February 19, 2012

Rep. James Tokioka
Rep. Ryan Yamane
Rep. Dee Morikawa

Subject: HB2079

Dear Representatives Tokioka, Yamane, and Morikawa:

I am writing this letter to you to express my support for passage of HB2079. I am a microbiologist with over 40 years of professional experience, including 20 years as a military scientist (US Army Medical Service Corps). I have lived in Hawaii for the last 16 years, during which time I have worked at the University of Hawaii, Manoa, as well as for a private biotech company, Hawaii Biotech, Inc.

I believe that it is important to increase the visibility of science in general and increase the knowledge of the scientific method for discovery of the mechanisms involved in the natural world among the broader public, especially young people. We need to show how science affects our lives and how scientific discoveries are made. I believe that the promotion of the bacterium *Nesiotobacter exalbescens* as the "State Microbe" will aid in this endeavor by providing a tangible example of a new scientific discovery that directly relates to Hawaii. By designating this bacterium as an official Hawaiian emblem, it may be used as a teaching tool in public and private schools within our state. This should increase interest and enhance enthusiasm for science among young students, who may then pursue this interest further in their education, as well as keep awareness of science in mind in their everyday lives.

If you have any questions or would like additional information, please don't hesitate to contact me. Thank you very much for your consideration.

Sincerely,

Michael Lieberman

Michael Lieberman, Ph.D.

From: Gabriel D. Peckham, Ph.D.
Principal Investigator
Black Ivory Biotech

To: The Committee on Health
Rep. Ryan I. Yamane, Chair
Rep. Dee Morikawa, Vice Chair

Hearing (HLT 02-24-12 2)
DATE: Friday, February 24, 2012
TIME: 11:00 a.m.
PLACE: Conference Room 329
State Capitol
415 South Beretania Street

Re: HB2079 (RELATING TO THE STATE MICROBE, Establishes and designates the bacterium *Nesiotobacter exalbescens* as the official microbe of the State)

Dear Committee,

I am the Principal Investigator at a new biotech company, Black Ivory Biotech. I received my PhD and post doc experience at the University of Hawaii before running my own lab here in Aiea.

I am writing this letter in support of bill HB2079, designating a State Microbe of Hawaii. The designation of a State Microbe increases the awareness of microbiology, and science more generally, in Hawaii's culture. In addition, it enhances the awareness of Hawaii's ecology for scientists all over the world. Therefore, the broad implications for designating a State Microbe are great, including increasing the interest of our young residents in science and attracting scientists to practice here which brings in more research funds. Most of Hawaii's residents are already aware of our unique ecology and efforts made to protect it, but designating a State Microbe highlights why it is so important and just how unique we really are.

Nesiotobacter exalbescens is a rare microbe (only one isolate has shown any similarity) and it was isolated from a remote environment (hypersaline lake on Laysan atoll, Northwestern Hawaiian Islands). I believe these characteristics make it an excellent candidate to represent our State.

The opinions expressed here are solely my own and don't necessarily represent those of Black Ivory Biotech, or any other persons or entities in which I collaborate. I do not have at present nor do I anticipate any financial interest in HB2079, nor am I aware of any specific person or business enterprise that does so.

If you wish to discuss this issue further please do not hesitate to contact me.

Thank you,

Sincerely,

Gabriel D. Peckham

TESTIMONY OF
Kenneth Y. Kaneshiro

IN SUPPORT OF HB 2079 Relating to the State Microbe

BEFORE THE
HOUSE COMMITTEE ON HEALTH
Representative Ryan L. Yamane, Chair
Representative Dee Morikawa, Vice Chair

Date: Friday, February 24, 2012
Time: 11:00 am
Place: Conference Room 329

Aloha Chair Yamane and members of the Committee on Health. My name is Ken Kaneshiro and I am the Director for Conservation Research & Training at the University of Hawaii at Manoa. However, I am presenting testimony as a private individual and my comments do not reflect the opinion of the University of Hawaii.

I am not a microbiologist but I am in strong support of the designation of a State Microbe and the bacterium species being proposed by Dr. Stuart Donachie appear be an appropriate candidate for such a designation. The justification for designating ***Nesiotobacter exalbescens*** is presented in the written testimony submitted by Dr. Donachie and I will not provide any further discussion in my comments. However, I do want to provide a brief discussion on the importance of microorganisms in Hawaii's native ecosystems.

I have been involved in a research project at the University of Hawaii for nearly 50 years now. I started to work on the project as a dishwasher on the Hawaiian Drosophila Project when I was a sophomore at UH Manoa in 1963 and so 2013 marks the 50th Anniversary of the Project. Since then, more than 80 senior scientists from all over the world have come to Hawaii to study the evolution of this group of insects. More than 400 students, undergraduates, graduates, and postdoctoral fellows have participated on this project and more than 500 scientific papers have been published as a result of the research on this group. The work on the Hawaiian Drosophila is cited in a number of textbooks of Biology as a leading example of speciation and evolution.

About 10 years ago, one of the scientists (now deceased) from New York University and his student, discovered a huge fauna of bacteria species associated with the Hawaiian Drosophila species. They were able to isolate and culture nearly 600 colonies of bacteria from just 40 of the potential 1000 species of Hawaiian Drosophila. It turns out that many of the bacteria species showed strong resistance to antibiotics, not just the antibiotics currently available on the market today but

even the next generation antibiotics that were still in the development/testing stage. That could mean that the bacteria were being exposed to some potent antibiotic substances produced by the host fly and potentially, if are able to understand the mechanism by which the bacterial pathogen is triggering a gene or group of genes that were responsible for the production of a protein or enzyme which serves as an antibiotic against the pathogenic effects of the bacteria, we may be able to develop a similar mechanism to turn on genes for neutralizing the effects of pathogens in humans. The potential application to medicine and human health is huge.

Last summer, a high school student from Iolani School did a 6-week internship with our research program and ended up working in Dr. Donachie's lab because she was interested in the microorganisms associated with the host plants of our Hawaiian Drosophila species. I believe Ms. Iris Kuo will be present at the hearing and will be able to describe the research and how she discovered some new species of bacteria; we are conducting some further testing to confirm the identification of the species, but Iris has already experienced the excitement of scientific discovery researching the bacteria associated with our Hawaiian Drosophila and will be involved in the publication of scientific papers describing her discoveries.

The biological diversity of microorganisms (potentially thousands of species) that could be found in the native Hawaiian ecosystem is a gold mine waiting to be discovered and it will be important to focus more research effort on this fauna. Designation of a State Microbe will bring greater attention to this fauna and foster the kind of research and education that is needed to uncover the potential value of our native ecosystems.

I strongly support the intent of HB 2079.

HOUSE OF REPRESENTATIVES · THE TWENTY-SIXTH LEGISLATURE
REGULAR SESSION OF 2012

RELATING TO THE STATE MICROBE
HB 2079: Establishes and designates the bacterium *Nesiotobacter exalbescens** as the official microbe of the State

Testimony provided by Dr. Stuart P. Donachie, as a private individual, in support of HB 2079 for a public hearing on Friday 24th February, 2012

Background
The State of Hawai'i and its individual islands have 31 official emblems, from colors and sports, to plants and animals. Microbes are not represented in our state emblems, yet theyare the most abundant organisms in Hawaii, and on Earth. They created and sustain our environment.

Why are microbes not represented?
Recognition. Colors, sports, plants and animals are conspicuous and recognizable. Microbes are neither conspicuous nor recognizable, but they and their activities are within and around us. Without microbes we would not be here today. Unfortunately, most people perceive microbes negatively, that they cause diseases, for example.

Why the negative perception?
Children are warned of the dangers of 'germs'. So, 'germs' are bad. Through state emblem projects, however, children fall in love with whales, the Hawaiian monk seal, or the nene. Thus are born the marine biologists and conservationists of tomorrow. Microbes' contributions to our health and the environment are overlooked; we need microbes as much as we need people to study them!

What can we do?
Expose everyone to microbes! The good ones, at least, and in an intellectual sense; discoveries are made daily in microbiology, and more await. We promote science, technology, engineering and math (STEM); 7,000 students joined the 54th Annual State Science and Engineering Fair in 2011, yet STEM fields need researchers. Some will come from Science Fairs because they have the (science) 'bug' already! Others need the right story, or example… They need inspiration.

We can establish a State Microbe
To encourage or stimulate minds with microbial discoveries and applications. A microbe among our state emblems will take the 'bug' to the classroom, with questions such as:

- What are microbes?
- Where did they come from?
- What do they do?
- Are they really all bad?
- How do they help us?
- What would you like microbes to do?
- Where does the State Microbe come from?
- What does it eat? What do other microbes eat?
- How many microbes are there?

****Nessy-oh-toe-bacter ex-al-bess-kens***

Why Nesiotobacter exalbescens?

Hawai'i is famous for unique plants and animals. It is acknowledged as a 'Biodiversity Hotspot.' Had Darwin visited Hawai'i rather than the Galapagos, he would have written a different book! A state microbe should reflect, as far as possible, the novelty we see among Hawaii's plants and animals, *e.g.*, Silverswords on Haleakala, Mauna Kea and Mouna Loa, and hundreds of species of Hawaiian *Drosophila*, some unique to a particular island. *Nesiotobacter exalbescens* meets these criteria, bearing in mind that endemism in the microbial world is a hotly debated subject.

Other states' microbes

None. No other state has adopted a microbe.

Wisconsin's attempt to recognize *Lactobacillus lactis*, the bacterium used in Wisconsin's cheese production, did not pass. No other state has an official microbe emblem.

Hawai'i can lead the way. *Nesiotobacter exalbescens* is Hawaii's microbe. And it can be the first state microbe in the nation.

Is Nesiotobacter exalbescens unique?

First grown from Laysan atoll in 2000 as part of an NSF funded project to investigate the microbiology of Hawaii's five true lakes. Known from just one culture. Not detected elsewhere in Hawai'i during 16 years of fieldwork, or anywhere else in 25 years of the author's fieldwork. To compare *Nesiotobacter exalbescens* with other microbes, we compare part of the microbe's DNA with that held, in electronic form, in 'GenBank', part of the National Center for Biotechnology Information (NCBI). Over 100,000 distinct organisms are represented in this database. The database is accessed daily by millions of researchers globally, and doubles in size every 18 months. As of 15 February 2012, some 150 million sequences were hosted.

Is Nesiotobacter unique?

The 'industry standard' ribosomal DNA sequence was submitted to GenBank on 20th May, 2002. Leading up to that, comparison with other sequences in the database suggested a new genus would be needed to accommodate the microbe. That was confirmed according to strict guidelines, and the new genus and species, Nesiotobacter exalbescens, was published in a peer-reviewed journal in 2006. Seven years passed before a related sequence appeared.

What does Nesiotobacter exalbescens do?

Based on the formal description, the species is ideally suited to life in sub-tropical saline waters. In pure culture it converts nitrate to nitrogen, and thus it may be involved in the nitrogen cycle in the environment. The scale of such a contribution is not known. However, key elements in accepting whether or not a candidate for state emblem is accepted or not might rather be discovery or development in Hawai'i, and presence in Hawai'i. After all, neither Silverswords nor nene are known for their abundance.

Conclusion

Two reports of any microbe being detected in 12 years (since first isolation) is extremely unusual. This species has been detected only once in the author's 500,000 sequences and 10,000+ cultures over ~25 years work in this field. *Nesiotobacter exalbescens* is not a 'weed' in any sense. It is not widespread globally, or in Hawai'i.

I support HB2079 and request that members of the committee do so, too.

Declaration: The author has no conflict of interest in writing this document. The author has never had, and continues to have no commercial interest in *Nesiotobacter exalbescens*. The author is a microbiologist and was the first person known to cultivate the species. He also first-authored the formal description of the genus and species.