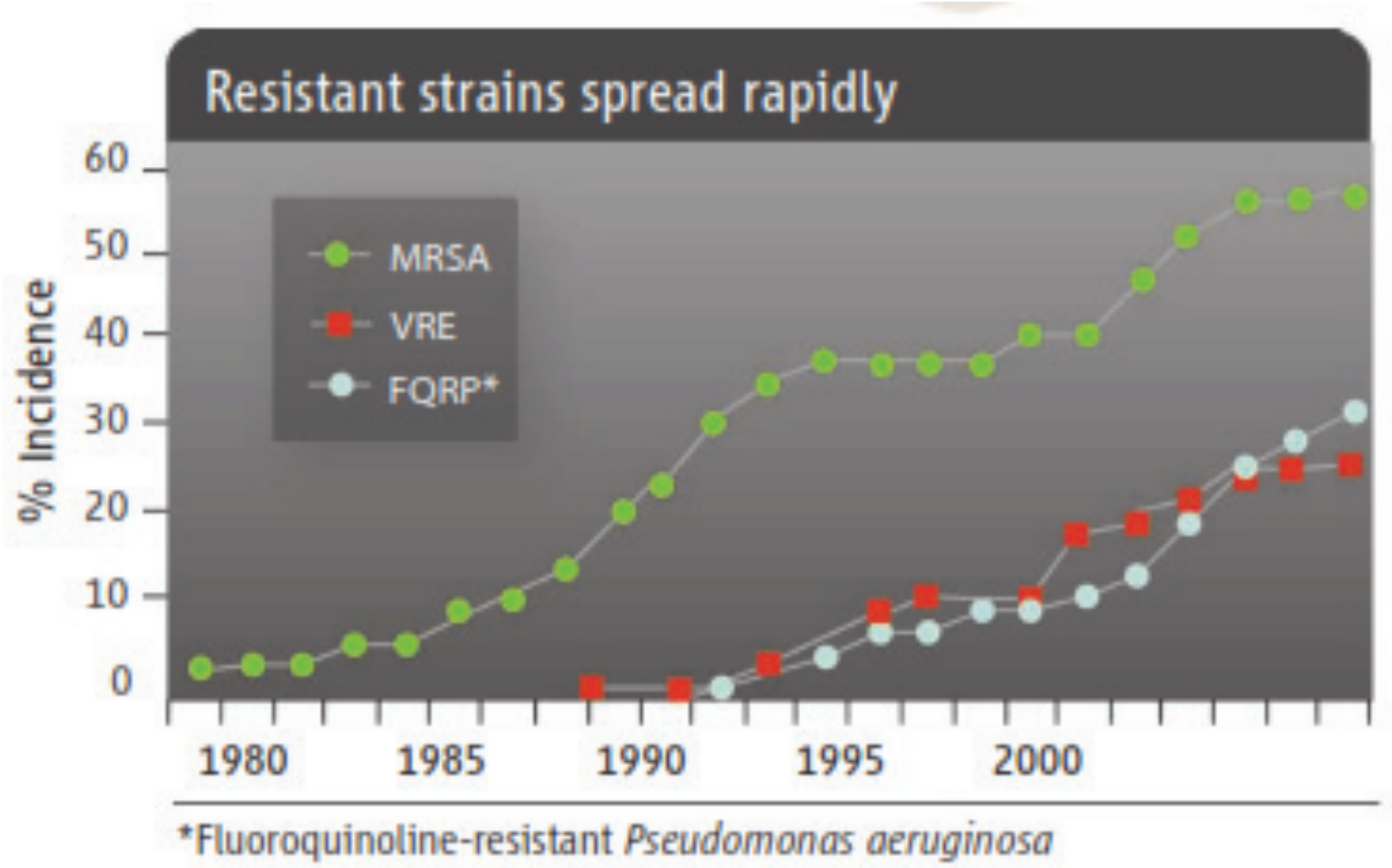

Figura 1. Aumento gradual de la incidencia de bacterias resistentes (Taubes, 2008).

La resistencia a los antimicrobianos se debe a que las bacterias, en su lucha por sobrevivir se han adaptado y han desarrollado estrategias para evadir la acción de los antibióticos.
Una de estas estrategias es el desarrollo enzimas hidrolíticas en la pared celular de las bacterias que actúan sobre los antibióticos haciéndolos totalmente inocuos.
Como ejemplo de estas enzimas tenemos las beta-lactamasas, que actúan inactivando los antibióticos que contienen grupos beta-lactama en su estructura química, tales como las penicilinas, las cefalosporinas y los carbapenems (ver Figura 2).
La mayoría de los antibióticos de uso clínico son productos naturales o derivados de

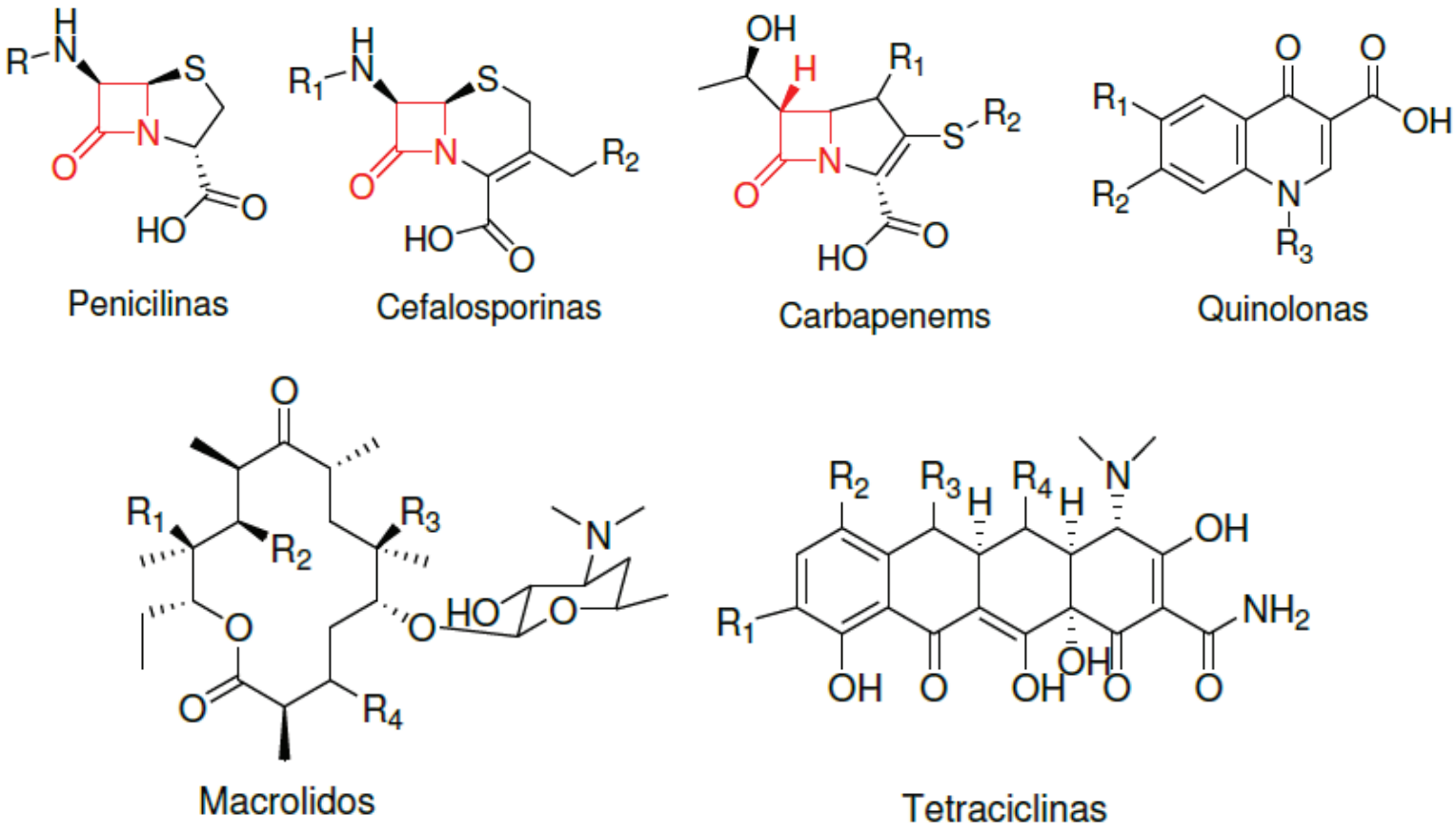

Figura 2. Quimiotipos de antibióticos tradicionales. Grupos β-lactama en rojo.

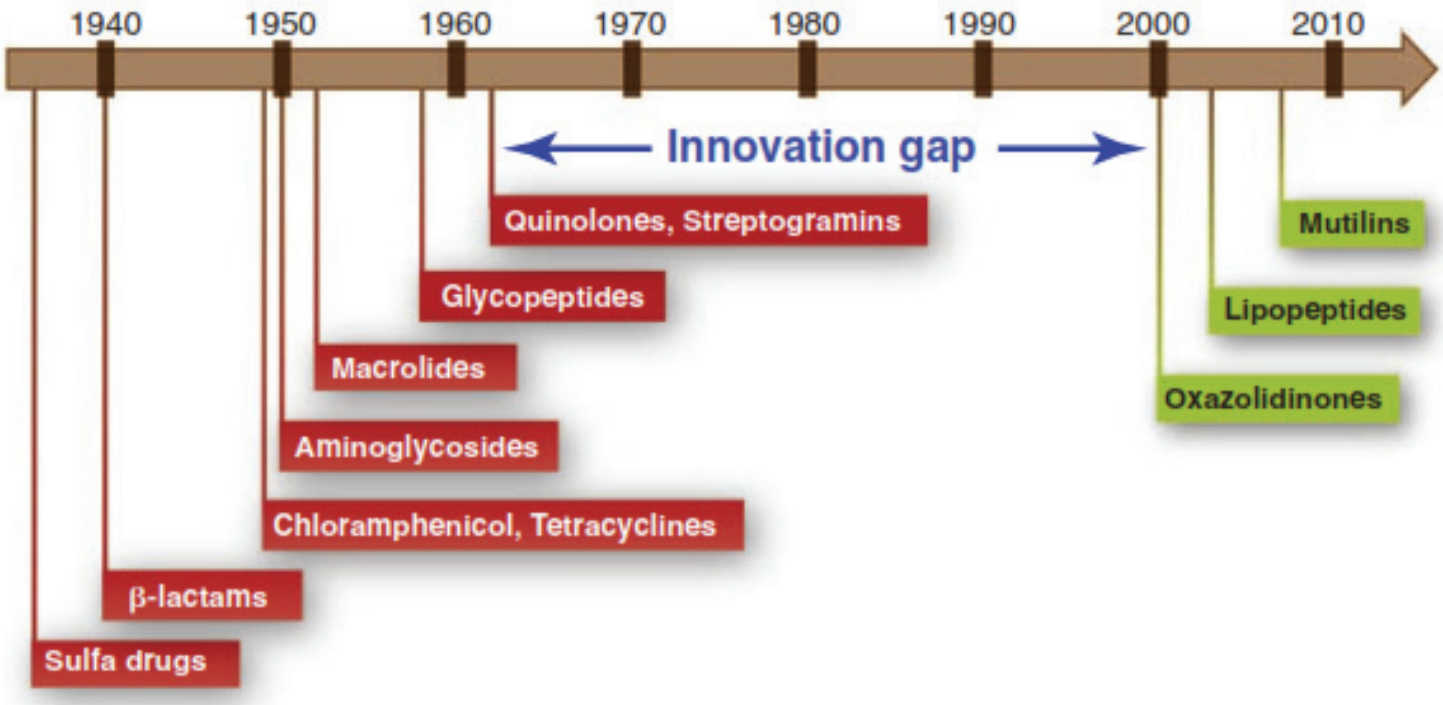

Figura 3. Antibióticos descubiertos entre 1940 y 2010 (Fischbach, 2009).

productos naturales aislados de microorganismos asociados al suelo entre las décadas de los 40's y los 60's, conocida como la "época de oro" de los antibióticos. Los principales grupos incluyen las beta-lactamas, macrólidos, tetraciclinas, y los aminoglicósidos (Figura 2), el resto del arsenal existente contra bacterias patógenas consiste en compuestos obtenidos exclusivamente mediante síntesis orgánica, como las quinolonas.

Después de la época de oro de los antibióticos, se observó un descenso en la taza de descubrimiento de nuevos quimiotipos y un aumento en el re-aislamiento de compuestos conocidos. Debido a esto la mayoría de las compañías farmacéuticas que se dedicaban al descubrimiento y desarrollo de antibióticos abandonaron sus programas ya que estos no eran rentables (Fox et al., 2006; Payne, 2008).

Como consecuencia, entre los años 60´s y el 2000 no se aprobó ningún antibiótico con nuevo quimiotipo (Figura 3, Fischbach, 2009). En el periodo comprendido entre el 2000 y 2011 unos 20 nuevos antibióticos han sido aprobados para uso clínico. De estos 11 son productos naturales de origen microbiano y 9 son productos sintéticos (Butler, 2011). Aunque este número de antibióticos aprobados en la última década pueda sonar alentador, la realidad es que únicamente 3 de ellos representan nuevos quimiotipos y el resto pertenecen a clases estructurales ya conocidas contra las cuales las bacterias ya han mostrado algún nivel de resistencia.

Dado que la resistencia a los antibióticos es un problema real y en crecimiento exponencial, y la taza de descubrimiento de antibióticos pertenecientes a clases estructurales o quimiotipos nuevos ha sufrido un declive dramático desde los 60´s, se requiere tomar iniciativas serias en términos de control del uso indiscriminado de antibióticos y del apoyo a programas innovadores de búsqueda de antibióticos, en donde se descubran nuevos quimiotipos con mecanismos de acción diferentes a los existentes.

Muchos investigadores coinciden en que buscar nuevos antibióticos en las fuentes ya exploradas es de alto riesgo, ya que hay una alta probabilidad de re-descubrimiento de compuestos conocidos. No obstante, la exploración de nuevos nichos tiene mayores probabilidades de éxito.

En ese sentido, la diversidad de bacterias de Panamá representa una fuente de moléculas activas inexplorada. Nuestro grupo de investigación de productos naturales en el Centro de Biodiversidad y Descubrimiento de Drogas (CBDD) de INDICASAT está realizado esfuerzos pioneros en el estudio de la diversidad bacteriana de Panamá con fines de bioprospección. Nuestros estudios se enfocan en la diversidad química producida por bacterias asociadas a macroorganismos tales como invertebrados marinos (corales y esponjas), ranas y hormigas cultivadoras de hongos.

Nuestras estrategias consisten en: i) utilizar interacciones microbianas como herramienta para el descubrimiento de nuevos fármacos, basándonos en el hecho de que en la naturaleza los microorganismos se encuentran en grupo interactuando entre ellos y con su entorno, en lugar de encontrarse en aislamiento. ii) el uso de herramientas genómicas con fin de encontrar clústeres de genes que codifican la

biosíntesis de antibióticos y otras moléculas de interés farmacológico.

Actualmente nuestro laboratorio posee una colección de bacterias con aproximadamente 6000 cepas, aisladas principalmente de invertebrados marinos. De esta colección se ha evaluado cerca del 10% en ensayos de antagonismo microbiano, que ayudan a detectar bacterias con potencial como productoras de antibióticos. Hemos encontrado un número significativo de cepas con actividad antifúngica y antibacteriana y las cepas más promisorias están siendo estudiadas con mayor detalle con el fin de aislar nuevos antibióticos.

Adicionalmente, nuestro grupo del CBDD, en colaboración con el grupo de investigación del Dr. Pieter Dorrestein de la Universidad de California San Diego, está utilizando nuevas herramientas basadas en imágenes producidas por espectrometría de masas (MALDI-TOF imaging) y redes moleculares formadas por espectrometría de masas-masas (MS^2 molecular networking) para estudiar estas interacciones microbianas y acelerar el proceso de descubrimiento de compuestos con actividad antibiótica y antifúngica.

Como muestra de la aplicación de estas tecnologías, en esta edición del INDICASAT Times se presentan los resúmenes de dos artículos publicados recientemente en las revistas Proceedings of the National Academy of Sciences y en el Journal of Chemical Ecology.

Nuestro equipo de trabajo está conformado por técnicos químicos y microbiólogos con amplia experiencia, doctores en química de productos naturales, doctores en biología molecular y estudiantes de doctorado en biotecnología.

Los fondos utilizados para nuestros proyectos han sido obtenidos de SENACYT por medio de sus programas de convocatorias públicas en I+D, del Sistema Nacional de Investigación y de los Grupos Internacionales Cooperativos de Biodiversidad del NIH (ICBG-Panama).

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La Evolución no es un mito

Luis Fernando De León

En este artículo intento aclarar algunos errores de interpretación comunes acerca de la evolución. La evolución es un proceso probabilístico que permite la adaptación, supervivencia y diversificación de los seres vivos. Actualmente es la única explicación lógica para la existencia de la biodiversidad – incluyendo nuestra propia especie. La biogénesis no es ciencia ni ley, por el contrario, es una corriente filosófica que intenta explicar el origen de la vida a partir de la vida. A lo sumo, es una hipótesis falsificada desde el momento en que se logró sintetizar aminoácidos y ácidos ribonucleicos en el laboratorio. La evolución por su lado, es una teoría científica, lo que significa que está debidamente fundamentada con evidencia tangible obtenida a través de la observación y experimentación. La misma ha sido demostrada tantas veces que podríamos decir que la evolución no es sólo una teoría, es un hecho. ¿Pero cómo ocurre la evolución?

La materia prima de la evolución es la variabilidad genética o fenotípicade los individuos dentro una población. Esta es generada a través de mutaciones aleatorias, de la recombinación (sexo) y otros mecanismos tales como inversiones y duplicaciones del material genético (ADN). Con respecto a la duplicación, no sólo se ha observado cómo se duplican los genes, sino también, cromosomas enteros y grandes regiones del genoma o genomas completos.

En humanos por ejemplo, el Síndrome de Down, no es más que la duplicación parcial o total del cromosoma 21. Por lo tanto, desestimar la duplicación de genes es negar un paradigma central en biología – incluyendo la dilucidación de la molécula de ADN.

Los cambios evolutivos per se son generados por múltiples mecanismos que actúan sobre la variabilidad. Uno de estos mecanismos es la selección natural de Wallace y Darwin que a veces es confundida con el proceso de evolución. La selección natural (e.g., depredación, temperatura, humedad) se encarga de filtrar y fijar la variación que confiere ventaja adaptativa (i.e., supervivencia del más apto) a las poblaciones. Sin este mecanismo, los humanos poseeríamos una cola larga, y posiblemente no caminaríamos (saltaríamos) y habitaríamos en los árboles como otros primates. Los cambios evolutivos también pueden ser generados por mecanismos no adaptativos, como la deriva génica, el flujo de genes, o por una combinación de múltiples mecanismos. Estos mecanismos no son "magia", sino mecanismos específicos con predicciones concretas, las cuales han sido probadas en reiteradas ocasiones.

¿Es el Gen egoísta una explicación a la vida? La retórica de este libro no es explicar el origen de la vida, sino entender cuál es la unidad mínima de la selección y cómo se perpetúa la variabilidad. Los candidatos de Richard Dawkins son los genes "egoístas"– que también pueden ser "altruistas". Mucho hemos aprendido desde que se publicó este libro hace casi 40 años. Sabemos por ejemplo, que cerca del 50% del genoma humano está constituido por "elementos saltarines" (transposons), que en esencia son parásitos de ADN que se duplican de forma "egoísta". A pesar de esto, sólo se ha identificado un puñado de genes bajo selección y en muchos casos es difícil determinar si la selección actúa sobre genes individuales o sobre grandes regiones genómicas compuestas por múltiples genes. Por otro lado, también sabemos que la selección no sólo actúa sobre los genes sino también sobre los feno-

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tipos; recordemos que el fenotipo es la interfase entre el organismo y el ambiente. En este sentido, la visión genocéntrica de Dawkins no satisface la compleja realidad de los sistemas biológicos, pero no niega – en ningún grado – el hecho de la evolución.

¿Podemos observar la evolución? La evolución se ha observado tanto en el campo como en el laboratorio. En efecto, existen innumerables ejemplos de evolución rápida en donde los cambios evolutivos se han observado en pocas generaciones (décadas o menos). Esto ha ocurrido en todos los reinos taxonómicos desde virus y bacterias hasta plantas y animales. El virus del SIDA por ejemplo, puede evolucionar aún dentro de la persona infectada.

En medicina existen innumerables ejemplos de patógenos que han evolucionado (en décadas o menos) resistencia a medicamentos y a tratamientos clínicos. De hecho, vivimos en una guerra constante en contra de la evolución de estos patógenos. Cada vez que visitamos un hospital y somos sometidos a tratamientos con antibióticos, estamos promoviendo procesos evolutivos dentro de nuestro cuerpo. Esto se debe a que ejercemos presión o selección directa sobre los gérmenes que nos atacan, lo que promueve la evolución de 'super gérmenes' capaces de contrarrestar el efecto de estos antibióticos. Este proceso crea la resistencia e impide el control de las enfermedades infecciosas. Esto es particularmente riesgoso cuando nos automedicamos o incumplimos las recomendaciones médicas con respecto al uso de medicamentos. Para muchos, la evolución de la resistencia a medicamentos de muchos patógenos (e.g., Tuberculosis, MRSA , VIH, influenza) supone un gran riesgo para nuestra civilización.

En resumen, la Evolución no es un mito y negarla es retroceder al oscurantismo intelectual de la edad media. Por esta razón, considero imperante promover el buen entendimiento de esta Ciencia en todos los niveles de nuestra sociedad. Esto implica incluirla en el planeamiento curricular de nuestro sistema educativo. No dudo que una sociedad educada científicamente comprenderá mejor su rol en el universo y aprenderá a convivir con los miembros su propia especie y con el resto de las especies de la biosfera.

*El autor es científico de INDICASAT, miembro del Sistema Nacional de Investigación de Panamá, y tiene un Ph.D. en Biología Evolutiva.

** Este artículo fue publicado en la sección de Opinión del diario La Prensa del sábado 10 de Agosto de 2013.

Imaging Mass Spectrometry of a Coral Microbe Interaction with Fungi

Wilna J. Moree, Jane Y. Yang, Xiling Zhao, Wei-Ting Liu, Marystella Aparicio, Librada Atencio, Javier Ballesteros. Joel Sánchez, Ronnie G. Gavilán, Marcelino Gutiérrez & Pieter C. Dorrestein.

Abstract

Fungal infections are increasing worldwide, including in the aquatic environment. Microbiota that coexist with marine life can provide protection against fungal infections by secretion of metabolites with antifungal properties. Our laboratory has developed mass spectrometric methodologies with the goal of improving our functional understanding of microbial metabolites and guiding the discovery process of antiinfective agents from natural sources. GA40, a Bacillus amyloliquefaciens strain isolated from an octocoral in Panama, displayed antifungal activity against various terrestrial and marine fungal strains. Using matrix-assisted laser desorption/ ionization-imaging mass spectrometry (MALDI-IMS), the molecular species produced by this microbe were visualized in a side-by-side interaction with two representative fungal strains, Aspergillus fumigatus and Aspergillus niger. The visualization was performed directly on the agar without the need for extraction. By evaluating the spatial distributions, relative intensities and m/z values of GA40 secreted metabolites in the fungal interactions and singly grown control colonies, we obtained insight into the antifungal activity of secreted metabolites. Annotation of GA40 metabolites observed in MALDI-IMS was facilitated by MS/MS networking analysis, a mass spectrometric technique that clusters metabolites with similar MS/MS fragmentation patterns. This analysis established that the predominant GA40 metabolites belong to the iturin family. In a fungal inhibition assay of A. fumigatus, the GA40 iturin metabolites were found to be responsible for the antifungal properties of this Bacillus strain.

Wilna J. Moree, Jane Y. Yang, Xiling Zhao, Wei-Ting Liu, Marystella Aparicio, Librada Atencio, Javier Ballesteros. Joel Sánchez, Ronnie G. Gavilán, Marcelino Gutiérrez & Pieter C. J Chem Ecol, 2013, In Press.

Critical evaluation of biodegradable polymers used in nanodrugs

Edgar Marin, Maria Isabel Briceño, Catherina Caballero-George.

Abstract

Use of biodegradable polymers for biomedical applications has increased in recent decades due to their biocompatibility, biodegradability, flexibility, and minimal side effects. Applications of these materials include creation of skin, blood vessels, cartilage scaffolds, and nanosystems for drug delivery. These biodegradable polymeric nanoparticles enhance properties such as bioavailability and stability, and provide controlled release of bioactive compounds. This review evaluates the classification, synthesis, degradation mechanisms, and biological applications of the biodegradable polymers currently being studied as drug delivery carriers. In addition, the use of nanosystems to solve current drug delivery problems are reviewed.

Edgar Marin, Maria Isabel Briceño, Catherina Caballero-George. International Journal of Nanomedicine, 2013, In press.

MS/MS networking guided analysis of molecule and gene cluster families

Don Duy Nguyen, Cheng-Hsuan Wu, Wilna J. Moree, Anne Lamsa, Marnix H. Medema, Xiling Zhao, Ronnie G. Gavilan, Marystella Aparicio, Librada Atencio, Chanaye Jackson, Javier Ballesteros, Joel Sanchez, Jeramie D. Watrous, Vanessa V. Phelan, Corine van de Wiel, Roland D. Kersten, Samina Mehnaz, René De Mot, Elizabeth A. Shank, Pep Charusanti, Harish Nagarajan, Brendan M. Duggan, Bradley S. Moore, Nuno Bandeira, Bernhard Palsson, Kit Pogliano, Marcelino Gutiérrez, and Pieter C. Dorrestein.

Abstract

The ability to correlate the production of specialized metabolites to the genetic capacity of the organism that produces such molecules has become an invaluable tool in aiding the discovery of biotechnologically applicable molecules. Here, we accomplish this task by matching molecular families with gene cluster families, making these correlations to 60 microbes at one time instead of connecting one molecule to one organism at a time, such as how it is traditionally done. We can correlate these families through the use of nanospray desorption electrospray ionization MS/MS, an ambient pressure MS technique, in conjunction with MS/MS networking and peptidogenomics. We matched the molecular families of peptide natural products produced by 42 bacilli and 18 pseudomonads through the generation of amino acid sequence tags from MS/MS data of specific clusters found in the MS/MS network. These sequence tags were then linked to biosynthetic gene clusters in publicly accessible genomes, providing us with the ability to link particular molecules with the genes that produced them. As an example of its use, this approach was applied to two unsequenced Pseudoalteromonas species, leading to the discovery of the gene cluster for a molecular family, the bromoalterochromides, in the previously sequenced strain P. piscicida JCM 20779T. The approach itself is not limited to 60 related strains, because spectral networking can be readily adopted to look at molecular family–gene cluster families of hundreds or more diverse organisms in one single MS/MS network. **Don Duy Nguyen, Cheng-Hsuan Wu, Wilna J. Moree, Anne Lamsa, Marnix H. Medema, Xiling Zhao, Ronnie G. Gavilan, Marystella Aparicio, Librada Atencio, Chanaye Jackson, Javier Ballesteros, Joel Sanchez, Jeramie D. Watrous, Vanessa V. Phelan, Corine van de Wiel, Roland D. Kersten, Samina Mehnaz, René De Mot, Elizabeth A. Shank, Pep Charusanti, Harish Nagarajan, Brendan M. Duggan, Bradley S. Moore, Nuno Bandeira, Bernhard Ø. Palsson, Kit Pogliano, Marcelino Gutiérrez, and Pieter C. Dorrestein. PNAS Early Edition, in press (2013).**

Molecular Epidemiology and Genetic Variation of Pathogenic Vibrio parahaemolyticus in Peru

Ronnie G. Gavilan, Maria L. Zamudio, Jaime Martinez-Urtaza.

Abstract

Vibrio parahaemolyticus is a foodborne pathogen that has become a public health concern at the global scale. The epidemiological significance of V. parahaemolyticus infections in Latin America received little attention until the winter of 1997 when cases related to the pandemic clone were detected in the region, changing the epidemic dynamics of this pathogen in Peru. With the aim to assess the impact of the arrival of the pandemic clone on local populations of pathogenic V. parahaemolyticus in Peru, we investigated the population genetics and genomic variation in a complete collection of non-pandemic strains recovered from clinical sources in Peru during the pre- and post-emergence periods of the pandemic clone. A total of 56 clinical strains isolated in Peru during the period 1994 to 2007, 13 strains from Chile and 20 strains from Asia were characterized by Multilocus Sequence Typing (MLST) and checked for the presence of Variable Genomic Regions (VGRs). The emergence of O3:K6 cases in Peru implied a drastic disruption of the seasonal dynamics of infections and a shift in the serotype dominance of pathogenic V. parahaemolyticus. After the arrival of the pandemic clone, a great diversity of serovars not previously reported was detected in the country, which supports the introduction of additional populations cohabitating with the pandemic group. Moreover, the presence of genomic regions characteristic of the pandemic clone in other non-pandemic strains may represent early evidence of genetic transfer from the introduced population to the local communities. Finally, the results of this study stress the importance of population admixture, horizontal genetic transfer and homologous recombination as major events shaping the structure and diversity of pathogenic V. parahaemolyticus.

Gavilan RG, Zamudio ML, Martinez-Urtaza J. (2013) Molecular epidemiology and genetic variation of pathogenic Vibrio parahaemolyticus in Peru. PLOS Neglected Tropical Diseases. 7(5):e2210, in press (2013).

Factors associated to depression in renal transplant recipients in Panama

Vivian Vásquez, Nelson Novarro, Régulo A. Valdés, Gabrielle B. Britton.

Abstract

Aim: High rates of affective disorders have been reported in kidney transplant recipients treated for end-stage renal disease. Latin America has experienced a significant increase in transplant activity in recent decades, but there is a dearth of data regarding psychosocial issues following kidney transplantation. The aim of this study was to measure the prevalence of depression and the demographic factors associated to depression among renal transplant recipients in Panama.

Materials and Methods: This cross-sectional study was conducted between March and May 2010 in a hospital setting during routine outpatient evaluations. The study included 119 renal transplant recipients (58 males, 61 females). Depressive symptoms were measured using the self-report Hospital Anxiety and Depression Scale and diagnoses were established by a trained psychiatrist using the Mini-International Neuropsychiatric Interview. Regression models were used to explore the association between depression and sociodemographic variables.

Results: The prevalence of depression was 11.8% among transplant recipients. Linear regression indicated that the presence of an anxiety disorder, increasing age, and lower education levels were significantly and independently associated with depressive symptoms. Logistic regression analysis confirmed that anxiety and a perception of negative social support significantly increased the likelihood of depression.

Conclusions: These findings have important clinical implications. Depression after kidney transplantation has been shown to affect health outcomes adversely. Our results underscore the need to assess depressive symptoms as well as other affective disorders as part of the screening and treatment of renal transplant patients in Panama.

Vivian Vásquez, Nelson Novarro, Régulo A. Valdés, Gabrielle B. Britton. Ind.J.Psychiatry 2013, In Press.

Anti-phospholipid IgM antibody response in acute and chronic Mycobacterium tuberculosis mouse infection model.

Goodridge A, Zhang T, Miyata T, Lu S, Riley LW.

Abstract

INTRODUCTION:

The clinical management of tuberculosis (TB) could be greatly improved by an affordable biomarker test to monitor treatment response. Here, we examined changes in IgM antibody response to lipids as a potential biomarker for monitoring TB treatment in an experimental mouse model.

METHODS:

We performed ELISA to investigate changes in IgM antibody response against cardiolipin (CL), phosphatidylcholine (PTC), phosphatidylethanolamine (PE), phosphatidylinositol (PI) and sphingolipid (SL) in BALB/c mice that were treated after being infected with Mycobacterium tuberculosis for 4 weeks (acute infection) and 20 weeks (chronic infection). Cytokine levels (IL-5, IL-10, IFNγ, MCP-1) in lung and spleen homogenates as well as in blood were also compared.

RESULTS:

In both acutely and chronically-infected mice, lungs were sterilized of M. tuberculosis infection after 8 weeks of treatment. The IgM response to CL, PTC, PE, PI, and SL were consistently elevated throughout the course of infection in chronically-infected mice compared to acutely-infected mice. In acutely-infected mice, the IgM antibody response against cardiolipin (CL) significantly decreased after 8 weeks of treatment, but not against other lipids.

In chronically-infected mice, the IgM response showed no significant changes against any of the lipids after 8 weeks of treatment. Of the cytokines examined, only MCP-1 levels in lungs decreased significantly after treatment.

CONCLUSION:

These findings demonstrate that anti-lipid IgM antibody can remain elevated in chronically-infected mice, but with treatment, only anti-CL IgM antibody levels decreased together with M. tuberculosis bacterial burden in acutely-infected mice. Treatment did not affect anti-lipid IgM levels in chronically-infected mice. **Goodridge A, Zhang T, Miyata T, Lu S, Riley LW. The Clinical Respiratory Journal, 2013, in press.**

Serum samples can be substituted by plasma samples for the diagnosis of paratuberculosis.

Goodridge A, Correa R, Castro P, Escobar C, de Waard JH.

Abstract

Employing plasma samples rather than serum samples for serological paratuberculosis diagnosis is practical, especially when bovine TB is assessed in the same cattle herd with the gamma interferon bovine avian (IFN-γ BA) test. We demonstrate that antibody titers in serum and plasma samples, utilizing the PARACHECK® ELISA kit, are highly comparable (Cohen's kappa test, k=0.955). We conclude that serum can be replaced with plasma in this commercially available antibody detection assay resulting in working hour savings for sampling and blood sample work-up and cost reductions for materials and sample storage.

Goodridge A, Correa R, Castro P, Escobar C, de Waard JH. Preventive Veterinary Medicine, 2013, In Press.

Electrical polarization of Titanium surfaces for the Enhancement of osteoblast differentiation.

Rolando A. Gittens, Rene Olivares-Navarrete, Robert Rettew, Robert J. Butera, Faisal Alamgir, Barbara D. Boyan, and Zvi Schwartz.

Abstract

Electrical stimulation has been used clinically to promote bone regeneration in cases of fractures with delayed union or nonunion, with several in vitro and in vivo reports suggesting its beneficial effects on bone formation. However, the use of electrical stimulation of titanium (Ti) implants to enhance osseointegration is less understood, in part because of the few in vitro models that attempt to represent the in vivo environment. In this paper, the design of a new in vitro system that allows direct electrical stimulation of osteoblasts through their Ti substrates without the flow of exogenous currents through the media is presented, and the effect of applied electrical polarization on osteoblast differentiation and local factor production was evaluated. A custom-made polycarbonate tissue culture plate was designed to allow electrical connections directly underneath Ti disks placed inside the wells, which were supplied with electrical polarization ranging from 100 to 500 mV to stimulate MG63 osteoblasts. Our results show that electrical polarization applied directly through Ti substrates on which the cells are growing in the absence of applied electrical currents may increase osteoblast differentiation and local factor production in a voltage-dependent manner.

Rolando A. Gittens, Rene Olivares-Navarrete, Robert Rettew, Robert J. Butera, Faisal Alamgir, Barbara D. Boyan, and Zvi Schwartz. Bioelectromagnetics (BEMS), 2013, in press.

First record of Gymnotus henni (Albert, Crampton & Maldonado, 2003) in Panama: phylogenetic position and electric signal characterization.

Fernando Alda, Sophie Picq, Luis Fernando De León, Rigoberto González, Henriette Walz, Eldredge Bermingham, Rüdiger Krahe

Abstract

We present the first record of the weakly electric fish, Gymnotus henni, in Panama, which also represents the first record of Gymnotus in the Pacific slope of the country. One specimen was collected in a tributary of the Chucunaque River in the Tuira basin. The species showed a monophasic electric organ discharge. Molecular analyses indicated that G. henni from Panama and Colombia are closely related and represent an independent and basal lineage to the Central American G. cylindricus and South American G. carapo groups. Evolutionary and biogeographic implications are discussed.

Fernando Alda, Sophie Picq, Luis Fernando De León, Rigoberto González, Henriette Walz, Eldredge Bermingham, Rüdiger Krahe. Checklist 9, 2013, 9:655-659.

Depredación de arañas hacia visitantes florales y herbívoros, balance entre mutualismo y antagonismo

Mariana Tadey, Roger Ayazo, Farah Carrasco-Rueda, Yuliana Christopher, Marisol Domínguez, Giomara La Quay-Velázquez & Miriam San José.

Abstract

Spider predation on fl oral visitors and herbivores, balance between mutualism and antagonism: Spiders-plant interactions are usually complex and affect their host plants in multiple ways. The lynx spider Peucetia viridans camoufl ages to hunt fl ower visitors and herbivores potentially reducing the levels of herbivory and reproduction of their host plant. Plus, these green spiders are usually associated with plant species presenting trichomes, which usually facilitate the spider predation. We determined the balance of this double interaction on the forb Ruellia nudifl ora in a dry forest of Costa Rica. In three different sites we performed an experiment changing the spider color to red to determine whether the increment on the spider detectability affects pollinators visitation frequency. We also estimated spider, pollinators and herbivores abundance and the levels of herbivory, trichomes density and fruit set. The presence of the spider was not associated to a decrease in pollinators visitation or fruit set. Spiders were associated to plants with low trichomes density. Herbivory was higher in plants with spiders than in plant without them, however, plants with low herbivory level and without spiders presented higher trichomes density. Sites differed in their assemblages of pollinators and herbivores but this did not affect the interactions studied. This is the fi rst study showing that the spider P. viridans is associated with plants of the same species with low trichome density. If this spider affects pollinators visitations, the adaptive value of trichomes would be double; they reduce herbivory and repel the presence of pollinators predators. These results highlight the relevance of studying both mutualistic and antagonistic interactions to determine their relative importance.

Mariana Tadey, Roger Ayazo, Farah Carrasco-Rueda, Yuliana Christopher, Marisol Domínguez, Giomara La Quay-Velázquez & Miriam San José. Ecología Austral, 2013, In Press.

Randomized, Double-Blinded, Phase 2 Trial of WR 279,396 (Paromomycin and Gentamicin) for Cutaneous Leishmaniasis in Panama.

Sosa N, Capitán Z, Nieto J, Nieto M, Calzada J, Paz H, Spadafora C, Kreishman-Deitrick M, Kopydlowski K, Ullman D, McCarthy WF, Ransom J, Berman J, Scott C, Grogl M.

Abstract

In this randomized, double-blinded Phase 2 trial, 30 patients with Leishmania panamensis cutaneous leishmaniasis were randomly allocated (1:1) to receive once daily topical treatment with WR 279,396 (15% paromomycin + 0.5% gentamicin) or Paromomycin Alone (15% paromomycin) for 20 days. The index lesion cure rate after 6 months follow-up was 13 of 15 (87%) for WR 279,396 and 9 of 15 (60%) for Paromomycin Alone (P = 0.099). When all treated lesions were included, the final cure rate for WR 279,398-treated patients was again 87%, but the final cure rate for Paromomycin Alone-treated patients was 8 of 15 (53.3%; P = 0.046). Both creams were well tolerated with mild application site reactions being the most frequent adverse event. The increased final cure rate in the WR 279,396 group in this small Phase 2 study suggests that the combination product may provide greater clinical benefit than paromomycin monotherapy against L. panamensis cutaneous leishmaniasis.

Sosa N, Capitán Z, Nieto J, Nieto M, Calzada J, Paz H, Spadafora C, Kreishman-Deitrick M, Kopydlowski K, Ullman D, McCarthy WF, Ransom J, Berman J, Scott C, Grogl M. Am J Trop Med Hyg. 2013, In Press.

Novel genetic diversity within Anopheles punctimacula s.l.: Phylogenetic discrepancy between the Barcode cytochrome c oxidase I (COI) gene and the rDNA second internal transcribed spacer (ITS2).

Jose R. Loaiza, ME. Scott, E. Bermingham, OI. Sanjur, JR. Rovira, LC. Dutari, YM. Linton, S. Bickersmith, JE. Conn.

Abstract

Anopheles punctimacula s.l. is a regional malaria vector in parts of Central America, but its role in transmission is controversial due to its unresolved taxonomic status. Two cryptic species, An. malefactor and An. calderoni, have been previously confused with this taxon, and evidence for further genetic differentiation has been proposed. In the present study we collected and morphologically identified adult female mosquitoes of An. punctimacula s.l. from 10 localities across Panama and one in Costa Rica. DNA sequences from three molecular regions, the three prime end of the mitochondrial cytochrome c oxidase I gene (3′ COI), the Barcode region in the five prime end of the COI (5′ COI), and the rDNA second internal transcribed spacer (ITS2) were used to test the hypothesis of new molecular lineages within An. punctimacula s.l. Phylogenetic analyses using the 3′ COI depicted six highly supported molecular lineages (A-F), none of which was An. malefactor. In contrast, phylogenetic inference with the 5′ COI demonstrated paraphyly. Tree topologies based on the combined COI regions and ITS2 sequence data supported the same six lineages as the 3′ COI alone. As a whole this evidence suggests that An. punctimacula s.l. comprises two geographically isolated lineages, but it is not clear whether these are true species. The phylogenetic structure of the An. punctimacula cluster as well as that of other unknown lineages (C type I vs C type II; D vs E) appears to be driven by geographic partition, because members of these assemblages did not overlap spatially. We report An. malefactor for the first time in Costa Rica, but our data do not support the presence of An. calderoni in Panama.

Jose R. Loaiza, ME. Scott, E. Bermingham, OI. Sanjur, JR. Rovira, LC. Dutari1, YM. Linton, S. Bickersmith, JE. Conn. Acta Tropica, 2013, in press.

SMALL-SCALE GENETIC STRUCTURE OF *CERASTODERMA GLAUCUM* IN A LAGOONAL ENVIRONMENT: POTENTIAL SIGNIFICANCE OF HABITAT DISCONTINUITY AND UNSTABLE POPULATION DYNAMICS

Carlos Vergara-Chen, Mercedes González-Wangüemert, Concepción Marcos and Ángel Pérez-Ruzafa.

Abstract

Environmental heterogeneity in coastal lagoons is expected to facilitate local adaptation in response to different ecological conditions, causing significant genetic structuring within lagoon populations at a small scale and also differentiation between lagoons. However, these patterns and processes of genetic structuring are still poorly understood. The aims of our study were (1) to seek genetic structure at a small scale in Cerastoderma glaucum inside the Mar Menor coastal lagoon using a mitochondrial DNA marker (COI) that has previously detected genetic differentiation inside the lagoon in other species and (2) to evaluate the influence of extreme environmental conditions and habitat discontinuity on its genetic composition. The results indicate high levels of haplotype diversity and low values of nucleotide diversity. COI data provide evidence of significant population differentiation among some localities within the lagoon. Limited gene flow and unstable population dynamics (i.e. fluctuations in population size caused by local extinction and recolonization), probably due to the high environmental heterogeneity, could generate the small-scale genetic divergence detected between populations within the lagoon.

Carlos Vergara-Chen, Mercedes González-Wangüemert, Concepción Marcos and Ángel Pérez-Ruzafa. Journal of Molluscan Studies, 2013, In Press.

Thursday the 16th of May 2013, the US-Television team in Panama attended an important meeting with Dr. Jagannatha Rao, Director of Scientific Research, High Technology, and Services Institute in Panama (INDICASAT, in Spanish). Dr Rao is a member of some of the most important scientific journals in his field. He is an advisory member of some organizations, and a Editorial Board member for Open Pathology Journal (with recent patents in drug discovery), Guest Editor for two issues of International Journal of Alzheimer´s Disease, Scientific Advisor to School of Pharmacy of Fudan University (China), Adjunct Faculty to UTHS (Houston, USA), and Advisor to Biotech innovation (India).

Dr. Rao explained the history of INDICASAT. The Institute was created in 2002 by the National Secretariat of Science, Technology and Innovation (SENACYT, in Spanish) to promote the development of science in Panama, based on the premise that scientific advances from a country is crucial to its economic and cultural development.

The Institute has one of the most complete research infrastructures in Central America in areas of chemistry and biology. Additionally, it has researchers and specialized technicians with expertise in critical areas of biomedical research. In recent years, it has generated a significant number of scientific publications, theses, internships, along with many other achievements. The two main strategic objectives of INDICASAT are: the generation of scientific knowledge in areas of interest to the country, and training of highly qualified personnel. All this is completed through scientific research in biomedicine and other related science fields accompanied by the transfer of technology and technological services.

INDICASAT has mainly four different research centers: the Excellency Drug Discovery Center (CEDD in Spanish), the Neuroscience Center, the Center for Molecular and Cellular Biology of Disease, and the Clinical Research and Translational Medicine. Dr Jagannatha Rao explained the functions and projects developed by each of them.

The Excellency Drug Discovery Center (CEDD in Spanish) was created with the aim of finding new molecules with potential for drug development from the Panamanian marine biodiversity. CEDD's mission is to become the leading drug discovery in Panama and the entire Latin American region, specifying a partnership between universities, government, and industry to integrate research, development, and commercialization of natural products.
The Neuroscience Center investigates cognition, the brain and behavior from multiple perspectives on a methodological basis. These include experimental psychology, neurobiology, neuropsychology, neuro-anatomy, and molecular biology. Current projects include studying cellular and the neurochemical bases of various forms of learning and memory, and intelligence and neuropsychological factors in children as well as indigenous populations. Other fields of study that must be highlighted are research in pediatric depression, neurodegenerative animal models, biomarkers for depression, Alzheimer´s, Parkinson´s, nutrition and the brain, and protein and DNA dynamics in ageing brain.

The Center for Molecular and Cellular Biology of Disease is dedicated to research in the area of parasitological, immunology, genetics, and molecular biology of tropical diseases. The Center develops projects and programs such as studies of genetic epidemiology and molecular biology of Leishmania. These projects are exploring new ways to attack malaria, research projects in corals natural compounds to treat inflammatory processes in Alzheimer's, and research projects on improving the diagnosis, treatment, and control of tuberculosis in Panama.

The Clinic of Research and Translational Medicine is a department within INDICASAT-AIP to support the conduct of clinical trials of several sponsors in various therapeutic areas. This pertains to building research teams, providing clinical research services, and providing support in principal investigations. The unit also coordinates clinical epidemiology studies which evaluate the characteristics and clinical epidemiology of particular diseases. "With these studies we can determine the impact of vaccines used in the expanded program for immunization in the country in

terms of existing vaccines and time trends in the incidence of various diseases."
According to Dr. Rao, some of the research projects that are being developed in INDICASAT are considered of high risk. However, due to the success of the previous research and studies, as well as the amount of scientific papers published (45 in 2012), the institute receives important grants from international organizations such as IFS, NIH, EU, SENACYT, Bill & Melinda Gates' Foundation, and also directly from countries like India.
Most of the people from the research teams of INDICASAT have received international recognition. For example Dr. Gabrielle Britton (elected as Fellow of Association of Biotechnology and Pharmacy (India) and also invited as Scientific Advisor to City of Knowledge, adjunct faculty to FSU), Dr. Carmenza Spadafora (elected as Board of Director´s of ICGEB (Italy) for 3 years, Fellow of Association of Biotechnology and Pharmacy (India) and TED speaker, Examiner for University India, US Army Clinical trial recognitions, Invited speakers toree International Meetings, Bill & Melinda Gates' Foundation grant), Dr. Ricardo Lleonart (invited as an examiner to evaluate Ph.D thesis of Acharya Nagarjuna University (India) and also Welcome trust travel award), Dr. Catherina Caballero (winner of TWAS-APANAC-2011 award) and Dr. Marcelino Gutierrez (invited speaker in Mexico and also won TWAS-OLAC Young Scientist speakership award-2011).
Finally, our interview and visit finished with an interesting tour, in which Dr. Jagannatha Rao showed us all the facilities of INDICASAT as well as the new building that is being built to widen the whole capacity of the complex. He introduced us to all the different research teams working within the institute. We were also given an INDICASAT Times issue, a monthly publication source of achievements and events of the Institute, as well as courtesy gifts and an unforgettable experience thanks to our host, Dr. Jagannatha Rao.
http://www.us-television.tv/articles/indicasat

DECCAN HERALD

‘Female sperm’ and ‘male eggs’ may be possible

Breaking News

Researchers have suggested that it may be possible in the future to create sperm from women and eggs from men - a feat, that if achieved, could revolutionise infertility treatments.
Katsuhiko Hayashi of Kyoto University in Japan and his senior professor Mitinori Saitou used skin cells from mice to create primordial germ cells or PGCs. PGCs are the common precursor of both male and female sex cells. These cells were then developed into both sperm and eggs. Scientists used these to create live-births via in vitro fertilisation.

The technique offers numerous possibilities for reproductive medicine. It may allow infertile women to have babies by creating eggs from their skin cells, and also make it possible for sperm and eggs cells to be created from either males or females, ‘The Independent’ reported.
In the technique, pluripotent stem cells were extracted from early-stage embryos and somatic cells, and were then converted into PGCs using signalling molecules.
These germ cells were transplanted into the ovaries and testes of living mice to develop. Once these cells were mature they were extracted and used to fertilise one another in vitro.
The initial research took place in October last year, with researchers claiming that the live-births were merely a ‘side effect’ of the research to demonstrate that the creation of PGCs had been successful.
Other researchers have replicated the production of PGCs but could not succeed in producing live births. The scientists involved also have many other hurdles to overcome including the production of ‘fragile’ and ‘misshapen’ eggs, wrote David Cyranoski in ‘Scientific American’.

The Japanese team is now working on monkey embryos and believe they could repeat the mouse work in monkeys within 5–10 years, with the creation of human PGCs following shortly after.

While making PGCs for infertility treatment will be a huge jump, many scientists are urging caution as embryonic stem cells frequently pick up chromosomal abnormalities, genetic mutations and epigenetic irregularities during culture.
Hayashi has also said that a viable infertility treatment could be 10 or even 50 years in the future.
“My impression is that it is very far away. I don’t want to give people unfeasible hope,” he said.

Talleres, Cursos, Diplomados:

- Bioinformática.
- Técnicos de Laboratorio y cultivo de células.
- Técnicas de Genómica.
- Biodiversidad.
- Nutrición.
- Tecnología Animal.
- Buenas Prácticas Clínicas.
- Bioética.
- Otros.

Servicios:

- Consultoría Ambiental.
- Prueba de Laboratorio Bovina de Tuberculosis.
- Monitoreo de Calidad de Agua.
- Espectometría de masas.
- Instrumentación Analítica (MALDI-TOF, MS/MS, NMR).
- Asesoría Técnica de Equipos de Laboratorio.
- Otros.

Investigaciones:

Búsqueda de la cura o tratamiento para la Malaria, Leishmaniasis, Dengue, enfermedades neurodegenerativas como el Alzheimer, trastornos mentales, patologías del sistema nervioso e investigación clínica.

LUGAR: Salón de INDICASAT AIP, Cayton, Ciudad del Saber, Edif. 219, Panamá, Rep. de Panamá

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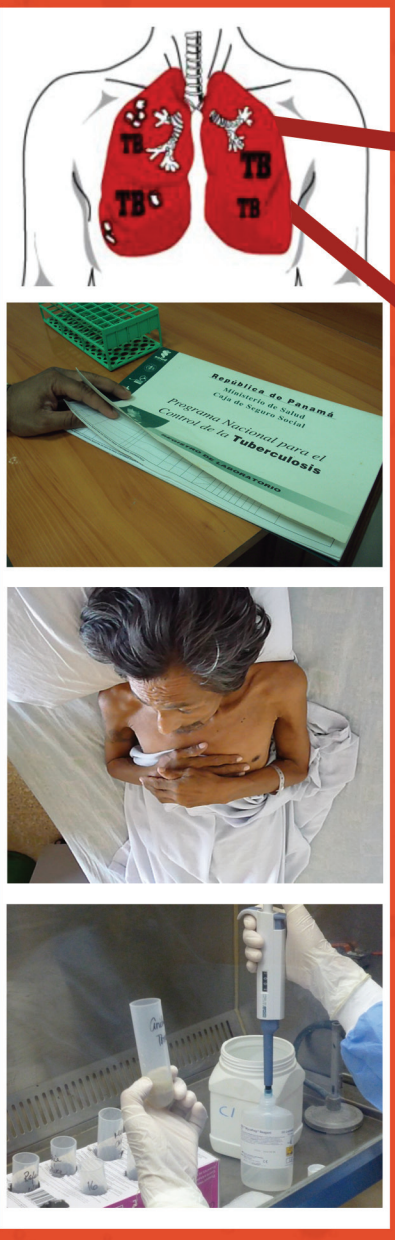
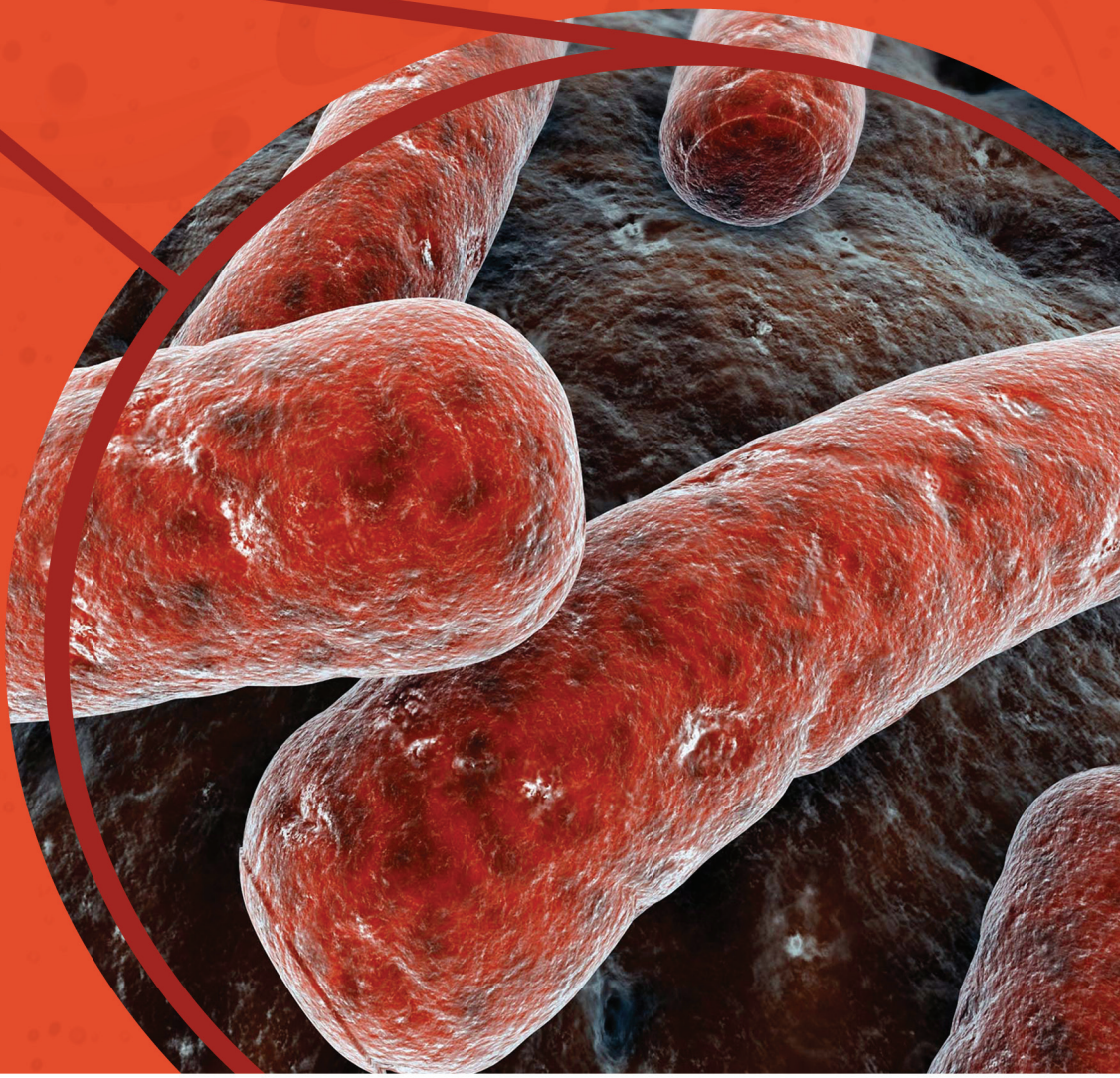
Foro: Actualización, Experiencias y Avances en Tuberculosis de la Región de Salud de Colón

"Acabemos con la TB en nuestra generación"

10 y 11 de octubre del 2013

Colón, Provincia de Colón





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La Dra. Catherina Caballero participó del Curso Teórico-Práctico sobre Células Madre y Terapias Celulares, dictado en la Fundación Instituto Leloir y subvencionado por el Centro Argentino-Brasileño de Biotecnología, desde 08 Julio hasta 19 Julio 2013. La aplicación para estos cursos se hace a través de una convocatoria internacional abierta y pública por la Comisión para el Desarrollo Científico y Tecnológico de Centroamérica, Panamá y República Dominicana (CTCAP), quién asigna el cupo según concurso entre los participantes de cada país miembro. El objetivo del curso fue el de reforzar los conceptos fundamentales relacionados a la manipulación de células madre o tronco, su caracterización biológica, los mecanismos moleculares involucrados en el mantenimiento de su pluripotencia y sus aplicación en el tratamiento de enfermedades hepáticas, neurodegenerativas, cardiovasculares y como vehículo para la transferencia genética. El curso fue dado por investigadores que trabajan directamente en la aplicación de células madre para tratar la cirrosis hepática, el infarto del miocardio, los trasplantes de médula ósea y en terapia génica en la enfermedad de Parkinson. Además ha sido invitada al Simposio de Buceo Científico Internacional que se celebrará el próximo 23 de octubre al 27 de 2013.

La Dra. Britton fue invitada a la EU-LAC Health - Enfermedades neurológicas y accidentes cerebrovasculares que se llevará a cabo del 15 hasta 18 octubre, 2013.

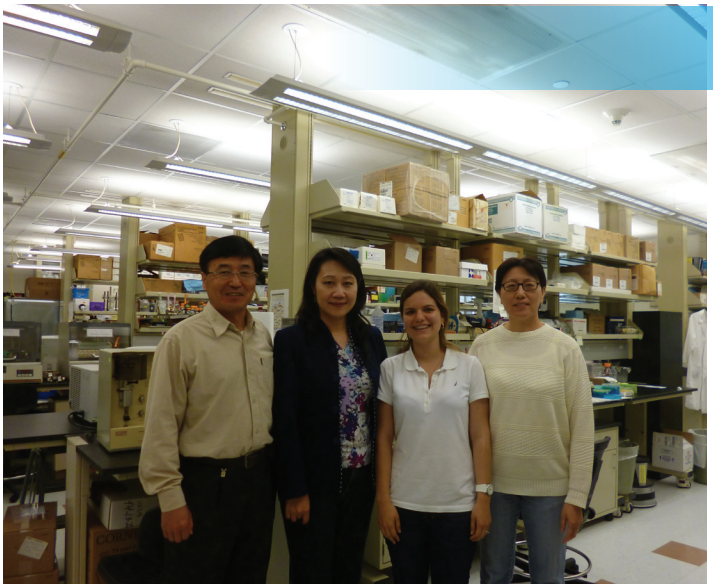
Felicidades

Carol Enith Vásquez Saldaña fue selecciona por IBRO LARC Short Stay Funding program. Ella estará de visita en el laboratorio del Dr. Fornaguera en Costa Rica en septiembre del 2013. Ella es el primer panameño en obtener este premio.

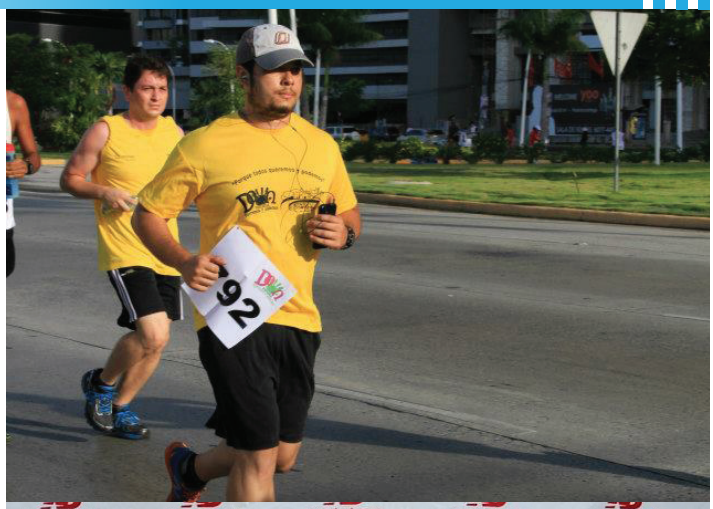
La Dra. Catherina Caballero fue invitada como oradora en el Simposio de Buceo Científico Internacional que se celebrará desde el 23 al 27 de octubre de 2013.

El Abstract del Estudiante Carlos M. Restrepo fue seleccionado para el Thinking Box Program en Brasil en el Congreso Mundial 2013. Es una oportunidad única para exponer la innovación de su trabajo.

El Dr. Omar López fue invitado como orador en el taller de la FAO, en Turrialba, Costa Rica en mayo de 2013.



De izq a derecha salen:
Junling Gao, Ping Wu, Deborah Doens y Tiffany Dunn
La estudiante de Ph.D. Débora Doens, asistió a una capacitación en Galveston en la Universidad de Texas Medical Branch (UTMB) en el Departamento de neurociencias, en el laboratorio: Wu lab. Bajo la guía de la Dra. Ping Wu.



Los estudiantes de Ph.D. Carolina De La Guardia, Dioxelis López, Alcibiades Villarreal, el técnico Ricardo Cossio y Jacob Ricca corrieron tres carreras de 5 kilómetros, Organizada por TV Max, New Balance 5K y en la Cinta Costera.

Felicidades

Se invitó al Dr. Armando Durant a ser miembro del Consejo Editorial de la revista "Tecnociencia". Esta revista se publica en español, y es la revista más antigua y más importante publicada en español en Panamá, que se ocupa de la ciencia y la investigación tecnológica. El Dr. Juan Jaén es actualmente el Presidente de la Junta Editorial.

El Dr. Mahabir Gupta forma parte del Consejo Editorial de Medicina Complementaria y Alternativa Basada en la Evidencia. Es una revista internacional, revisada por expertos, que busca comprender las fuentes y fomentar la investigación rigurosa en este nuevo pero antiguo mundo de la medicina complementaria y alternativa. La revista se publica desde 2004, y el más reciente factor de impacto de la evidencia basada en la medicina complementaria y alternativa es 1.722 según el Journal Citation Reports 2012 publicado por Thomson Reuters (ISI) en 2013.

El INDICASAT, a través del Centro de Biodiversidad y Descubrimiento de Drogas, tomo parte en el Curso ***"Introducción a las Investigaciones de Biología de Campo"*** popularmente conocido entre los estudiantes e instructores como el ***"Curso de Gigante".*** Este curso, con una tradición de mas de 20 años en Panamá brinda a estudiantes panameños y de la región la oportunidad de observar, preguntar, investigar y comunicar resultados sobre el estudio de fenómenos naturales en el bosque tropical húmedo y en los cuerpos de agua asociados. El curso conto con la participación de 16 estudiantes (11 panameños (Universidad de Panamá y Universidad Marítima Internacional de Panamá, y 5 centro-americanos incluyendo estudiantes de El Salvador, Nicaragua y Costa Rica). El curso se realizo del 27 de julio hasta el 10 de agosto en las instalaciones del STRI en Gamboa, Isla de Barro Colorado y en Galeta en el Caribe. Los científicos e estudiantes de INDICASAT que participaron fueron: Dr. José Loaiza, Ph.D. Student

Larissa Dutari, Dr. Luis Fernando De León, Dr. Hermógenes Fernández y el Dr. Omar López y la Investigadora Visitante Dra. Carolina Puerta. El curso fue organizado por la Dra. Diana Sharpe, Investigadora Postdoctoral del STRI y Científica Visitante del INDICASAT.

Conferencias

Foto Rita Marissa Giovani

Taller de Investigación e Innovación en los Sistemas Universitarios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universidades oficiales y particulares
del país.


SENACYT
INDICASAT AIP

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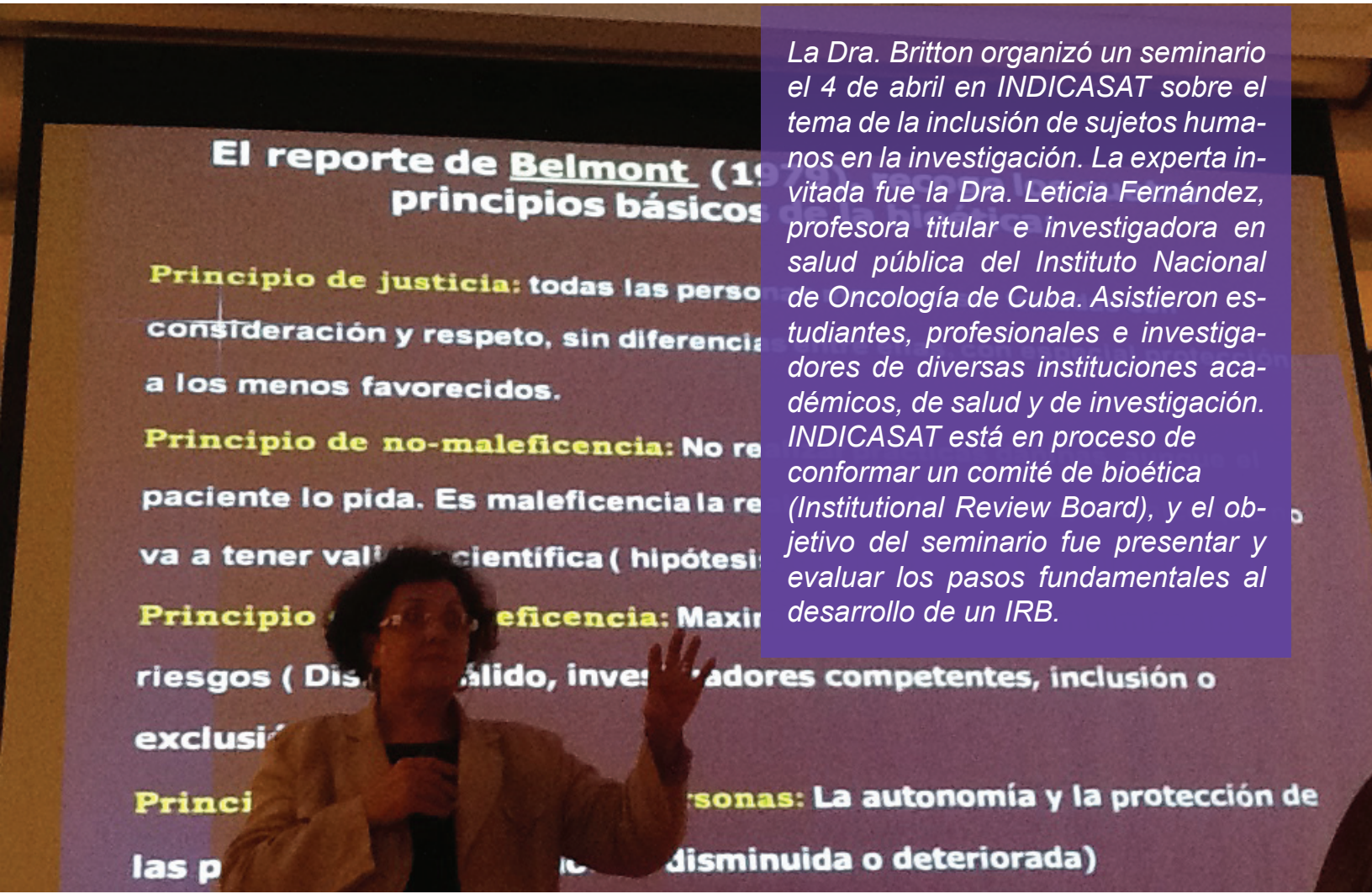
Taller de Introducción a la Estadística y diseño Experimental, dictado por la Dra. Carolina Puerta Piñero.

TALLER DE ESCRITURA CIENTÍFICA: NIVEL INTERMEDIO

Conferencias

Foto Rita Marissa Giovani

Taller de Escritura de Artículos Científicos



La Dra. Britton organizó un seminario el 4 de abril en INDICASAT sobre el tema de la inclusión de sujetos humanos en la investigación. La experta invitada fue la Dra. Leticia Fernández, profesora titular e investigadora en salud pública del Instituto Nacional de Oncología de Cuba. Asistieron estudiantes, profesionales e investigadores de diversas instituciones académicos, de salud y de investigación. INDICASAT está en proceso de conformar un comité de bioética (Institutional Review Board), y el objetivo del seminario fue presentar y evaluar los pasos fundamentales al desarrollo de un IRB.

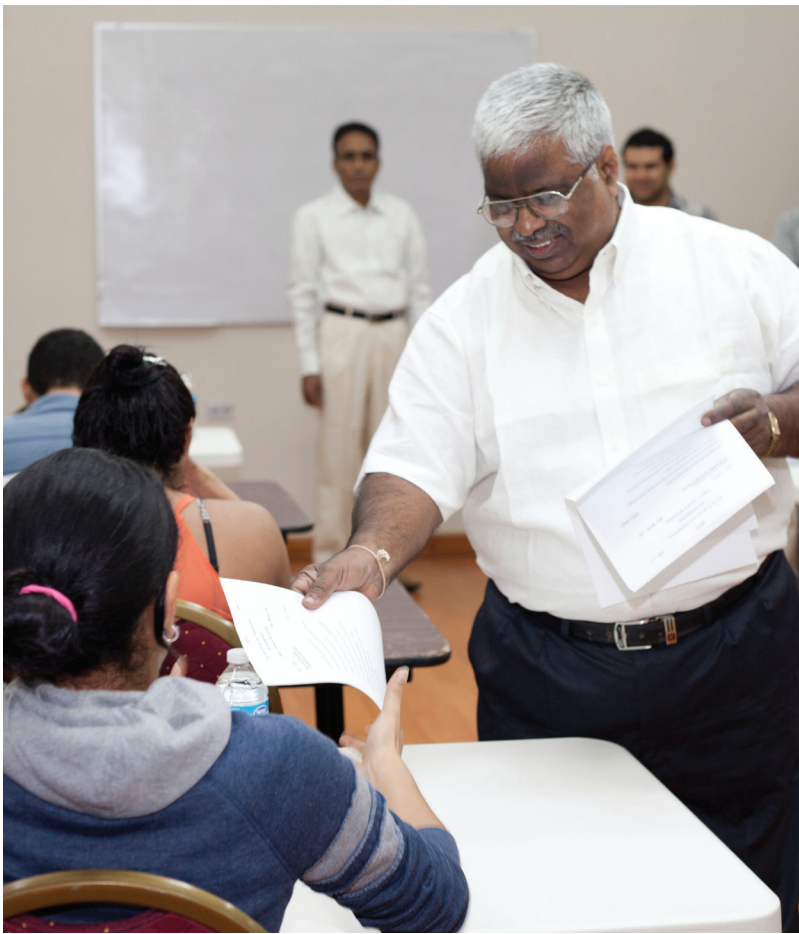
Conferencias

El pasado sábado 29 de junio, de 9 AM-12 PM, en el Hotel Le Meridien (Calle Uruguay y Ave. Balboa) se dio la 3a reunión de avances del proyecto "Características fisiológicas y efectos del envejecimiento en personas mayores de 64 años atendidas en el Servicio de Geriatria del Complejo Hospitalario Dr. Arnulfo Arias Madrid de la CSS". El proyecto es llevado adelante por dos instituciones públicas: el INDICASAT (en la Ciudad del Saber) y el Complejo Hospitalario (CSS). Se contó con la presentación de una charla por el Dr. Baltasar Isaza. Jefe del Servicio de Radiología del complejo Hospitalario de la CSS. Dicha reunion fue patrocinada por la empresa Promed

El lunes 26 de agosto se realizó el seminario "Two approaches to understanding complex systems", a cargo de la Dra. Elaine Reynolds, Departamento de Biología, Lafayette College (Easton, PA)

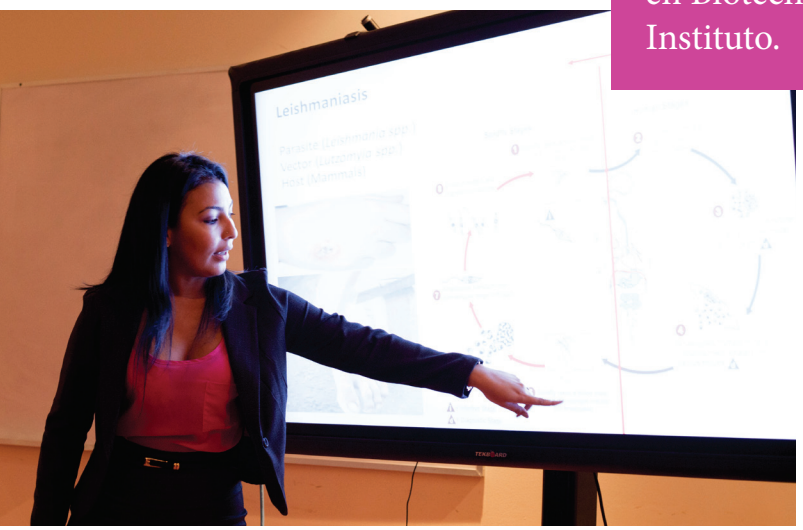
REUNIÓN PARA REVISIÓN DEL SUBSIDIO OTORGADO POR MELO ACERCA DEL ENVEJECIMIENTO CEREBRAL

Segundo Grupo de Estudintes de PhD. Presentando Examen de la Universidad de Nagarguna, de la India.



Vistazo

Presentación de resultados por parte de los estudiantes de Ph.D. en Biotecnología del Instituto.



Molecular Taxonomy and Ecology of Crab - Hole mosquitoes (Culicidae: Deinocerites) in Panama

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The genus Deinocerites is composed of 18 species of Crab – Hole mosquitoes that have been clustered morphologically into five distinct groups (Adames, 1971). Although, the morphological review done by Dr. Abdiel Adames was fundamental, further research is still needed to understand the evolutionary history and phylogenetic relationships among the members of this assemblage. Furthermore, few studies have been carried out to examine larval ecology and none to assess the possibility of cryptic diversification.

We collected adult Deinocerites mosquitoes in five sites along the coasts of Panamá and morphologically identified them using Adames' key. Via PCR and sequencing of the Folmer (Barcode) region of the mtDNA COI gene, we were able to determine the phylogenetic relationships between Deinocerites species found in Panamá. We found that all morphologically identified samples clustered into different groups, similar to those proposed by Adames (1971). However, mosquitoes from two sites in the Atlantic cost

Angie Betancourt, a MHIRT fellow from The University of Texas at El Paso, collects Deino cerites larvae from Crab –holes in Bocas del Toro, western Panama (Photo by L. Dutari).

of Panama that were morphologically identified as Deinocerites cancer clustered separately into two different groupings. These groupings showed values of genetic divergence that were higher than 2% (Based on Kimura 2 parameters mode of evolution) and did not overlap geographically. This finding might suggest that D. cancer could be more than one taxon, contrary to Adames' review, though further work is needed to confirm this outcome.

In 1941, Fisk reported a relationship between the number of larvae of D. mathesoni and the pH of the water in the crab hole. In Bocas del Toro, Western Panama, we sought to determine whether other Deinocerites species may depict the same correlation. We collected larvae and measured both the pH and temperature of the water in the crab holes. We found no relationship between the number of larvae and these abiotic variables, though our results could be confounded by the presence of more than one Deinocerites species in a single hole. Future studies should rear and identify the larvae to determine which species are present and assess the association between abiotic variables and the number of larvae in different species separately.

During my summer internship with Dr. Jose R. Loaiza and his group, I learned laboratory techniques such as DNA extraction, PCR and sequencing. I also learned about mosquito taxonomy and how to identify mosquitoes using a morphological key, something I never thought I would learn to do. Additionally, during our field work in Bocas del Toro, I was able to observe the poor living conditions of people in rural areas of Panamá, and to see the tragic cases of Leishmaniasis in children. I am incredibly grateful for this summer internship; an experience like this would not have been possible if not for the MHIRT program and INDICASAT-AIP.

I am deeply grateful to Dr. Jagannatha Rao and Dr. JR. Loaiza for this fantastic opportunity.

La Junta directiva de INDICASAT AIP visita las instalaciones de los nuevos equipos dentro del Instituto.

Visitas Recientes

La Junta Directiva de INDICASAT AIP visita el nuevo laboratorio de Bioinformática.

Personal del Área de Salúd Animal del MIDA visitó las Instalaciones de INDICASAT.

Visitas Recientes

INDICASAT se hizo presente en la Feria TerraExpo Internacional 2013, que se realizó en ATLAPA del 31 de mayo al 2 de junio.

Visita de Delegación de la Universidad de Panamá, Sede en Chitré.

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