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INSTITUTO DE INVESTIGACIONES CIENTÍFICAS Y SERVICIOS DE ALTA TECNOLOGÍA

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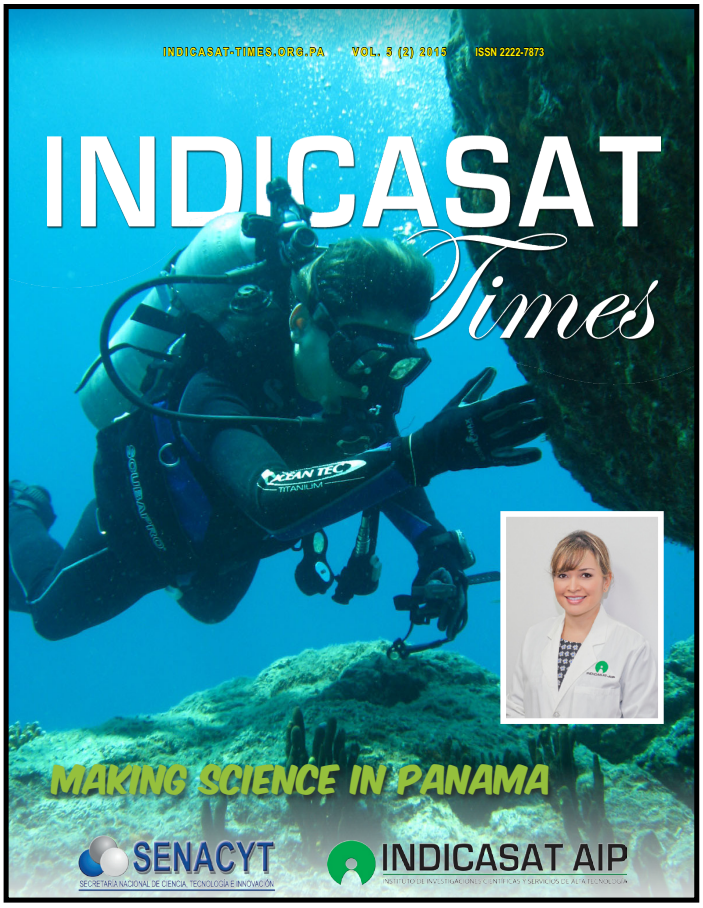

En la Portada / Dra. *Catherina Caballero-George, Investigadora en INDICASAT AIP colectando esponjas en el Parque Nacional Coiba* / Fotografía Edgardo Ochoa.

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INVESTIGACIONES FARMACÉUTICAS EN EL INDICASAT AIP:

EXPLORANDO EL POTENCIAL MEDICINAL DE LA NATURALEZA

PHARMACEUTICAL RESEARCH AT INDICASAT AIP:

EXPLORING NATURE´S MEDICINAL POTENTIAL

By: Catherina Caballero-George, Ph.D.,
Molecular Pharmacology and Pharmacognosy/
Group of Pharmaceutical Research.

La principal fuente de medicamentos ha sido y aún sigue siendo la naturaleza, pues solo un tercio de los medicamentos disponibles actualmente en el mercado provienen de programas de síntesis química basados en diseños aleatorios (Newman *et al.* 2003).

La naturaleza se mantuvo como la única fuente de medicamentos hasta que la tecnología permitió comprender el origen de las enfermedades a niveles sub-celulares, y logró sintetizar sustancias específicamente diseñadas. Sin embargo, a pesar de los avances científicos, la creatividad de la naturaleza diseñando estructuras químicas complejas con propiedades biológicas novedosas, no ha podido ser superada (Montaser & Luesch, 2011). Por ejemplo, el 40% de los productos naturales que se conocen representan estructuras químicas sin precedente, las cuales no han podido ser obtenidas aun por la química sintética. Por lo tanto, sugerir que ya se ha logrado completar todo el conocimiento sobre el potencial medicinal de los productos naturales, y que no hay posibilidad de encontrar innovaciones en esta área de investigación, es un desacierto (Henkel *et al.* 1999).
De hecho, ha sido esta elevada biodiversidad la

Nature has been, and still is, the main source of drugs, since only a third of currently available medicines at the pharmaceutical market come from screening programs based on randomly designed synthetic drugs (Newman *et al.* 2003).

Nature prevailed as the only source of drugs until technology allowed the understanding of the origin of diseases at sub-cellular levels, and was capable to synthesize specially designed substances. Nevertheless, in spite of the scientific advancements, the creativity of nature in designing complex chemical structures with novel biological properties has not yet been defeated (Montaser & Luesch, 2011). For instance, 40% of natural products known so far represent chemical structures without precedent, which has not yet been obtained by synthetic chemistry. Therefore, suggesting that the knowledge about the medicinal potential of natural products has been completed, and that there are no possibilities to find innovations in this area of research, is a mistake (Henkel *et al.* 1999).

In fact, it is this high biodiversity the respon-

Panamá como país de una elevada biodiversidad, terrestre y marina, posee el potencial para proveer de novedosos agentes químicos con propiedades medicinales diversas.

responsable de la rica colección de plantas medicinales que posee la medicina tradicional de Panamá (Caballero-George & Gupta, 2011).

GRUPO DE INVESTIGACIONES FARMACÉUTICAS DEL INDICASAT AIP

El Grupo de Investigaciones Farmacéuticas se formó *ad hoc* para que, bajo un esquema de trabajo internacional y multidisciplinario, se pudieran impulsar en Panamá las áreas de investigación dentro de las Ciencias Farmacéuticas.

Las Ciencias Farmacéuticas estudian el origen, naturaleza, propiedades físico-químicas y biológicas, y técnicas de preparación de medicamentos para su correcto aprovechamiento terapéutico, así como el efecto de éstos en el cuerpo.

sible for the rich collection of medicinal plants that conforms traditional Panamanian medicine (Caballero-George & Gupta, 2011).

Panama as a country of high biodiversity, both terrestrial and marine, has the potential to provide new chemical agents with diverse medicinal properties.

GROUP OF PHARMACEUTICAL RESEARCH AT INDICASAT AIP

The Group of Pharmaceutical Research was formed *ad hoc* in order to, under an international and multidsciplinary working scheme, thrust research within Pharmaceutical

Pharmaceutical Sciences study the origin, nature, physico-chemical and biological properties, and techniques to prepare medicaments for a correct therapeutic benefit, as well as their effects in the body.

Lic. Jessica Bolaños aislando hongos del tejido de las esponjas en el laboratorio portátil.
Jessica Bolaños isolates fungi from the tissue of sponges in a portable laboratory unit.

Dr. José Antonio Cruz colectando esponjas incrustantes en el Área Especial de Manejo del Archipiélago de Las Perlas.
Dr. José Antonio Cruz collecting boring sponges in the Special Zone of Management Las Perlas Archipelago.

Estas ciencias incluyen a la Farmacología (Farmacodinámica y Farmacocinética), Farmacogenética y Farmacogenómica, Toxicología, Química Farmacéutica (Análisis Farmacéutico), Farmacognosia (Etnofarmacología y Fitoquímica) y la Farmacia Galénica (Tecnología Farmacéutica y Biofarmacia).

Cada investigador colaborador ha aportado experticia única en temas que cubren desde nuevos mecanismos moleculares de acción de productos naturales, pasando por el diseño de novedosas nanopartículas que los contienen, hasta incluir el desarrollo de los métodos analíticos para el aseguramiento de su calidad. Sumado a esto, y gracias a la contribución de expertos taxónomos de plantas, esponjas y hongos, biólogos marinos, ecólogos,

Sciences in Panama.

These sciences include Pharmacology (Farmacodynamic and Pharmacokinetics), Pharmacogenetics and Pharmacogenomics, Toxicology, Pharmaceutical Chemistry (Pharmaceutical Analysis), Pharmacognosy (Ethnopharmacology and Phytochemistry) and Galenics (Pharmaceutical Technology and Biopharmacy).

Each collaborating scientist in this group has

Equipo de científicos en la expedición al Parque Nacional Coiba. De Izq a Der: José Antonio Cruz, Edgardo Ochoa, Catherina Caballero-George, Francis Torres.
Team of scientists on expedition to Coiba National Park. From left to right: José Antonio Cruz, Edgardo Ochoa, Catherina Caballero-George, Francis Torres.

Identificación taxonómica de esponjas marinas en la estación de investigación de STRI en la Isla Colón, Bocas del Toro. Frente: José Antonio Cruz, atrás: Edgardo Ochoa.
Taxonomic identification of marine sponges at STRI´s Marine Station in Colon Island, Bocas del Toro. Front: José Antonio Cruz, back: Edgardo Ochoa.

oceanógrafos y especialistas en genética, ha sido posible contribuir paralelamente con datos valiosos sobre la biodiversidad Panameña.

INVESTIGACIONES FARMACOGNÓSTICAS

La Farmacognosia es la disciplina dentro de las Ciencias Farmacéuticas que estudia la estructura química de los metabolitos secundarios de plantas o animales, su origen metabólico, sus efectos biológicos y toxicológicos a nivel celular, de órgano y sistemas.

El origen de los productos naturales

En los organismos vivos se producen una

contributed with unique expertise in topics covering the discovery of new molecular mechanisms of action of natural products, the design of novel nanoparticles loaded with natural products, and the development of analytical methods for quality control of these products. Additionally, and thanks to the contribution of expert taxonomists of plants, porifera and fungi, marine biologists, ecologists, oceanographers and genetists; it has been possible to contribute in parallel with valuable data on Panamanian biodiversity.

PHARMACOGNOSTIC RESEARCH

Pharmacognosy is the discipline within

Preparación de cultivos líquidos de hongos aislados de esponjas marinas.
Preparation of liquid cultures of sponge-associated fungi.

Hongos aislados de las esponjas marinas.
Fungi isolated from marine sponges.

serie de reacciones bioquímicas que originan sustancias con funciones complementarias al crecimiento y la reproducción (funciones del metabolismo primario). Estas sustancias químicas o "metabolitos secundarios" eran consideradas como productos de desecho hasta que se descubrió que estaban en un estado de equilibrio dinámico íntimamente involucrado a las funciones del metabolismo primario. Se ha demostrado que los metabolitos secundarios juegan un papel importante en la

Pharmaceutical Sciences studying the chemical structure of secondary metabolites from plants or animals, their metabolic origin, their biological and toxicological effects at cellular, organ and systemic level.

The origin of natural products

In living organisms a series of biochemical reactions take place originating substances with complementary functions to growth and reproduction (functions of the primary metabolism). These chemical substances or "secondary metabolites" were originally considered as waste products until it was discovered that they were in a dynamic equilibrium state closely

Ensayo biológico en líneas celulares cultivadas para prueba de los extractos de hongos.
Bio-assay on cultured cell lines to test fungal extracts.

Dra. Catherina Caballero-George midiendo la respuesta celular a los productos naturales.
Dra. Catherina Caballero-George measuring cell responses to natural products

regulación de procesos bioquímicos como la respiración, fotosíntesis y defensa de las plantas (Siegler y Price, 1976).

Cribado de productos naturales cardioprotectores

En el INDICASAT AIP se realizan investigaciones en el área de la Farmacognosia desde el año 2007. Las primeras investigaciones iniciaron con la búsqueda de sustancias de origen marino (esponjas, algas, hongos asociados a esponjas) que tuvieran propiedades antagonistas de los receptores de endotelina ET_A (ET_A) y neuropéptido Y Y_1 (Y_1), los cuales juegan un papel importante en la remodelación vascular. Adicionalmente, el receptor Y_1 es un reconocido blanco farmacológico para tratar la ansiedad y desórdenes psiquiátricos. De esta

related to functions of the primary metabolism. It has been demonstrated that secondary metabolites play a important role in the regulation of biochemical processes like respiration, photosynthesis and defense of plants (Siegler y Price, 1976).

Screening of cardioprotective natural products

Since the year 2007, research in the area of Pharmacognosy has been carried out at INDICASAT AIP. The first investigations began with the search of substances of marine origin (sponges, algae, sponge-associated fungi) as antagonist of endothelin ET_A (ET_A) and neuropeptide Y Y_1 (Y_1) receptors, both receptors involved in vascular remodeling. Additionally, the Y_1 receptor is a known pharmacological

Grupo de investigación de Farmacología Molecular y Bioquímica, VUB, Bélgica. De izq a der: Anja Hofman, Prof. Dr. Patrick Vanderheyden, Mgtr. Ruba Bahem.
Research group of Molecular and Biochemcial Pharmacology, VUB, Belgium. From left to right: Anja Hofman, Prof. Dr. Patrick Vanderheyden, Ruba Bahem.

Grupo de Bioquímica y Biología Molecular, Universidad de Bonn, Alemania. de Izq a Der: Dr. Daniel Jacobs, Dra. Anne Wolf, Dr. Thomas Sorkalla, Dra. Anne Sieben, Dra. Catherina Caballero, Prof. Dr. Hanns Häberlein.
Group of Molecular Biochemistry and Biology, University of Bonn, Germany. From left to right: Dr. Daniel Jacobs, Dr. Anne Wolf, Dr. Thomas Sorkalla, Dr. Anne Sieben, Dr. Catherina Caballero, Prof. Dr. Hanns Häberlein.

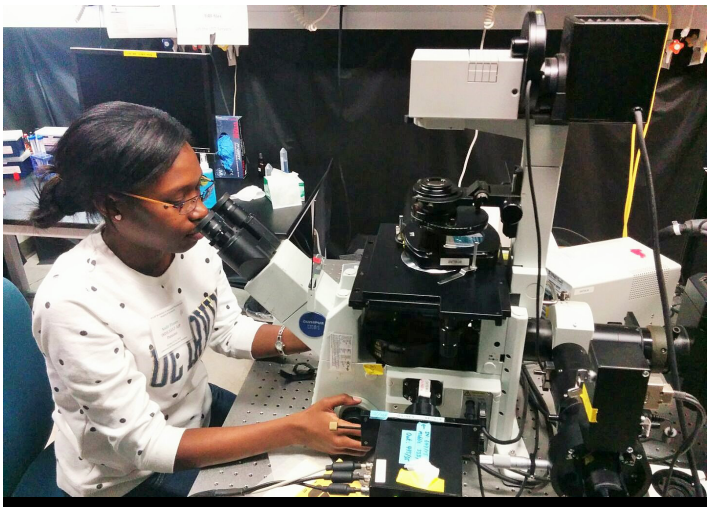
investigación se determinó que los compuestos identificados como norKA, 5,6-dibromo-*N,N*-dimetiltriptamina, 3-hidroxidihidrodiscorhabdina C, discorhabdinas A y C, y sceptrina prevenían la unión del neuropéptido Y a su receptor Y_1, siendo el depsipéptido norKA (obtenido de *Bryopsis pennata*, Hawaii) el más activo (Gao *et al.*, 2009).

Las investigaciones también arrojaron resultados interesantes en cuanto a los hongos aislados de las esponjas marinas colectadas en Panamá. Del estudio realizado en el 2009 se encontraron 6 cepas de hongos activos en una evaluación preliminar de 62 cepas. Los extractos de cinco de estas cepas mostraron afinidad sobre el receptor de ET_A y una sobre el Y_1 (Caballero-George *et al.*, 2010). Experimentos

target to treat anxiety and psiquiatric disorders. From this investigation it was determined that compounds identified as norKA, 5,6-dibromo-N,N-dimethyltryptamine, 3-hydroxydihydrodiscorhabdin C, discorhabdins A and C, and sceptrin prevented neuropeptide Y binding to the Y_1 receptor, and that the depsipeptide norKA (obtained from *Bryopsis pennata*, Hawaii) was the most active compound (Gao *et al.*, 2009).

These investigations also produced interesting results regarding fungi isolated from marine sponges collected in Panama. From the study carried out in 2009, six strains of active fungi were selected out of 62 strains in a preliminary screening. The extracts of five of these strains showed affinity to the ET_A receptor and one to

Prof. Dr. Enrico Gratton fundador del Laboratory for Fluorescence Dynamics (LFD) de la Universidad de California Irvine y Prof. Dra. Michelle Digman co-Investigadora.
Prof. Dr. Enrico Gratton founder of the Laboratory for Fluorescence Dynamics (LFD) from the University of California Irvine and Prof. Dr. Michelle Digman co-principal investigator.



Estudiante de doctorado Nadir Planes determinando la organización de receptores de endotelinas en el LFD.
Nadir Planes, doctoral student, resolving endothelin receptors organization at LFD.

posteriores mostraron que los extractos de hongos de los géneros *Fusarium y Phoma* previnieron el 50% de la activación de los receptores de ET_A y angiontensina II AT_1 (AT_1) (importantes blancos farmacológicos para medicamentos anti-hipertensivos) (Bolaños *et al.*, 2015). Estos resultados sustentan que las esponjas marinas de Panamá son una inusual, pero rica fuente de sustancias farmacológicamente activas que debe ser explorada.

INVESTIGACIONES FARMACOLÓGICAS

La Farmacología involucra el conocimiento de la historia, fuente, propiedades físico-químicas,

the Y_1 receptor (Caballero-George *et al.*, 2010). Following experiments showed that fungal extracts of the genus *Fusarium and Phoma* reduced to 50% the response of ET_A and angiontensin II AT_1 (AT_1) receptors (important pharmacological targets for anti-hypertensive drugs) to their specific agonists (Bolaños *et al.*, 2015). These results support that marine sponges from Panama are an unusual, but rich source of pharmacologically active substances that ought to be explored.

PHARMACOLOGICAL RESEARCH

Pharmacology involves the knowledge about the history, source, physico-chemical properties, biochemical and physiological effects,

Entrenamiento avanzado de Microscopía de Fluorescencia dado en Panamá por el Prof. Dr. Enrico Gratton y la Prof. Dr. Michelle Digman.
Advance training on Fluorescence Microscopy given in Panama by Prof. Dr. Enrico Gratton and Prof. Dr. Michelle Digman.

efectos bioquímicos y fisiológicos, mecanismos de acción, absorción, distribución, biotransformación y excreción, y los usos terapéuticos y no terapéuticos de los medicamentos (Goodman & Gilman, 1995).

La descripción del efecto farmacológico de una sustancia se obtiene en dos fases:

1) Farmacodinámica o Farmacodinamia: "se refiere a lo que el medicamento hace sobre el cuerpo". Estudia los efectos bioquímicos y fisiológicos de los medicamentos y sus mecanismos de acción.
2) Farmacocinética: "se refiere a lo que el cuerpo hace sobre el medicamento". Estudia la absorción, distribución, biotransformación y excreción de los medicamentos.

mechanism of action, absorption, distribution, biotransformation and excretion, and therapeutic and no therapeutic applications of medicaments (Goodman & Gilman, 1995).

The description of the pharmacological effects of a substance is achieved by two phases:

1) Pharmacodynamics: "refers to what the medicament does to the body". It is the study of the biochemical and physiological effects of medicaments and their mechanism of action.
2) Farmacokinetics: "refers to what the body does to the medicament". It is the study of the absorption, distribution, biotransformation and excretion of medicaments.

Equipo de NANO Dispersions Technologies, Inc diseñando la estrategia de encapsulado de productos herbarios. De derecha a izquierda: Lic. Verónica Díaz, Dra. María Isabel Briceño, Lic. Edgar Marín.
Team at NANO Dispersions Technologies, Inc designing a strategy to encapsulate herbal products. From right to left: Ms. Verónica Díaz, Dr. María Isabel Briceño, Mr. Edgar Marín.

Edgar Marín, estudiante de doctorado, cuantificando el contenido de las nanopartículas cargadas con productos naturales. *Edgar Marín, doctoral student, quantifying natural products incorporated within the nanoparticles.*

Receptores y Farmacodinamia

Los receptores son componentes celulares que al interactuar con los medicamentos desencadenan una serie de eventos bioquímicos que definen el efecto terapéutico de la sustancia. Es por esto que los receptores se han convertido en el foco principal del estudio del efecto de los medicamentos y sus mecanismos de acción (Katzung, 2004).

La evaluación del potencial biomédico de los productos naturales encontrados en nuestro laboratorio, inicia con estudios celulares de interacción con receptores de membrana aplicando técnicas de detección basados en la luminiscencia (Bolaños *et al*. 2015) o la

Receptors and Pharmacodynamics

Receptors are cellular components that interact with medicaments producing a series of biochemical events that define the therapeutic effect of a substance. This is the reason why receptors have become the focal point of the study of the effect of medicaments and their mechanism of action (Katzung, 2004).

The evaluation of the biomedical potential of natural products found in our laboratory, begins with cellular studies of interaction with membrane receptors applying detection techniques based on either luminescence (Bolaños *et al*. 2015) or fluorescence (Caballero-George *et al*. 2012). The studied receptors belong to the G-protein coupled receptors (GPCR)

Grupo NatuRA de la Universidad de Amberes, Bélgica y Profesor Dr. Luc Pieters.
NatuRA group at the University of Antwerp, Belgium.

fluorescencia (Caballero-George *et al*. 2012). Los receptores estudiados pertenecen a la familia de los receptores acoplados a proteína G (la principal familia de receptores que representan blancos farmacológicos) involucrados en la regulación de la presión arterial, estos son receptores de angiotensina, endotelina, neuropéptido Y y adrenérgicos.

En esta área de investigación contamos con la valiosa colaboración del Profesor Patrick Vanderheyden de la Universidad Libre de Bruselas en Bélgica. Una fructífera colaboración de más de una década que ha originado publicaciones de alta relevancia en el área de la Farmacología

family (the main family of receptors representing pharmacological targets) involved in blood pressure regulation; these are angiotensin, endothelin, neuropeptide Y and adrenergic receptors.

In this field of research we count with the valuable collaboration of Prof. Dr. Patrick Vanderheyden from the Free University of Brussels in Belgium. This fruitful collaboration of more than a decade, has produced publications of high relevance to the area of Pharmacology of natural products.
Application of the bioluminescence produced by the aequorin protein obtained from the hy-

Desarrollo de métodos de análisis para el control de calidad de productos herbarios. En la foto aparecen el Mgtr. Andrés Rivera y la Lic. Nadir Planes.
Development of analytical methods for the quality control of herbal products. In this picture Andres Rivera and Nadir Planes.

de los productos naturales.

Utilizando la bioluminiscencia producida por la proteína aequorina obtenida de la hidromedusa *Aequorea* sp., se creó un modelo celular capaz de medir los cambios transientes de calcio intracelular luego de la activación de este tipo de receptores (Le Poul *et al*., 2002). Este modelo ha sido utilizado efectivamente por nuestro grupo para medir el efecto farmacológico de los productos naturales mediados por receptores que regulan la presión arterial.

dromedusa *Aequorea* sp., a cell model capable of measuring transient changes of intracellular calcium after GPCR activation was created (Le Poul *et al*., 2002). This model has been effectively used by our group to measure the pharmacological effect of natural products on receptors that regulate blood pressure.

Recently, the group discovered that silibinin, a flavanolignan present in the plant *Sylibum marianum* (milk thistle), act as competitive antagonist of the angiotensin AT_1 receptor, which

Recientemente el grupo descubrió que silibinina, un flavanolignano presente en la planta *Sylibum marianum* (cardo mariano o cardo blanco), actúa como antagonista competitivo del receptor de angiotensina AT_1, el cual es un mecanismo de acción molecular nuevo para este producto natural (Bahem *et al*., 2015).

Biofísica de los receptores

Los receptores no son partículas estáticas. Cambios en su dinámica (difusión, organización y trayectoria) han sido directamente correlacionados a la eficacia terapéutica de los medicamentos y sus posibles efectos adversos. En esta área de investigación colaboramos con los profesores Enrico Gratton y Michelle Digman, ambos de la Universidad de California Irvine (Estados Unidos), y el profesor Hanns Häberlein de la Universidad de Bonn (Alemania).

En nuestros estudios hemos utilizado con éxito la Espectroscopía de Correlación de Fluorescencia y el nuevo ligando Alexa532-endotelina-1 para estudiar la dinámica de los receptores de ET_A, caracterizando la difusión del complejo ligando-receptor y evaluando el efecto de nuestros productos naturales sobre esta difusión. El extracto del hongo *Fusicladium* sp., aislado de la esponja *Amphimedom viridis* colectada en el Parque Nacional Isla Bastimentos, funcionó como agonista inverso del receptor ET_A (Caballero-George *et al*. 2012). Actualmente, hemos aplicado

is a new molecular mechanism for this natural product (Bahem *et al*., 2015).

Receptor Biophysics

Receptors are not static particles. Changes in their dynamics (diffusion, organization and trajectories) have been directly correlated to the therapeutic efficacy of medicaments and their possible adverse effects. In this area of research we collaborate with professors Enrico Gratton and Michelle Digman, both from the University of California Irvine (United States), and professor Hanns Häberlein from the University of Bonn (Germany).

In our studies we have successfully used Fluorescence Correlation Spectroscopy and the newly synthesized ligand Alexa532-endothelin-1 to study dynamics of the ET_A receptor, characterize the diffusion of the receptor-ligand complex and evaluate the effect of our natural products on this diffusion. The obtained results showed that the extract of the fungus *Fusicladium* sp., isolated from the sponge *Amphimedom viridis* collected in Bastimentos Island National Park, functioned as inverse agonist of the ET_A receptor (Caballero-George *et al*. 2012). Currently, we have applied

bre esta difusión. Los resultados obtenidos muestran que el extracto del hongo *Fusicladium* sp., aislado de la esponja *Amphimedom viridis* del Parque Nacional Isla Bastimentos, actuó como agonista inverso del receptor ET_A (Caballero-George *et al*. 2012).

Actualmente, hemos aplicado técnicas adicionales de microscopía fluorescente como la Microscopía de Fluorescencia de Reflexión Interna Total (TIRF por sus siglas en inglés) además de diversos métodos de análisis como el "Raster image correlation spectroscopy" (RICS), Microscopía de Fluorescencia de Tiempo de Vida (FLIM por sus siglas en inglés), y Número y Brillo (N&B) para completar la caracterización dinámica, funcional y organizacional de los receptores de ET_A.

Farmacocinética

Los medicamentos necesitan alcanzar concentraciones efectivas en los lugares donde actúan para poder producir su efecto terapéutico. Estas concentraciones no solo dependen de la dosis administrada, sino de la magnitud y la tasa de la absorción, distribución, biotransformación y excreción del medicamento, lo cual depende a su vez del paso de estas sustancias a

additional microscopic techniques like Total Internal Reflexion Fluorescence Microscopy (TIRF) and other methods of analysis like Raster image correlation spectroscopy (RICS), Fluorescence Lifetime Imaging Microscopy (FLIM), and Number and Brigthness (N&B) to complete the characterization of dynamics, functionality and organization of the ET_A receptor.

Pharmacokinetics

Medicaments need to reach effective concentrations in all the places where they act to produce their therapeutic effects. These concentrations not only depend on the administered doses, but in the magnitude and absorption rate, distribution, biotransformation and excretion of medicaments, which also depends on the capacity of these substances to cross biological barriers: cell membrane, cells monolayer or cells multilayer.

In this area we collaborate with Dr. Alicia Torres from the School of Veterinary Medicine at the University of Panama. Our group is working on the evaluation of the Pharmacokinetic profile of chemical markers present on medicinal plants. These important parameters

Dra. Alicia Torres inyectando una dosis de productos herbarios a ratones antes del análisis farmacocinéticos.
Dr. Alicia Torres injecting a dose of herbal products to mice prior to the pharmacokinetic analysis.

través barreras biológicas: la membrana celular, una monocapa de células o múltiples capas de células.

En esta área colaboramos con la Dra. Alicia Torres de la Escuela de Medicina Veterinaria de la Universidad de Panamá. Nuestro grupo está trabajando en la evaluación del perfil Farmacocinético de marcadores químicos presente en plantas medicinales. Estos parámetros importantes son necesarios para validar su

are necessary to validate their therapeutic effects.

PHARMACEUTICAL TECHNOLOGY: NANOTECHNOLOGY

Nanotechnology applied to Pharmaceutical Sciences has produced novel carriers for drug-delivery with unique characteristics that allow the active substance to efficiently cross biological barriers and increase their bioavailability.

efecto terapéutico.

TECNOLOGÍA FARMACÉUTICA: NANOTECNOLOGÍA

La nanotecnología aplicada a las ciencias farmacéuticas ha producido novedosos vehículos para la entrega de medicamentos con características únicas que le permiten cruzar eficientemente las barreras biológicas y aumentar su biodisponibilidad.

La colaboración entre el INDICASAT AIP y la compañía de nanotecnología NANO Dispersions Technologies, Inc. nos ha permitido explorar la factibilidad de incorporar productos naturales de diferentes características en

La continua evolución de nuestras investigaciones, nos lleva al siguiente paso lógico que involucra, el establecimiento de capacidades e infraestructuras que permitan el desarrollo de métodos analíticos, para asegurar la calidad, eficacia y seguridad de los productos obtenidos de la naturaleza.

Collaboration between INDICASAT AIP and the company NANO Dispersions Technologies, Inc. has allowed us to explore the feasibility to incorporate natural products from diverse characteristics in nanoemulsions and nanoparticles. The biomedical potential found in our new formulations is high. Nevertheless, additional tests for toxicity and efficacy should be carried out.

The continue evolution of our research, has taken us to the next logic step which involves, the establishment of local capacities and infrastructure to support the development of analytical methods, to guarantee quality, efficacy and safety of the products obtained from nature.

PHARMACEUTICAL ANALYSIS

Pharmaceutical analysis determines the identity, purity, content and stability of the substances present in pharmaceutical forms: active ingredients and excipients. These analyses are

emulsiones y partículas a escala nanométrica. El potencial biomédico que hemos encontrado en estas nuevas formulaciones es elevado. Sin embargo, pruebas adicionales de toxicidad y efectividad son necesarias.

ANÁLISIS FARMACÉUTICO

El análisis farmacéutico determina la identidad, pureza, contenido y estabilidad de las sustancias presentes en las formas farmacéuticas: ingredientes activos y excipientes. Estos análisis se hacen siguiendo lineamientos internacionales como los del "International Conference on Harmonisation of Technical Requirements for Registration of Pharmaceutical for Human Use (ICH) y las farmacopeas.

El grupo de Investigaciones y Análisis de Productos Naturales y Alimentos (NatuRA) de la Universidad de Amberes en Bélgica, liderizado por el Prof. Dr. Luc Pieters, posee una experticia única en el área de Análisis Farmacéutico, Plantas Medicinales y Nutracéuticos.
Este grupo colabora con nuestro equipo en Panamá para la creación de un laboratorio de investigaciones y control de calidad de productos herbarios pionero en Latinoamérica. Na-

performed following international guidelines like the International Conference on Harmonization of Technical Requirements for Registration of Pharmaceutical for Human Use (ICH) and pharmacopoeias.

The group of Natural Products and Food Research and Analysis (NatuRA) from the University of Antwerp in Belgium, directed by Prof. Dr. Luc Pieters, has unique expertise in the area of Pharmaceutical Analysis, Medicinal Plant Research and Nutraceuticals. This group collaborates with our team in Panama to create a laboratory of research and quality control of herbal products, pioneer in Latinamerica. NatuRA counts on the expertise of professors Arnold Vlietinck and Sandra Apers, who also collaborate with our team at INDICASAT AIP.

Prof. Dr. Vlietinck has played a key role in the subject of efficacy, quality and safety of herbal medicinal products in Europe and in the world, as member of the Working Party on Herbal Remedies at the European Agency for the Evaluation of Medicinal Products (EMEA) (since 1997-2004) and of the Committee on Herbal Medicinal Products (HMPC) of EMA (since 2004).

Profesor Dr. Arnold Vlietinck

Profesora Dra. Sandra Apers

tuRA también cuenta con la experticia de los profesores Arnold Vlietinck y Sandra Apers, quienes también colaboran con nuestro equipo en INDICASAT AIP.

El Prof. Dr. Vlietinck ha jugado un papel crucial en el tema de eficacia, calidad y seguridad de los productos medicinales herbarios en Europa y en el mundo entero, como miembro del Grupo de Trabajo en "Herbal Remedies" de la Agencia Europea para la Evaluación de Productos Medicinales (EMEA) (desde 1997-2004) y en el Comité de Productos Herbarios Medicinales de Agencia Europea de Medica-

Prof. Dr. Sandra Apers, specialist in Pharmaceutical Analysis, is the scientific director of the University Centre for the Analysis of Pharmaceuticals and Health Products at the University of Antwerp, and an active member of the European Pharmacopoeia Commission.

The Pharmaceutical Research Group has built up over the years, thanks to the invaluable collaboration of high profile research scientists like Prof. Dr. Mark Hamann (Olemiss, USA), Dr. Andrea Porras-Alfaro(USA), Dr. Huzefa Raja (USA), Prof. Dr. Carol Shearer (USA), Prof. Andrew Miller (USA), Dr. Elizabeth Arnold (USA), Mr. Edgardo Ochoa (CI, USA),

mentos (EMA) (desde el 2004).

La Prof. Dra. Sandra Apers, especialista en Análisis Farmacéutico, es la directora científica del Centro de Análisis de Productos Farmacéuticos y de la Salud en la Universidad de Amberes, y miembro activo de la Comisión de la Farmacopea Europea.

El Grupo de Investigaciones Farmacéuticas se ha ido fortaleciendo a través de los años, gracias a la invaluable colaboración de investigadores de alto prestigio como el Prof. Dr. Mark Hamann (Olemiss, USA), Dr. Andrea Porras-Alfaro(USA), Dr. Huzefa Raja (USA), Prof. Dr. Carol Shearer (USA), Prof. Andrew Miller (USA), Dr. Elizabeth Arnold (USA), Mr. Edgardo Ochoa (CI, USA), Prof. Dr. José Luis Carballo (UNAM, México), Dr. José Antonio Cruz (UNAM, México) Prof. Dr. Luis C´Croz (UP, Panamá), Prof. Dr. Magaly de Chial (UP, Panamá), Prof. Dr. Mahabir Gupta (UP, Panamá), Dr. Eldredge P. Bermingham (STRI, Panamá) y el Dr. Luis Fernando De León (INDICASAT AIP, Panamá).

Prof. Dr. José Luis Carballo (UNAM, Mexico), Dr. José Antonio Cruz (UNAM, Mexico) Prof. Dr. Luis C´Croz (UP, Panama), Prof. Dr. Magaly de Chial (UP, Panama), Prof. Dr. Mahabir Gupta (UP, Panama) and Dr. Eldredge P. Bermingham (STRI, Panama) and Dr. Luis Fernando De León (INDICASAT AIP, Panama).

The goal of the Pharmaceutical Research Group is to apply the knowledge generated by its research to develop innovations that can be at service of society under high standards of quality.

La meta del Grupo de Investigaciones Farmacéuticas es aplicar el conocimiento generado por sus investigaciones para desarrollar innovaciones que se pongan al servicio de la sociedad bajo altos estándares de calidad.

Referencias Bibliográficas

Bolaños J, De León LF, Ochoa E, Darias J, Raja HA, Shearer CA, Miller AN, Vanderheyden P, Porras-Alfaro A, Caballero-George C. Phylogenetic Diversity of Sponge-Associated Fungi from the Caribbean and the Pacific of Panama and Their In Vitro Effect on Angiotensin and Endothelin Receptors. Marine Biotechnology (NY). 2015 May 31. [Epub ahead of print]

Caballero-George, Catherina; Jessica Bolaños; Edgardo Ochoa; José Luis Carballo; José Antonio Cruz; A. Elizabeth Arnold. 2010. Protocol to isolate sponge-associated fungi from tropical waters and an examination of their cardioprotective potential. Current Trends in Biotechnology and Pharmacy 4(4): 880-898

Caballero-George, Catherina; Mahabir P. Gupta. 2011. A Quarter Century of Pharmacognostic Research on Panamanian Flora: A Review. Planta Medica 77(11):1189-202

Caballero-George, Catherina; Thomas Sorkalla; Daniel Jakobs; Jessica Bolaños; Huzefa Raja; Carol Shearer; Eldredge P. Bermingham; Hanns Häberlein. 2012. Fluorescence Correlation Spectroscopy in Drug Discovery: Study of Alexa532-endothelin 1 binding to the endothelin ETA receptor to describe the pharmacological profile of natural products. TheScientificWorldJournal, doi:10.1100/2012/524169

Gao J.; C. Caballero-George; B. Wang; K. Rao; A. G. Shilabin; MT. Hamann. 2009. 5-OHKF and NorKA, Depsipeptides from a Hawaiian Collection of *Bryopsis pennata*: Binding Properties for NorKA to the Human Neuropeptide Y Y_1 Receptor. Journal of Natural Products, 72(12): 2172-2176

Henkel T, Brunne RM, Müller H, Reichel F. 1999. Statistical investigation into the structural complementarity of natural products and synthetic compounds. Angewandte Chemie International Edition, 38:643–647.

Katzung, Bertram. Farmacologia basica y clinica / 9 ed. / pd. Editorial: El Manual Moderno. 2004

Le Poul E, Hisada S, Mizuguchi Y, Dupriez VJ, Burgeon E, Detheux M. 2002. Adaptation of aequorin functional assay to high throughput screening. Journal of Biomolecular Screening. 7(1):57-65.

Montaser R; Luesch H. 2011. Marine natural products: a new wave of drugs? Future Medicinal Chemistry 3(12):1475-89. doi: 10.4155/fmc.11.118.

Newman, David; Gordon M. Cragg; Kenneth M. Snader. 2003. Natural Products as Sources of New Drugs over the Period 1981-2002. Journal of Natural Products, 66, 1022-1037

Seigler, David; Peter W. Price. 1976. Secondary Compounds in Plants: Primary Functions. The American Naturalist, Vol. 110, No. 971

Trease and Evans. 2004. Pharmacognosy. 15th Edition. Ed. W.C. Evans. Saunders, Elsevier.

Recommendations of generic names in Diaporthales competing for protection or use

Amy Y. Rossman, Gerard C. Adams, Paul F. Cannon, Lisa A. Castlebury, Pedro W. Crous, Marieka Gryzenhout, Walter M. Jaklitsch, Luis C. Mejia, Dmitar Stoykov, Dhanushka Udayanga, Hermann Voglmayr, and Donald M. Walker. IMA Fungus · 6(1): 145–154 (2015)

Abstract

In advancing to one name for fungi, this paper treats generic names competing for use in the order *Diaporthales (Ascomycota, Sordariomycetes)* and makes a recommendation for the use or protection of one generic name among synonymous names that may be either sexually or asexually typified. A table is presented that summarizes these recommendations. Among the genera most commonly encountered in this order, *Cytospora* is recommended over *Valsa* and *Diaporthe* over *Phomopsis*. New combinations are introduced for the oldest epithet of important species in the recommended genus. These include *Amphiporthe tiliae, Coryneum lanciforme, Cytospora brevispora, C. ceratosperma, C. cinereostroma, C. eugeniae, C. fallax, C. myrtagena, Diaporthe amaranthophila, D. annonacearum, D. bougainvilleicola, D. caricae-papayae, D. cocoina, D. cucurbitae, D. juniperivora, D. leptostromiformis, D. pterophila, D. theae, D. vitimegaspora, Mastigosporella georgiana, Pilidiella angustispora, P. calamicola, P. pseudogranati, P. stromatica, and P. terminaliae.*

First report of *Tomato leaf curl Sinaloa virus* infecting tomato crops in Panama

J.A. Herrera-Vásquez , D. Ortega, A.B. Romero, S. Davino, L.C. Mejía, S. Panno and M. Davino. New Disease Reports (2015) 31, 30.

Abstract

In April 2011 and September 2012, virus-like symptoms were observed in open field- and greenhouse-grown tomato crops *(Solanum lycopersicum)* in Chiriquí, the westernmost province of Panama. Samples from symptombearing plants (127 in all) were collected and tested for the presence of begomoviruses by polymerase chain reaction (PCR) assays with sets of degenerated primers designed to amplify parts of the DNA-A and DNA-B components (Rojas *et al.,* 1993; Table 1). Products of the expected sizes, obtained with both DNA-A- and DNA-B-specific primers for 49 samples, suggested infection with New World bipartite begomoviruses. This corresponds to an incidence of 26% (8 plants) in open field, and 43% (41 plants) in greenhouse crops. Primers specific for ten tomato-infecting begomoviruses found in Central America (Engel *et al.,* 1998; Nakhla *et al.,* 2005; Table 1) were used to typify the PCR-positive samples.

This analysis revealed *Potato yellow mosaic Panama virus* (PYMPV) or *Tomato leaf curl Sinaloa virus* (ToLCSiV) in 44 (90%) or 40 (82%) of the samples, respectively. All contained at least one virus, the majority (i.e. 35) indeed both, with no indication of the other viruses tested. BLAST analysis of two PCR products' sequences of the distinct viruses (GenBank Accession Nos. KP313717 for PYMPV and KP318651 for ToLCSiV, respectively) revealed that KP313717 shared 99 % DNA sequence identity with PYMPV - [Panama:Divisa:Tomato:1996] (PYMPV-[PA:Div:Tom:96], (Y15034) (Engel *et al.,* 1998), and KP318651 99 % identity with ToLCSiV - [Nicaragua:Santa Lucia] (ToLCSiV-[NI:SL], (AJ608286) (Rojas *et al.,* 2005) and three other ToLCSiV sequences: [Nicaragua:Santa Lucia] (AJ508779), [Nicaragua:Sebaco] (AJ508780) (Rojas *et al.,* 2005), and [Costa Rica:Alajuela] (AF131213); as well as 98 % identity with ToLCSiV-[Nicaragua:Condega] (AJ508778) (Rojas *et al.,* 2005).

Differences in symptom expression were in some cases observed between plants infected with both viruses (Fig. 1A), or with PYMPV (Fig. 1B) or ToLCSiV (Fig. 1C) alone. Begomovirus-free plants (Fig. 1D) also showed virus-like symptoms resembling those induced by other viruses, especially in the *Potyviridae and Tobamoviridae* (Polston & Anderson, 1997). Due to the high capacity of recombination between different begomoviruses (Davino *et al.,* 2012), the existence or development of novel recombinant molecules cannot be excluded, which could lead to the emergence of new begomoviruses with different biological properties compared to the ancestral parental viruses in the future. To our knowledge, this is not only the first detection of ToLCSiV in Panama, but also the first report of PYMPV in Panama's western highlands, and the first ever report of PYMPV/ToLCSiV mixed infection. Additional studies on incidence and distribution of these viruses in Panama are in progress.

Critical review on the physical and mechanical factors involved in tissue engineering of cartilage

Carrie Gaut, & Kiminobu Sugaya. Regenerative Medicine 2015, 10(5) 665-679.

Abstract

Articular cartilage defects often progress to osteoarthritis, which negatively impacts quality of life for millions of people worldwide and leads to high healthcare expenditures. Tissue engineering approaches to osteoarthritis have concentrated on proliferation and differentiation of stem cells by activation and suppression of signaling pathways, and by using a variety of scaffolding techniques. Recent studies indicate a key role of environmental factors in the differentiation of mesenchymal stem cells to mature cartilage-producing chondrocytes. Therapeutic approaches that consider environmental regulation could optimize chondrogenesis protocols for regeneration of articular cartilage. This review focuses on the effect of scaffold structure and composition, mechanical stress and hypoxia in modulating mesenchymal stem cell fate and the current use of these environmental factors in tissue engineering research.

Phylogenetic Diversity of Sponge-Associated Fungi from the Caribbean and the Pacific of Panama and Their In Vitro Effect on Angiotensin and Endothelin Receptors

Jessica Bolaños, Luis Fernando De León, Edgardo Ochoa, José Darias, Huzefa A. Raja, Carol A. Shearer, Andrew N. Miller, Patrick Vanderheyden, Andrea Porras-Alfaro, Catherina Caballero-George. Mar Biotechnol (NY). 2015 May 31.

Abstract

Fungi occupy an important ecological niche in the marine environment, and marine fungi possess an immense biotechnological potential. This study documents the fungal diversity associated with 39 species of sponges and determines their potential to produce secondary metabolites capable of interacting with mammalian G-protein-coupled receptors involved in blood pressure regulation. Total genomic DNA was extracted from 563 representative fungal strains obtained from marine sponges collected by SCUBA from the Caribbean and the Pacific regions of Panama. A total of 194 operational taxonomic units were found with 58 % represented by singletons based on the internal transcribed spacer (ITS) and partial large subunit (LSU) rDNA regions. Marine sponges were highly dominated by Ascomycota fungi (95.6 %) and represented by two major classes, Sordariomycetes and Dothideomycetes. Rarefaction curves showed no saturation, indicating that further efforts are needed to reveal the entire diversity at this site. Several unique clades were found during phylogenetic analysis with the highest diversity of unique clades in the order Pleosporales. From the 65 cultures tested to determine their in vitro effect on angiotensin and endothelin receptors, the extracts of *Fusarium sp.* and *Phoma* sp. blocked the activation of these receptors by more than 50 % of the control and seven others inhibited between 30 and 45 %. Our results indicate that marine sponges from Panama are a "hot spot" of fungal diversity as well as a rich resource for capturing, cataloguing, and assessing the pharmacological potential of substances present in previously undiscovered fungi associated with marine sponges.

Experimental and Mechanistic Analysis of the Palladium-Catalyzed Oxidative C8-Selective C–H Homocoupling of Quinoline *N*-Oxides

D. Stephens, J. Lakey-Beitia, G. Chavez, C. Ilie, H. Arman and O. V. Larionov, Chem. Commun., 2015, DOI: 10.1039/C5CC02227D.

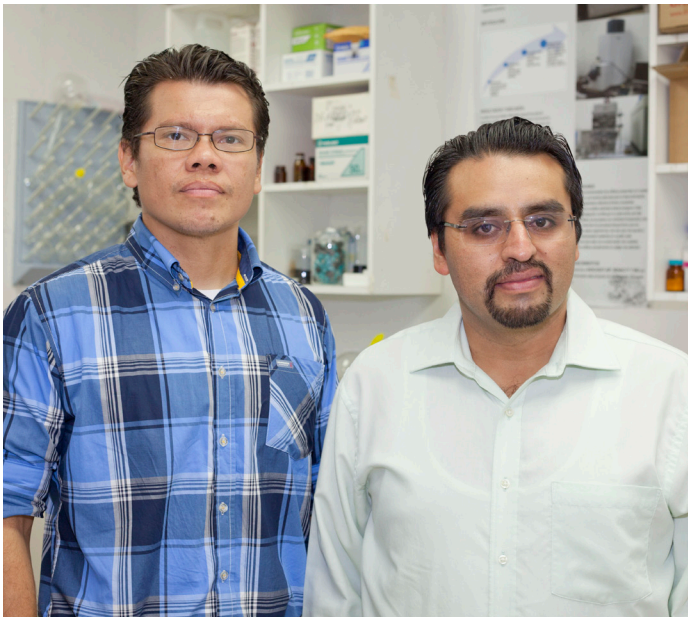
Summary

A novel site-selective palladium-catalyzed oxidative C8–H homocoupling reaction of quinoline *N*-oxides has been developed. The reaction affords substituted 8,8'-biquinol *N,N'*-dioxides that can be readily converted to a variety of functionalized 8,8'-biquinolyls. Mechanistic studies point to the crucial role of the oxidant and a non-innocent behavior of acetic acid as a solvent.

Heteroaryl-heteroaryl bond formation is an important synthetic strategy en route to homo- and heterodimeric structural motifs with applications in catalysis,[1] drug discovery[2] and materials science.[3] Catalytic oxidative C–H homocoupling of heteroarenes is an attractive method of direct biheteroaryl synthesis, as it by-passes prefunctionalization of the heteroarene precursors (e.g. as halides, stannanes or boronic acids). Recent examples of regioselective catalytic oxidative C–H homocoupling of heteroarenes include thiophenes (C2[4]/C3[5]), indoles (C2,[5,6] C2/C3[7]), indolizines (C3),[8] azoles (C2),[9] and furans (C2).[4c] In addition, pyridine and 1,2,3-triazole *N*-oxides undergo oxidative C2–H and C5–H homocoupling reactions, respectively.[10]

Marine Natural Products as Breast Cancer Resistance Protein Inhibitors

Lilia Cherigo, Dioxelis Lopez, and Sergio Martinez-Luis. Marine Drugs 2015, 13(4) 2010 - 29.



Abstract

Breast cancer resistance protein (BCRP) is a protein belonging to the ATP- binding cassette (ABC) transporter superfamily that has clinical relevance thanks to having its multi-drug resistance properties in cancer. BCRP can be associated with clinical cancer drug resistance, in particular, acute myelogenus or acute lymphocytic leukemias. The overexpression of BCRP contributes to the resistance of several chemotherapeutic drugs, such as topotecan, methotrexate, mitoxantrone, doxorubicin, and daunorubicin. The Food and Drugs Administration has already recognized that BCRP is clinically one of the most important drug transporters mainly because it leads to a reduction of clinical efficacy of various anticancer drugs through its ATP-dependent drug efflux pump function as well as its apparent participation in drug resistance. This review article aims to summarize the different research findings on marine natural products with BCRP inhibiting activity. In this sense, the potential modulation of physiological targets of BCRP by natural or synthetic compounds offers a great possibility for the discovery of new drugs and valuable research tools to recognize the function of the complex ABC-transporters.

Impact of Hepatitis A vaccination with a two-dose schedule in Panama: Results of epidemiological surveillance and time trend analysis

Dora Estripeaut, Rodolfo Contreras, Olga Tinajeros, Maria Mercedes Castrejón,Fakrudeen Shafi, Eduardo Ortega-Barria, Rodrigo DeAntonio. Vaccine 2015, 33(28)3200-7. In Press.

Abstract

Purpose: In April 2007, Panama introduced Hepatitis A universal vaccination using a two-dose schedule *(Havrix® junior;* GSK Vaccines, Belgium). We assessed the impact of this hepatitis A vaccine three years after it was recommended for universal mass vaccination in Panama.
Materials and methods: Hepatitis A vaccination impact was assessed using two different approaches. The first approach used retrospective data (incidence and number of cases for all age groups), collected from the passive surveillance of the Epidemiologic Surveillance System of the Ministry of Health of hepatitis A and unspecified hepatitis before (2000–2006) and after (2008–2010) introduction of hepatitis A vaccine. The second approach was a prospective hospital-based active surveillance for hepatitis cases conducted in subjects (0–14 years) during 2009–2011 at three sentinel hospitals in Panama.
Results: Overall, the annual incidence of hepatitis A and unspecified hepatitis in 2008, 2009 and 2010 were 13.1, 7.9 and 3.7 per 100,000 subjects, lower than the baseline incidence of 51.1 per 100,000 subjects. In comparison to the mean baseline period (2000–2006), there was an 82% mean reduction in the overall hepatitis-related outcomes (hepatitis A and unspecified hepatitis) after vaccine introduction (2008–2010) in all age groups.
In the hospital-based surveillance (2009–2011), of the 42 probable viral hepatitis A cases, nine cases were confirmed as acute hepatitis A (8 in 2009, 1 in 2010). Of these confirmed cases, two belonged to the targeted vaccine group (1–4 years) but were not vaccinated.
Conclusions: Our study suggests that the introduction of two-dose hepatitis A vaccines in Panama has contributed to the reduction in the incidence of overall hepatitis-related outcomes for all age groups, suggesting herd protection. Additional monitoring is required to document a sustained long-term effect.

Scalable efficient expansion of mesenchymal stem cells in xeno free media using commercially available reagents

Neil H Riordan, Marialaura Madrigal, Jason Reneau, Kathya de Cupeiro, Natalia Jiménez, Sergio Ruiz, Nelsy Sanchez, Thomas E Ichim, Francisco Silva and Amit N Patel. Riordan *et al.* J Transl Med (2015) 13:232 DOI 10.1186/s12967-015-0561-6

Abstract

Background: The rapid clinical translation of mesenchymal stem cells (MSC) has resulted in the development of cell-based strategies for multiple indications. Unfortunately one major barrier to widespread implementation of MSC based therapies is the limited supply of fetal calf serum (FCS) used to expand cells to therapeutic numbers. Additionally, the xenogeneic element of fetal calf serum has been previously demonstrated to stimulate antibody mediated reactions and in some cases sensitization leading to anaphylaxis.
Method: XcytePLUS™ media, a human platelet lysate based product, was used to supplement the culture medium at 5, 7.5 and 10% and compared to fetal calf serum at 10%, for human umbilical cord MSC expansion. Properties of the expanded cells were investigated.
Results: This study demonstrated equivalent or superior effects of human platelet lysate compared to standard
FCS supplemented media, based on doubling rate, without loss of identity or function, as demonstrated with flow cytometry characterization. Differentiation into osteocytes, adipocytes and chondrocytes was comparable from cells expanded in either media supplement.
Conclusions: These data support the implementation of human platelet lysate supplemented media as an alternative to xenogeneic containing preparations which may lead to safer MSC products with therapeutic uses.

Overcoming obstacles to sharing data on tree allometric equations.

Cifuentes Jara M, Henry M, Réjou Méchain M, Lopez O.R., Wayson C, Michel Fuentes J, Castellanos E, Zapata-Cuartas M, Piotto D, Alice Guier F, Castañeda Lombis H, Cuenca Lara R, Cueva Rojas K, del Águila Pasquel J, Duque Montoya Á, Fernández Vega J, Jiménez Galo A, Marklund L, Milla F, Návar Chaidez J, Ortiz Malavassi E, Pérez J, Ramírez Zea C, Rangel García L, Rubilar Pons R, Saint-André L, Sanquetta C, Scott C, Westfall J. Ann. For. Sci.: 1-6. 10.1007/s13595-015-0467-8.

Abstract

Advances in ecology face the complexity of ecosystems with dynamics longer than a single scientist's career. In forestry and REDD+ practice, in particular, our ability to understand forest ecosystem dynamics and to manage them for mitigation and adaptation strongly relies on the combination of long-term research efforts and on data sharing. However, data collected by many measurement campaigns are regularly lost because of a lack of capacity to archive and maintain such information. Much progress would be achieved by encouraging researchers to provide access to primary data or publish "data-papers" (Chavan and Penev 2011; Cifuentes Jara *et al.* 2013; Fady *et al.* 2014). Archiving, sharing, and harmonizing data among researchers allows replication of analyses among researchers and thus ensures consistency of measurements over time and, ultimately, measurement accuracy (IPCC 2006). For allometric equations in particular, data sharing avoids the duplication of expensive and time-consuming field data collection.
More importantly, it also increases the size of datasets, which directly enhances the quality of the resulting allometric equations in terms of diameter at breast height (DBH) range, goodness of fit indicators, and geographic range where the equations are valid (Chave *et al.* 2014). Furthermore, the calculation of uncertainty cannot be properly carried out if the original data are not available (Chave *et al.* 2004; Molto *et al.* 2013). As robust allometric equations are critical for calculating baseline biomass and carbon stocks for REDD+ and other climate change mitigation initiatives, the need for sharing the best available data becomes more relevant. Here, we identify constraints and propose solutions to facilitate data sharing of allometric equations in forestry research. We analyze which factors limit data sharing among researchers and propose solutions to overcome those limitations.

An overview of existing and promising technologies for national forest monitoring.

Henry M, Réjou-Méchain M, Jara M, Wayson C, Piotto D, Westfall J, Fuentes J, Guier F, Lombis H, López E, Lara R, Rojas K, Del Águila Pasquel J, Montoya Á, Vega J, Galo A, López O.R., Marklund L, Milla F, de Jesús Návar Cahidez J, Malavassi E, Pérez J, Zea C, García L, Pons R, Sanquetta C, Scott C, Zapata-Cuartas M, Saint-André L. Ann. For. Sci.: 1-10. 10.1007/s13595-015-0463-z.

Abstract

The main goal of national forest programs is to lead and steer forest policy development and implementation processes in an inter-sectoral way (FAO 2006). National forest monitoring systems contribute to forest programs through monitoring forest changes and forest services over time (FAO 2013). To do so, they generally collect and analyze forest-related data and provide knowledge and recommendations at regular intervals. This article introduces some newly operational technological tools and approaches that may considerably improve national forest monitoring systems. This overview of forestry technologies and methods is the result of an extensive literature survey and was initiated by discussions held during the "Regional Technical Workshop on Tree Volume and Biomass Allometric Equations in South and Central America" in Costa Rica, on May 21– 24, 2013. We firstly introduce some useful technologies in the context of forest monitoring and then discuss how these new technologies can be integrated when monitoring national forests.

Pervasive and strong effects of plants on soil chemistry: a meta-analysis of individual plant 'Zinke' effects

Bonnie G. Waring, Leonor Álvarez-Cansino, Kathryn E. Barry, Kristen K. Becklund, Sarah Dale, Maria G. Gei, Adrienne B. Keller, Omar R. Lopez, Lars Markesteijn, Scott Mangan, Charlotte E. Riggs, María Elizabeth Rodríguez-Ronderos, R. Max Segnitz, Stefan A. Schnitzer and Jennifer S. Powers. Proc. R. Soc. B 282: 20151001.

Abstract

Plant species leave a chemical signature in the soils below them, generating fine-scale spatial variation that drives ecological processes. Since the publication of a seminal paper on plant-mediated soil heterogeneity by Paul Zinke in 1962, a robust literature has developed examining effects of individual plants on their local environments (individual plant effects). Here, we synthesize this work using meta-analysis to show that plant effects are strong and pervasive across ecosystems on six continents. Overall, soil properties beneath individual plants differ from those of neighbours by an average of 41%. Although the magnitudes of individual plant effects exhibit weak relationships with climate and latitude, they are significantly stronger in deserts and tundra than forests, and weaker in intensively managed ecosystems.

The ubiquitous effects of plant individuals and species on local soil properties imply that individual plant effects have a role in plant–soil feedbacks, linking individual plants with biogeochemical processes at the ecosystem scale.

Bastimolide A, a Potent Antimalarial Polyhydroxy Macrolide from the Marine Cyanobacterium Okeania hirsuta

Chang-Lun Shao , Roger G. Linington , Marcy J. Balunas , Argelis Centeno , Paul Boudreau , Chen Zhang , Niclas Engene , Carmenza Spadafora , Tina S Mutka , Dennis E Kyle , Lena Gerwick , Chang-Yun Wang , and William H Gerwick J. Org. Chem (2015 In press)

Abstract

Bastimolide A (1), a polyhydroxy macrolide with a 40-membered ring, was isolated from a new genus of the tropical marine cyanobacterium *Okeania hirsuta*. This novel macrolide was defined by spectroscopy and chemical reactions to possess one 1,3-diol, one 1,3,5-triol, six 1,5-diols and one t-butyl group; however, the relationships of these moieties to one another were obscured by a highly degenerate 1H NMR spectrum. Its complete structure and absolute configuration were therefore unambiguously determined by X-ray diffraction analysis of the nona-p-nitrobenzoate derivative (1d). Pure bastimolide A (1) showed potent antimalarial activity against four resistant strains of Plasmodium falciparum with IC50 values between 80 nM and 270 nM, although with some toxicity to the host Vero cells (IC50 = 2.1 μM), and thus represents a potentially promising lead for antimalarial drug discovery. Moreover, rigorous establishment of its molecular arrangement gives fresh insight into the structures and biosynthesis of cyanobacterial polyhydroxymacrolides.

Functional role of phenylacetic acid from metapleural gland secretions in controlling fungal pathogens in evolutionarily derived leaf-cutting ants.

Hermógenes Fernández-Marín, David R. Nash, Sarah Higginbotham, Catalina Estrada, Jelle S. van Zweden, Patrizia d'Ettorre, William T. Wcislo, Jacobus J. Boomsma. Proceedings of the Royal Society B- Biological Sciences 282 (1807) doi:10.1098/rspb.2015.0212

Abstract

Summary

Fungus-farming ant colonies vary four to five orders of magnitude in size. They employ compounds from actinomycete bacteria and exocrine glands as antimicrobial agents. Atta colonies have millions of ants and are particularly relevant for understanding hygienic strategies as they have abandoned their ancestors' prime dependence on antibiotic-based biological control in favour of using metapleural gland (MG) chemical secretions. Atta MGs are unique in synthesizing large quantities of phenylacetic acid (PAA), a known but little investigated antimicrobial agent. We show that particularly the smallest workers greatly reduce germination rates of *Escovopsis* and *Metarhizium* spores after actively applying PAA to experimental infection targets in garden fragments and transferring the spores to the ants' infrabuccal cavities. In vitro assays further indicated that *Escovopsis* strains isolated from evolutionarily derived leaf-cutting ants are less sensitive to PAA than strains from phylogenetically more basal fungus-farming ants, consistent with the dynamics of an evolutionary arms race between virulence and control for *Escovopsis*, but not *Metarhizium*. Atta ants form larger colonies with more extreme caste differentiation relative to other attines, in societies characterized by an almost complete absence of reproductive conflicts. We hypothesize that these changes are associated with unique evolutionary innovations in chemical pest management that appear robust against selection pressure for resistance by specialized mycopathogens.

Phylogenetic Analysis of Hepatitis B Virus Genotypes Circulating in Different Risk Groups of Panama, Evidence of the Introduction of Genotype A2 in the Country

Alexander A. Martínez, Yamitzel Zaldívar, Griselda Arteaga, Zoila de Castillo, Alma Ortiz, Yaxelis Mendoza, Omar Castillero, Juan A. Castillo, Juan Cristina, Juan M. Pascale. PLOS ONE | DOI:10.1371/journal.pone.0134850 July 31, 2015

Abstract

The Hepatitis B Virus (HBV) can cause acute or chronic infection it is also associated with the development of liver cancer, thousands of new infections occur on a yearly basis, and many of these cases are located in certain areas of the Caribbean and Latin America. In these areas, the HBV prevalence is still high which makes this virus a serious public health concern to the entire region. Studies performed in Panama suggest a complex pattern in the distribution of HBV among the country's different risk groups. We use phylogenetic analysis in order to determine which HBV genotypes were circulating in these specific groups; for this we used a fragment of the PreS2/2 region of the HBV genome. Subsequently whole HBV genome sequences were used for Bayesian analysis of phylodynamics and phylogeography. Two main genotypes were found: genotype A (54.5%) and genotype F (45.5%). There was a difference in the distribution of genotypes according to risk groups: 72.9% of high risk groups were associated to genotype A, and 55.0% of samples of genotype F were associated to the low risk group ($p<0.002$). The Bayesian analysis of phylogeny-traits association revealed a statistically significant geographical association ($p<0.0001$) with both genotypes and different regions of the country. The Bayesian time of most recent common ancestor analysis (tMRCA) revealed a recent tMRCA for genotype A2 circulating in Panama (1997, 95% HPD: 1986—2005), when it is compared with Panamanian genotype F1c sequences (1930, 95% HPD: 1810 – 2005). These results suggest a possible change in the distribution of HBV genotypes in Panama and Latin America as a whole. They also serve to encourage the implementation of vaccination programs in high-risk groups, in order to prevent an increase in the number of new HBV cases in Latin America and worldwide.

Phylogenetic and syntenic data support a single horizontal transference to a Trypanosoma ancestor of a prokaryotic proline racemase implicated in parasite evasion from host defences.

Caballero ZC, Costa-Martins AG, Ferreira RC, P Alves JM, Serrano MG, Camargo EP, Buck GA, Minoprio P, G Teixeira MM. Parasit Vectors. 2015 Apr 12;8:222. doi: 10.1186/s13071-015-0829-y.

Abstract

BACKGROUND: Proline racemase (PRAC) enzymes of *Trypanosoma cruzi* (*Tc*PRAC), the agent of Chagas disease, and *Trypanosoma vivax* (*Tv*PRAC), the agent of livestock trypanosomosis, have been implicated in the B-cells polyclonal activation contributing to immunosuppression and the evasion of host defences. The similarity to prokaryotic PRAC and the absence in *Trypanosoma* brucei and *Trypanosoma congolense* have raised many questions about the origin, evolution, and functions of trypanosome PRAC (*Try*PRAC) enzymes.

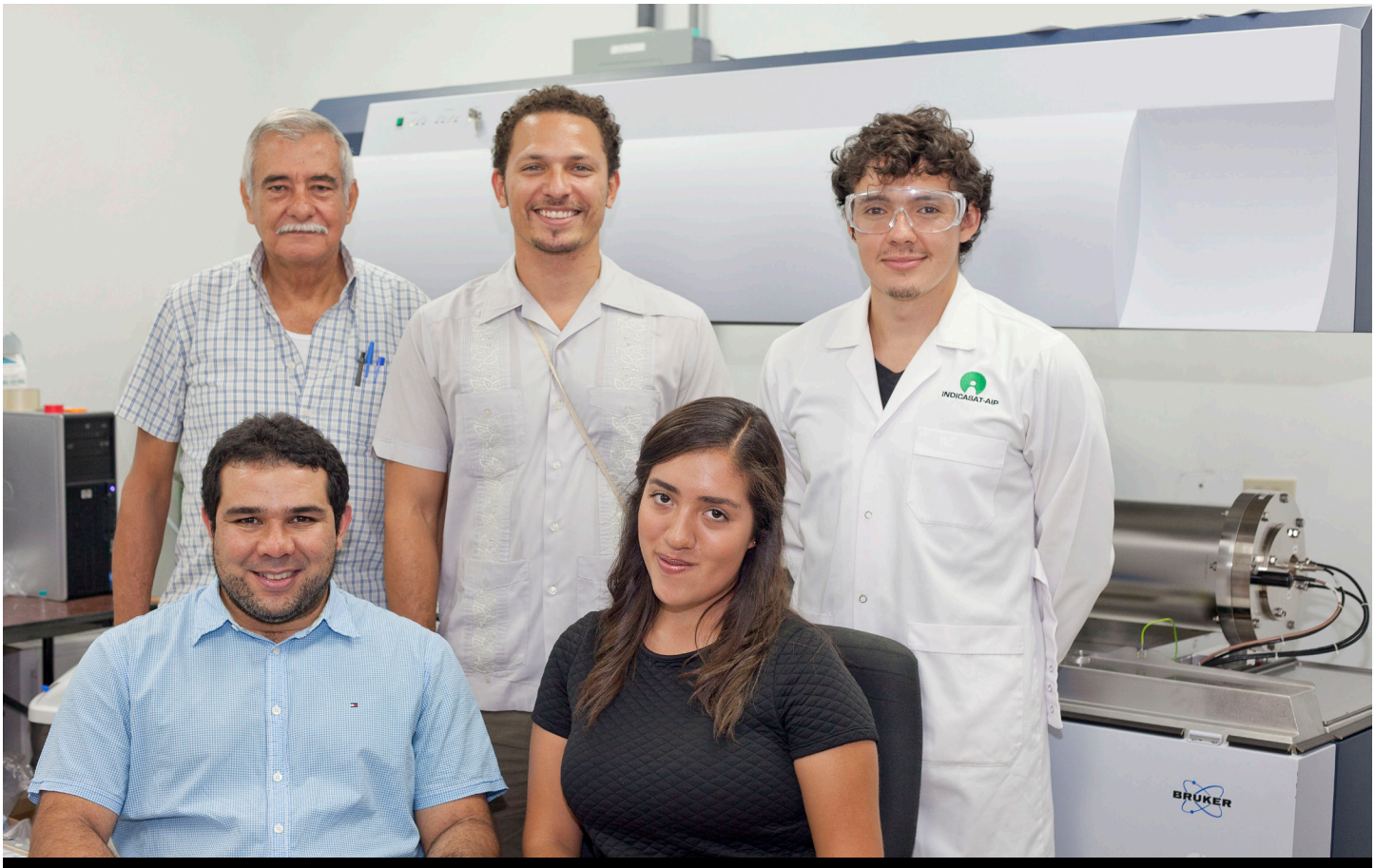
FINDINGS: We identified *Try*PRAC homologs as single copy genes per haploid genome in 12 of 15 *Trypanosoma* species, including *T. cruzi* and *T. cruzi* marinkellei, *T. dionisii*, *T. erneyi*, *T. rangeli*, *T. conorhini* and *T. lewisi*, all parasites of mammals. Polymorphisms in *Tc*PRAC genes matched *T. cruzi* genotypes: TcI-TcIV and Tcbat have unique genes, while the hybrids TcV and TcVI contain *Tc*PRACA and *Tc*PRACB from parental TcII and TcIII, respectively. PRAC homologs were identified in trypanosomes from anurans, snakes, crocodiles, lizards, and birds. Most trypanosomes have intact PRAC genes. *T. rangeli* possesses only pseudogenes, maybe in the process of being lost. *T. brucei*, *T. congolense* and their allied species, except the more distantly related *T. vivax*, have completely lost PRAC genes.

CONCLUSIONS:The genealogy of *Try*PRAC homologs supports an evolutionary history congruent with the *Trypanosoma* phylogeny. This finding, together with the synteny of PRAC loci, the relationships with prokaryotic PRAC inferred by taxon-rich phylogenetic analysis, and the absence in *Trypanosoma*tids of any other genera or in bodonids or euglenids suggest that a common ancestor of *Trypanosoma* gained PRAC gene by a single and ancient horizontal gene transfer (HGT) from a Firmicutes bacterium more closely related to Gemella and other species of Bacilli than to *Clostridium* as previously suggested. Our broad phylogenetic study allowed investigation of *Try*PRAC evolution over long and short timescales. *Try*PRAC genes diverged to become species-specific and genotype-specific for *T. cruzi* and *T. rangeli*, with resulting genealogies congruent with those obtained using vertically inherited genes. The inventory of *Try*PRAC genes described here is the first step toward the understanding of the roles of PRAC enzymes in trypanosomes differing in life cycles, virulence, and infection and immune evasion strategies.

MALDI-TOF-MS Approaches to Identify Neotropical Mosquito Vectors of Human Malaria

N. Daphne Cervantes[1], Larissa Dutari[2], Juan Camilo Rojas[2], Jose Rovira[2], Rolando Gittens[2], José R. Loaiza[2].

[1]The University of Texas at El Paso
[2]Instituto de Investigaciones Científicas y Servicios de Alta Tecnología



De Izquierda a derecha arriba: Jose Rovira, Rolando Gittens, Juan Camilo Rojas. Abajo: José R. Loaiza y N. Daphne Cervantes.

Mosquitoes are important vectors of human pathogens worldwide. Malaria was one of the leading causes of death during the construction of the Panamanian Interoceanic Canal, early last century, and still continues to be among the most threatening public health issues in the country

currently. Despite ongoing efforts to control malaria in Panama, this disease has emerged powerfully in indigenous areas with social problems and health disparities. One of the possible causes of this resurgence is a shift in species composition of mosquito vectors owing to demographic changes and climate disturbances during the last 35 years.

Mosquito control is difficult because morphological identification of *Anopheles* species that vector malaria efficiently is not always reliable. Hence, often times one cannot easily distinguish between vector and non-vector *Anopheles* species. Recent biomolecular initiatives to solve this problem include DNA barcodes to accurately determine species, but the procedure is laborious and requires a very well trained technician. In Panama there is a need to develop new tools to quickly and accurately identify mosquito vector of pathogens without having to perform complicated laboratory protocols. Matrix Assisted Laser Desorption/Ionization Time-of-Flight Mass Spectrometry (MALDI–TOF–MS) is an analytical technique that allows for the sensitive and accurate detection of complex molecules such as proteins, peptides and nucleic acids, among others. There are several studies published already with the MALDI-TOF-MS to identify insect vectors mostly from Europe, but no study has been undertaken with this technique to assess taxonomic identify in a diverse Neotropical mosquito assemblage such as the *Anopheles* genus.

The first five weeks of my project in Panama, I worked in the laboratory with three different mosquito species: *Anopheles albimanus* (vector of malaria), *Aedes aegypti* (vector of dengue), and *Aedes albopictus* (vector of Chikungunya). I worked with a total of 23 colonized mosquitoes

during this part of the project. The first experiment was to determine if different parts of the mosquito body contained different protein spectra; we did this only with female mosquitoes in order to find the portion of the body that would give us less variability and more consistency across individuals. As a result we obtained that legs, regardless of their position (i.e., anterior, middle and posterior) always gave us the same protein spectra across individuals of the same species, while other parts of the body such as wings, head, thorax and abdomen produced noisier or more confounding spectra. The second experiment was to determine if males and females of the same species display differences in their protein spectra as shown by previous studies using whole insect bodies. For this we compared again head, thorax, abdomen, wings and legs (i.e., anterior, middle and posterior) of both females and males of the same three species of mosquitoes, and obtained slightly different outcomes for males and females when using abdomens and heads. In contrast, similar protein spectra for both genders within species were obtained consistently when using the legs.

During the last two weeks of my internship in Panama I visited a malaria endemic area in Darien, located on the eastern part of the country, to collect fresh *Anopheles* mosquitoes for eight days in a row. Mosquitoes were collected at night with different types of traps (Intersection, CDC and Shannon) and processed the next day in the morning. They were transported back into the lab in Panama City and processed with the same MALDI-TOF-MS protocols used before with colonized mosquitoes. The goal of my last experiment was to determine if different *Anopheles* species, all vectors of human *Plasmodia* in Darien, had specific protein profiles generated

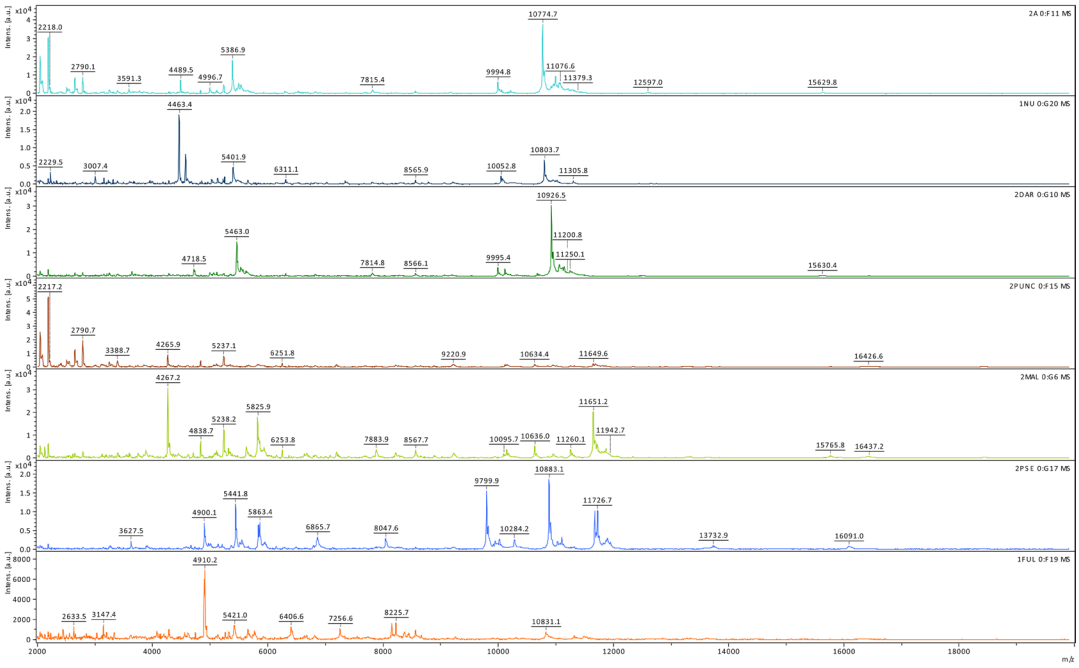


Figura 1. Perfiles proteínicos para discriminar las principales especies de mosquitos vectores de malaria en Panamá. Paneles en orden descendente (De arriba hacia abajo = *Anopheles albimanus, Anopheles nuneztovari, Anopheles darlingi, Anopheles punctimacula, Anopheles malefactor, Anopheles pseudopunctipennis y Aedes fulvus).*

with the MALDI–TOF–MS that could be used for identification purposes. For this, we first identified the samples to species level using morphological characters, and ran the MALDI-TOF-MS using only the middle pair of legs from six different species of *Anopheles* (Two females per taxa): *Anopheles albimanus, Anopheles darling, Anopheles nuneztovari, Anopheles punctimacula, Anopheles malefactor, Anopheles apicimacula, Anopheles pseudopunctipennis.* We obtained a distinct set of *m/z* peaks, or in other words particular protein masses in the spectra for each of the species analyzed. My results serve as the foundation to establish the practicality of MALDI–TOF–MS approaches to assist workers at the Ministry of Health to better understand the complexity of malaria transmission dynamic in endemic areas of Panama. They also suggest that reliable species identification can be achieved by using only mosquito legs, thus keeping the rest of the body for other important epidemiological analysis such as vector competence, morphometry, longevity, molecular assays and genomics.

During my summer internship with Dr. Jose R. Loaiza and his group, I learned new laboratory techniques such as the MALDI–TOF–MS. My study is a pilot experiment that provides the basis for future taxonomic analysis in Neotropical malaria vectors. While in Darien I was able to experience new situations, which made me value every single thing I have back at home. This research experience was wonderful, I am thankful for the opportunity given, thanks to MHIRT program at UTEP and to INDICASAT-AIP. I particularly want to thank Drs: J. Rao, JR. Loaiza, and R. Gittens as well as Larissa Dutari, Juan Camilo Rojas and Jose Rovira for their support while in Panama.

Welcome to ILEANA RODRÍGUEZ NEW ADMINISTRATOR OF INDICASAT AIP

Ileana Rodríguez, la nueva Administradora de INDICASAT AIP, es una profesional en el área de Contabilidad y Administración, organizada, planificada y con muchas ganas de compartir todas las experiencias adquiridas a través de los años en favor de contribuir a hacer Ciencia en Panamá.

Estudios, cursó sus estudios primarios y

Ileana Rodríguez, the new INDICASAT AIP administrator, is a professional in the Accounting and Administration areas, she is organized, planned and is looking forward to share all the experiences acquired over the years in favor of contributing to making Science in Panama.

Studies, attended her education at the Pan

secundarios en el Instituto Panamericano obteniendo su diploma de Bachiller en Comercio, realizando su práctica profesional en una Firma de Contadores pequeña que marcó en ella el continuar en esta línea. Obtiene su título de Licenciada en Administración con énfasis en Contabilidad en la Universidad Santa María La Antigua (USMA) y con este título su certificado de idoneidad de Contador Público Autorizado.

Experiencias Profesionales, su vida profesional empezó recién graduada del Colegio, y tuvo la oportunidad de trabajar en una diversidad de lugares, de donde las más sobresalientes fueron las empresas multinacionales directamente relacionadas con el área electrónica, tales como Sony Corporation, Philips Caribbean, Kenwood Electronics Latin America, donde se manejaron múltiples funciones administrativas y financieras, las cuales incluían desde las más simples y sencillas transacciones hasta los más complejos reportes y estados financieros.

Igualmente tuvo la experiencia de trabajar en el área financiera de una gran farmacéutica, Glaxo Welcome, quien luego se fusionará en "fusión de iguales" con Smithkline Beecham formando la nueva compañía GSK (GlaxoSmithkline) de la cual formó parte también al

American Institute (IPA) obtained a Diploma in Accounting, during this time she also made her professional practice in an small Accounting firm which marked her to continue in this business line. Later, she obtained his bachelor's degree in Business Administration with an emphasis in accounting from the Universidad Santa Maria La Antigua (USMA) and this title give the opportunity to obtain her Certification of Public Accountant.

Professional experiences, his career began once graduate from the College and had the opportunity to work in a variety of places, where the most prominent multinationals were directly related to electronics field as Sony Corporation, Philips Caribbean, Kenwood Electronics Latin America, where many administrative and financial functions were handled, which ranged from common and simple transactions to complex reports and financial statements.

Also had the experience of working in the financial area of a large pharmaceutical company as, Glaxo Wellcome, who merged into "merger of equals" with Smithkline Beecham forming the new company GSK (GlaxoSmithKline), after an internal employee acquisition process, was considered as part of the new company.

Lic. Ileana Rodríguez en la IFRC Sede - Ginebra

salir airosa en el proceso interno de contrataciones.

Organismos humanitarios, dentro de su vasta experiencia cabe resaltar una que marcó mucho su sentir humanitario, y fue su trabajo en la Federación Internacional de la Cruz Roja y la Media Luna Roja, Zona de América, donde empezó su labor como Analista Fi-

Humanitarian organism, within their vast experience worth mentioning one that marked her humanitarian feeling, and it was her work at the International Federation of Red Cross and Red Crescent Societies, Americas Zone, where her work begin as a financial analyst and ended as Administration Manager, being in charge to meet all the request from the 35

Lic. Ileana Rodríguez en el Terremoto en Haití.

nanciera y finalizó como Gerente de Administración, teniendo a su cargo el atender a solicitud a todas las 35 sociedades nacionales de la Cruz Roja en América, y las oficinas zonales ubicadas en Centroamérica, Suramérica y el Caribe.

Formando parte de este organismo le tocó desplegarse en enero de 2010 a una de las emergencias más grandes de América, que fue el terremoto de Haití, donde tuvo que encargarse de velar financieramente y administrativamente por que se mantuviera la transparencia del proceso y la cual requería de una constante actualización de las cifras y presupuestos financieros para una mejor toma de decisión a favor de los hermanos haitianos, en un ambiente muy hostil y difícil. Seguidamente unos meses después se da el terremoto de Chile al cual también es enviada a realizar igual labor en favor en esta ocasión de los hermanos chilenos.

national Red Cross societies in America, and the zonal offices located in Central and South America and the Caribbean.

As part of the Red Cross she was deployed in January 2010 to one of the biggest emergencies of America, which was the earthquake in Haiti, where she had to take care financially and administratively to ensure about the transparency of the process, which required constantly updated figures and financial budgets for better decision-making in favor of the Haitian country, all this in a very hostile and difficult environment. Then a few months later, came the earthquake in Chile where also deployed to perform the same work at this time of Chilean country.

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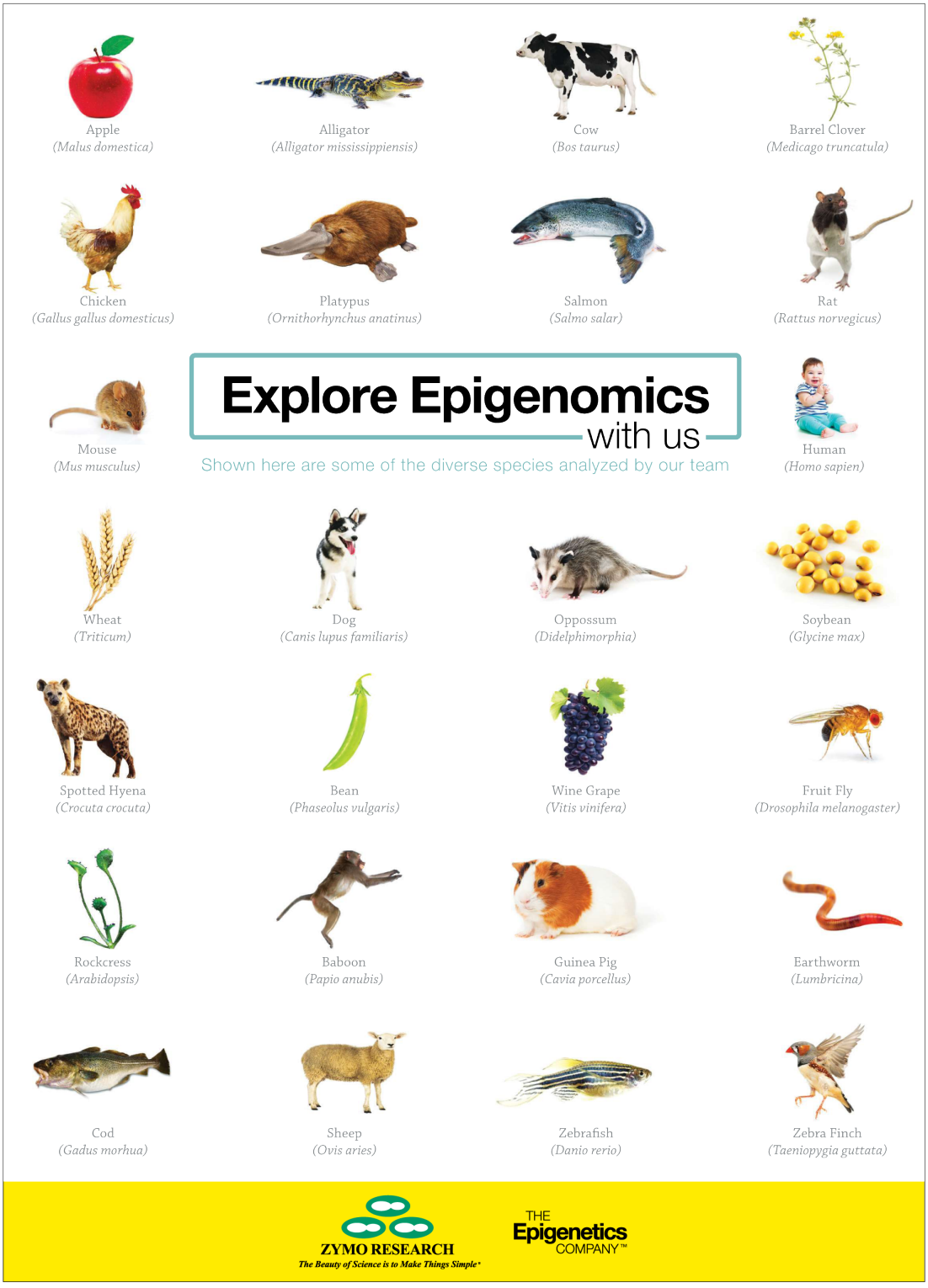

GEN EXCLUSIVE

Working Out the Bugs in Genetic Mosquito Plan

CONGRATULATIONS
Dr. Jose Loaiza and
Dr. Matthew J. Miller for
recognition of their work.

NIMBY Swarm Gathers When Oxitec, Agency Lay Out Proactive Disease Control Field Trial

Alex Philippidis

Five years ago when Key West, Florida, had its dengue outbreak, the regional mosquito-control agency stepped up truck and aerial spraying using larvicide and handheld adulticide foggers and ovitraps, even going door-to-door to find mosquito breeding sites.

Now, the Florida Keys Mosquito Control District hopes a preventive measure can stave off a future outbreak of dengue or another mosquito-borne viral disease, chikungunya. The district wants to deploy mosquitoes genetically modified by **Oxitec** to combat mosquito-borne diseases, saying the approach is not only safer and cheaper, but more effective.

Oxitec is seeking FDA approval for a field trial of the company's GM mosquito. The field trial would take place in Key Haven, some four miles north of Key West, where the City Commission in 2012 passed a resolution opposing the test.

Key West officials have sided with residents in and around the resort community, joined by several environmental groups. They argue the GM mosquito plan is unnecessary and poses potential environmental and safety risks that outweigh its benefits and should be examined before any decision.

The district and Oxitec say the need for genetically modified mosquitoes has increased in the eight months since the first locally acquired case of chikungunya was reported in Florida.

The outbreak began on the French side of the Caribbean island of St. Martin in December 2013, and has grown to more than 1.2 million cases (1,217,093 suspected cases, 27,529 confirmed locally acquired cases, and 3,471 imported cases) as of February 20, according to the Pan American Health Organization. Cases have been reported in the U.S. and some 50 Caribbean nations and territories.

"The issue here is that Florida is at risk," Oxitec CEO Hadyn Parry told GEN. "They [the district] are worried because they know they have the mosquito, and they know they can't control it. The game plan is, let's give ourselves another tool, because if we do run into a problem, and we do run into a disease issue, then we've got another tool with which we can combat this."

Unintended Consequences

Oxitec's assurances have been met skeptically by local residents and environmental groups. As of February 26, 150,354 people signed a petition posted on Change.org by the owner of a Key West real estate firm, Mila de Mier, opposing the field trial.

"Nearly all experiments with genetically modified crops have eventually resulted in unintended consequences: superweeds more resistant to herbicides, mutated and resistant insects, also collateral damage to ecosystems," the petition reads. "Why would we not expect GM (genetically modified) insects, especially those that bite humans, to have similar unintended negative consequences?"

While no cases of dengue have been reported in Key West since October 2010, according to the district, mosquito suppression offers the best option for protecting public health, especially if types 2–4 should occur (a type 1 strain was associated with the 2009–10 outbreak and its associated 88 cases). Oxitec has also cited the chikungunya outbreak, which includes 11 confirmed cases in Florida.

Walter J. Tabachnick, Ph.D., director of the Florida Medical Entomology Laboratory at the University of Florida, Institute of Food and Agricultural Sciences, told GEN the chikungunya outbreak's small number of cases in Florida poses a conundrum for the community: There's no epidemic, yet Oxitec's trial won't work should one occur. While conventional spraying has been effective against common outdoor mosquitoes that breed in marshes and swamps, he said it won't be effective on urban mosquitoes like aegypti, which breed in and around houses, in areas that collect water: "That's the compelling idea of having the male mosquitoes go out and do the work for you."

Oxitec says "it's very unlikely" its mosquito would have any major effects on local ecosystems, saying they would benefit from removal of aegypti since it is an invasive species. The company acknowledges dengue can mutate, but says reducing the number of mosquitoes can prevent new outbreaks.

A Tale of Two Species

Critics have raised concerns that controlling *Aedes aegypti* may result in another mosquito species, *Aedes albopictus*, spreading disease. Both are vectors of chikungunya and dengue viruses.

Dr. Tabachnick believes that is unlikely in the Florida Keys, where *albopictus* has not been able to establish long-term populations. But in a study published in January, two Smithsonian Tropical Research Institute researchers cited two earlier studies suggesting that aegypti may be less effective at reducing chikungunya and dengue outbreaks without efforts to lower the albopictus population.

Writing in PLOS Neglected Tropical Diseases, Matthew J. Miller, Ph.D., and Jose R. Loaiza, Ph.D., who is also at Panama's INDICASAT AIP, said supplanting *aegypti* with albopictus "could have both favorable and unfavorable consequences that are difficult

Environmentalists worry that Oxitec's release of *Aedes aegypti* mosquitoes with genetically modified males will allow another disease-carrying mosquito strain, *Aedes albopictus* (above), to further spread diseases like dengue fever. Marco Uliana/Fotolia

News PRODUCTS & SERVICES

> **VWR**, a provider of laboratory products, services, and solutions, expanded a distribution agreement with **New England Biolabs** (NEB). This agreement allows VWR increased access to NEB's growing product portfolio and technical support in the United States and Puerto Rico. In addition, customers will now have access to NEB's products through VWR's e-business platform, sales organization, and VWRCATALYST, the company's on-site services organization. NEB develops solutions to support research, including developments in genome editing, synthetic biology, and next-generation sequencing.

> **Sygnis** has signed a nonexclusive distribution agreement for its TruePrime™ family with **Funakoshi** for the Japanese market. Sygnis grants Funakoshi the nonexclusive rights to promote, market, and sell all existing as well as future products for DNA and RNA amplification from the smallest amounts of samples down to single cells for applications such as next-generation sequencing.

The TruePrime™ product family is based on the company's multiple displacement amplification technology for the amplification of various DNA or RNA species for a multitude of applications. Funakoshi is offering a broad portfolio of research reagents as well as high-tech instruments in the fields of molecular biology, protein research, cell biology, and diagnostics to customers all over Japan.

> **Merrimack Pharmaceuticals** is using RNAscope technology from **Advanced Cell Diagnostics** (ACD) to select patients for a Phase II study of its product candidate MM-121. Merrimack said it will utilize RNAscope to identify patients with heregulin-positive, locally advanced or metastatic non-small cell lung cancer, making this the company's first MM-121 trial to include only patients with a high heregulin biomarker profile.

"We believe that the high sensitivity and specificity that RNAscope provides are necessary to identify the patients most likely to benefit from MM-121 in this Phase II clinical trial," said Gavin MacBeath, senior vice president of translational research at Merrimack. "RNAscope's ability to detect heregulin within the confines of tumor cells, and compatibility with existing automation instruments and with small tissue specimens such as fine needle aspirates and core needle biopsies were all important considerations in our decision to work with ACD."

> **ToolGen** will license its CRISPR/Cas9 intellectual property portfolio to **Thermo Fisher Scientific**, which will utilize the technology to develop and market new CRISPR reagent kits. Thermo Fisher said the kits will enhance its portfolio in the complementary transcription activator-like effector nucleases (TALEN) technique.

The licensed intellectual property is based, in part, on the discovery by Jin Soo Kim, Ph.D., a researcher at Seoul National University and co-founder of ToolGen, that the CRISPR/Cas9 system can be used to engineer cells found in multicellular organisms such as mammals, plants, and fungi.

As part of the agreement, Thermo Fisher Scientific is granted a worldwide license for research applications including the development and sale of reagents, cell lines, and animal models, as well as rights for high-throughput screening, diagnostics, and bioproduction. Thermo Fisher Scientific also has the right to grant sublicenses in each of these fields. ToolGen retains its rights in broad areas including high-throughput screening, diagnostics, bioproduction, plant biotechnology, and gene/cell therapy.

to predict a priori."

The researchers also raised the possibility that Oxitec's success against *aegypti* in Panama—the company said January 27 its Panama trial reduced that population by "over 90%"—could be reversed without continuous release of modified mosquitos.

Dr. Tabachnick agreed repeated mosquito releases will likely be needed: "This is not a one-bullet type of strategy. This is a strategy that is going to require continual application."

Parry said results of Oxitec's initial release will determine whether and how it carries out subsequent releases.

"What Oxitec hasn't answered is, what kind of effect will multiple releases have on the ecosystem?" Jeremy Gruber, J.D., president and executive director of the Council for Responsible Genetics, told GEN. "That's not to say that we know that these mosquitoes will absolutely harm the environment, or they will absolutely harm humans. But that potential is there, and that potential needs to be fully and thoroughly investigated through peer-reviewed study."

Especially, Gruber added, since past field trials have occurred in less-developed areas where residents lack representation and means to ensure their views are heard: "They (Oxitec) have done that intentionally, to ensure that they can move through these field trials without limitation."

Parry counters that Oxitec carries out trials where directed by local authorities, and dismisses as "pretty good nonsense" the argument that it seeks to exploit poorer areas.

FDA spokeswoman Theresa Eisenman told GEN the agency is reviewing information on Oxitec's field-trial plan and mosquito, "in consultation with government experts." The agency won't discuss details of its review, citing confidentiality concerns.

"FDA will not support a field release until it has thoroughly reviewed all the necessary information and assessed potential environmental impacts. We cannot offer a timeline for when FDA will complete its review," Eisenman said.

Deliberation and Education

Food & Water Watch, a nonprofit that opposes the field trial, says the agency has yet to show it is adequately reviewing Oxitec's request.

"There is no indication that the FDA has done any [National Environmental Policy Act]-required environmental review of this field trial, with either an environmental assessment (EA) or environmental impact statement (EIS). We believe FDA should conduct an EIS," Genna Reed, a Food & Water Watch researcher, told GEN.

Reed said FDA should heed its Final Guidance #187, "Regulation of Genetically-Engineered Animals Containing Heritable Recombinant DNA Constructs" (2009). In it, the FDA said it intends to hold advisory committee meetings before approving any GE animal, adding: "We may revisit that policy in the future as we gain more experience with reviews of GE animals."

Said Reed: "These committees should be made up of relevant experts (including entomologists, epidemiologists, ecologists, biologists, sociologists) looking at Oxitec's application, with the opportunity for public comment. These meetings should also be hosted in the Florida Keys so that the residents of the target field trial area will be informed and able to voice their concerns."

Oxitec says its public education efforts have included posting information on its website, fulfilling every media interview request, distributing flyers, and holding town halls: "People who think this is a good idea don't turn up. People who aren't interested don't turn up. You tend, really, to get those who are concerned or anti to turn up," Parry said.

As Dr. Tabachnick correctly notes, Oxitec's efforts have not persuaded field-trial opponents.

"I don't think their public relations campaign has been particularly effective. The public has real skepticism," Dr. Tabachnick said. "All of these questions that I'm responding to, they (Oxitec) need to respond to the community."

Genetic modification alone shouldn't preclude approval of Oxitec's mosquito field trial in Florida. But officials—both at the FDA and in the district—should not decide the issue without reviewing two sources of science—Oxitec's experience with past trials, and the peer-reviewed research that has emerged on mosquito control, as evidenced by the PLOS study. The comfort with which officials can answer questions raised by both sources should determine whether Oxitec has worked out enough bugs to warrant a trial of its mosquitoes in Florida. GEN

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Neurociencias Panamá: Memoria y Salud

One of the main goals I have always had since I started pursing my degree in Biomedical Engineering was to be able to obtain experience in regenerative medicine. As it is currently a highly demanding field to work on, it is difficult to obtain an internship with this focus and even less to get the proper training for it. However, it was different when I had the opportunity to apply for an internship at INDICASAT in Panama. Due to the difficulty of carrying out a project in organ regeneration in countries such as those in Latin America, they are always looking for students who are willing to learn and offer their assistance. That is how after a long search of mentors and projects, we finally got in touch with Dr. Rolando Gittens who was carrying out a project in regeneration of neurons.

Lindsay Jimenez
University of Connecticut

During my stay at INDICASAT and my focus at Dr. Gittens' project I have been able to have a broader understanding of the different protocols that currently exist for organ regeneration as well as how these can still be improved. I also had the chance of having hands on experience in techniques that would incorporate cell culture along with scaffolds that would regenerate a patient's neurons after having a brain damage.

It is true however that not everything was easy at INDICASAT. The institution had a problem that probably most of Latin American countries usually have. Limitations in machinery, reagents and other tools made it difficult to perform all the experiments at a prompt manner. Therefore this led to the need of working on more than one project at a time, which ended up giving me experience in other fields besides my own including those of chemistry, neurology and microbiology.

On the other hand, I believe that one of the biggest assets that INDICASAT has is its people. For the most part they are highly knowledgeable and they are constantly looking for ways to improve science in Panama. They are always trying to get the maximum potential of all the machinery they have at the institute and they are also aiming to reduce wasting material as much as possible. This was really noticeable, mainly because things are not as highly appreciated in the USA and producing waste is a common thing.

After having so many direct encounters with both technology and people at INDICASAT, I can say it has been a great experience that has allowed me to growth as both a person and a scientist. The fact of being able to improve my understanding in laboratory procedures, investigation projects, improvement of current research, sharing knowledge and skills and most importantly how all this can be applied to my major and my future endeavors is something that I will always be thankful for.

INDICASAT AIP a futuro...

En el futuro me gustaría que el Instituto fuese reconocido a nivel Nacional y Centroamericano, para contar con más científicos en diferentes áreas y que nuestro país sea reconocido por los logros y esfuerzos de muchos profesionales en el área de la ciencia; es importante reconocer que INDICASAT AIP está logrando que estudiantes se interesen por descubrir más del mundo científico y la tecnología y es por esto que debemos apoyarlos para que todos sus logros se cumplan.

Yamileth Ojo

La tecnología y la ciencia deben tener una interrelación y es en INDICASAT AIP donde vislumbro en un futuro dicha fusión de estos grandes campos del conocimiento, a medida que el tiempo pase, será totalmente conocido el trabajo arduo que el personal de esta Institución le dará al país. Estoy convencido que las investigaciones que nacen de las ideas de los científicos de hoy, serán un marco de referencia para los futuros investigadores, no solo de INDICASAT AIP, si no a nivel global.

Davis Sánchez

El conocimiento, la información y las tecnologías generados a través de la investigación científica de INDICASAT AIP juegan un papel importante en el futuro desarrollo del país, pues ha permitido formar profesionales con creatividad, dispuestos a innovar, y hacer ciencia útil y rentable. En el futuro es fundamental disponer de una capacidad científica y tecnológica actualizada que permita desarrollar y solucionar las mejores tecnologías disponibles en el país.

Mercedes Rodríguez

Mi visión de INDICASAT AIP sería la resultante de una serie de conjugaciones entre las funciones básicas del Instituto, tales como Investigación, docencia, publicaciones y la interrelación con la sociedad a la cual se debe y beneficia con su actividad. Igualmente podemos mencionar una mística institucional constituida por principios y valores fortalecidos, los cuales guiando el pensamiento, la conciencia y las acciones de todos sus miembros, hagamos posible nuestra tan anhelada "Ciencia en Panamá".

Ileana Rodríguez

Ser una institución Líder a nivel nacional e internacional y de experiencia en el ámbito de investigaciones científicas, informar conocimientos a personas de diferentes edades con el fin de enseñar los proyectos en desarrollo dentro de INDICASAT AIP.

Kathia Domínguez

A lo largo de los años no imagine tener la responsabilidad de algo tan importante como Encargado de un Bioterio, lugar destinado a cría y reproducción de pequeños animales de laboratorio. A meses de recibir una infraestructura nueva donde albergaremos a estos animales de laboratorio con mucha más comodidad, solo me queda decir que espero seguir ofreciendo la calidad, cantidad, manejo adecuado de estas especies ofreciéndoles bienestar animal; a todas las áreas de investigación que lo soliciten, contribuyendo a resultados confiables en las investigaciones realizadas.

René Rivera

Desearía que INDICASAT AIP sea un Instituto Modelo reconocido a Nivel Nacional como Internacional, donde podamos poner en práctica los procedimientos de Tecnología de Punta Científica y que los colaboradores puedan crecer como profesionales. Que INDICASAT AIP pueda ser independiente teniendo sus propios recursos, estar reconocidos en el nivel educativo y ganarnos el mérito como tal, de este modo contribuimos a que se haga mejor Ciencia en Panamá y crecer más.

Yamibel Díaz

"Me gustaría que INDICASAT AIP, fuese el mejor Instituto de Investigaciones Científicas de Panamá y la Región Centroamericana, brindando apoyo en temas de ciencia para la investigación aunados a nuevos y modernos estándares tecnológicos, que nos permitan establecer practicas automatizadas cumpliendo con nuestro lema de "alta tecnología".

Osiris Pineda

Constituirnos en un laboratorio reconocido por su excelencia y prestigio siendo un ejemplo para las demás instituciones en el país.

Alfonso López

Visualizar a INDICASAT AIP como el MIT de Panamá: Sueño o Realidad
¿Cómo lograrlo como administración?
Apoyar a los científicos para la compra de equipos, productos químicos, consumibles, cristalería, etc., manejo efectivo de pagos e informes financieros, manejo de los recursos humanos, ofrecer seguridad de nuestro trabajo y ofrecer seguridad en su lugar de trabajo.
Estos puntos ayudarán a los científicos enfocarse 90% en desarrollar la ciencia y solo aportar 10% en roles administrativos. Siendo este el primer y más importante paso para que sueño se convierta en realidad.

Anna Melhado

Que sea una institución de un alto nivel, que se catalogue por ser referentes y competentes en nuestro contexto, para instituciones públicas y privadas sean de formación o investigación, empresas y profesionales, distinguiéndonos por liderar la investigación e innovación, fomentar y difundir la cultura de calidad y excelencia institucional, de proyectos y de programas identificando nuevas alternativas y la utilización de tecnologías, promover la incorporación y desarrollo de nuevos investigadores. Consolidar la unidad como un servicio que trabaja con procesos de gestión eficaz, eficiente, de calidad y de mejora continua, comprometidos con las necesidades del investigador, simplificando el trámite administrativo de los procedimientos, adecuándolos a la administración electrónica, capaz de afrontar los procesos cambiantes y la demanda de la comunidad, del sector empresarial y la sociedad.

Alvin Winter

Neuro-perspective of emotions

There is not a consensus definition for emotions that is accepted across fields from neuroscience to psychology to philosophy. According to many contemporary psychologists our emotions are a product of the way in which we interpret the world. In contrast, neuroscientists have viewed emotions as expressions of inherited programs for action in specific situations that have been of importance to humans and related species. The goal of neuroscience research is to identify the neural systems responsible for the basic responses of fear, rage, disgust, affiliation, and so on (1, 2). But which view is correct? Are emotions the product of complex cognitive appraisals or are they the product of simple programs embedded in our genes and brains? A complete account of emotion should make reference to all levels of analysis, reaching from the feelings and behaviors associated with emotion to how they are computed at the neural level of brain structures and systems.

Evidence from multiple domains suggests that automatic and controlled emotion processes are carried out by at least five distinct neural systems. Each system plays a different but essential functional role in the generation and regulation of emotion

Deborah Doens

(2). These systems include the amygdala, the basal ganglia, lateral prefrontal and association cortices, anterior cingulated cortex, ventral and medial orbital frontal cortex.

THE AMYGDALA: The limbic system was proposed to

modulate the emotional quality of stimuli and support autonomic effector mechanisms associated with emotional states. A key limbic structure that has a critical role in emotional expression is the amygdala. Information of a stimulus can reach the amygdala by one of two routes: either through cortically based systems used to recognize stimuli on the basis of distinct perceptual features or through more direct connections to sensory organs via the thalamus that bypass the longer cortical route (1-3).

Due to the connection between the amygdala and other neural systems, it play's its important role on the mediation and control of major affective activities like friendship, love and affection, on the expression of mood and, mainly, on fear, rage and aggression The amygdala, being the center for identification of danger, is fundamental for self-preservation.

THE BASAL GANGLIA:

Situations that elicit positive and negative affect seem to require very different kinds of responses. The Basal Ganglia are designed to slowly encode series of behavior that, over time, have been repeated and rewarded -or at least not punished (4). The representations it encodes not only support the execution of habitual behaviors but the prediction of what comes next in a sequence of thoughts or actions.

LATERAL PREFRONTAL AND ASSOCIATION CORTICES:

Some areas of the lateral prefrontal cortex have been involved in the autosomic use of knowledge (5). Much of the knowledge that we use to assess the emotional relevance of stimuli and events is stored in the form of organized knowledge. It is the source of emotion concepts and theories, and links diverse and discrete memories together that share a common emotional association.

ANTERIOR CINGULATE CORTEX:

Regulation of emotional responses requires that one know such intervention might be necessary. Evaluating the need for regulation is the function of anterior cingulate cortex, and this evaluative function is an essential part of many types of controlled processing. The anterior cingulate cortex has many subregions that together seem to serve a similar function in different domains (1, 6, and 7). Together they evaluate the feelings that one is experiencing by signaling uncertainty, conflict, or pain.

VENTRAL AND MEDIAL ORBITAL PREFRONTAL

CORTEX:

Our bottom-up emotional responses are not always appropriate for every situation, and effective emotion regulation involves both the active modification of these responses, as well as the active use of emotional responses to guide judgment and decision-making. Data from both animal and human studies indicate that the orbital and ventral medial frontal cortices are important for selecting and implementing these regulatory actions (8). These functions allow us to both alter our emotional responses based on analyses of the current context, and also to generate affective responses based on these analyses.

Other key elements in the emotions neuro-perspective are the neurotransmitters wish play an important role in the neuronal system of emotions. The more studied are the monoamine systems that include the neurotransmitters serotonin, nor-adrenaline and dopamine. The monoamine systems is dynamic because is involve in the modification of behaviors and emotion has to adjust to changes very rapidly (9). About these topics there are several variables to take in account and different points of view and yet there is not a complete understanding of emotions. There are different aspects that may influence in behavioral disorders or affective illnesses. Genetic, developmental, environmental and learning variables can influence neurochemical, limbic and cortical systems which ultimately affect behavior. Alterations in these neurochemical and/or neural structures associated with emotions may underlie or contribute to the emergence of psychiatric illness, particularly depression and anxiety.

References

1. Phan, K.L.; Wager, T.D.; Taylor, S.F.; Liberzon, I. (2002). "Functional neuroanatomy of emotion: A meta-analysis of emotion activation studies in PET and fMRI." Neuroimage 16 (2): 331–348.
2. LaBar, K. S. and R. Cabeza (2006). "Cognitive neuroscience of emotional memory." Nat Rev Neurosci 7(1): 54-64.
3. Adolphs, R. (1999). The human amygdala and emotion. The Neuroscientist, 5, 125-137.
4. Paulmann, S., M. D. Pell, *et al.* (2008). "Functional contributions of the basal ganglia to emotional prosody: evidence from ERPs." Brain Res 1217: 171-178.
5. Tulving, E., Kapur, S., Craik, F. I. M., Moscovitch, M., & Houle, S. (1994). Hemispheric encoding/retrieval asymmetry in episodic memory: Positron emission tomography findings. Proceedings of the National Academy of Science, 91, 2016-2020.
6. Bagdaiyan, R. D., & Posner, M. I. (1997). Mapping the cingulate cortex in response selection and monitoring. Neuroimage, 7, 255-260.
7. Elliott, R., & Dolan, R. J. (1998). Activation of different anterior cingulate foci in association with hypothesis testing and response selection. Neuroimage, 8, 17-29.
8. Stuss, D. T., Eskes, G. A., & Foster, J. K. (1994). Experimental neuropsychological studies of frontal lobe functions. In F. Boller & J. Grafman (Eds.), Handbook of Neuropsychology. Amsterdam: Elsevier.
9. Lovheim, H. (2012). "A new three-dimensional model for emotions and monoamine neurotrasmitters." Med Hypotheses 78(2): 341-348.

Emotions, immune system, and associated diseases.

In 1964, George F. Solomon published a paper: "Emotions, immunity, and disease: a speculative theoretical integration" which coined the term "psychoimmunology" for the first time. Then, in 1975, Robert Ader (a psychologist) and Nicholas Cohen (an immunologist) coined the term "psychoneuroimmunology" demonstrated that the nervous system could affect the immune function using a classic conditioning experiment. Currently, psychoneuroimmunology (PNI) is defined as the study of the interaction between psychological processes, the nervous and immune systems. The main interest of PNI is understanding the interactions between the nervous and immune systems and the relationships between mental processes and health.
There is substantial evidence suggesting that psychological stressors can influence physiology and lead to immunological dysregulation. That can result in increased risks of chronic diseases, such as cardiovascular diseases and cancer.

PSYCHOLOGICAL STRESS AND ASSOCIATED DISEASE CARDIOVASCULAR DISEASE

Psychological stress is implicated in the pathogenesis of certain cardiovascular diseases such as coronary artery disease, atherosclerosis, etc. (1). Acute or chronic psychological stress can induce an inflammatory process in the cardiovascular system.

Yisett Gonzalez

Psychological stress activates the sympathetic nervous system (SNS) and the hypothalamic pituitary axis (HPA), which regulates heart rate, stimulates the production of adhesion molecules on endothelial cells, alters the expression of stress hormones (e.g. catecholamine) and serum levels of cytokines which re-

cruit inflammatory cells. The relationship between stress and immunity can exacerbate cardiovascular conditions (2).

CANCER

The majority of cancer deaths can be attributed to metastasis. Metastasis is defined as a primary neoplasm biologically heterogeneous. The result of cancer metastasis depends on interactions between metastatic cells and homeostatic mechanisms that to a given a tumor. The process of metastasis involves proliferation, invasion, embolization and evasion of immune system (3). The role of psychological stress in the progression of metastasis is beginning to be investigated. Acute and chronic psychological stress can trigger signaling pathways, which result in the production of proangiogenic factors (e.g., VEGF, IL-6, TGF-α and -β and TNF-α). Interestingly, these same factors are also secreted by metastatic cells to cause endothelial activation, blood vessel growth and subsequent tumor expansion. Additionally, the release of epinephrine (E) and norepinephrine (NE) often associated with psychological stress induces the expression of adrenergic receptor beta (ADRBs). ADRBs appear to play a key role in accelerated tumor growth and metastasis by acting as a chemoattractant to induce cell migration and by increasing matrix metalloproteinases (MMP) production by metastatic cells (4). There is evidence that psychological stress can be affecting the ability to cope with cancer.

VIRAL INFECTION

In certain viral infections, an overactive immune system can further exacerbate infections. For example, elevated levels of the pro-inflammatory cytokine, IL-6 in stressed HIV patients are associated with increased progression into AIDS and death as IL-6 can induce HIV replication, upregulate CCR5 HIV co-receptor, and induce inappropriate apoptosis of immune cells (5). This unwanted increase in the production of pro-inflammatory cytokines (e.g. IL-6) could be caused by acute or chronic psychological stress.

References

[1] G. K. Hansson, "Inflammation, atherosclerosis, and coronary artery disease.," *The New England journal of medicine,* vol. 352, no. 16, pp. 1685–95, Apr. 2005.
[2] R. C. M. Ho, L. F. Neo, A. N. C. Chua, A. A. C. Cheak, and A. Mak, "Research on psychoneuroimmunology: does stress influence immunity and cause coronary artery disease?," *Annals of the Academy of Medicine, Singapore,* vol. 39, no. 3, pp. 191–6, Mar. 2010.
[3] S. K. Lutgendorf, A. K. Sood, and M. H. Antoni, "Host factors and cancer progression: biobehavioral signaling pathways and interventions.," *Journal of clinical oncology : official journal of the American Society of Clinical Oncology,* vol. 28, no. 26, pp. 4094–9, Sep. 2010.
[4] M. Moreno-Smith, S. K. Lutgendorf, and A. K. Sood, "Impact of stress on cancer metastasis.," *Future oncology (London, England),* vol. 6, no. 12, pp. 1863–81, Dec. 2010.
[5] C. R. Fumaz, M. Gonzalez-Garcia, X. Borras, J. A. Muñoz-Moreno, N. Perez-Alvarez, B. Mothe, C. Brander, M. J. Ferrer, J. Puig, A. Llano, J. Fernandez-Castro, and B. Clotet, "Psychological stress is associated with high levels of IL-6 in HIV-1 infected individuals on effective combined antiretroviral treatment.," *Brain, behavior, and immunity,* vol. 26, no. 4, pp. 568–72, May 2012.

Stress are related with susceptibility to disease.

In the last decades the integration between Brain, Endocrine and Immune systems has been much explored. Whether health or illness condition the interaction between systems occur among immune cells, secreted cytokines, hormones, and neurotransmitters. A series of studies have shown that brain has a key role in the stress body respond with the activation of hypothalamus-pituitary-adrenal axis (HPA) and subsequently release of cortisol that could be stimulate inflammatory cells in the brain and others peripheral immune cells and their cytokines production. Brain has closing functions in stress body response by binding to glucocorticoid receptors (1).

Sympathetic nervous system (SNS) responds to stress by

Ciara Ordoñez

releasing the neurotransmitter Norepinephrine directly to the nerve fibers and the hormone Epinephrine by the adrenal gland. Beta-adrenergic epinephrine and norepinephrine receptors bind resulting in the activation of transcription factors such as cyclic AMP response element binding protein (CREB), which upregulates genes encoding proinflammatory cytokines.

Additionally the Central Nervous Systems (CNS) elicits differential immune effects dependent on cell type and stage of development, inducing the expansion and migration of immature dendritic cells. Several researches have demonstrated that the SNS is able to modulate immune activity through production of epinephrine and norepinephrine promoting a T helper type 2 (Th2) and Th17 phenotype in T cells and dendritic cells. Other recent study found that subjects with memory of anger events showed an increase in Tumor Necrosis Factor (TNF) and Interleukin IL-6 cytokines as well as higher levels of norepinephrine C-reactive protein and blood pressure (2,3). So stress probably serves a one-two punch with HPA axis signals and consequently activation of inflammation process, while messages from the SNS ramp up. Furthermore, epinephrine and norepinephrine binding of beta-adrenergic receptors inhibits the response factor (IRF) interferon transcription factors.

Nowadays, the idea that social stress in adults with a troubled childhood might cause epigenetic effects is controversial. Currently, there are many evidence that social stress can be affected the pro-inflammatory genes expression. For example, Miller *et al.* 2012 mentioned that it could be possible that epigenetics changes induced by stressors components are transmitted to next generation (4). In there, they observed a correlation between unfortunate events that occur during childhood and DNA methylation profile in whole white blood cells of these adults.

Mansuy *et al.* 2011 demonstrated that the epigenetics effects could be transmitted to next generation thought the sperm and cause DNA methylation in genes related with social behavior (5). Next, this author for first time reported in an experimental murine model that mice under experimental chronic stress showed depressed behavior and significant highest levels of mRNA in blood and brain, then they were injected these mRNA in fertilized ovules and finally they observed that mice from parents that suffer early signals of depression also showed highest mRNA levels in blood and brain as compared with controls (6).

Rachel *et al.* 2014 found that children with both parents had post-trauma disorders

had lower levels of methylation in genes related with the promoter region that encoding for glucocorticoid receptor that controls cortisol levels (7). Other study showed that children born to women who had experienced brutality had lower cortisol levels than controls, and the highest levels of methylation of a gene known to play a role in regulating stress hormone.

In summarize, immune molecules and their interactions with brain and endocrine system are critical for studying behavioral outcomes, including cognition, mood, and social relation. Also the environment and social conditions impact on human body functions and abilities by diverse challenges early in the development this phenomenon is a candidate mechanism of risk for neuropsychiatric disorders, as well as a novel target for behavioral, therapy and pharmacological interventions.

Referencias

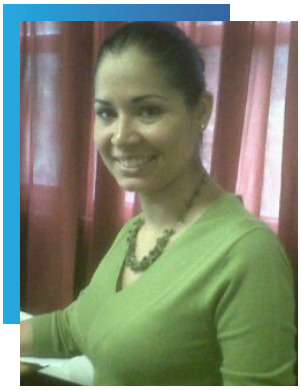
1. Bilbo et. al. The Immune System and Developmental Programming of Brain and Behavior Front Neuroendocrinol. 2012 ; 33(3): 267–286.
2. Greeson JM *et .al.* Stressinduce changes in the expression of monocytic b2-integrins: the impact of arousal of negative affect and adrenergic responses to the Anger Recall Interview. Brain BehavImmun 2009; 23:251–6.
3. Brod S. *et .al.* 'As above, so below' examining the interplay between emotion and the immune system, John Wiley & Sons Ltd, Immunology, 2014; 143, 311–318.
4. Miller *et al.*The Prevalence and Latent Structure of Proposed DSM-5 Posttraumatic Stress Disorder Symptoms in U.S. National and Veteran Samples. Psychological Trauma: Theory, Research, Practice, and Policy.2012.
5. Mansuy *et al.* Influence of Early Stress on Social Abilities and Serotonergic Functions across Generations in Mice 2011. PLoS ONE 6(7).
6. Mansuy *et al.* Implication of sperm RNAs in transgenerational inheritance of the effects of early trauma in mice2014 Nature Neuroscience 17, 667–669.
7. Yehuda Rachel *et al.* Site-specific methylation changes in the glucocorticoid receptor exon 1F promoter in relation to life adversity: systematic review of contributing factors Frontiers Neuroscience 2014; 8: 369.

El Doctor José R. Loaiza fue invitado a participar como expositor en el curso "2015 Sao Paulo School of Advanced Science - Science of Eradication: Malaria" (http://scienceoferadication.org/courses/science-of-eradication-malaria-brazil/overview/) organizado por el instituto de ciencias biomédicas de la Universidad de Sao Paolo, el Instituto de Salud Global de Barcelona, la Universidad de Harvard, y el instituto Suizo de Salud Pública Tropical. Este evento se celebrará del 22 de Septiembre al 2 de Octubre del presente, y los gastos de viaje internacional, estadía y alimentación del Dr. Loaiza serán cubiertos a través de una beca de la Fundação de Amparo a Pesquisa do Estado de São Paulo (FAPESP).

Alcibíades Villarreal, estudiante de doctorado de la Dra. Britton ha ganado un premio de viaje de Novartis Pharma Logistics Inc. (división Neurología) a asistir y presentar un póster en SFN Congreso 2015 que se celebrará en Chicago, EE.UU. (octubre 17-21).

Larissa C. Dutari, estudiante de doctorado obtuvo una beca de la SENACYT para visitar a la doctora Sandra Juglen en el Laboratorio de Virología en Bonn, Alemania.

Erika N. Guerrero, estudiante de doctorado ha ganado el Awards & Honors Committee of the Environmental Mutagenesis and Genomics Society (EMGS), otorgandole uno de los premios de viaje EMGS como Estudiante y Nuevo Investigador para el año 2015. Este es un premio basado en reconocer la excelencia de su investigación, el progreso de la investigación, y su promesa como colaborador a largo plazo de la investigación en temas relacionados con la misión de EMGS. La estudiante Guerrero lo recibirá en la ceremonia de premios durante el Banquete EMGS el Martes, 29 de septiembre, en la 46ª Reunión Anual de la EMGS en el Sheraton New Orleans en Nueva Orleans, Louisiana.



Hemos desarrollado el modelo de red molecular para entender las interacciones con oxitocina neuroquímicos implicados en las vías de neurodegeneración, ganando IBRO-SFN del premio 2015 de $ 2,000. Se da este premio a presentar el trabajo en sesión SFN en Chicago por la joven científica Ivana Tejada.

Chemistry of birth

Debate Biologists have long favoured the idea that the first information-carrying molecule of life was not DNA but its close chemical cousin RNA. Nich

It was the actions of Jupiter and Saturn that quite inadvertently created life on Earth. Not the gods of the Roman pantheon, but the giant planets, which once orbited much closer to the sun. Driven outward, they let loose a cascade of asteroids, known as the Late Heavy Bombardment, that blasted the surface of the young Earth and created the deep pockmarks still visible on the face of the moon.

Nicholas Wade, May 12, 2015, NYT

In the intense heat of these impacts, carbon from the meteorites reacted with nitrogen in Earth's atmosphere to form hydrogen cyanide. Though a deadly poison, cyanide is, nonetheless, the ancient pathway for inert carbon atoms to enter the chemistry of life.

By the time the Late Heavy Bombardment had eased, some 3.8 billion years ago, the cyanide had rained down into pools, reacted with metals, evaporated, been baked and irradiated with ultraviolet light, and dissolved by streams flowing down to a freshwater pool. The chemicals formed from the interactions of cyanide combined there in various ways to generate the precursors of lipids, nucleotides and amino acids. These are the three significant components of a living cell – lipids make the walls of a cell's various compartments; nucleotides store its information; and amino acids assemble into the proteins that control its metabolism.

All of this is a hypothesis, proposed by John Sutherland, a chemist at the University of Cambridge in England. But he has tested all the required chemical reactions in a laboratory and developed evidence that they are plausible under the conditions expected of primitive Earth.

Having figured out a likely chemistry needed to produce the starting materials of life, John then developed the geological scenario above because it provides the conditions required by

the chemistry. As for the chemistry itself, that springs from John's discovery six years ago of the key to the RNA world.

Biologists have long favoured the idea that the first information-carrying molecule of life was not DNA but its close chemical cousin RNA. RNA can store genetic information and act as an enzyme to create more RNA. Like DNA, RNA is made up of a string of chemical units known as nucleotides. Each nucleotide consists of a sugar, ribose in the case of RNA, joined to a base at one end and to a phosphate group at the other.

Researchers trying to reconstruct the chemistry that led to life had shown plausible ways in which ribose and the bases could have arisen. But in prebiotic chemistry, the assumed natural chemistry of Earth before life began, they could find no likely way of joining ribose to a base. So daunting was this obstacle that some began to doubt the idea of an RNA world, looking instead for a pre-RNA system.

After 10 years of testing every possible combination of prebiotic chemicals, John discovered that the solution was not to build the ribose and the sugar units separately in textbook fashion, but to construct a substance that was part sugar and part base. The addition of another simple chemical converted this hybrid into a ribonucleotide. The door to the RNA world had at last been opened.

If this step was critical, John inferred, then the rest of prebiotic chemistry must somehow be related to it. He and colleagues have spent the last six years doing experiments to see how the ribonucleotide chemistry pathway can be linked back to hydrogen cyanide as its starting point, and how other significant prebiotic chemicals might have emerged from the cyanide-to-nucleotide pathway.

Evidences

So far they have demonstrated ways to generate 12 of the 20 amino acids used in proteins, two of the four ribonucleotides of RNA, and glycerol 1-phosphate, the universal building block of the lipids from which cell membranes are formed. Their findings were reported in March in Nature Chemistry.

Though other researchers have shown how several of these substances could have formed on primitive Earth, these required a variety of conditions, some incompatible. This is the first time that so many significant life chemicals have been shown to emerge from the same chemistry.

John's report "lays out for the first time a scenario for generating potentially all of the building blocks of life in one geological setting," said Jack W Szostak, a geneticist at Massachusetts General Hospital who studies the origin of life. "The details of the scenario will be debated for some time, but over all, I think it's a very big advance," he said. Jack shared the Nobel Prize in Medicine in 2009 for the discovery of the mechanism that protects the ends of chromo-

somes.

John's chemicals cannot all be mixed together at once. His reaction scheme requires them to be delivered in sequence to a central pool. So in his scenario, separate streams flow over mineral deposits and arrive one by one at the pool. Therein lies a possible weakness, Paul J Bracher, a chemist at Saint Louis University in Missouri, said in a commentary in Nature Chemistry. "This new report represents a fantastically interesting approach, but origin-of-life chemists still have plenty of work to do in the kitchen," he wrote.

Others have deeper reservations. Steven Benner, the director of the Foundation for Applied Molecular Evolution in Gainesville, Florida, said that many of the reactions in John's scheme "aren't real," meaning that pure chemicals might react as proposed in the laboratory, but that the process could not be expected to proceed the same way in a natural mix of chemicals.

Steven also noted that the popular idea of an RNA world is burdened with several unresolved paradoxes. One is that if you have a pool of chemicals and pump energy in, "you don't get life, you get asphalt," he said, meaning that the chemicals will react together to form a gooey tar. Another is that water is essential for life, as are nucleotides, but water destroys nucleotides. A third problem is that RNA is assumed to act as an enzyme and as a store of genetic information, but the two roles require contradictory properties: An enzyme must fold up and be reactive, while a genetic molecule should do neither.

The traditional field of prebiotic chemistry has made some headway, in Steven's view, but not nearly enough to suggest real answers. "Still, to have these very basic problems left hanging suggests that maybe we're not answering the correct question," he said.

John is still trying to find plausible routes to the other two RNA nucleotides. He also hopes to understand how the molecules of life could have been built up from their individual units, a process known as polymerisation. "In biology, RNA makes protein and proteins make RNA, so the biology is telling you they work in cahoots with each other," he said. He added that he did not yet know if polymerisation would take place on a metal surface, often assumed to be a good catalyst, or inside a cell membrane.

Life may still be unlikely, but at least it's beginning to seem almost possible.

Don't teach ideas, foster them

David Lynch is right. Ideas are like fish. If you want to catch little fish, you can stay in the shallow water. But if you want to catch the big fish, you've got to go deeper. Down deep the fish are more powerful and more pure.

Sreelatha S, March 26, 2015, DHNS

They're huge and abstract. And they're very beautiful. True progress is often measure by one's success. And this success is only guaranteed with innovation and creativity. And how does one become creative and innovative? Well, just dig deep into your mind for some refreshing and new ideas.

But our current education system doesn't encourage such digging for ideas. All we are taught to do is to rote defined concepts, which culls the inquisitiveness of our minds. So, in such a situation, can we expect to experience the sweet taste of forming ideas and giving them life? It is well-known that if we need to progress, we need a good sense of scientific temper. But how can we develop this attitude? It's pretty simple. You can start by nurturing your personal ideas, applying them in different situations and finally transforming them into a staircase to reach greater heights.

Ideas should be caught not taught. Just like mobile signals, ideas are floating all around us. Ideas are just like newborn babies that require utmost focus and attention. Maximal care should be taken to avoid deforming an idea or its principle.

When we sense an idea, we have to adapt, equip ourselves to receive it. If the idea seems like a big lump, break it down into smaller, manageable pieces. This helps you grasp the nitty-gritties of the idea.

On the other hand, if only the essence of the idea is in the purview, before reaching the very core, the fragrance gets dissipated. In that case, the idea will be applicable to local situations only at certain points of time and its global application will be far from reality.

How to nurture?

While nurturing any idea, one should keep

perceptions of vision and audition in full vigour. Allow the ideas to get stored in the transit block, which is the superficial memory. Try not to meddle with the idea in the formative stage itself. When you catch yet another idea similar to or related to the one, scan your memory and try to develop a broader perspective.
Broader (horizontal) or deeper (vertical) perspective depends on the type of the idea perceived. You can then nurture the idea with relevant data and start working towards making the idea a full-blown concept. Sadly, most of us let our ideas sit for too long and lose out on some ingenious visions.

A scientific attitude can surface from anybody. Science is only in our minds and doesn't have any physical representation. But it can be given a form and made mobile. It can be brought to use only when people of different skills join together and work together. Hence, the need of the hour is to locate and catch the ideas and use them to better our world.

When a set of people see a beautiful sculpture, different people perceive it in different ways. A geologist may start pondering over the age of the rock, a historian may think about the living styles of the people then, an artist may think about the colour mix or implements used, an atheist may marvel at the beauty while a theist may see god in the sculpture.

Persistence matters a lot in this field. Archimedes kept thinking about the problem before an idea finally struck him. For Newton it was the falling apple, which led him through to discover the gravitation principle. To take another example, while walking through the garden, the fragrance of the jasmine flowers reach us before we actually see it. Look for the source and try to find whether only white petal flowers are fragrant. The facts start unveiling that light-coloured petal flowers are usually fragrant for the purpose of pollination.

Innumerable ideas flash across after keen observation and analysis. A chain of facts link one to another, making a beautiful garland. The only requirements for opening our minds to new ideas are a scientific temper and positive attitude and keen observation skills.If nothing else helps, you can always try the following things:

Whenever an idea pops in your head, make it a point to write it down. It doesn't have to be a detailed description. Just few points describing your idea would suffice.

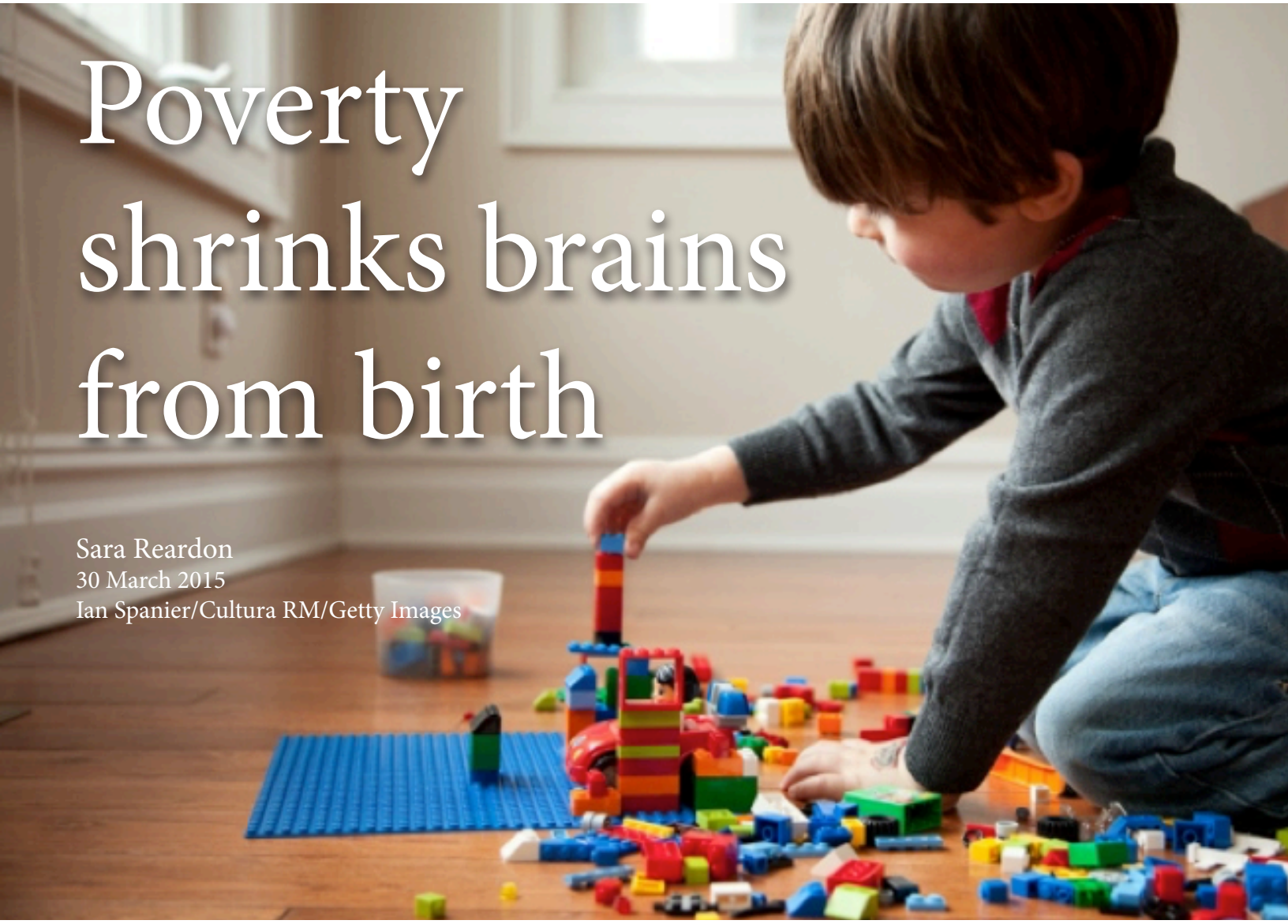
In your idle time, start training you mind to think about useful things. Instead of procrastinating, think about something productive. This helps generate ideas faster.

Doodling is considered to be effective in producing ideas. While you catch a break, take out your pens and pencils and unleash your creativity on a notepad.

Get started right now because the next big thing might be lurking in some corner of your mind!

Poverty shrinks brains from birth

Sara Reardon
30 March 2015
Ian Spanier/Cultura RM/Getty Images



Studies show that children from low-income families have smaller brains and lower cognitive abilities.

A new study finds that children's cognitive skills are linked to family income.

The stress of growing up poor can hurt a child's brain development starting before birth, research suggests — and even very small differences in income can have major effects on the brain.

Researchers have long suspected that children's behaviour and cognitive abilities are linked to their socioeconomic status, particularly for those who are very poor. The reasons have never been clear, although stressful home environments, poor nutrition, exposure to indus-

trial chemicals such as lead and lack of access to good education are often cited as possible factors.

In the largest study of its kind, published on 30 March in Nature Neuroscience1, a team led by neuroscientists Kimberly Noble from Columbia University in New York City and Elizabeth Sowell from Children's Hospital Los Angeles, California, looked into the biological underpinnings of these effects. They imaged the brains of 1,099 children, adolescents and young adults in several US cities. Because people with lower incomes in the United States are more likely to be from minority ethnic groups, the team mapped each child's genetic ancestry and then adjusted the calculations so that the effects of poverty would not be skewed by the small differences in brain structure between ethnic groups.

The brains of children from the lowest income bracket — less than US$25,000 — had up to 6% less surface area than did those of children from families making more than US$150,000, the researchers found. In children from the poorest families, income disparities of a few thousand dollars were associated with major differences in brain structure, particularly in areas associated with language and decision-making skills. Children's scores on tests measuring cognitive skills, such as reading and memory ability, also declined with parental income.

Martha Farah, a cognitive neuroscientist at the University of Pennsylvania in Philadelphia, calls the research "unbelievably cool". Having such a large sample of children allowed the researchers to show the great impact of poverty on developing brains, she says, although the study cannot measure how individual brains change over time.

Nature versus nurture

The findings are in line with unpublished research conducted by Farah and her colleagues that scanned the brains of 44 African American girls, each approximately a month old, from various socioeconomic groups in Philadelphia.

Even at this early age, the researchers found, infants in the lower socioeconomic brackets had smaller brains than their wealthier counterparts. The scientists presented their research on 19 March at the Society for Research in Child Development meeting in Philadelphia. Jamie Hanson, a psychologist at Duke University in Durham, North Carolina, says that both papers underscore the impact of adversity on child development. "These early life circumstances make it tougher for many children and it's on many of us in society to make sure that children have equal possibilities," he says. While he praises the cross-sectional studies, he adds that it is important to follow children over time in order to see how individual brains are affected by socioeconomic status.

Farah and her colleagues plan to continue to

observe these infants for two years and watch how their brain's surface area change over time. They also plan to visit the infants' homes in the hopes of pinpointing factors that might contribute to the differences, such as how many stimulating toys they have and how much attention they get from their parents.

Neither study explains the cause of the cognitive differences. Although the authors of both studies admit that genetic factors could be involved, they suspect that environmental exposures such as stress and nutrition are more important and begin even before the babies are born.

"It does make us think the focus should be redirected at gestation and stresses like nutrition and exposure to toxins," says Hallam Hurt, a neonatologist at Children's Hospital of Philadelphia who led the infant research study.

Older children may be affected in different ways. For instance, poorer parents who work multiple jobs to make ends meet may have less time to spend with their children, and less money to buy toys to stimulate their children's minds as they grow, says Laura Betancourt, a paediatrician at the Children's Hospital of Philadelphia who authored the infant study.

And Hanson suggests that epigenetics — modifications to DNA caused by environmental factors such as stress — could also be playing an important role, and can be passed down through generations.

Still, the researchers are hopeful that the impacts could be reversible through interventions such as providing better child care and nutrition. Research in humans and in other animals suggests that is the case: a study in Mexico, for instance, showed that supplementing poor families' income improved their children's cognitive and language skills within 18 months.

"It's important for the message not to be that if you're poor your brain is smaller and will be smaller forever," Sowell says.

Nature doi:10.1038/nature.2015.17227

Scientist or artist? Genes may decide

London, Jun 14, 2015, PTI

Parents, take note! Genes may decide whether a child will be good at science or arts, according to a new study.

Robert Plomin, a professor at King's College London, has found that there is a genetic component to whether one is good at arts or science.

Plomin is conducting research to identify the genes that underpin the intelligence of more than 10,000 sets of twins born between 1994 and 1996.

Initial results suggest that chances of identical twins both choosing either science or arts at A-level was 80 per cent compared with 50 per cent for typical siblings.

A-level is a qualification in a specific subject typically taken by school students aged 16-18 in the UK.

Plomin and his team also found that going to a good or a bad school had much less influence on a child's exam scores than did their IQ, 'The Sunday Times' reported.

"Going to different schools in England accounts for less than 20 per cent of the differences between teenagers in their A-level performance," Plomin said.

"On average 70 per cent of the differences between children in their A-level grades is down to genetic differences," he said.

Increasing coffee intake bad for your brain

London, July 29, 2015 (IANS)

While drinking your daily cup of coffee can help you stay sharp, modifying your habit by increasing coffee consumption over time may increase risk of mild cognitive impairment (MCI), early symptoms of Alzheimer's disease (AD) and dementia, says new research.

"These findings from the Italian Longitudinal Study on Ageing suggested that cognitively normal older individuals who never or rarely consumed coffee and those who increased their coffee consumption habits had a higher risk of developing MCI," said one of the researchers Francesco Panza from the University of Bari Aldo Moro, Bari, Italy.

"Therefore, moderate and regular coffee consumption may have neuroprotective effects also against MCI - confirming previous studies on the long-term protective effects of coffee, tea, or caffeine consumption and plasma levels of caffeine against cognitive decline and dementia," Panza noted.

The study involved 1,445 individuals aged 65-84 years.
An interesting finding in this study was that cognitively normal older individuals who modified their habits by increasing with time their amount of coffee consumption (more than a cup of coffee/day) had about two times higher rate of MCI compared to those with reduced habits (less than a cup of coffee/day).

They also had about one and a half time higher rate of MCI in comparison with those with constant habits (neither more nor less than one cup of coffee/day).

Moreover, those who habitually consumed a moderate amount of coffee (one or two cups of coffee/day) had a reduced rate of the incidence of MCI than those who habitually never or rarely consumed coffee.

These findings were published in the Journal of Alzheimer's Disease.

Unravelling climate change-health ties

Sabrina Tavernise, July 29, 2015

Scientists agree that evidence is growing that warmer weather is having an effect on health

Is climate change a serious threat to human health? Simple logic would suggest the answer is yes, a point that the Obama administration is using to build support for the president's effort to make climate change a centrepiece of his final months in office.

A White House report listed deepening risks. Asthma will worsen, heat-related deaths will rise and the number and travelling range of insects carrying diseases once confined to the tropics will increase. But the bullet points convey a certainty that many scientists say does not yet exist.

Scientists agree that evidence is growing that warmer weather is having an effect on health, but they say it is only one part of an immensely complex set of forces that are influencing health. For example, scientists note that global travel and trade, not climate change, brought the first cases of chikungunya, a mosquito-borne tropical disease, to Florida.

Temperatures may be rising, but overall deaths from heat are not, in part because the march of progress has helped people adapt – air conditioning is more ubiquitous, for example, and the treatment of heart disease, a major risk for heat-related mortality, has improved. The resurgence of forests in the eastern United States and the subsequent increase in the deer population have helped drive a sharp growth in ticks and Lyme disease. But the increase in the prevalence of the illness in the US has little to do with the climate, federal health experts say.

"There's a lot of evidence showing that extreme weather can hurt people, but what we don't know is whether those effects are getting worse," said Patrick Kinney, director of the Columbia University Climate and Health Pro-

gramme, adding that scientists don't have the long-term data needed to pinpoint how climate change is affecting health.

Still, climate change is a contributing factor. Ragweed now blooms about two to three weeks longer in the north central US than it did a few decades ago, extending sneezing and watery eyes further into the fall, according to research led by Lewis Ziska, a plant scientist at the US Department of Agriculture.

The Asian tiger mosquito, which came to southern US from Japan in the 1980s, likely in a shipment of used tires, has recently spread as far north as Connecticut, an encroachment scientists have connected to rising temperatures, said Dina Fonseca, an entomology professor at Rutgers University.

Mary Hayden, a scientist at the National Centre for Atmospheric Research, Colorado, who studies climate and health, said of dengue fever, a tropical disease carried by mosquitoes: "I don't think we can dismiss the role of climate. But can we say there is a direct causal link? No, we can't. It's more complex than that."

The science is in its infancy. Data on insects, pollen counts and diseases in developing countries are often patchy. Many studies show associations, meaning two things are happening at the same time, but it is not clear that one is cau-sing the other. Some experts compare it to the state of science in the early days of understanding effect of smoking effect on lung cancer.

Evidence is accumulating, however. In 2000, the first National Climate Assessment, a government document weaving together the best evidence on climate change, had just 21 pages on health. The most recent assessment included a special section on health that filled more than 400 pages.

Two peer-reviewed British journals – Philosophical Transactions B and The Lancet – have dedicated many pages to the topic this year. Europeans, unburdened by the level of political controversy over climate change in the US, often give more conclusive interpretations of the science. "We are in a far more certain place now," said Nick Watts of the University College London Institute for Global Health, a co-author of the Lancet analysis. "We feel very comfortable talking about direct effects of climate change on health."

The climate's effect on health is generally less pronounced in wealthier countries like the US, where so many people are protected from the elements in their homes. A study comparing Laredo, Texas, and a city just across the border in Mexico found the incidence of dengue fever was far higher in Mexico, even though the mosquitoes that carry it were more abundant in Texas. Researchers attributed the Texan advantage to economics – air conditioning and windows that shut – not climate.

But climate change is affecting health in devel-

oped countries, too. In Canada, the tick population has exploded in recent years, with 13 areas where ticks were living and reproducing locally, up from just two in 1997. Researchers have found that some areas have become warmer, and thus more suitable for ticks. Warmer weather allows more immature ticks to survive into adulthood, expanding the population.

Pak heat deaths

But Lyme disease is also an example of just how difficult it is to draw broad conclusions about how climate change affects health. The disease is also moving south, with large sections of Virginia and parts of North Carolina now inundated with ticks that carry the disease. But that pattern appears to have little to do with climate.

Ben Beard, associate director for climate change at the Centres for Disease Control and Prevention, said reforestation in the eastern US and the expanding populations of deer and people appear to be factors. "Climate is probably not driving the southward expansion," he said. In general, the temperature effects of climate change on ticks are more significant in northern climates, he said.

Heat has caused hundreds of deaths in Pakistan recently, with victims concentrated among older adults and people who spend a lot of time outside, like the homeless. Scientists say it is all but impossible to tie a specific weather event to climate change but say with increasing certainty that temperatures are rising. But even heat is complicated. A review of heat mortality in the US found that the rate of heat-related deaths declined by more than half from 1987 to 2005.

The researchers concluded that the population had become more resilient to heat over time, which might have resulted in part from the increased use of heat warning systems by cities and improvements in medical treatment for conditions that are risk factors for heat mortality. A study in The Lancet in May analysed 74 million deaths from 1985 to 2012 in more than 10 countries, including the US, and found that about 8 per cent of the deaths had been caused by abnormal temperatures.

Health risks from climate change are fundamentally local. The dangers of heat are greater in New Delhi than in New York, not only because it is hotter in the Indian capital, but because fewer people have electricity, sturdy houses and modern medical care. That makes drawing broad conclusions tricky. But it does not mean the risks are not there. As Kinney noted, "if we wait for the health evidence to be ironclad, it may well be too late."

OLIMPIADA CENTROAMERICANA Y DEL CARIBE DE QUÍMICA

Panamá gana oro, plata y bronce en torneo internacional de química

Tres estudiantes ganaron medalla de oro, plata y bronce en la Olimpiada Centroamericana y del Caribe de Química, que tuvo como sede a Panamá. Ellos son: Luisi Huang (egresado del Instituto Panamericano, IPA); Irvin Sánchez (egresado del Instituto Urracá); y Elena Ng, del IPA.

LA PRENSA - Rella Rosenshain

Jóvenes panameños demostraron que gozan de habilidades en la química durante la reciente Olimpiada Centroamericana y del Caribe de Química, que este año tuvo a Panamá como sede.

Una medalla de oro, plata y bronce quedaron en suelo patrio, al ser merecidas para Luisi Huang, egresado del Instituto Panamericano (IPA); Irvin Sánchez, egresado del Instituto Urracá; y Elena Ng, estudiante del IPA, respectivamente. Por el istmo también compitió Carolina García, estudiante del IPA.

Un total de 19 jóvenes entre 16 y 17 años de Costa Rica, Cuba, El Salvador, Guatemala y Panamá pusieron a prueba su destreza en la asignatura —a través de un examen experimental y otro teórico— en el torneo, que se inició el 26 de julio y culminó el 1 de agosto, dijo la profesora Nidia Romero, presidenta de la Comisión de Olimpiada de Química de la Universidad de Panamá (UP). Huang y Sánchez son ganadores de la Olimpiada Nacional

Las medallas de oro fueron ganadas por Fernando Martín (Cuba), Luisi Huang (Panamá) y Alejandro Díaz (Cuba) LA PRENSA/Ricardo Iturriaga

de Química de 2014, mientras que Ng y García triunfaron en el certamen local de este año.

En la anterior versión de la Olimpiada Centroamericana y del Caribe de Química, celebrada en Antigua, Guatemala, Huang le valió a Panamá medalla de oro, y Sánchez obtuvo una mención de honor.

Las medallas de plata fueron ganadas por Gabriel Martín (Cuba), Jasson Rodríguez (Costa Rica), Hugo Salazar (El Salvador) e Irvin Sánchez (Panamá) LA PRENSA/Ricardo Iturriaga

Las medallas de bronce fueron ganadas por Ricardo Medina (Cuba), Luis Araya (Costa Rica), Elena Ng (Panamá), Luis Magandi (El Salvador) y Joel Chávez (El Salvador) LA PRENSA/Ricardo Iturriaga

Así mismo, en la Olimpiada Iberoamericana de Química de 2014, que se realizó en Montevideo, Uruguay, Huang mereció plata, e Irvin, presea de bronce.

Romero califica como "sobresaliente" la participación de la delegación local. "En las puntuaciones finales no hubo tanta diferencia entre los ganadores de oro, plata y bronce. La participación panameña fue excelente. Los muchachos se esmeraron en cumplir con el objetivo de la olimpiada, y durante el tiempo que estuvieron en entrenamiento en la UP dieron lo mejor de sí".

El país planea enviar a esta misma delegación a competir en la Olimpiada Iberoamericana de Química que se realizará en septiembre, en Teresina, Brasil.

http://www.prensa.com/salud_y_ciencia/Panama-bronce-torneo-internacional-Quimica_0_4269323171.html

Presentación de Resultados del Convenio de Colaboración-Apoyo a las Publicaciones Nacionales e Internacionales en Biociencias y Ciencias de la Salud 2015

De Izquierda a Derecha: Dr. Omar López, Coordinador del Proyecto, Dr. Jagannatha Rao, Director INDICASAT AIP, Dr. Jorge Motta, Secretario Nacional SENACYT, Ing. Milagro Mainieri, Directora I+D SENACYT, Dra. Gabrielle Britton, Coordinadora General del Proyecto y el Dr. Amador Goodridge, Coordinador del Proyecto.

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Conferencias

Conferencias

Conferencias

Taller: "Positivo en el Trabajo y en la Vida"

Dra. Digna Wong y Lic. Ileana Rodríguez

Conferencias

Personal de administración junto a estudiantes de doctorado e investigadores participaron de esta hermosa experiencia que enriqueció a todos los participantes.

Taller: "Uso del agua en selvas y bosques de manglar de la península de Yucatán - de las Moléculas a los Ecosistemas.

Dr. Omar López, Profesor-Investigador José Luis Andrade T. y el Dr. Amador Goodridge.

3er Encuentro de Ex-Becarios de la SENACYT

Conferencias

Mg. Felix Rodríguez, STRI

Dilcia Sambrano, INDICASAT AIP

Charla sobre Bioseguridad impartida por el Mg. Felix Rodríguez, Oficial de Seguridad Química en STRI

MICROWAVES EFFECTS ON MALARIA PARASITES

Por Lorena Coronado, estudiante de doctorado en INDICASAT AIP.

Dra. Carmenza Spadafora, INDICASAT AIP

Conferencias

Reunión Melo-Escobar en agradecimiento por apoyar la Ciencia y Tecnología
GRACIAS DR. ARTURO MELO!

Dr. Arturo Melo
Presidente de Empresas Melo

Dr. Julio Escobar
CEO Centuri Tecnologies Corporation

Estudiantes de doctorado y personal técnico de INDICASAT AIP

Investigadores de INDICASAT AIP junto a investigadores asociados y estudiante del Programa CREO.

Personal administrativo del área de Compras y Contabilidad de INDICASAT AIP

Investigadoras, invitados y amigos de INDICASAT AIP.

Lic. Ileana Rodríguez junto a su hija y personal del Instituto.

Día del Médico

En celebración del día del médico, la Asociación Médica Nacional y el Colegio Médico de Panamá le hizo un homenaje al Dr. Luis Alberto Picard-Ami por su dedicación a la medicina, la bioética y la docencia médica. El evento tuvo lugar en el Hotel Panamá el 19 de mayo de 2015.

De Izquierda a derecha: Dr. Luis Alberto Picard-Ami, Dra. Rosa María Britton y el Dr. Jorge Motta.

Firma de convenio CATHALAC - INDICASAT AIP

Dr. Freddy Picado, Director General de CATHALAC y el Dr. Jagannatha Rao Director de INDICASAT AIP

Dr. Omar López

Firma de convenio UTP - INDICASAT AIP

Dr. Jorge Motta Secretario Nacional de la SENACYT, Dr. Óscar M. Ramírez Rector de la UTP, Dr Jagannatha Rao Director de INDICASAT AIP y la Licda. Ileana Rodríguez Administradora de INDICASAT AIP.

Dr. Jorge Motta
Secretario Nacional de la SENACYT

Dr. Óscar M. Ramírez
Rector de la UTP

Dr. Óscar M. Ramírez Rector de la UTP junto al Dr Jagannatha Rao Director de INDICASAT AIP luego de firmar Convenio entre ambas instituciones.

Dra. Casilda Saavedra Vice rectora de Investigación, Post grado y extensión de la UTP y la Ing. Nery Caballero de Camacho Dir. de Extensión en la UTP.

Grupo de la UTP y de INDICASAT AIP

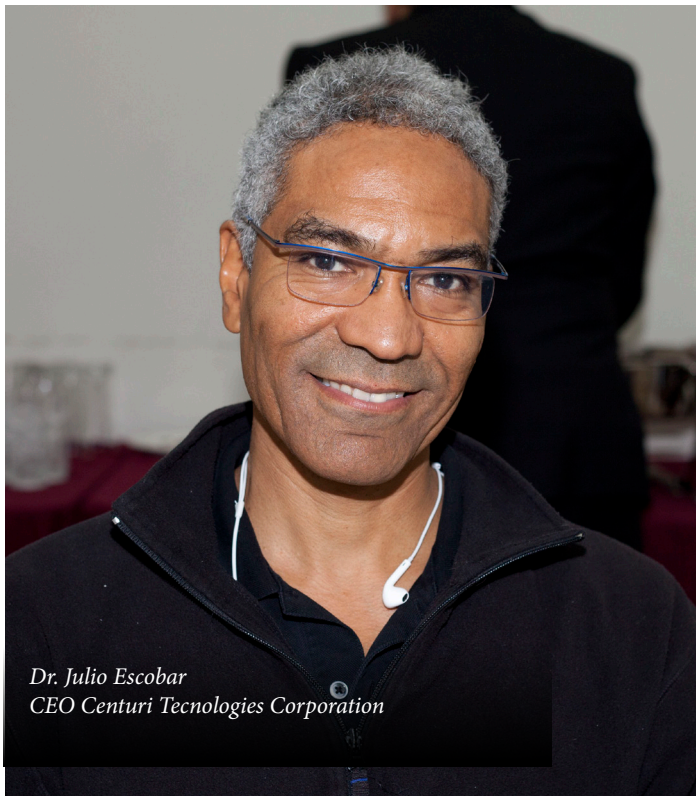
MELO DONATION PHASE II BRAIN GRANT

Presentación del Proyecto del Dr. Muralidhar Hedge, vía skype desde el Houston Methodist Research Institute.

Sr. Arturo Melo, Presidente de Empresas Melo y el Dr. Carlos Briceño, Neurólogo.

MELO DONATION PHASE II BRAIN GRANT

Velmarini Vásquez, estudiante de doctorado de INDICASAT AIP actualmente en University of Texas at San Antonio, USA



Dr. Julio Escobar
CEO Centuri Tecnologies Corporation

Dra. Maira Díaz Vergara
Administradora de Proyectos de Investigación
Empresas Melo

Los científicos Hermógenes Fernández, Ricardo Lleonart, Jagannatha Rao y Luis Mejía ganan Concurso Internacional

Siendo seleccionados a través de concurso para recibir el apoyo económico de la Embajada de Inglaterra.

El Dr. Hermógenes Fernández, especialista en ecología del comportamiento, presentó el proyecto sobre Polinización de Abejas.

El Dr. Luis Mejía, especialista en patología de plantas, presentó el proyecto sobre la Roya del Café.

Dr. Jorge Motta, Secretario Nacional de la SENACYT junto al Dr. Jagannatha Rao y al Dr. Ricardo Lleonart.

Dr. Jorge Motta Secretario Nacional de la SENACYT, la Dra. Marisin Peccio y el Dr. Jagannatha Rao Director de INDICASAT AIP

Dr. Jorge Motta Secretario Nacional de la SENACYT, la Lic. Ileana Rodríguez Administradora de INDICASAT AIP y el Dr. Jagannatha Rao Director de INDICASAT AIP.

Sra. Olga de Gupta
Pintora

Dra. Zilka Terrientes
Pintora

1er Arte - Ciencia

Sra. Olga de Gupta y Lic. Ileana Rodríguez
Agradecemos sus sabias palabras.

Pintura de la colección de la Sra. Olga de Gupta donada a INDICASAT AIP.

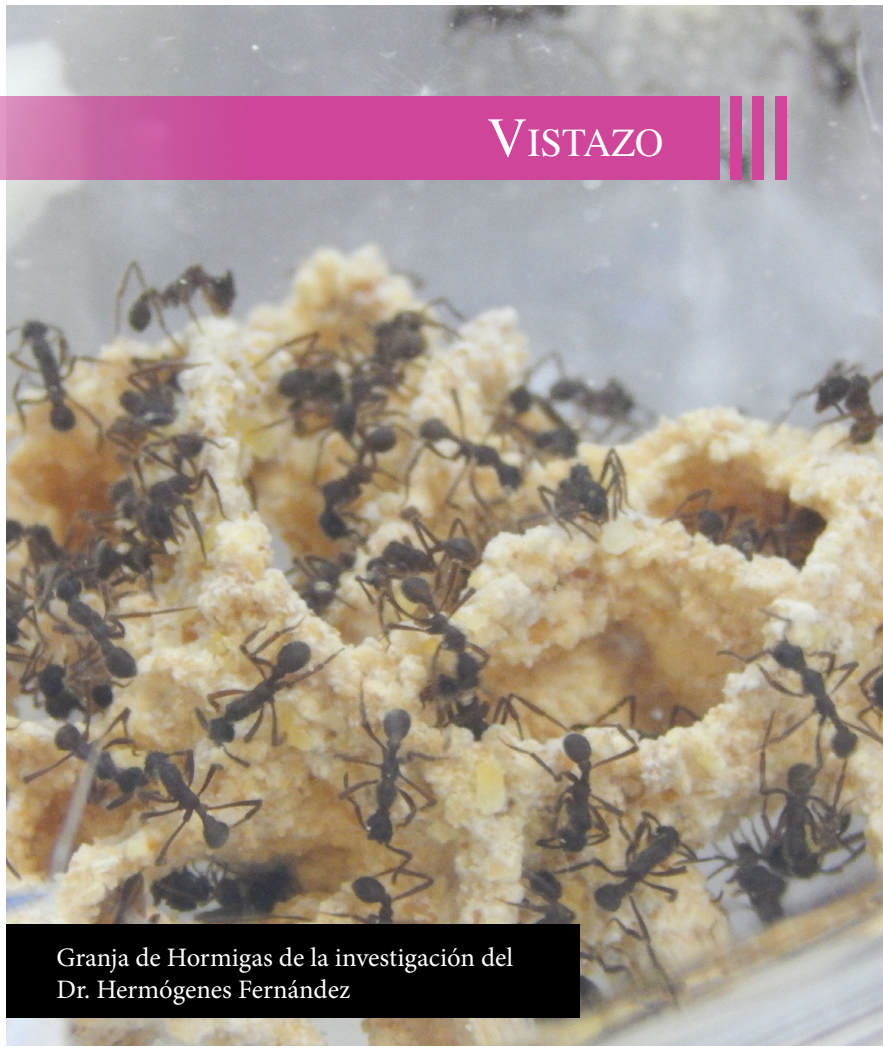
Dra. Zilka Terrientes y Lic. Ileana Rodríguez
Finalizando evento.

Carolina De La Guardia
Estudiante de Doctorado - INDICASAT AIP

Cristopher Boya
Estudiante de Doctorado - INDICASAT AIP

Visita de Campo a Gamboa por el Departamento Administrativo de INDICASAT AIP

Dr. Hermógenes Fernández explica investigación realizada con hormigas.



Granja de Hormigas de la investigación del Dr. Hermógenes Fernández

Dr. Luis Mejía explica al personal administrativo como el Hongo invade a las plantas

Vistazo

Hongo Endófito creciendo a partir de pedazo de Hoja.

Plantones de Café de la investigación del Dr. Luis Mejía.

Muestra de Cacao

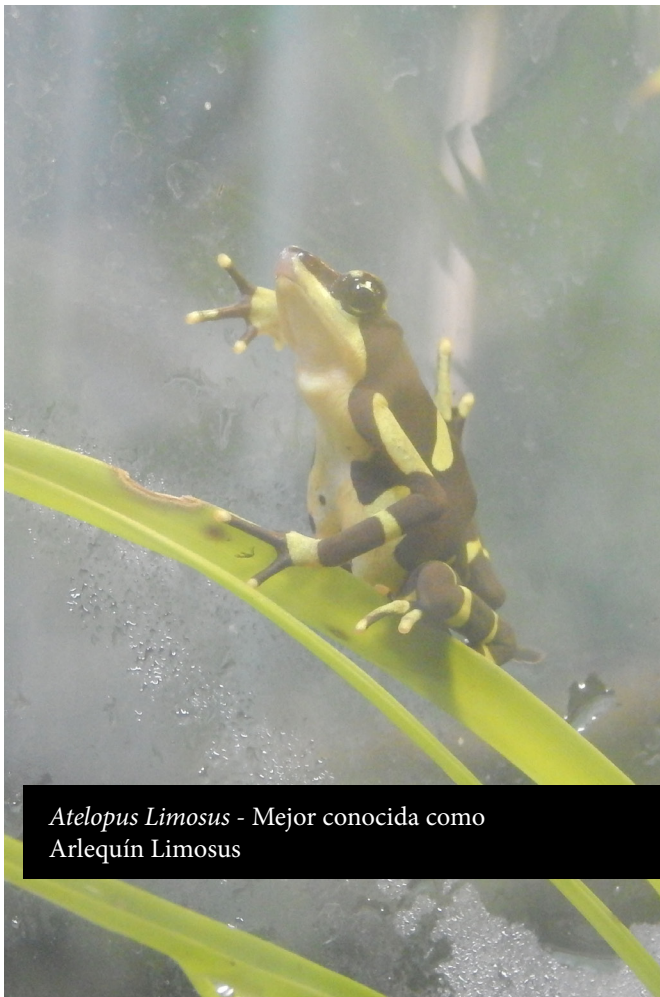
Vistazo

Arbol Ceiba, Sendero El Charco
Parque Soberanía.

Dr. Omar López junto a estudiante de doctorado Alejandro De Sedas.

Plantones de las investigaciones del Dr. Omar López

Proyecto de Conservación y Rescate de Anfibios en Panamá



Atelopus Limosus - Mejor conocida como Arlequín Limosus

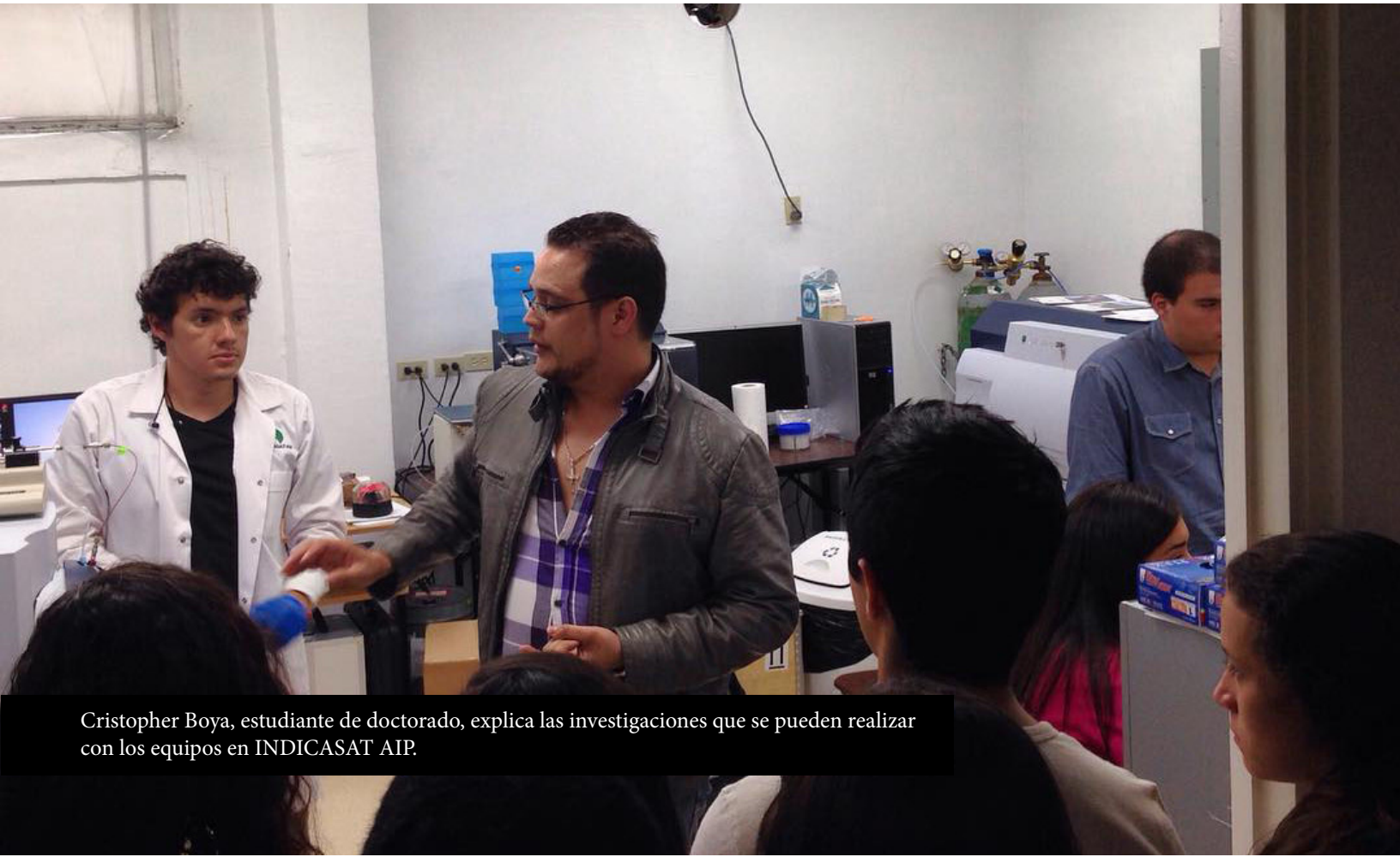
Visitas Recientes

Estudiantes de Medicina de la Universidad Latina con Sede en Santiago de Veraguas, visitaron INDICASAT AIP y conocieron los proyectos de investigación que se están desarrollando.

Estudiantes de Medicina de la Universidad de Panamá visitaron las Instalaciones de INDICASAT AIP y conocieron las investigaciones.

Visitas Recientes

Estudiantes de media de Oxford School - Santiago de Veraguas visitaron las instalaciones del Instituto como parte de la gira educativa que desarrolla el plantel.



Cristopher Boya, estudiante de doctorado, explica las investigaciones que se pueden realizar con los equipos en INDICASAT AIP.

Visitas Recientes

Estudiantes de séptimo de Oxford School - Santiago de Veraguas visitaron las instalaciones del Instituto como parte de la gira educativa que desarrolla el plantel.

El Grupo de Estudiantes de la carrera de Veterinaria de la Universidad de Panamá visitó INDICASAT AIP.

SENACYT

SECRETARÍA NACIONAL DE CIENCIA, TECNOLOGÍA E INNOVACIÓN

PANAMA AS AN INTERNATIONAL SCIENCE HUB

INDICASAT AIP