

4th International Workshop on Regulatory Approaches for Agricultural Applications of Animal Biotechnologies

Non-GMO decisions - CTNBio

Luiz Sergio A Camargo

Embrapa Dairy Cattle

CTNBio member



CTNBio

- Comissão Técnica Nacional de Biossegurança
Biosafety National Technical Commission
 - Created in 1995 – Law no. 8.974.
 - Current Law no. 11.105 from 2005
 - establishes safety standards and inspection mechanisms for construction, cultivation, production, handling, transport, transfer, import, export, storage, research, marketing, consumption, release into the environment and the disposal of genetically modified organisms - GMOs and their derivatives, having as guidelines the stimulus to scientific progress in the area of biosafety and biotechnology, the protection of human, animal and plant life and health, and the observance of the precautionary principle for the environment protection
 - Composed of Brazilian citizens of recognized technical competence, of notable scientific performance and knowledge, with an academic degree of Doctor and with outstanding professional activity in the areas of biosafety, biotechnology, biology, human and animal health or the environment

GMO commercial products approved by CTNBio

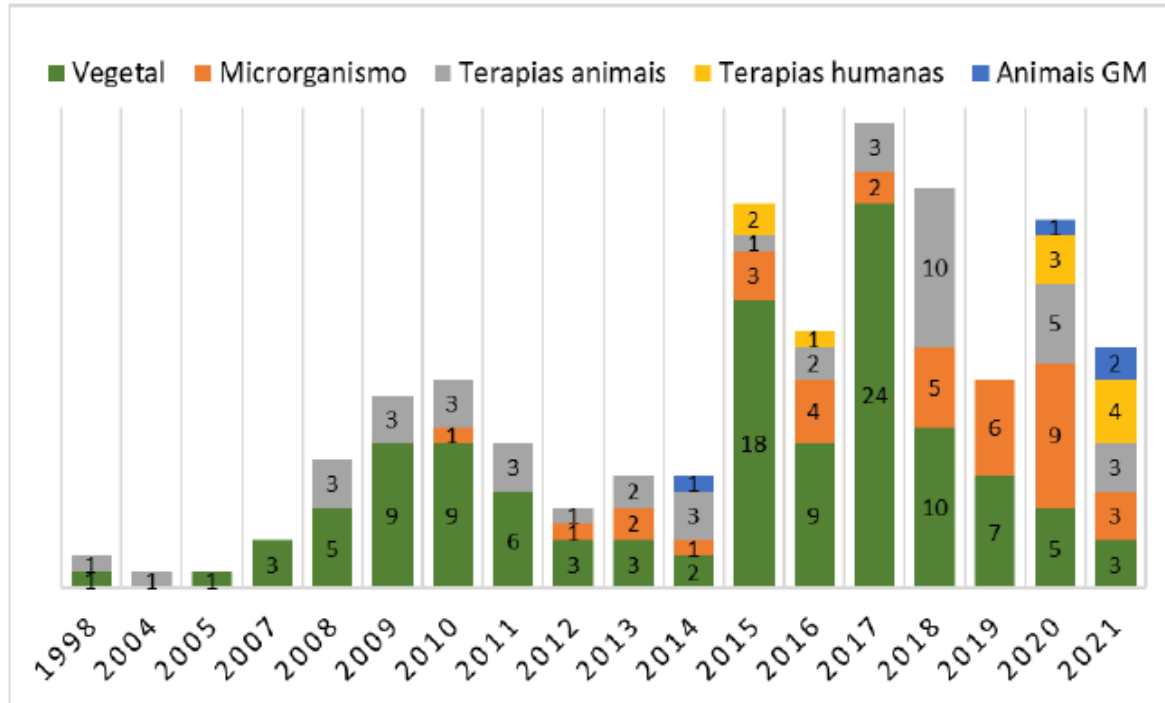
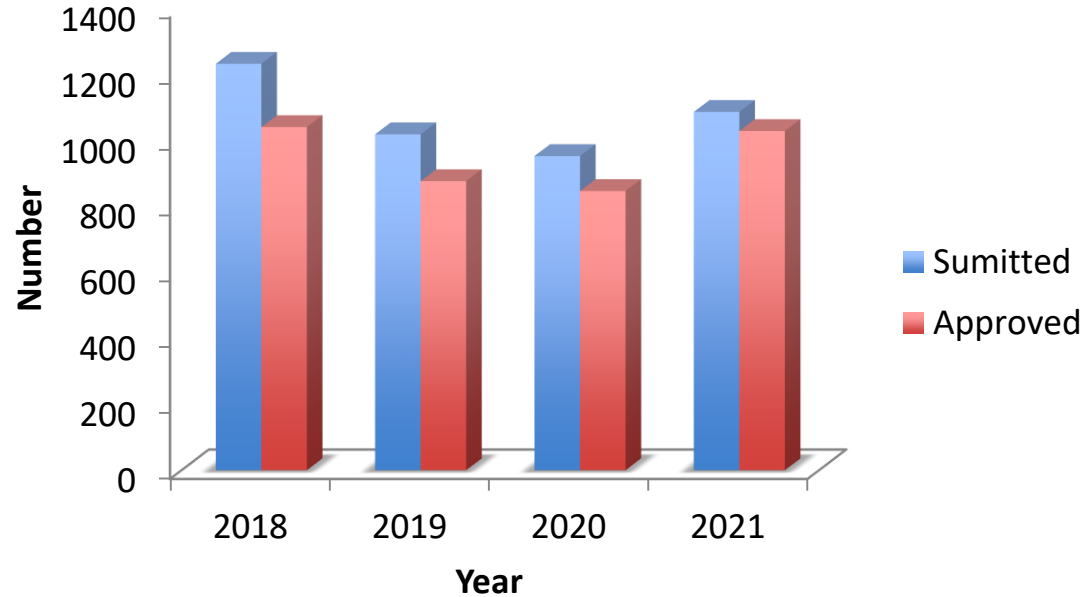


Figura 2. Número de liberações comerciais segundo o ano e o tipo de OGM até junho de 2021

Processes evaluated by CTNBio

Processes



Sectoral sub-commissions:

Human / Animal Health
Plants/Environment

Normative resolution no. 16, January, 15th 2018

- To establish the technical requirements to present to CTNBio a query (consultation) about products generated by new breeding technologies
 - Whether the product can be determined as non GMO. If so, it will not be under the CTNBio regulation – but it is still regulated by other Brazilian agencies as a conventional product
- Main requirements
 - Product without any introduction of exogenous/recombinant DNA/RNA;
 - Product can have site-directed mutations (for gain or loss of function), but only without introduction of recombinant DNA/RNA;
- Need to show
 - Genetic engineering strategy used to edit the genome and how on-targets and off-targets were detected and evaluated;
 - DNA sequences and localization, presence of off-targets
 - The output of the gene editing (traits)

Normative resolution no. 16, January, 15th 2018

ANNEX II:

Regarding the original organism (Parents), inform:

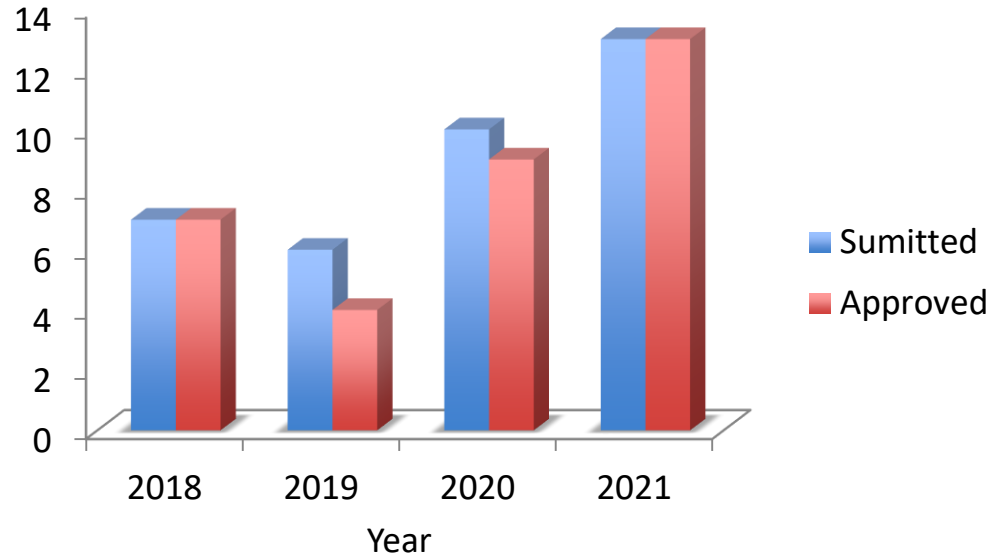
1. **identification of the genetic technology, purpose and intended use** of the resulting organism and its derivatives;
2. taxonomic classification, from family to the most detailed level of the organism to be released, including, where appropriate, subspecies, cultivar, pathovar, strain and serotype;
3. **the risk classification (BS)** of the genetically modified organism in accordance with Normative Resolution No. 2, of November 27, 2006
4. the gene(s) and/or genetic element(s) manipulated, organism(s) of origin and their specific functions, when applicable;
5. **the genetic strategy(s) used to produce the desired modification(s)**; the genetic map(s) of the construction(s) used in the indicating process, with all genetic elements present;
6. **molecular characterization of the result of manipulation** in the recipient organism (parental and final product), when applicable, providing information related to: (1) **number of manipulated copies** (e.g. number of genomic sequences, number of alleles, etc); (2) **location in the genome** of the manipulated region, when possible; (3) **identify the presence of unintentional genetic modifications** (off-target), when applicable.
7. **the product (or the result) of the expression** of the manipulated genomic region(s), described in detail, where applicable.

Regarding the product (offspring, lineage or the final product) inform:

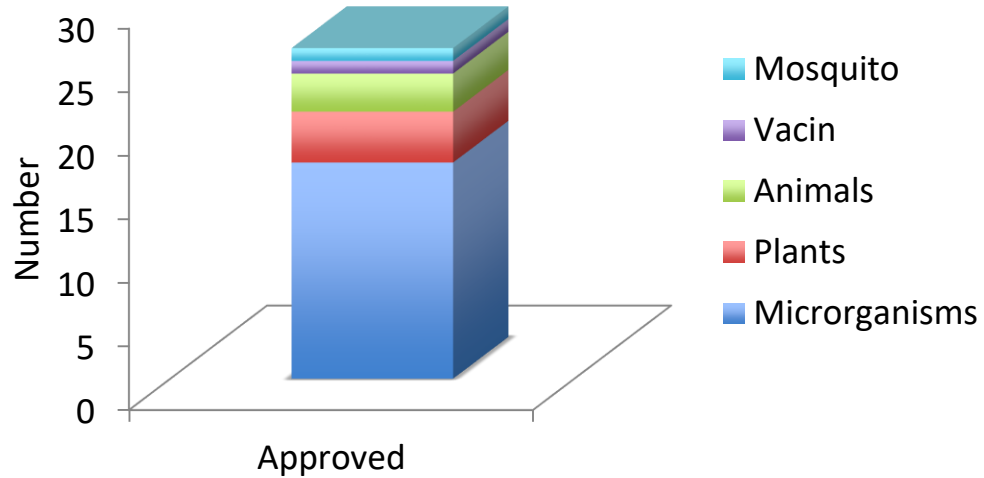
1. **proof of the absence of recombinant DNA/RNA molecules**, using molecular methods.
2. whether the product containing DNA/RNA molecules for topical/systemic use has the ability to insert into the target species and/or non-target species.
4. **if the product object of the request is commercially approved** in other countries.
5. if the product uses the principle of **gene drive**, which may allow the phenotypic alteration conferred to have the potential to spread throughout the population of the recipient organism, **explain how organism will be monitored**, using at least two different strategies.
6. how **the possible unintended effects (off-target)** of the technology that may be present in the product **was evaluated**.

Queries (consultations) submitted to CTNBio

Normative Resolution no. 16 from 2018

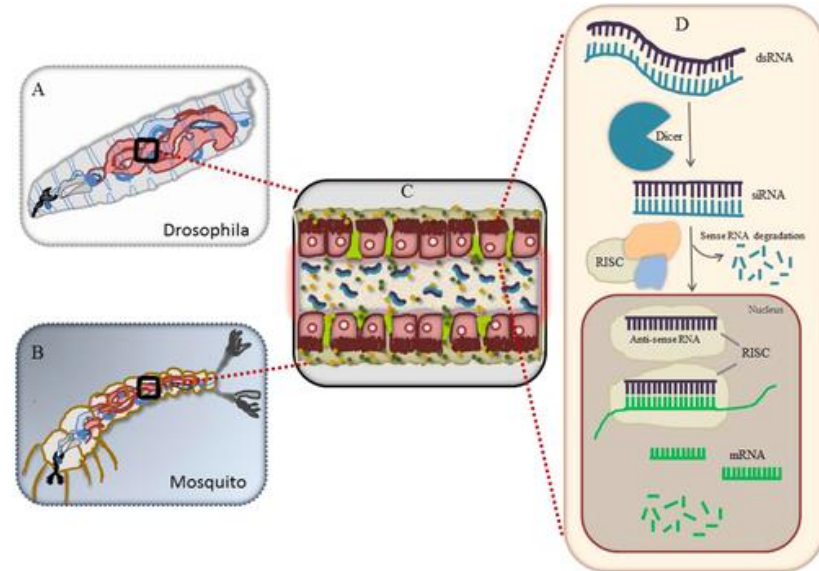


Queries submitted to CTNBio - fields



Mosquitos (*A. aegypti*)

- Sterile mosquito by means of RNAi (Sterile Insect Technique)
 - Mosquitos larvae fed with double-stranded RNA that target testis genes
 - dsRNAs are cleaved in short interfering RNAs (siRNA) when in the cells
 - Antisense RNA targets the complementary mRNA
 - Adult males with greatly reduced fertility
 - Product considered non-GMO in 2019



Fish (Tilapia)

- Nile tilapia with increased fillet yield
 - Fish embryos injected with CRISPR/Cas9 mRNA to target the myostatin gene
 - Deletions of nucleotides to knockout the gene
 - Increased growth rate and feed conversion
 - Product considered non-GMO in 2019



Cattle

- Semen from a bull (Nelore) with double muscle
 - TALENs injection into the cytoplasm of IVF zygotes
 - Indels to knockout the myostatin gene
- Male and female with slick hair
 - CRISPR/Cas9 injection into the cytoplasm of IVF zygotes;
 - Mutations inserted in the prolactin receptor
- Both considered non-GMO in 2021



Transgenic Res (2015) 24:147–153
DOI 10.1007/s11248-014-9832-x

ORIGINAL PAPER

Genome edited sheep and cattle

Chris Proudfoot · Daniel F. Carlson · Rachel Huddart · Charles R. Long ·
Jane H. Pryor · Tim J. King · Simon G. Lillico · Alan J. Mileham ·
David G. McLaren · C. Bruce A. Whitelaw · Scott C. Fahrenkrug



Changes in the Normative Resolutions of CTNBio

RN5
Commercial Releases
Of
Plants, animals,
microorganisms

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graph LR; RN5["RN5  
Commercial Releases  
Of  
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microorganisms"] --- RN21["RN21  
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Commercial Releases  
Of  
Plants and animals"]; RN5 --- RN33["RN??  
Commercial Releases  
Of  
Gene therapies and  
vaccines"];
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RN21
Commercial Release
Of
microorganisms

RN32
Commercial Releases
Of
Plants and animals

RN??
Commercial Releases
Of
Gene therapies and
vaccines

Thank you



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12-16 September, 2022 – São Paulo, Brazil

