

Detección de compuestos citotóxicos contaminantes del medio ambiente por medio del uso de embriones de pez cebra - Proyectos de Investigación en ciencia para jóvenes de nivel preuniversitario



Miguel L Allende

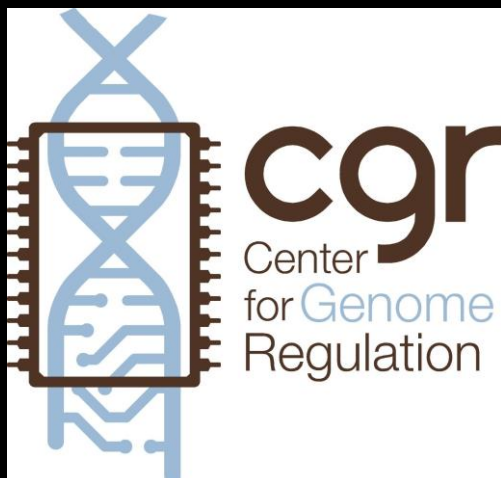
Zebrafish for Innovation and Research Lab

www.zebrafish.cl

Centro FONDAP de Regulación del Genoma

Facultad de Ciencias

Universidad de Chile

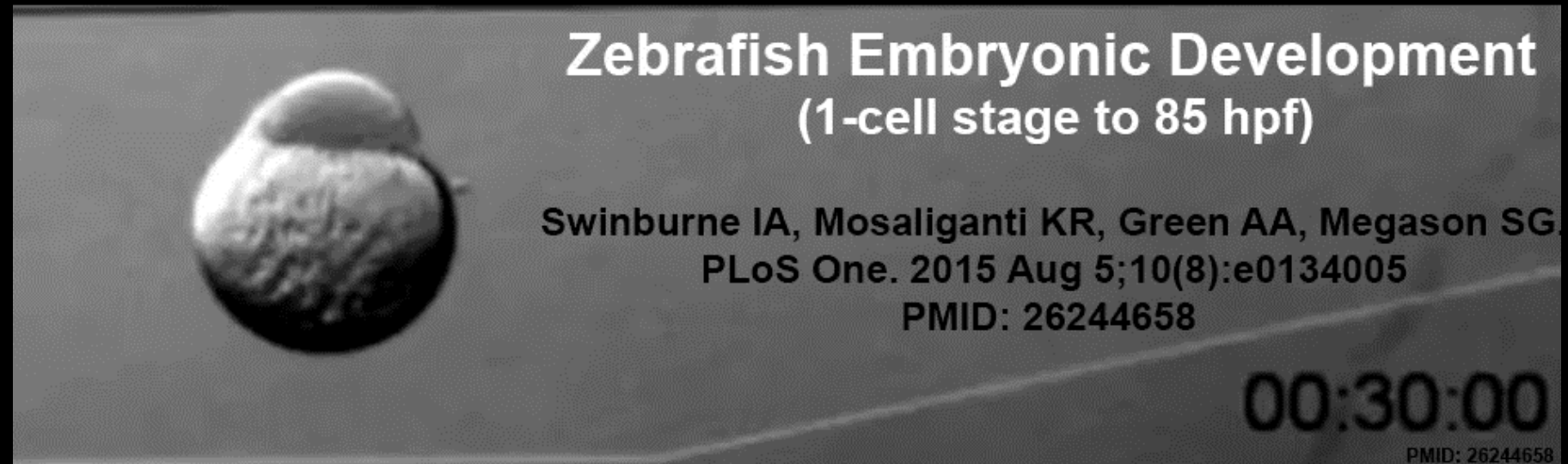


Latin American Zebrafish Network

Pez cebra - *Danio rerio*



Desarrollo embrionario: 0-22 hpf





- Investigación básica
- Aplicaciones preclínicas
- Toxicología
- Enseñanza

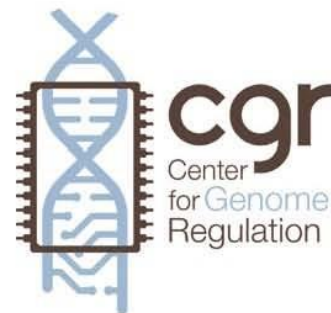


Fecundación y desarrollo temprano de animales

Taller del Proyecto de Laboratorios Portátiles para la enseñanza de la Biología en la Educación Media

11 al 15 de enero de 2016

Facultad de Ciencias, Universidad de Chile



UNIVERSIDAD DE CHILE

Observaciones

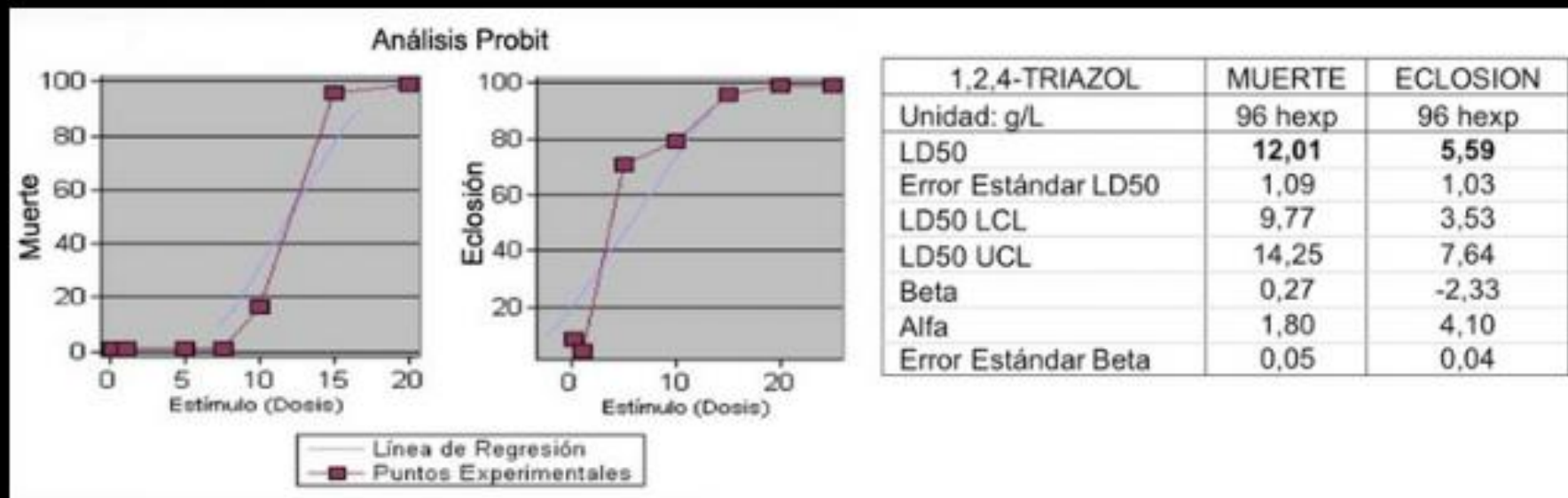
- Reproducción y fecundación
- Desarrollo: morfogénesis y organogénesis
- Circulación de sangre y latidos cardiacos
- Conductas
- Normal (silvestre) vs alterado (mutante)



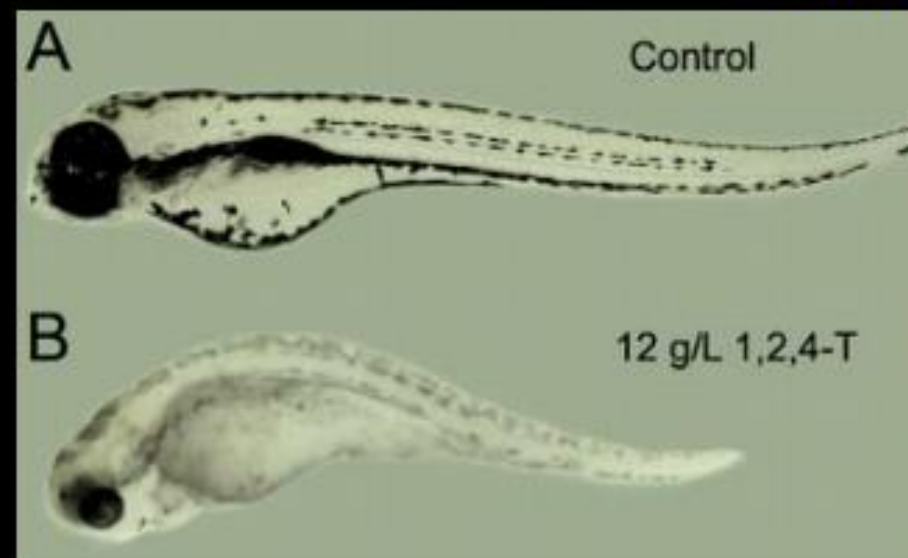
Conceptos

- **Crecimiento y proliferación**
- **Diferenciación**
- **Células troncales**
- **Herencia**
- **Teratogénesis**

Efectos de pesticidas en la embriogénesis

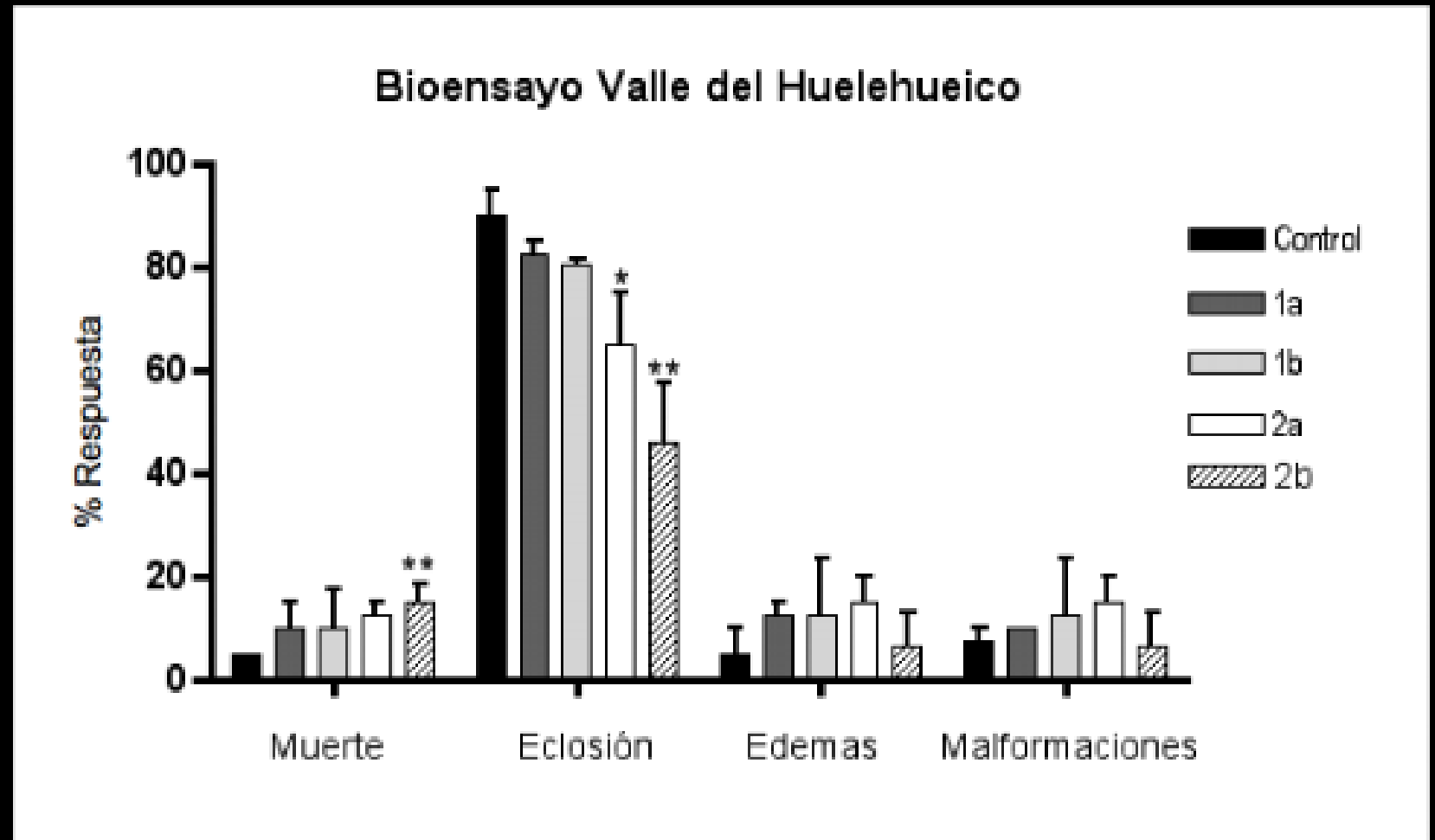


Determinación LC_{50} e IC_{50}



Fenotipo representativo de larvas de pez cebra expuestas durante 96 h a 1,2,4-T

Bioensayos para medir calidad de aguas



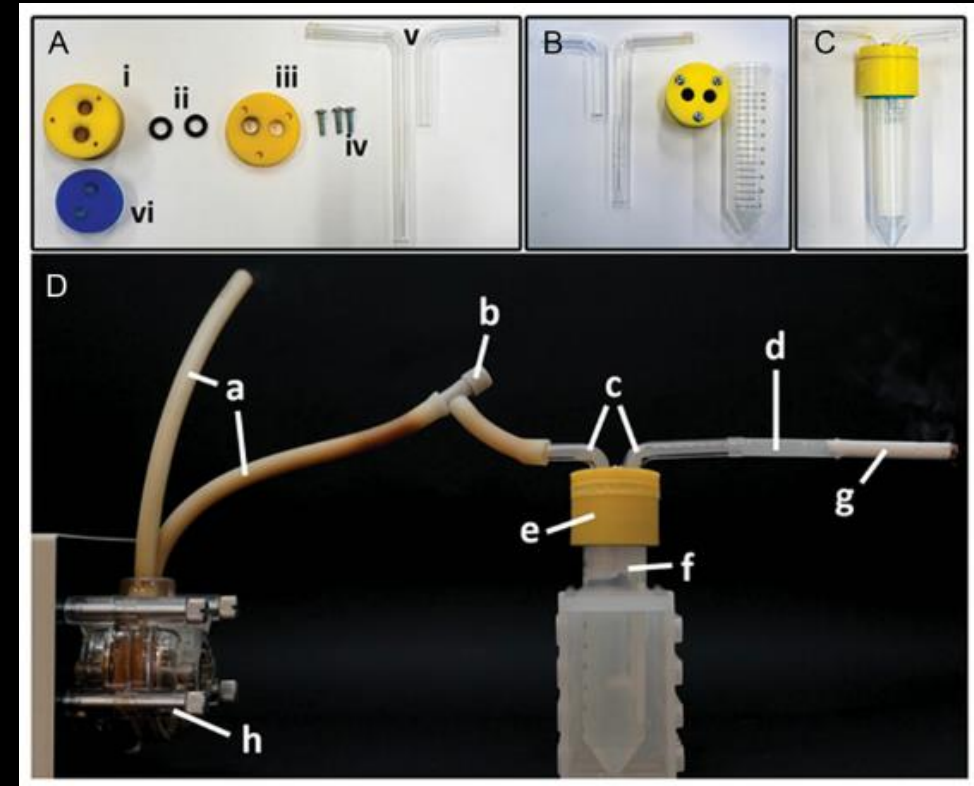
Efectos del humo de cigarrillo en el desarrollo embrionario



Current Protocols in Toxicology e78, Volume 80
Published in Wiley Online Library (wileyonlinelibrary.com).
doi: 10.1002/cptx.78
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A Reliable Preclinical Model to Study the Impact of Cigarette Smoke in Development and Disease

Geraldine Aedo,^{1,2} Miguel Miranda,^{1,3,4} Myra N. Chávez,^{2,3}
Miguel L. Allende,^{3,5} and José T. Egaña^{1,5}



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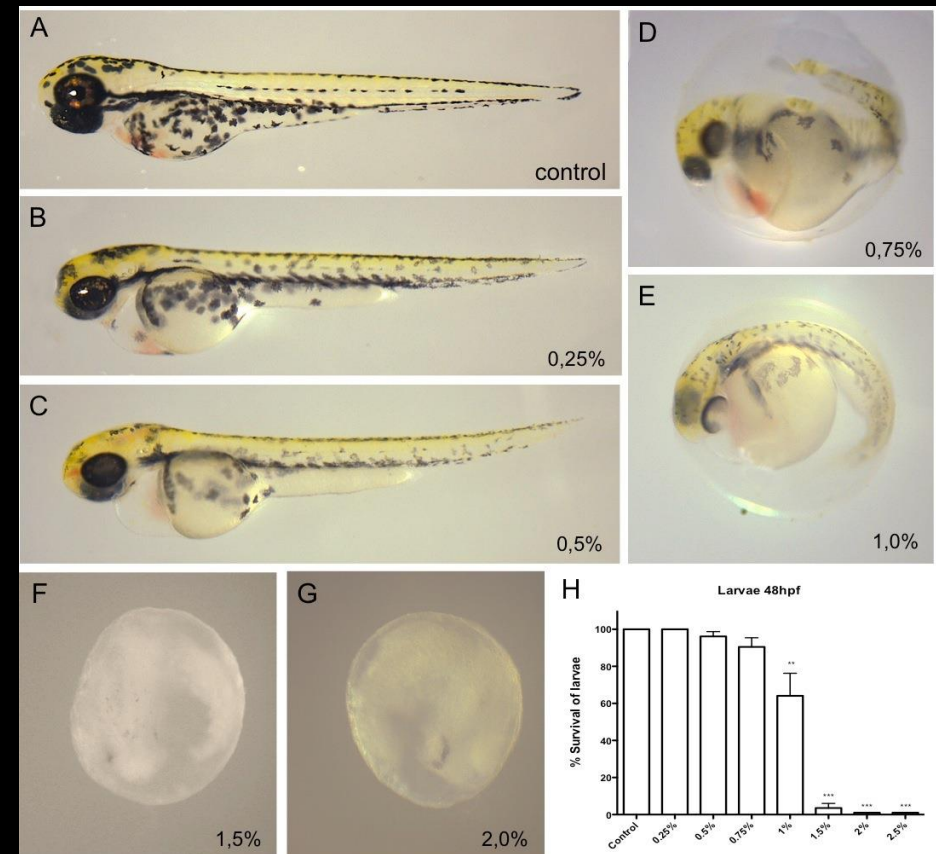
A Novel *In Vivo* Model to Study Impaired Tissue Regeneration Mediated by Cigarette Smoke

Marjorie Alvarez¹, Myra N. Chávez^{1,2}, Miguel Miranda^{1,3}, Geraldine Aedo¹, Miguel L. Allende¹ & José T. Egaña³

Received: 15 March 2018

Accepted: 13 June 2018

Published online: 10 July 2018



Proyectos escolares en toxicidad (iniciativas propias)

- Aguas de diversos orígenes encontrados en la vecindad de la comunidad escolar
- Diversas drogas o fármacos usados comúnmente
- Pegamentos y solventes caseros
- Bebidas de fantasía (gaseosas) y licores



Conclusiones de esta experiencia

- En las clases de biología es necesario enseñar con material vivo
- Es relativamente simple llevar embriones de pez cebra a la sala de clases
- Los profesores y estudiantes pueden familiarizarse rápidamente con los animales
- Se evita en gran medida el problema bioético al trabajar con embriones de pez
- Se enseña un tipo de experimento que puede adaptarse a los intereses locales

Agradecimientos

Financiamiento

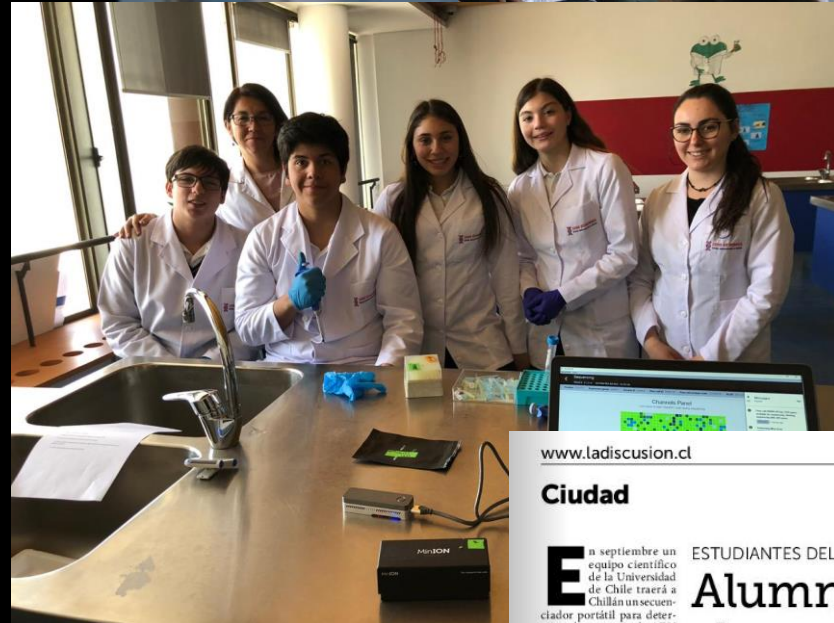
- FONDAP, FONDECYT (ANID, Ministerio de Ciencia, Tecnología, Conocimiento e Innovación, Chile)
- Fundación Allende-Connelly
- Facultad de Ciencias, Universidad de Chile

Miembros del laboratorio



Profesor@s y estudiantes

A close-up photograph of a person's hand holding a small, black and blue MinION sequencing device. The device is rectangular with a white label on the front that reads "MinION" in blue and black text. The background is a solid blue color.



De novo genome sequencing by secondary school students in the classroom: a collaborative experience with Oxford Nanopore technology

Miguel L. Allende, Alexis Gaete, Claudio Urrea, Lorena Díaz, Gino Nardocci, **Jonathan Maldonado***, Claudio Meneses, Christian Hodar, Mauricio González, 1000 Genomes Chile Initiative, FONDAF Center for Genome Regulation, Blanco Encalada 2085, Santiago. [*j.maldonado@gmail.com]

New low-cost sequencing technologies lend the promise of widespread use of genomic analysis in almost any environment and, very often, by the lay person. It gave the impetus to a full understanding of this cultural and technological change by the next generation of citizens, the 1000 Genomes Initiative has carried out a genome sequencing experience in 40 Chilean schools distributed widely throughout the country using the Oxford Nanopore Technologies (ONT) Sequencers from the Center of Excellence participating in the 1000 Genomes Initiative housed in the schools and carried out the sequencing experiment with school students simultaneously in all 40 schools. We selected the common pit bug (*Leptothorax curvicauda*) as an organism widely distributed in the country that could be captured in the hands of the students. DNA extraction was done in a University lab to comply with restrictions on the use of animals in schools as well as purification and library construction. Students replicated some steps of library construction, observed the loading of samples on sequencers and follow the sequencing procedure for 24 hours. During the event, students learnt about the principles of DNA and RNA sequencing, received basic bioinformatics training and carried out exercises aimed at learning molecular biology concepts. The results, which describe the genome sequence of the pit bug for the first time, will be published in a non-peer-reviewed journal with all participants as co-authors. The experience with students will surely extend and inspire us to continue on the way of educational activities on science with Nanopore as a great value partner.

Table 1: Information of participant schools.

Name	Region	District	Type	Students
Complejo Educacional Thomas Masaryk Green English School	Atacama	San Pedro de Atacama	Particular	10
Instituto Concesionario Pacifico Sur	Coquimbo	La Serena	Particular	10
Escuela Superior	Valparaíso	San Antonio	Particular	10
Colégio La Consuelo	Valparaíso	Santiago	Particular	10
Liceo San Agustín	Valparaíso	Concepción	Subvencionado	4
Colégio Instituto Victoria	Atacama	Valparaíso	Subvencionado	4
Liceo Bicentenario de Independencia Atacama	Valparaíso	Valparaíso	Particular	10
Colégio Concha Anadol	Valparaíso	Casino	Subvencionado	10
Liceo Alas del Sol	Atacama	Copiapó	Particular	10

Figure 1: Pictures with some activities performed by students in each school or Nanopore site.

Figure 2: Location of each school and picture of participant students.

Figure 3: Sequencing information.

A Nanopore sequencing data visualization. **B** Bar chart showing the number of reads per species.

C Pie chart showing the distribution of reads by species.

D Line graph showing the number of reads over time.

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ESTUDIANTES DEL LICEO MARTA BRUNET Y DEL LICEO BERNARDO O'HIGGINS

Alumnos de Chillán analizarán el genoma de las tijeretas

POR: NICOLE CONTRERAS *diario@discusion.cl / **FOTOS:** MAURICIO ULLOA

Miguel Allende, profesor de la Universidad de Chile y encargado del proyecto, explicó que lo que van a hacer "es un experimento bastante sofisticado, que en ninguna parte del mundo se ha hecho fuera de los laboratorios, y eso es posible porque tenemos aparatos de secuenciación de genoma que son portátiles. Además podremos tener un computador personal para que visualicen la información que van a extraer de la tijereta. Con lo que obtengamos de todos los colegios que participan, vamos a hacer un ensamble, que toma todas las lecturas de ADN que hicieron y las

MIGUEL ALLENDE
PROFESOR ENCARGADO U. DE CHILE

“Haremos un aporte científico que esperamos que motive al resto de nuestros compañeros”.

transforma en una sola que nos va a dar la secuencia completa del genoma. Eso se publicará en una revista científica".

Para ser seleccionados, los alumnos en conjunto con sus profesores enviaron un ensayo explicando por qué


● Dos establecimientos de 11 seleccionados, pertenecen a Ruble.

Haremos un aporte científico que esperamos que motive al resto de nuestros compañeros*.

SOFÍA MENDOZA
ALUMNA SELECCIONADA

transforma en una sola que nos va a dar la secuencia completa del genoma. Eso se publicará en una revista científica".

Para ser seleccionados, los alumnos en conjunto con sus profesores enviaron un ensayo explicando por qué

 Dos establecimientos de 11 seleccionados, pertenecerán a Ruble.

la genómica es importante para Chile. "Sabemos que en la ciencia los establecimientos tienen un déficit que se puede ir mejorando poco a poco. Esta es una gran posibilidad que se les ha dado a los estudiantes para ocupar otros instrumentos", afirmó Cecilia Sepúlveda, profesora encargada

del proyecto de ciencias del DAEM Chillán.

Del Liceo Marta Brunet, fueron seleccionados los alumnos de tercero medio Jared Defaur, Gisel Roca y Sofía Mendoza. La profesora de Biología y coordinadora del proyecto en el liceo, Elizabeth Insunza, destacó que "esto nos va a permitir aprender, lo que proyectándonos a futuro, el liceo podría contar con un laboratorio especializado, y eso le permitiría a los alumnos desarrollar este trabajo en otras especies endémicas de la zona y aportar a la ciencia".

La alumna Sofía Mendoza, quien participa del taller de microbiología del establecimiento, sostuvo que "haremos un aporte científico tanto para el país como para el liceo, para que se sigan motivando a más compañeros. Yo vengo de Pemuco, estoy en el internado, esto demuestra que aunque seamos un liceo municipal, no tenemos impedimentos para desarrollar la ciencia".

En el caso del Liceo Bernardo O'Higgins, técnico profesional, fueron seleccionados los alumnos Benjamín Zenteno, Magdalena Ponce, Daniel

Venegas y Brisa. Henríquez, de primero medio.

El director del DAEI de Chillán, Nelson Martín, enfatizó que "es un salto de calidad del equipo liderado por Marco Aguilera. A Noble le tocó dos establecimientos educacionales, y los dos son del sistema municipal. Secuenciar el genoma de la tijereta es poner a nuestros estudiantes en sintonía con la ciencia, y tendrán el rigor del pensamiento científico".

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