

# Recent developments in Synthetic Biology: Brazilian scenario

Lucas Garbini Cespedes, MSc

Global Forum On Scientific Advances Important To The Biological And Toxin Weapons Convention.

Geneva, 2018

# Content

Who we are

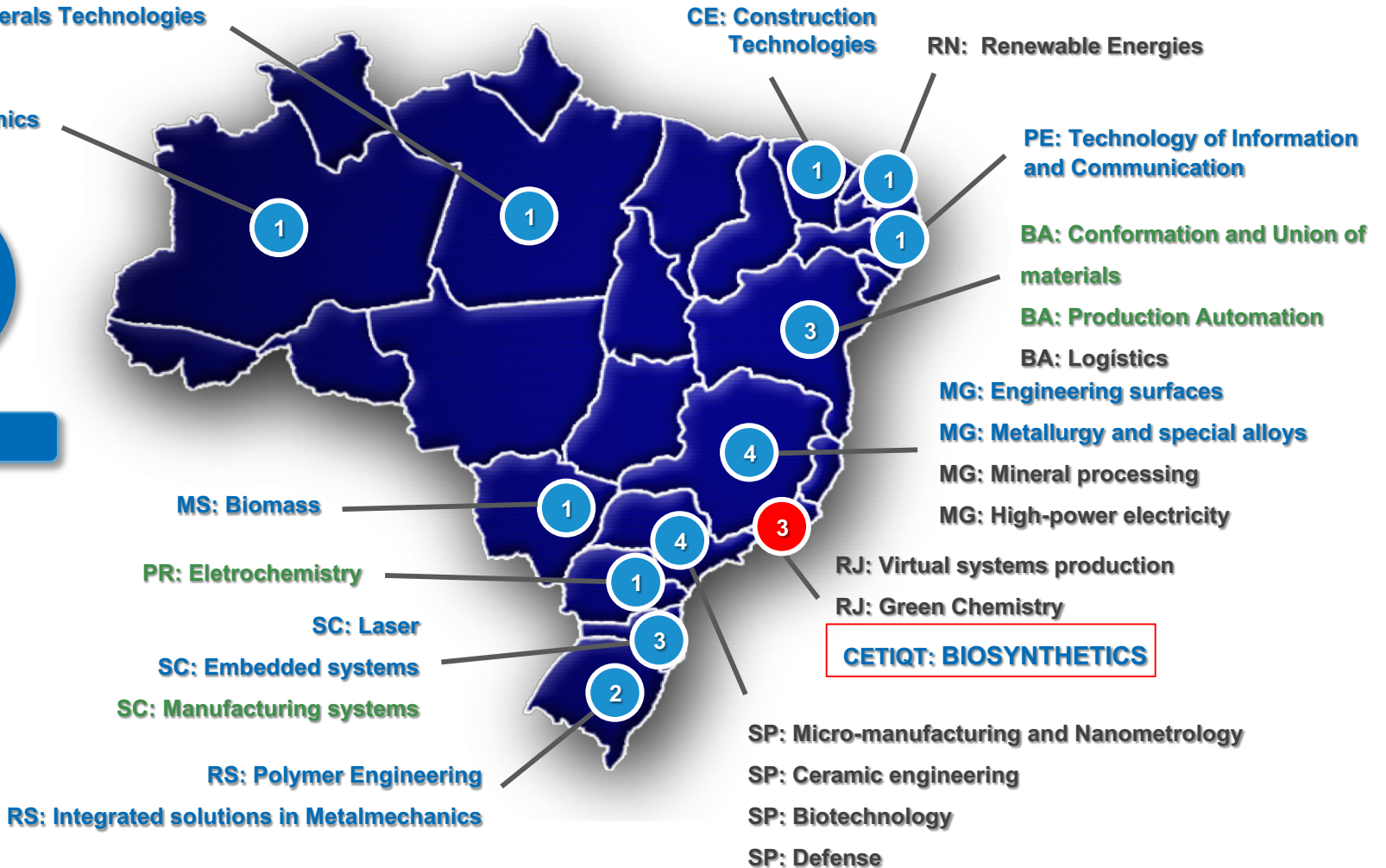
What we do

BWC impacts

**TOTAL  
25**

**LEGEND:**

**Planning**  
**Deployment**  
**Inaugurated**



# ISI for Biosynthetics

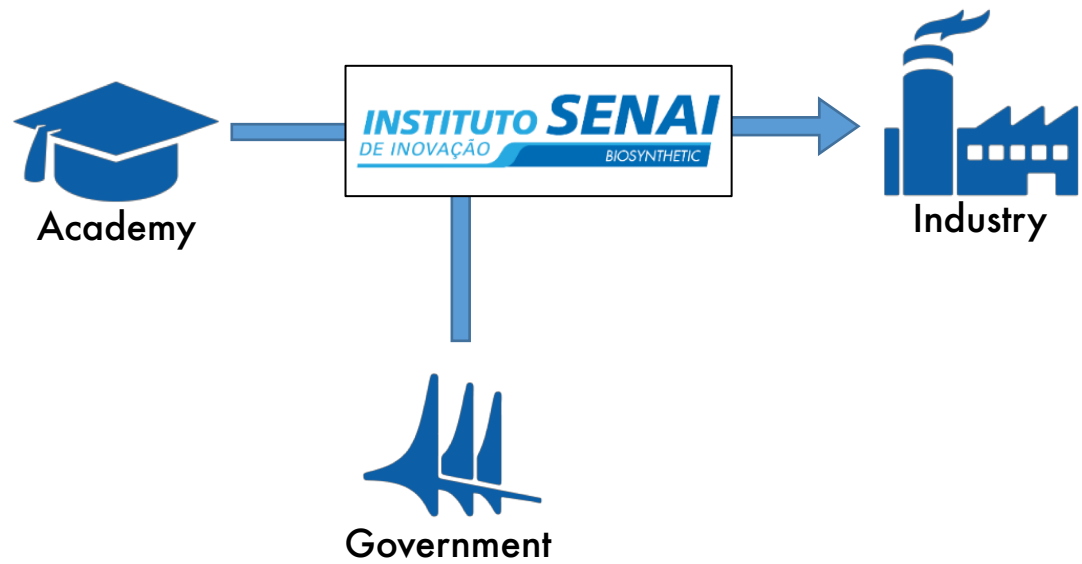
- **Founded in 2016**
- **Non-profit organization**
- **Projects are hired directly by companies or in partnership with funding agencies**
- **4 technology platforms:**

 Synthetic biology

 Chemical transformation

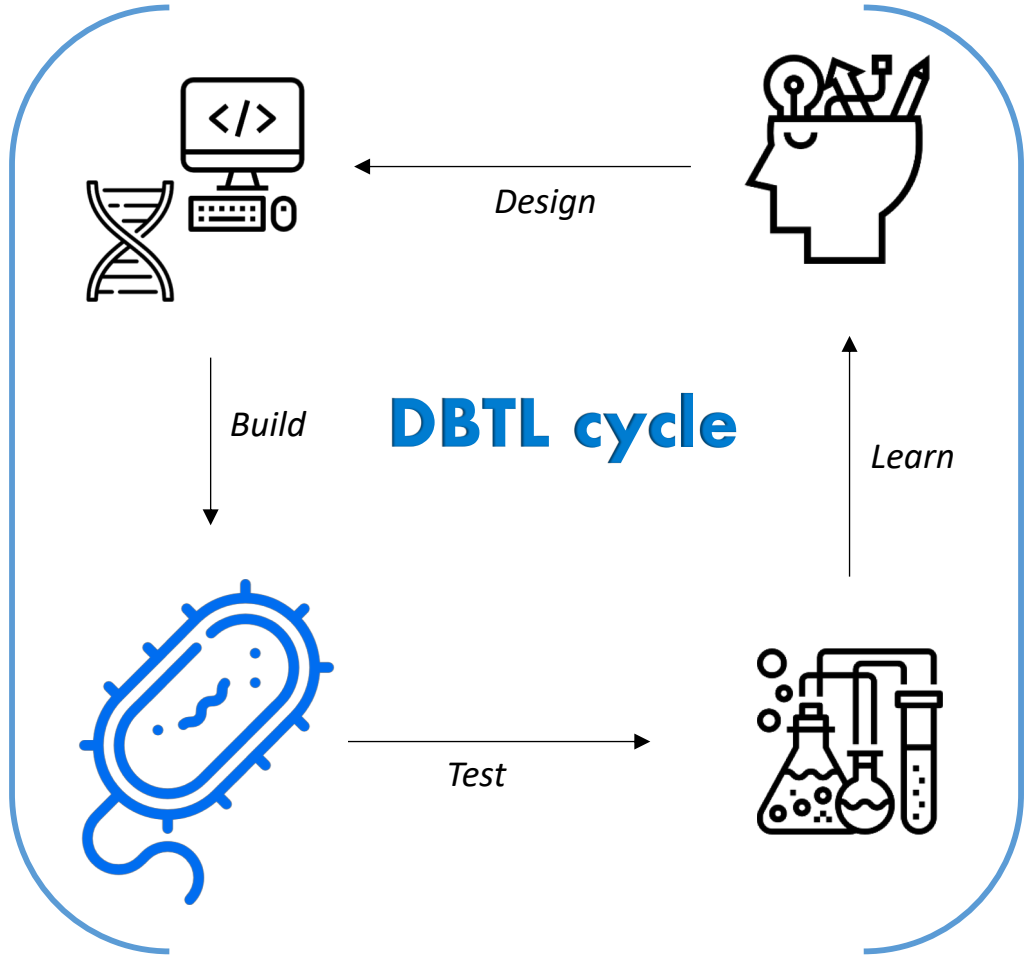
 Process engineering

 Fibers

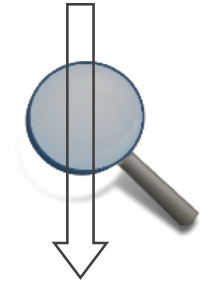




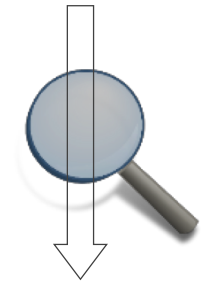
# Synthetic Biology



National Biosecurity Commission



Internal Biosecurity Commission



Projects

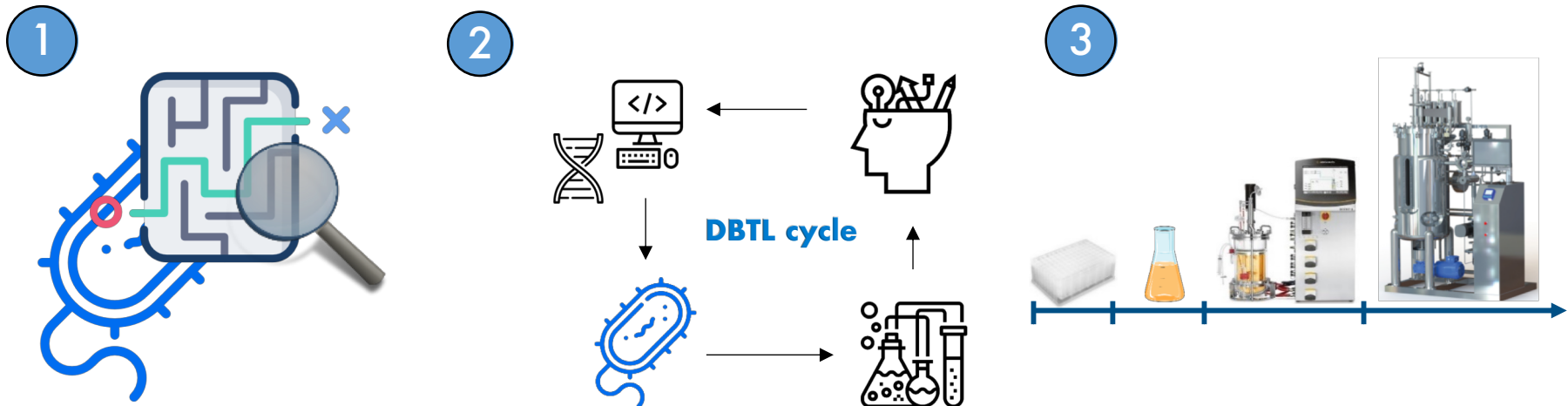
# Our approach

- **Creating unnatural pathways in characterized strains**
- **Exploring natural pathways of wild type strains**

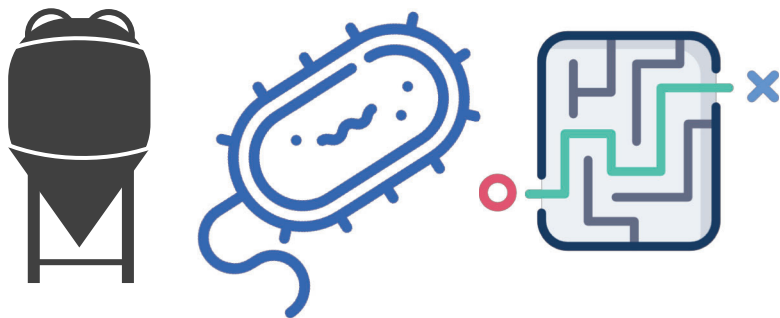
1- Identification and planning of new metabolic pathways

2- Microbial strain development (DBTL cycle)

3- Optimize and Scale up Bioprocesses

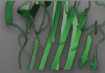


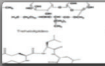
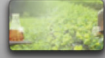
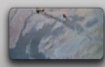

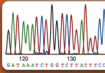
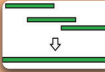
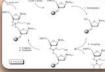




# Research Areas & Services



Main Research lines



-  Enzymes
-  Renewable chemicals
-  New fragrances
-  Biosurfactants
-  Agrochemicals
-  MEOR - *Microbial Enhanced Oil Recovery*
-  C<sub>1</sub> as raw material
-  DNA Sequencing
-  Bioinformatics analysis
-  DNA Synthesis
-  Customized Bioinformatic tools
-  High throughput system



Main Services



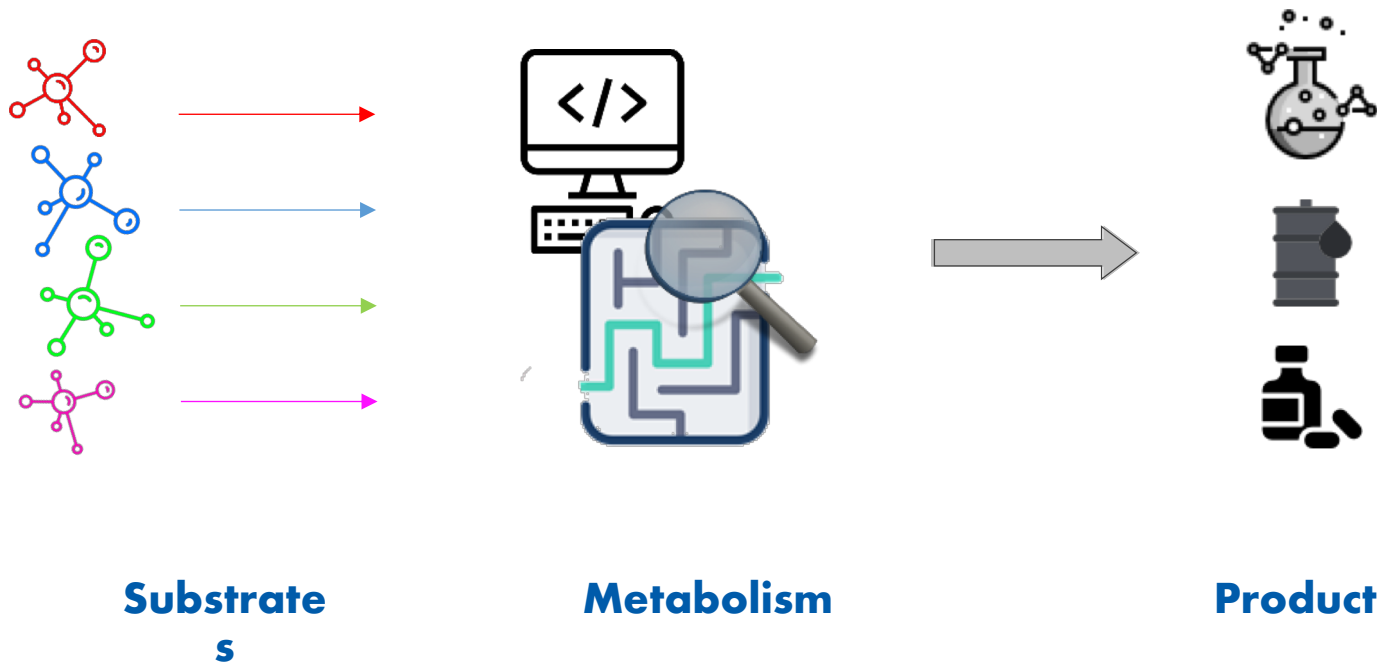
# Examples

**INSTITUTO SENAI**  
DE INOVAÇÃO BIOSYNTHETIC



**Chemical Company**

- **Software to search for and predict new metabolic pathways**



# Examples

**INSTITUTO SENAI**  
DE INOVAÇÃO **BIOSYNTHETIC**



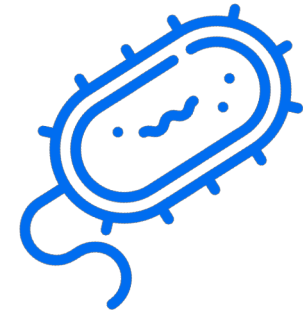
**Cosmetic Company**



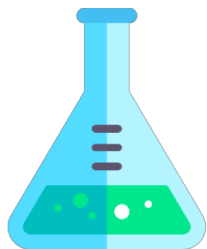
Extraction from plant



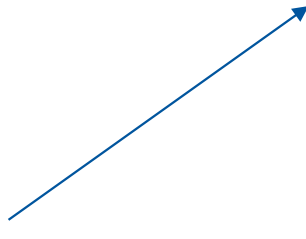
**Fragrance**



**Microbial production**



Chemical synthesis



## Synbio

- ✓ Completely new molecules
- ✓ Targeted production for complex molecules
- ✓ Less/No seasonality
- ✓ Milder production conditions
- ✓ Possibility to use agro industrial wastes or renewable feedstocks

# Brazilian scenario – Gaps to be filled

## The Big Picture:

- Increasing interest of academy, companies and general public
- No synthetic gene provider
- Only a few oligo providers

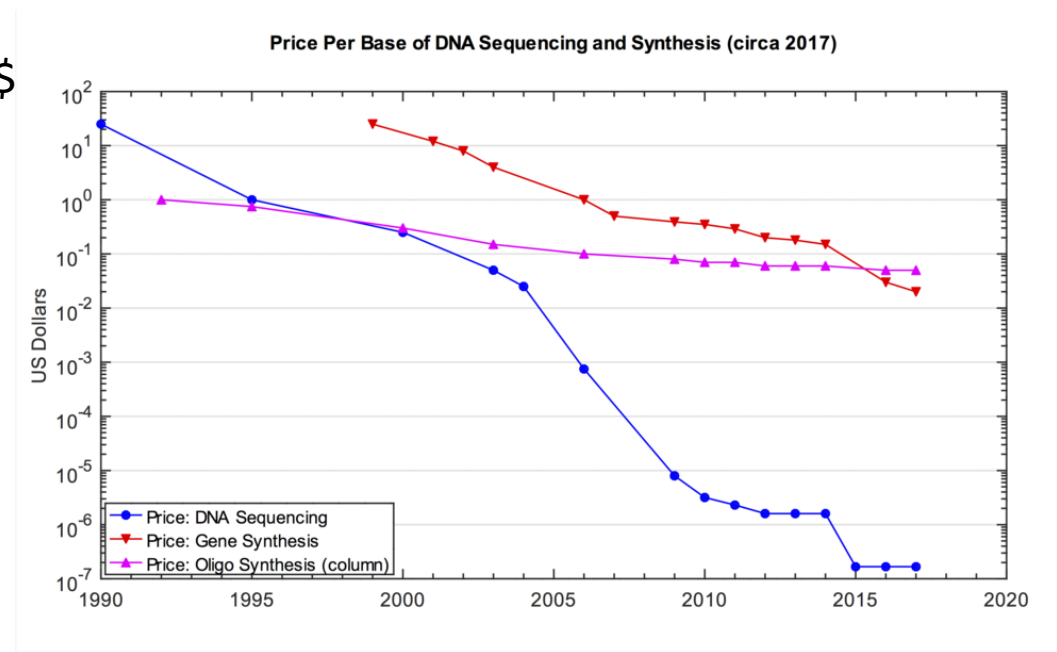
## ISI Biosynthetics will offer:



**Gene synthesis**

## ISI Biosynthetics will:

- Provide tools for academy and companies
- Foster Synthetic Biology nationally



Bioeconomy  
CAPITAL

20 January, 2018



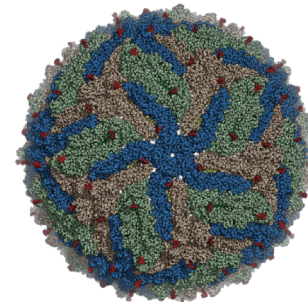
## Brazilian perspectives important to BWC

- **iRNA for pathogen control in agriculture** (Machado, 2017)
- **CRISPR/Cas modified crops may be treated as non-GMO** (CTNBio, 2018)
- **Development of sterile organisms for pest population control**



- **Zika virus:**

- **Detection in wild primates** (Favoretto, 2016)
- **Mutations increases pathogenicity** (Xia, 2018)



# Thank you!

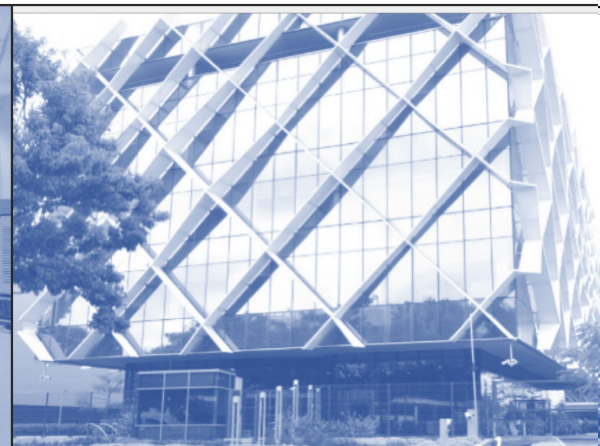
**Lucas Garbini Cespedes, MSc**

**[lcespedes@cetiqt.senai.br](mailto:lcespedes@cetiqt.senai.br)**

**+55 21 3812-5890**

<http://senaicetiqt.com/innovation/the-institute/>

**INSTITUTO SENAI**  
DE INOVAÇÃO  
BIOSYNTHETIC



1- Machado AK, Brown NA, Urban M, Kanyuka K, Hammond-Kosack KE. RNAi as an emerging approach to control Fusarium head blight disease and mycotoxin contamination in cereals. *Pest Manag Sci.* 2017;74(4):790-799.

2- [http://ctnbio.mcti.gov.br/en/resolucoes-normativas/-/asset\\_publisher/OgV431Rs9dQ6/content/resolucao-normativa-n%C2%BA-16-de-15-de-janeiro-de-2018](http://ctnbio.mcti.gov.br/en/resolucoes-normativas/-/asset_publisher/OgV431Rs9dQ6/content/resolucao-normativa-n%C2%BA-16-de-15-de-janeiro-de-2018)

3- First detection of Zika virus in neotropical primates in Brazil: a possible new reservoir.

Silvana Favoretto, Danielle Araujo, Danielle Oliveira, Nayle Duarte, Flavio Mesquita, Paolo Zanotto, Edison Durigon bioRxiv 049395; doi: <https://doi.org/10.1101/049395>

4- Xia, HongjieAU - Luo, HuanleAU - Shan, ChaoAU - Muruato, Antonio E.AU - Nunes, Bruno T. D.AU - Medeiros, Daniele B. A.AU - Zou, JingAU - Xie, XupingAU - Giraldo, Maria IsabelAU - Vasconcelos, Pedro F. C.AU - Weaver, Scott C.AU - Wang, TianAU - Rajsbaum, RicardoAU - Shi, Pei-YongPY - 2018DA - 2018/01/29TI - An evolutionary NSI mutation enhances Zika virus evasion of host interferon inductionJO - Nature Communications