

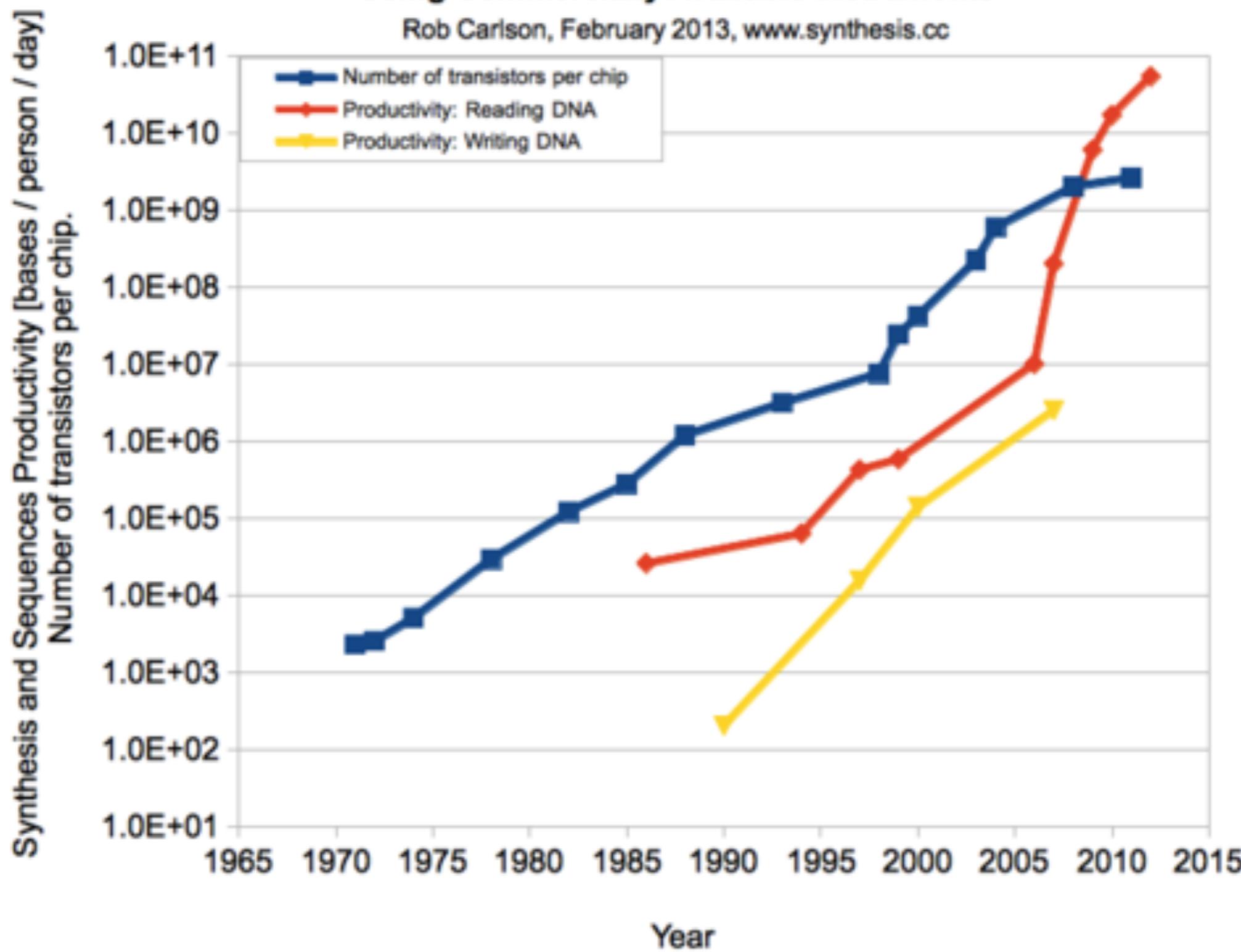
What ***changes*** might
bioengineers realize via DNA?

Given trends, when would be the
right time to start organizing to
make the changes you want?

*reminder! consider and study pre-class materials

Productivity in DNA Synthesis and Sequencing Using Commercially Available Instruments

Rob Carlson, February 2013, www.synthesis.cc



<https://synbiobeta.com/time-new-dna-synthesis-sequencing-cost-curves-rob-carlson/>

https://en.wikipedia.org/wiki/Carlson_curve

An Estimate of the Total DNA in the Biosphere

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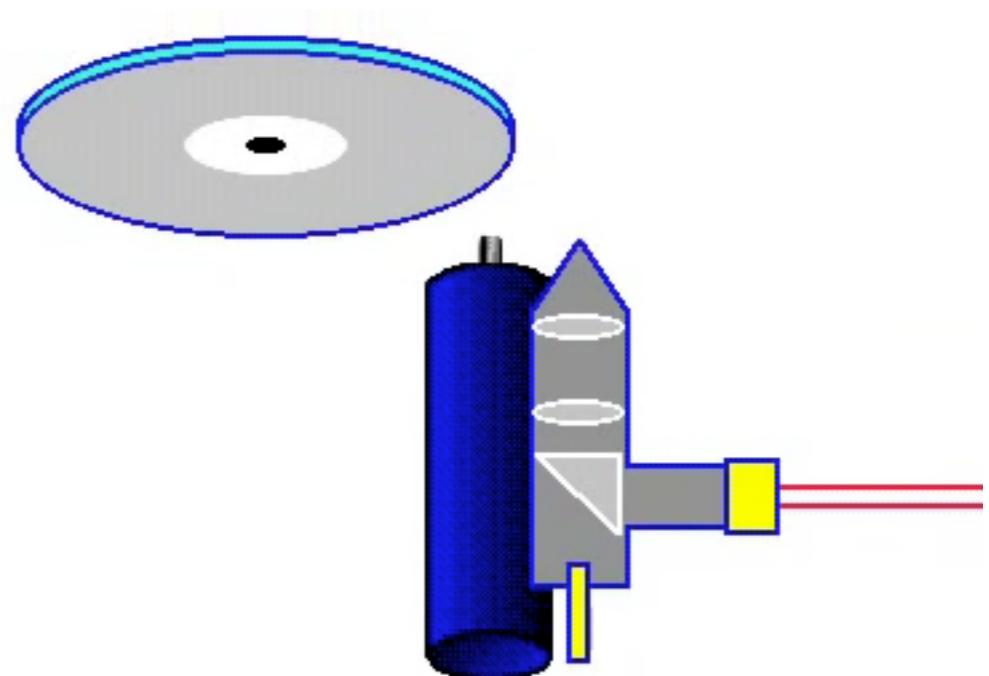
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Abstract

Modern whole-organism genome analysis, in combination with biomass estimates, allows us to estimate a lower bound on the total information content in the biosphere: 5.3×10^{31} ($\pm 3.6 \times 10^{31}$) megabases (Mb) of DNA. Given conservative estimates regarding DNA transcription rates, this information content suggests biosphere processing speeds exceeding yottaNOPS values (10^{24} Nucleotide Operations Per Second). Although prokaryotes evolved at least 3 billion years before plants and animals, we find that the information content of prokaryotes is similar to plants and animals at the present day. This information-based approach offers a new way to quantify anthropogenic and natural processes in the biosphere and its information diversity over time.

5.3×10^{31} Megabases of DNA





Actually perform the music.

Record music as physical object,
play back later via object.

Record music as digital object,
play back later via object.

Record music as shared digital
abstraction, play back wherever.

Life goes as four regimes

1. Natural lineages



3. Edit w/
intention

2. Screen
& breed

ATCG ... 0101 ... ATCG
SEQUENCE
SYNTHESIZE

4. Networked &
lineage agnostic



N°5

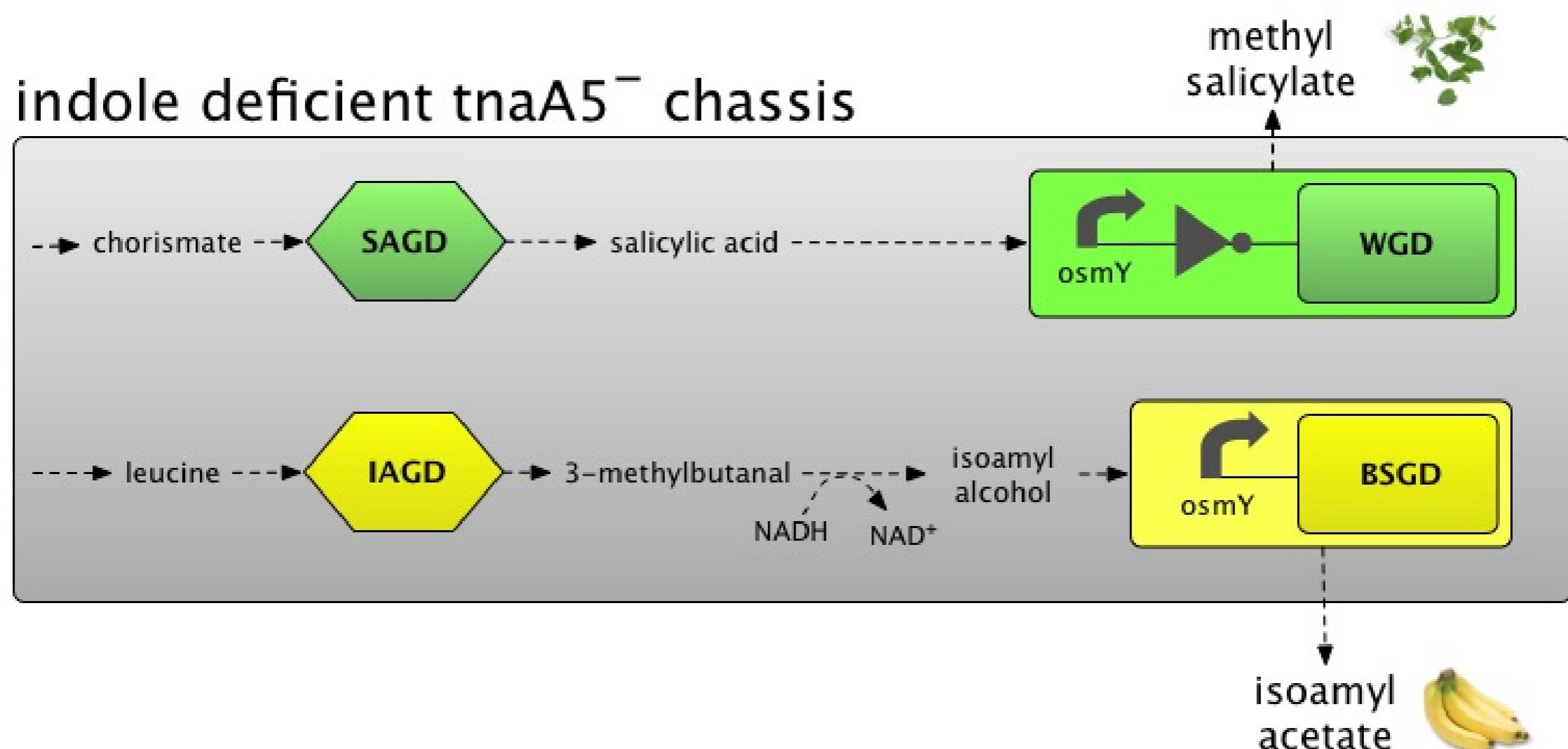
INÉVITABLE



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indole deficient *tnaA5⁻* chassis

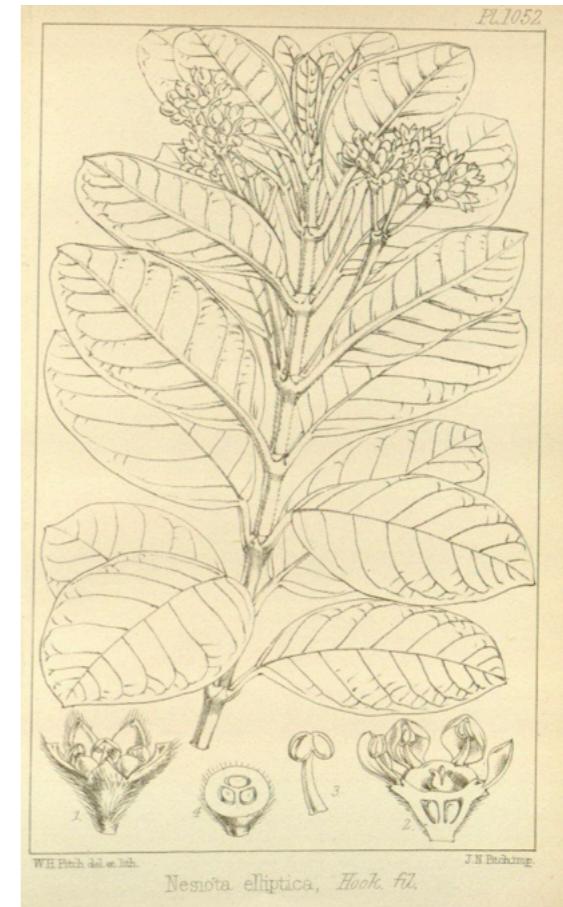


Rewriting Life

Would You Feel Sexy Wearing *Eau de Extinction*?

Synthetic biologists seek to make perfumes from extinct trees and flowers.

by Monique Brouillette December 5, 2016



To locate new terpene-making genes, in May of this year Agapakis and colleagues scoured the archives of the Harvard University Herbarium, which houses more than five million preserved plant specimens. They selected samples of a dozen species that have gone extinct in the last two centuries, including a Hawaiian hibiscus and *Nesiota elliptica*, a flowering olive bush native to the island of St. Helena's in the South Atlantic, which disappeared from the wild in 1994 and went extinct in 2003.



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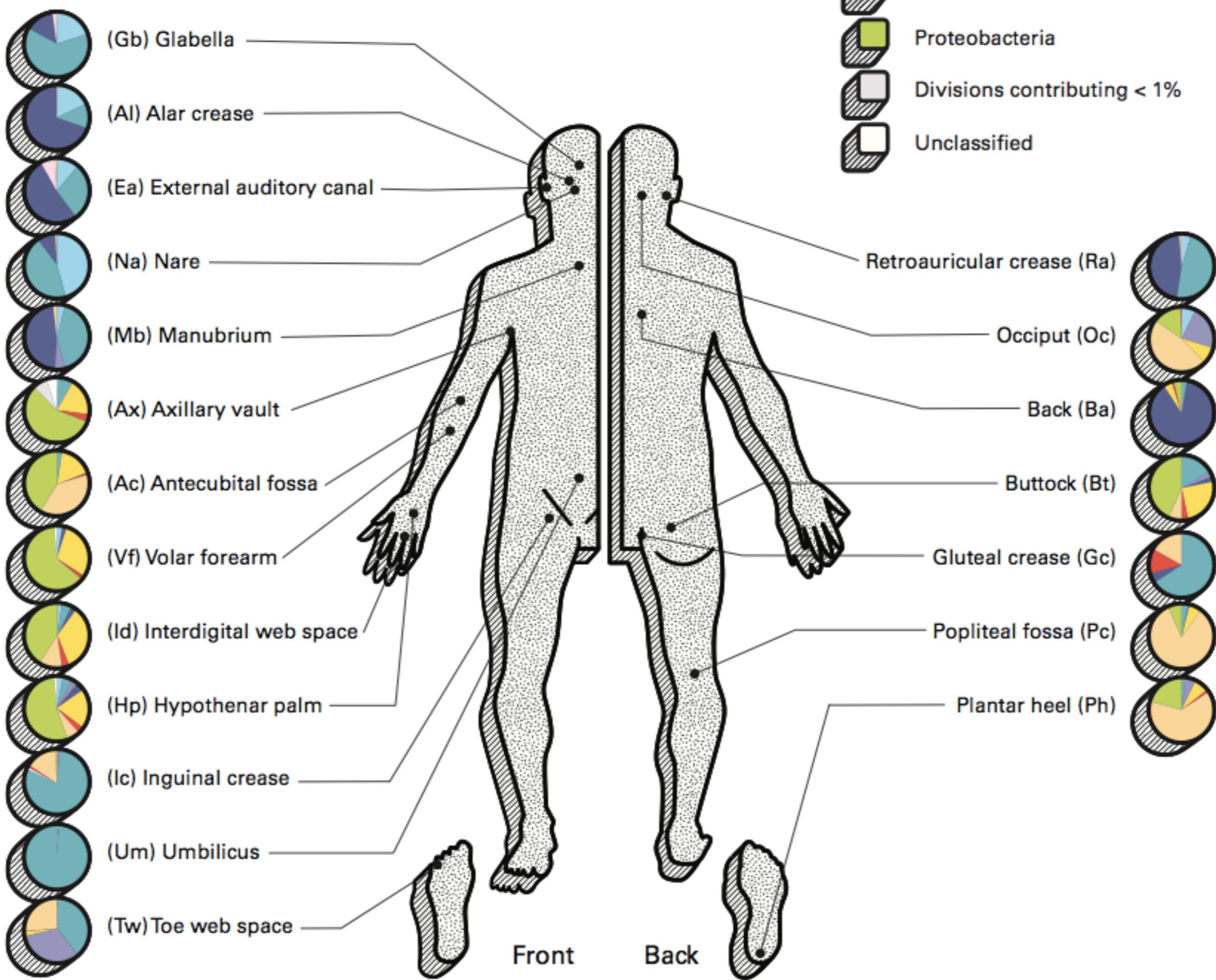


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N°5

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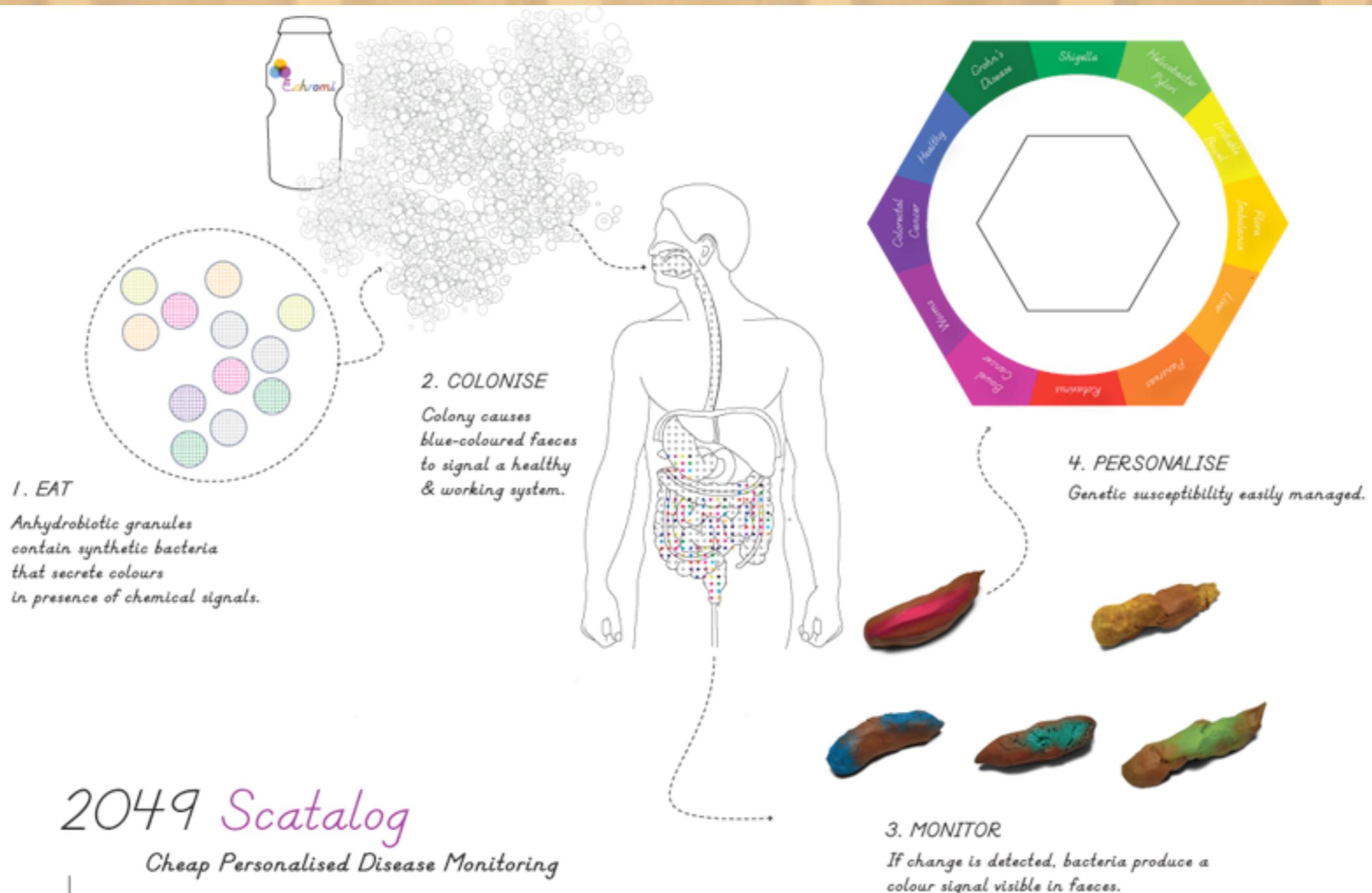


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Cambridge iGEM 2009



A computer is not a computer.

A yeast that makes a medicine is not
a yeast that makes a medicine.

A DNA sequencer is not
a DNA sequencer.

*it depends on who can access the tool when and where

Who will make the world's first personal biology synthesizer (aka, the PB)?

"Today we are introducing three revolutionary products..."





“Hereby it is manifest that during the time men live without a common Power to keep them all in awe, they are in that condition which is called War; and such a war as is of every man against every man.

[...]

In such condition there is no place for Industry, because the fruit thereof is uncertain: and consequently no Culture of the Earth; no Navigation, nor use of the commodities that may be imported by Sea; no commodious Building; no Instruments of moving and removing such things as require much force; no Knowledge of the face of the Earth; no account of Time; no Arts; no Letters; no Society; and which is worst of all, continual Fear, and danger of violent death;

And the life of man solitary, poor, nasty, brutish, and short.”

— Hobbes, Leviathan

RESEARCH ARTICLE

Construction of an infectious horsepox virus vaccine from chemically synthesized DNA fragments

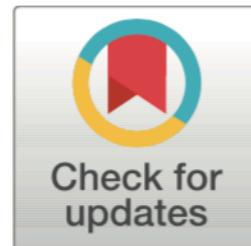
Ryan S. Noyce¹, Seth Lederman², David H. Evans^{1*}

1 Department of Medical Microbiology & Immunology and Li Ka Shing Institute of Virology, University of Alberta, Edmonton, Alberta, Canada, **2** Tonix Pharmaceuticals, Inc., New York, New York, United States of America

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Abstract

Edward Jenner and his contemporaries believed that his *variolae vaccinae* originated in horses and molecular analyses show that modern vaccinia virus (VACV) strains share common ancestry with horsepox virus (HPXV). Given concerns relating to the toxicity of modern VACV vaccines, we asked whether an HPXV-based vaccine might provide a superior alternative. Since HPXV may be extinct and the only specimen of HPXV that has been identified is unavailable for investigation, we explored whether HPXV could be obtained by large-scale gene synthesis. Ten large (10–30 kb) fragments of DNA were synthesized based on the HPXV sequence along with two 157 nt VACV terminal sequences, and were recombined into a live synthetic chimeric HPXV (scHPXV) in cells infected with Shope fibroma virus (SFV). Sequencing of the 212 kbp scHPXV confirmed it encoded a faithful copy of the input DNA. We believe this is the first complete synthesis of a poxvirus using synthetic biology approaches. This scHPXV produced smaller plaques, produced less extracellular virus and exhibited less virulence in mice than VACV, but still provided vaccine protection against a lethal VACV challenge. Collectively, these findings support further development of scHPXV as a novel replication-proficient smallpox vaccine.



OPEN ACCESS

Citation: Noyce RS, Lederman S, Evans DH (2018) Construction of an infectious horsepox virus vaccine from chemically synthesized DNA fragments. PLoS ONE 13(1): e0188453. <https://doi.org/10.1371/journal.pone.0188453>

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This paper should not have been published

drelman replied to PLOS_ONE_Group on 19 Jan 2018 at 20:15 GMT

I strongly disagree with the implication that an adequate assessment of the risks and benefits was undertaken, and strongly disagree with the statements made by your DURC committee. This paper should not have been published.

To suggest that poxviruses are no different from influenza or polio, and therefore that the details provided here "provided no new information" [about the synthesis of smallpox], is at best misleading, and better characterized as simply wrong. I could list for you the details provided in this paper that will substantively assist those with lesser degrees of experience to synthesize smallpox. The Committee mentioned compliance with relevant regulations. Which regulations are these, and how are they relevant and specific to this work at the University of Alberta? The so-called 'forthcoming' behavior in communications consisted of a presentation to the WHO Advisory Committee of a 'fait-accompli'. To my knowledge, there was no request for guidance before the work was undertaken. And the alleged benefits from this work simply do not hold water. This work was not needed or particularly helpful towards an improved vaccine.

What I find particularly inappropriate and frankly, unethical is that this paper with its obvious risks to public health was funded by and written by a for-profit, private entity (Tonix) that stands to gain money from this work and this paper. And the authors co-founded and consult for this entity and stand to make money from it. The conflicts of interest are obvious: the public health was put at risk by a private entity and a set of author-business partners who stand to gain financially from this work. This is wrong.

No competing interests declared.

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