



**CRF SP**  
CONSELHO REGIONAL  
DE FARMÁCIA  
DO ESTADO DE SÃO PAULO

## XX Congresso Farmacêutico de São Paulo

# III SIMPÓSIO “FRONTEIRAS NAS CIÊNCIAS FARMACÊUTICAS” 10 e 11 de Outubro de 2019

Da bancada ao terabyte: desenvolvimento de medicamentos orientados por tecnologia e Inteligência Artificial (IA).

Dr. Leonardo Teixeira  
[leonardo.teixeira@icf.com.br](mailto:leonardo.teixeira@icf.com.br)



CANNABIDIOL (Dr) x



in

Medline Abstracts

Explore

Advanced Options

Related Gene, disease | 2001-2018 | Show database relationships

240

Medline Abstracts

Searched Entity

Gene

Disease

Dr Drug

Discovered

Database

Both

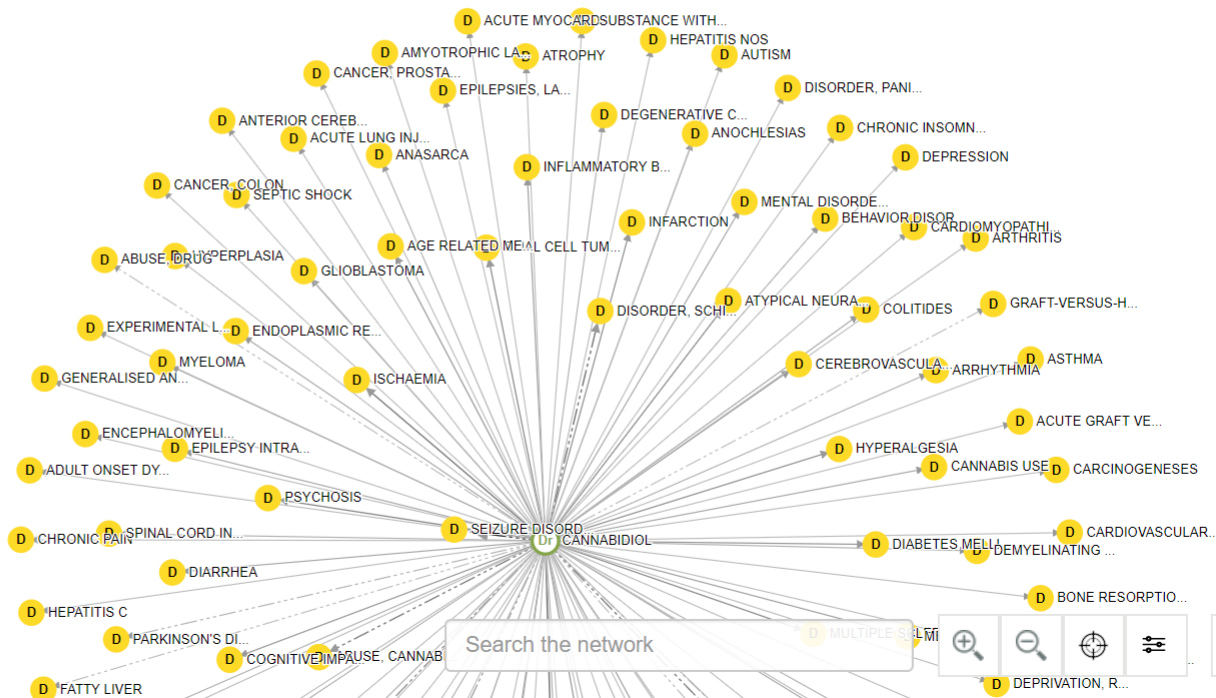
Confidence & Support

69% to 98%

0 to 40 documents

Inputs and Selection

Showing all links



CRF SP  
CONSELHO REGIONAL  
DE FARMÁCIA  
DO ESTADO DE SÃO PAULO

A complex network diagram with a dark blue background. The diagram features a central point from which numerous lines radiate outwards, forming a wide, fan-like shape. The lines are primarily orange and red, with some cyan and blue lines interspersed. At the end of each line is a small, glowing circular node. The overall effect is one of a vast, interconnected network of data points. The text "BIG DATA" is centered in the middle of the image in a bold, white, sans-serif font.

**BIG DATA**



# Algoritmos

- Conjunto ordenado e finito de instruções que levam à solução de um problema.





**CRF SP**  
CONSELHO REGIONAL  
DE FARMÁCIA  
DO ESTADO DE SÃO PAULO

Leonardo Teixeira

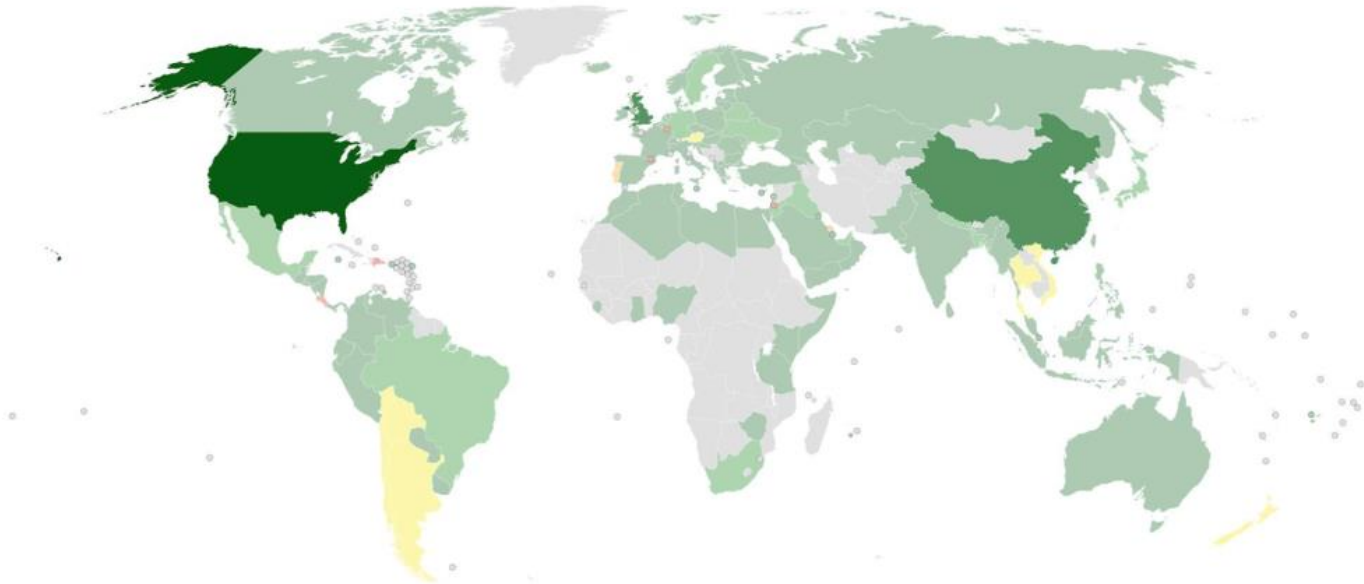


**CRF SP**  
CONSELHO REGIONAL  
DE FARMÁCIA  
DO ESTADO DE SÃO PAULO

Leonardo Teixeira



Users Across The Globe



**CRF SP**  
CONSELHO REGIONAL  
DE FARMÁCIA  
DO ESTADO DE SÃO PAULO

Leonardo Teixeira







## Firstly, I'd like to check that I understand you correctly.

Can you confirm if you have any of the following?

Upper back pain

Headache

Pain in face

None of the above apply

Confirm






**CRF SP**  
CONSELHO REGIONAL  
DE FARMÁCIA  
DO ESTADO DE SÃO PAULO

Leonardo Teixeira



# NHS GP appointments just a tap away\*

-  **On mobile** in minutes 24/7
-  **In person** at a choice of locations
-  **Free** digital Healthcheck

[Get Started](#)

\*To register you will need to switch from your current GP practice. Once an application is made, a registration period will apply before you are able to access the service. Available for people living or working within the catchment area of one of our clinic locations.



Leonardo Teixeira

Akihiko Kondo (35) married cyber celebrity Hatsune Miku, a vocaloid software voicebank



**CRF SP**  
CONSELHO REGIONAL  
DE FARMÁCIA  
DO ESTADO DE SÃO PAULO

This Japanese man married a hologram and people are calling him ‘digisexual’



Try Spritam FREE for 30 Days [Terms & Conditions](#)

ABOUT SPRITAM

CLINICAL CONSIDERATIONS

ZIPDOSE TECHNOLOGY

SAVINGS AND SUPPORT

# Manufactured Using 3D Printing

ZipDose® Technology is the first and only drug formulation platform that uses 3D printing (3DP).<sup>1</sup> This proprietary process does not rely on

[EXPAND](#)

## Indications and Usage

SPRITAM (levetiracetam) is a prescription medicine taken by mouth that is used with other medicines to treat partial onset seizures in patients 4 years of age and older with epilepsy, myoclonic seizures in patients 12 years of age and older with juvenile myoclonic epilepsy, and primary generalized tonic-clonic seizures in patients 6 years of age and older with idiopathic generalized epilepsy. SPRITAM is recommended for use in patients weighing 20 kg (44 lbs) or more.

## Important Safety Information

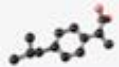
SPRITAM may not be for everyone. SPRITAM is contraindicated in patients with a hypersensitivity to levetiracetam. Reactions have included anaphylaxis and angioedema.



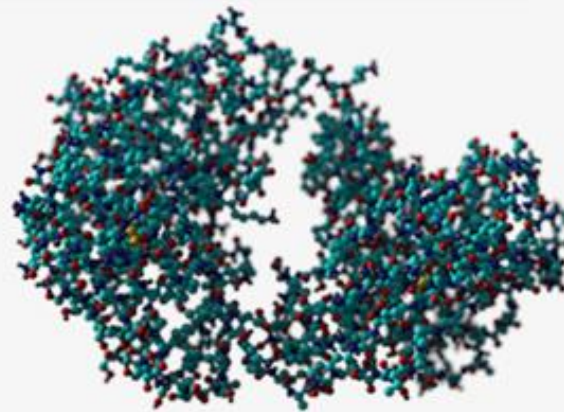
**CRF SP**  
CONSELHO REGIONAL  
DE FARMÁCIA  
DO ESTADO DE SÃO PAULO

Leonardo Teixeira

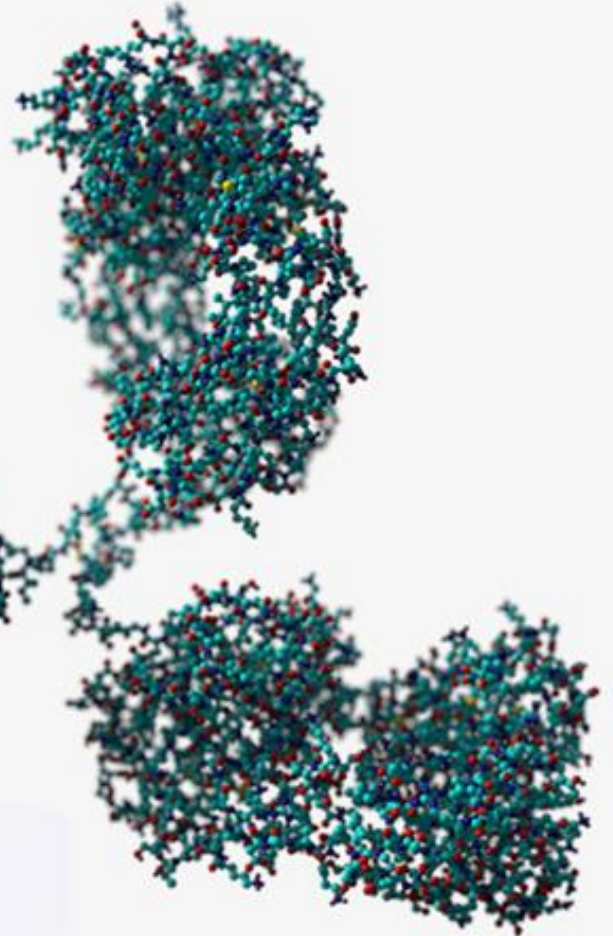
# Biológicos



Ibuprofeno



Anticorpo  
Monoclonal



Leonardo Teixeira



CRF SP  
CONSELHO REGIONAL  
DE FARMÁCIA  
DO ESTADO DE SÃO PAULO

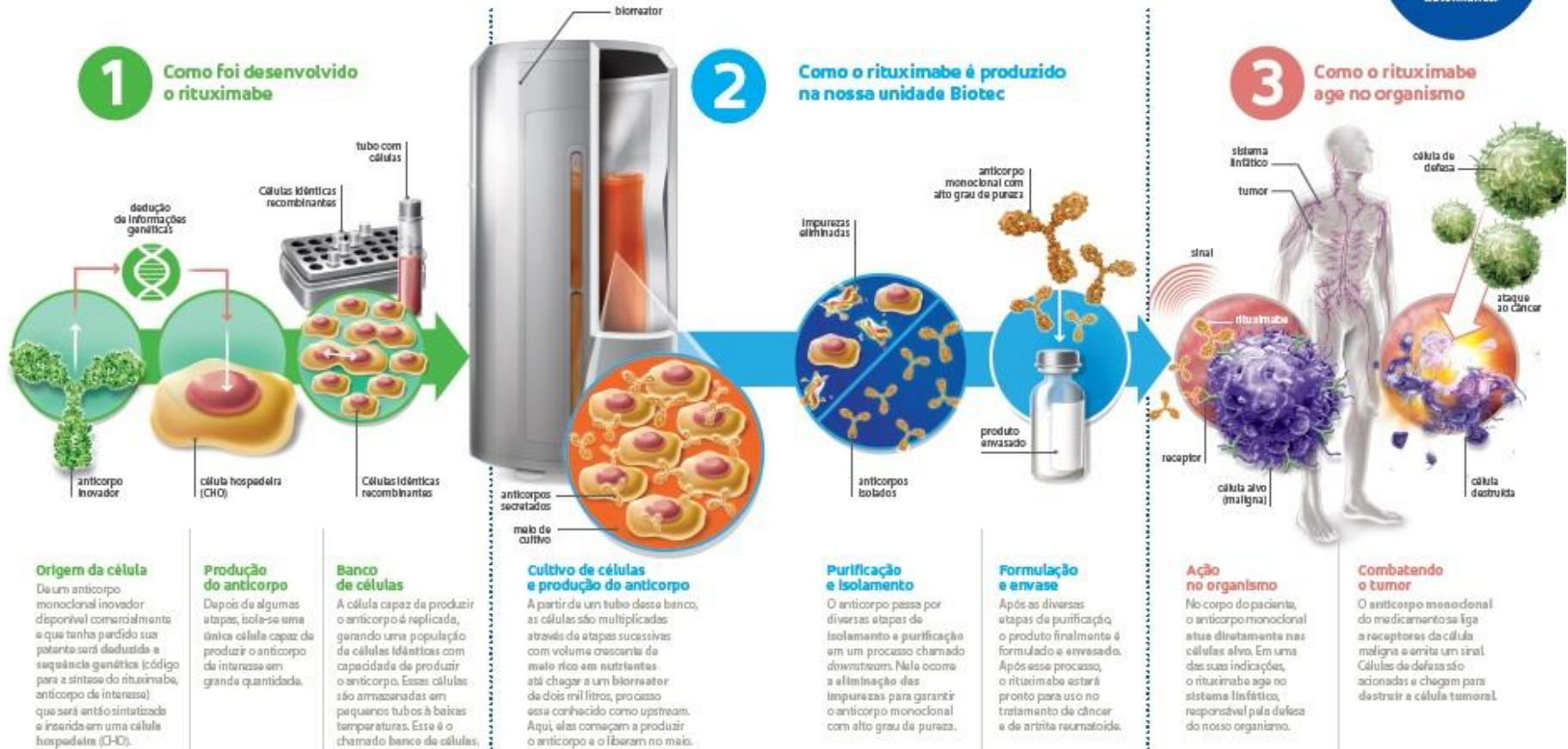


# Biossimilar

## Entenda as etapas de desenvolvimento e de fabricação de um medicamento biossimilar à base de anticorpo monoclonal

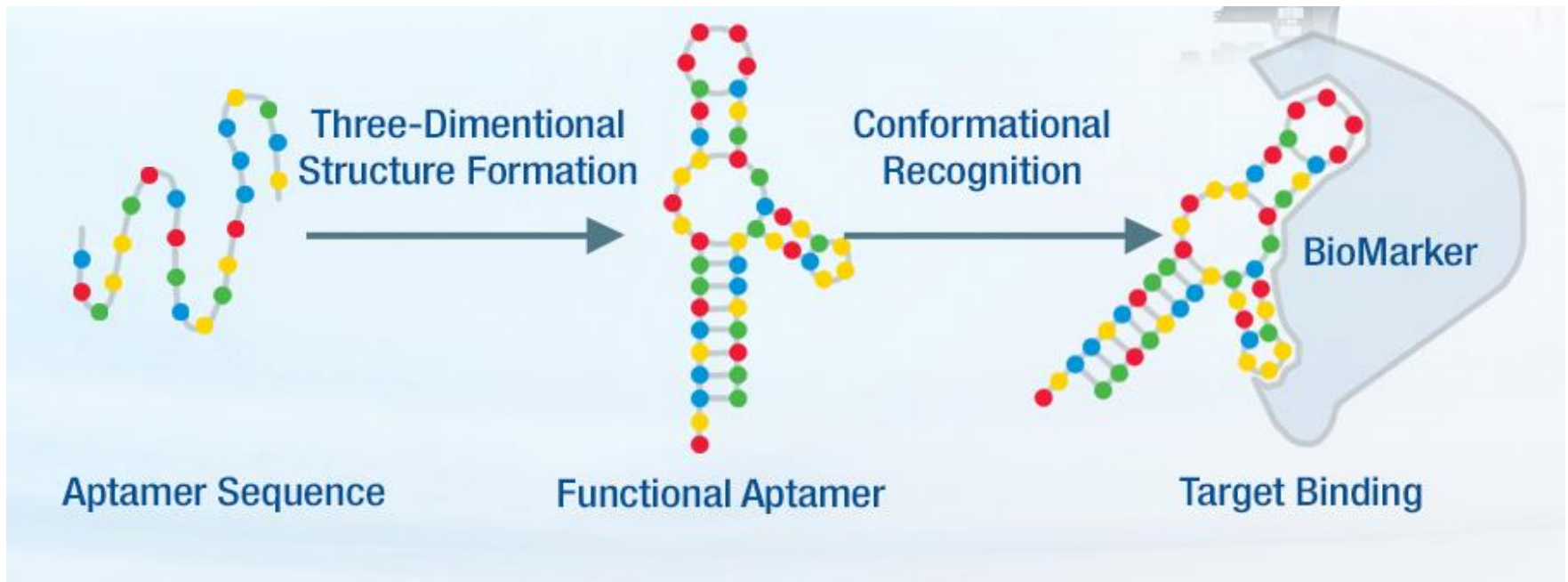
Diferente dos medicamentos sintéticos, que são produzidos por reações químicas bem definidas, os biossimilares, assim como outros medicamentos biológicos, são moléculas complexas produzidas por células vivas. Por meio da engenharia genética, essa célula é modificada e o anticorpo por ela sintetizado. Depois, passa por vários processos até ser uma molécula pura que será empregada para atacar e combater alvos específicos.

Os nossos biossimilares podem ajudar no combate a vários tipos de cânceres e doenças autoimunes.



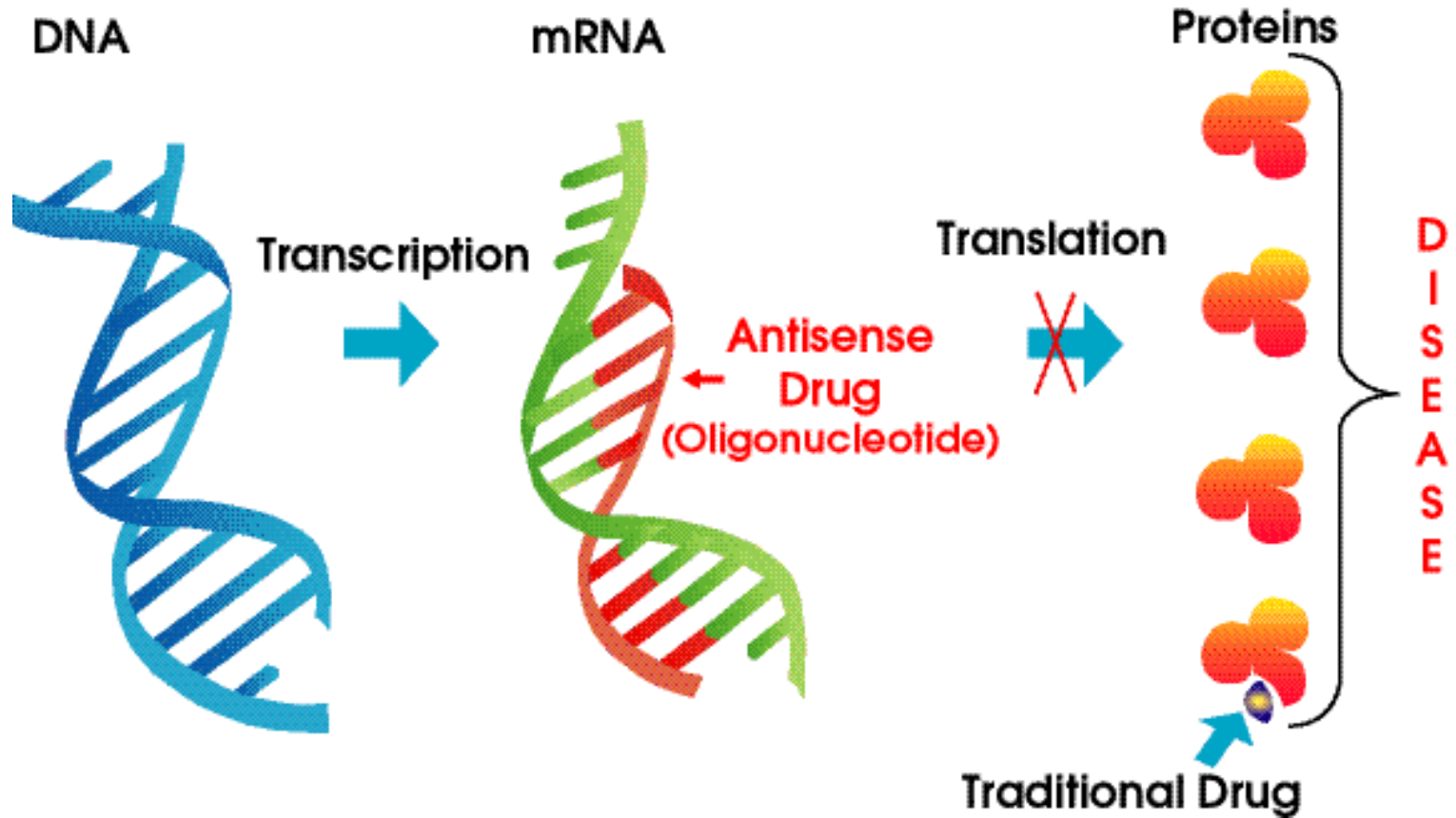
# Aptâmeros:

RNA ou DNA oligonucleotídeos que por meio da sua estrutura tridimensional se ligam especificamente a molécula alvo.



Leonardo Teixeira

# ASO



MENU ▾

**nature**  
REVIEWS  
**NEUROLOGY**

🔍 Search | ✉ E-alert | 📄 Submit | 👤 Login

Review Article | Published: 01 December 2017

# Antisense oligonucleotides: the next frontier for treatment of neurological disorders

Carlo Rinaldi & Matthew J. A. Wood ✉

*Nature Reviews Neurology* **14**, 9–21 (2018) | [Download Citation](#) ↓

58 Citations | 54 Altmetric | [Article metrics >>](#)

## Associated Content

Nature Outlook  
[Huntington's disease](#)

Sections | **Figures** | References

## Abstract

Antisense oligonucleotides (ASOs) were first discovered to influence RNA processing and modulate protein expression over two decades ago; however, progress translating these agents into the clinic has been hampered by inadequate target engagement, insufficient biological activity, and off-target toxic effects. Over the years, novel chemical modifications of ASOs have been employed to address these issues. These modifications, in combination with elucidation of the mechanism

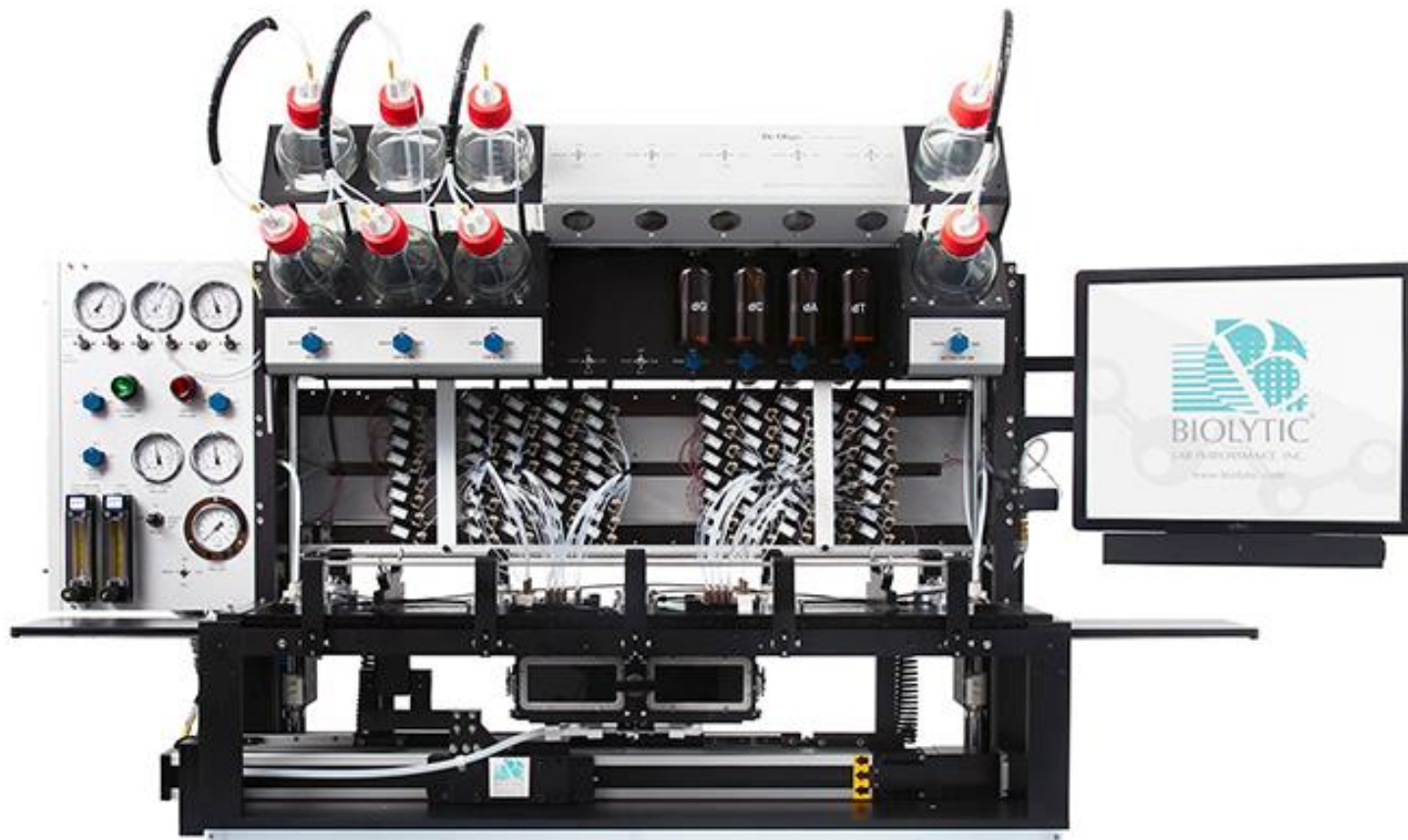
- Abstract
- Key points
- References
- Author information
- Rights and permissions
- About this article



Leonardo Teixeira



# Síntese Aptâmeros / ASO



**CRF SP**  
CONSELHO REGIONAL  
DE FARMÁCIA  
DO ESTADO DE SÃO PAULO

Leonardo Teixeira

Variáveis	Anticorpo Monoclonal	Aptâmero (RNA ou ssDNA)
<b>Tempo de desenvolvimento*</b> (Entrega do 1º lote de produção)	~ 4 – 6 meses	~ 1 semana
<b>Processo de desenvolvimento</b>	Anos	Meses
<b>Tamanho</b>	~ 150 – 170 kDa	~ 7 – 30 kDa
<b>Concentração ideal</b>	Varia amplamente	~ 5 a 10 vezes menor
<b>Estabilidade</b>	Refrigerado Desnatura	Temperatura ambiente;
<b>Disponibilidade a logo prazo</b>	Células congeladas	Síntese química



**CRF SP**  
CONSELHO REGIONAL  
DE FARMÁCIA  
DO ESTADO DE SÃO PAULO

Leonardo Teixeira

# Medicamentos Biológicos x Aptâmeros

ABBVIE

ICF



12 a 15 mil Reais

Leonardo Teixeira

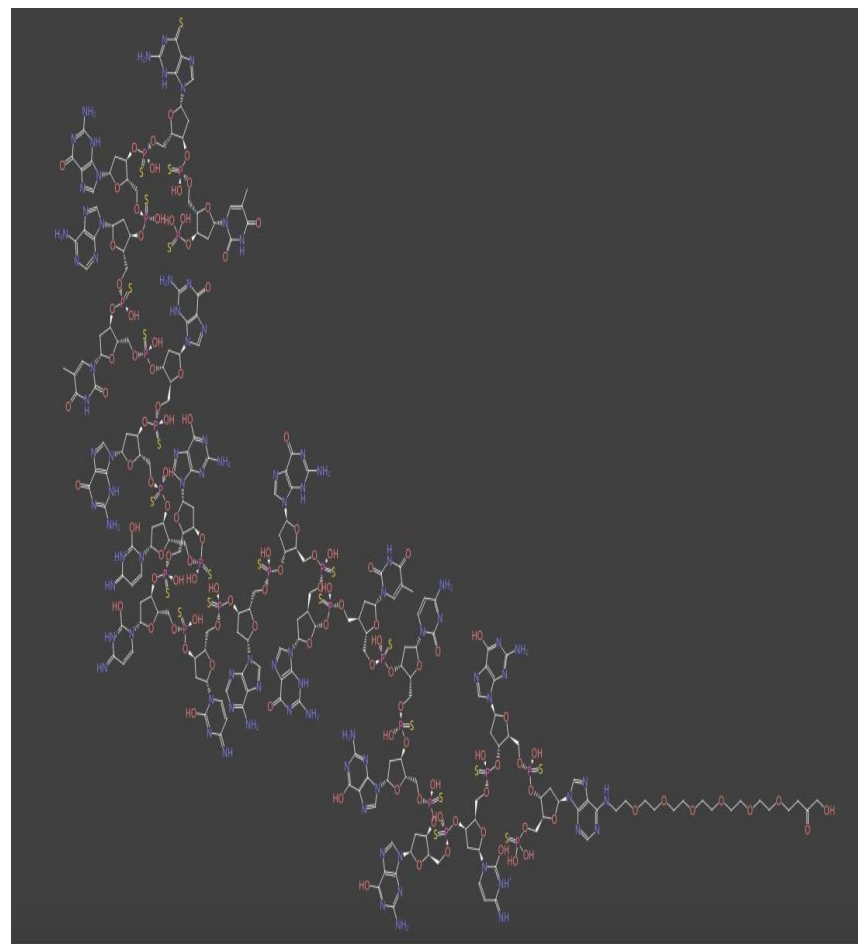


CRF SP  
CONSELHO REGIONAL  
DE FARMÁCIA  
DO ESTADO DE SÃO PAULO

# Viabilidade da Molécula

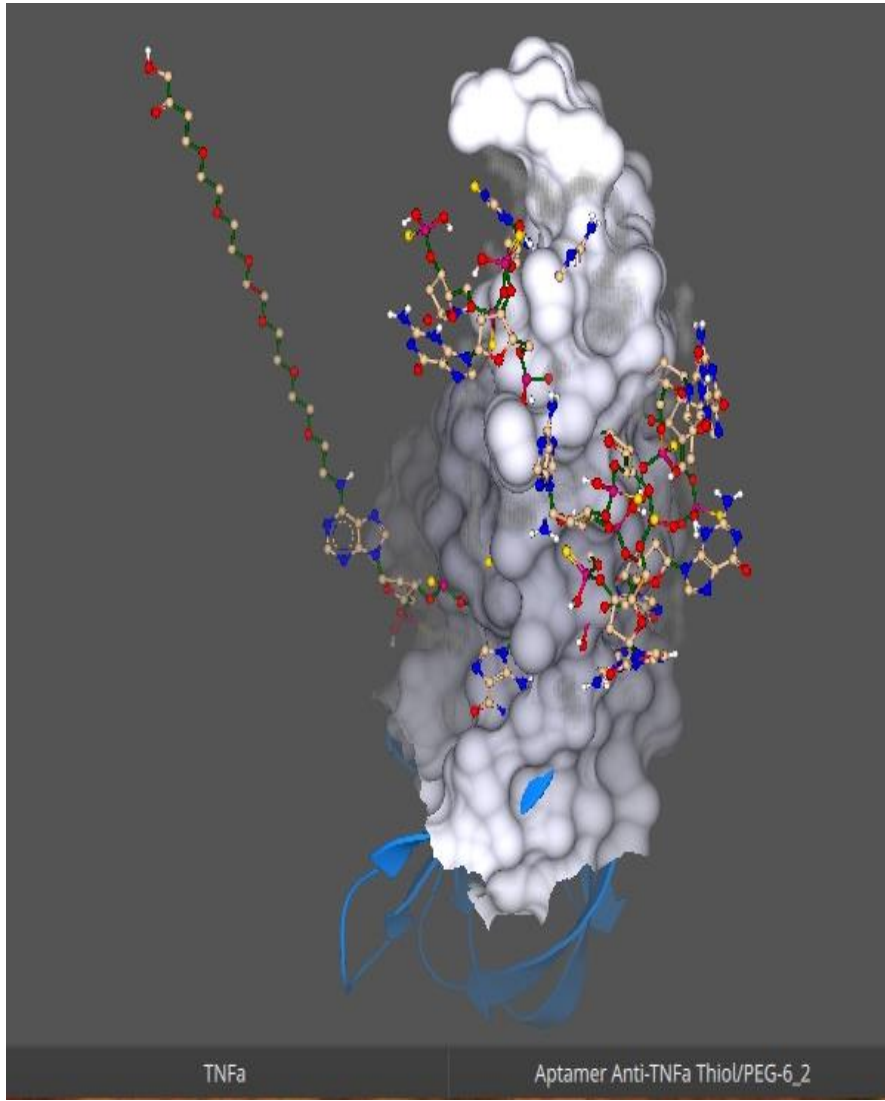
## Estudo de Predição do TNF $\alpha$ e Aptâmero Anti-TNF $\alpha$

Variável	Resultado
Peso Molecular	7425 Da
TPSA	2711.3
2C9 pki	5.616
Afinidade por 2D6	Normal
PBHC	-0.782
Absorção Intestinal	+
Glicoproteína-P Substrato	+
Ligação com Proteínas Plasmáticas (90%)	Baixa
hERG pIC50	2.338
Log D 7.4	17.789
Log P	10.40
Log P (octanol/água)	3.924
Log S (Solubilidade Aquosa)	4.562
Log S (Solubilidade em pH 7.4)	22.885



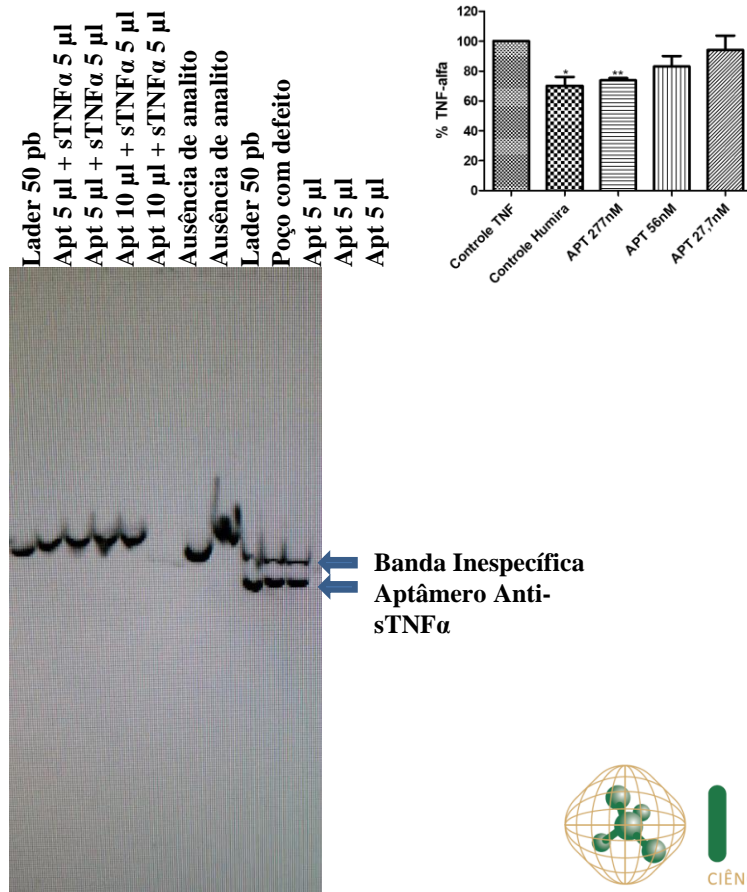


# TNF- $\alpha$ versus ICF Anti TNF- $\alpha$



## Etapa 1: Estudo de complexação por ELISA

- Incubação do Aptâmero (277, 56 e 27,7nM) e do medicamento referência Humira® (20 $\mu$ g/mL) com o padrão de TNF $\alpha$  (250pg/mL) 1 hora e detecção pelo método de ELISA:



# Cada dose do remédio para doença que atrofia bebês custa R\$ 364 mil

Enfermidade rara, a AME só pode ser tratada com um medicamento. Decepcionados, pais lutam por inclusão no SUS

Clarissa Pains

13/11/2017 - 19:25 / Atualizado em 28/03/2018 - 16:04



PHARMA

STAT+

## At \$2.1 million, newly approved Novartis gene therapy will be world's most expensive drug

By ADAM FEUERSTEIN @adamfeuerstein / MAY 24, 2019



CONSELHO REGIONAL DE FARMÁCIA DO ESTADO DE SÃO PAULO

# Distrofia Muscular Espinhal

SMN2 pre-mRNA

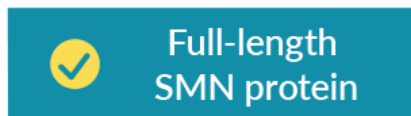


Full-length SMN2 mRNA



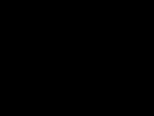
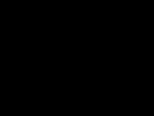
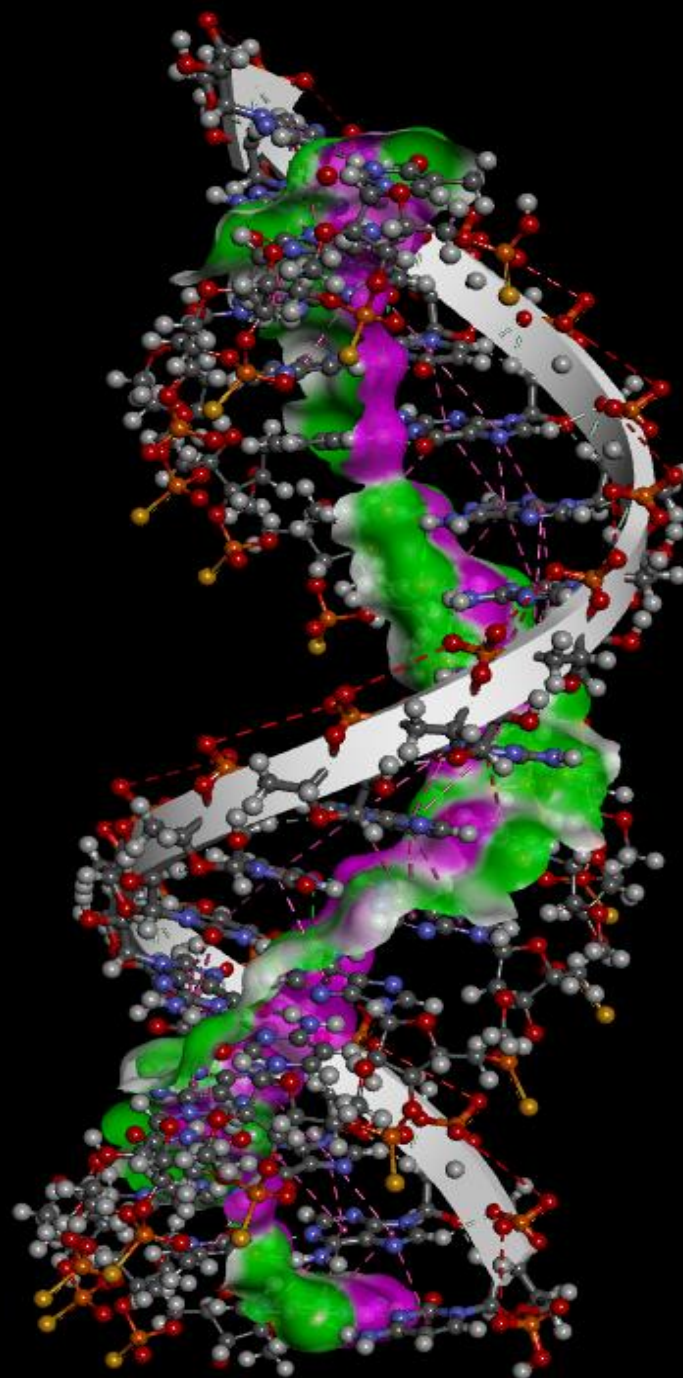
SPLICING

TRANSLATION



CRF SP  
CONSELHO REGIONAL  
DE FARMÁCIA  
DO ESTADO DE SÃO PAULO

Lauro D. Moretto



H-Bonds

Donor



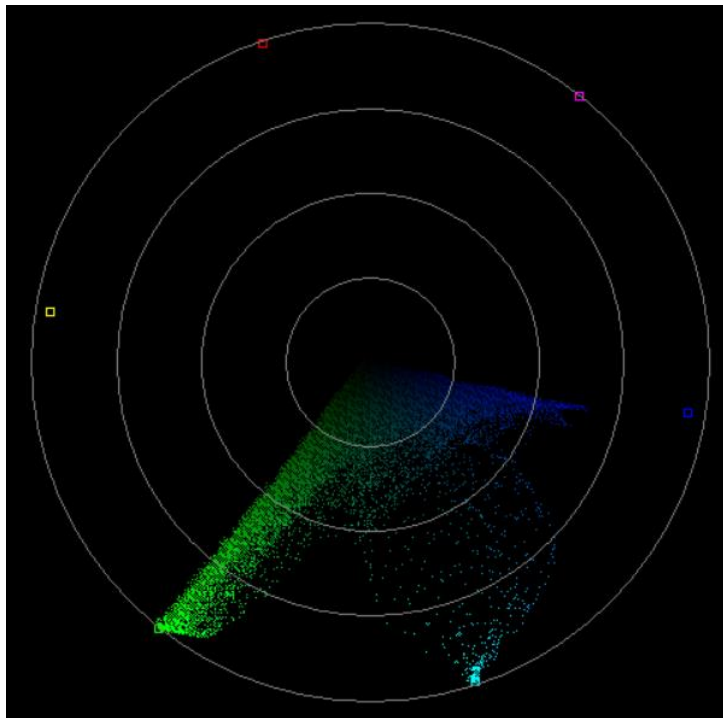
Acceptor



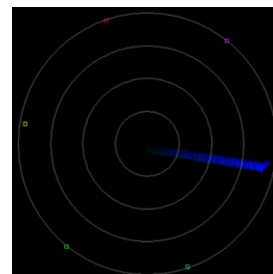
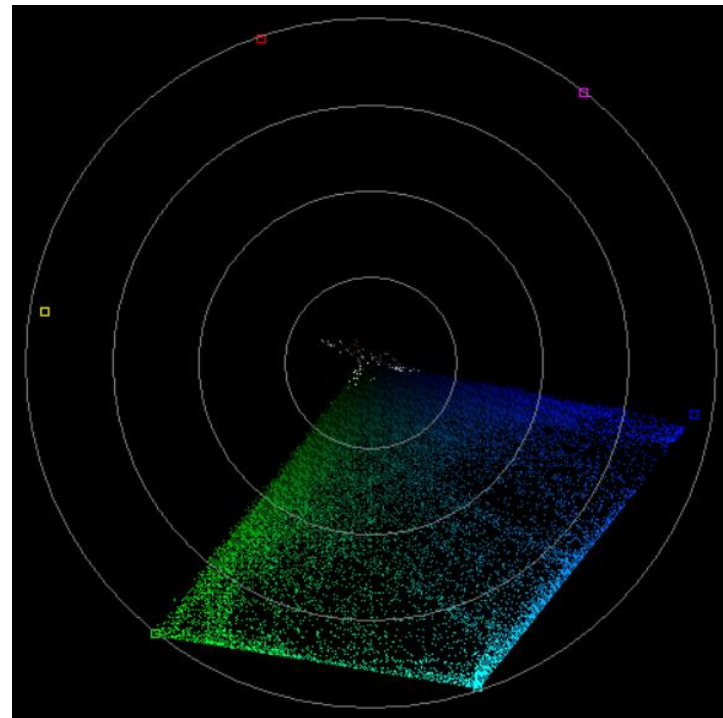
**CRF SP**  
CONSELHO REGIONAL  
DE FARMÁCIA  
DO ESTADO DE SÃO PAULO



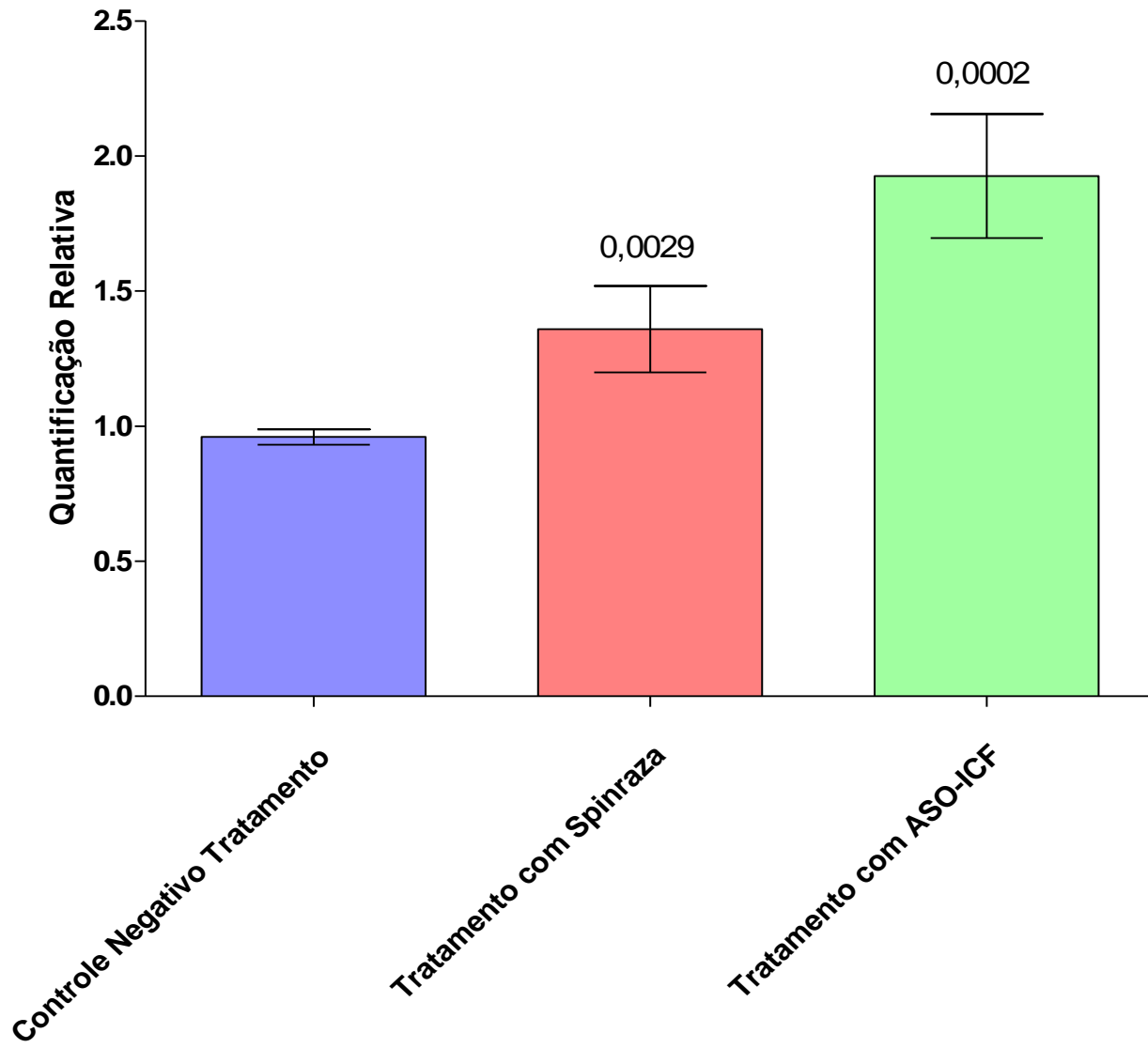
**Spinraza®**



**ASO-ICF**



**Controle Negativo**



**CRF SP**  
CONSELHO REGIONAL  
DE FARMÁCIA  
DO ESTADO DE SÃO PAULO

Leonardo Teixeira



About

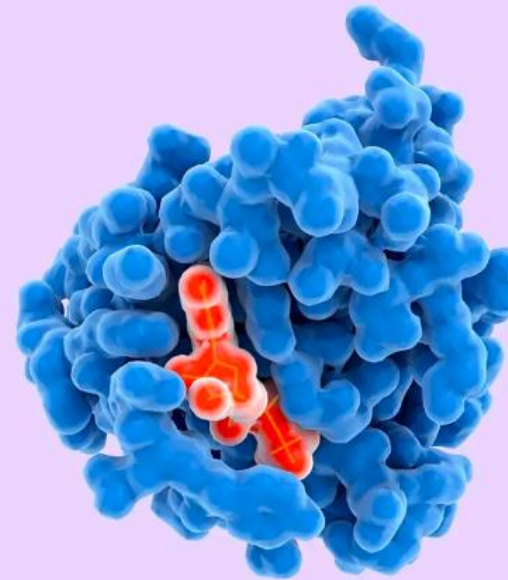
Research

Impact

Blog

Safety & Ethics

Careers



BLOG POST  
RESEARCH

02 DEC 2018

# AlphaFold: Using AI for scientific discovery

SHARE



CRF SP  
CONSELHO REGIONAL  
DE FARMÁCIA  
DO ESTADO DE SÃO PAULO

Leonardo Teixeira

## Múltiplos do byte

v • e

Prefixo binário (IEC)			Prefixo do SI		
Nome	Símbolo	Múltiplo	Nome	Símbolo	Múltiplo
byte	B	$2^0$	byte	B	$10^0$
kibibyte	KiB	$2^{10}$	Kilobyte	kB	$10^3$
mebibyte	MiB	$2^{20}$	megabyte	MB	$10^6$
gibibyte	GiB	$2^{30}$	gigabyte	GB	$10^9$
tebibyte	TiB	$2^{40}$	terabyte	TB	$10^{12}$
pebibyte	PiB	$2^{50}$	petabyte	PB	$10^{15}$
exbibyte	EiB	$2^{60}$	exabyte	EB	$10^{18}$
zebibyte	ZiB	$2^{70}$	<b>zettabyte</b>	ZB	$10^{21}$
yobibyte	YiB	$2^{80}$	yottabyte	YB	$10^{24}$



**CRF SP**  
CONSELHO REGIONAL  
DE FARMÁCIA  
DO ESTADO DE SÃO PAULO

Leonardo Teixeira





**CRF SP**  
CONSELHO REGIONAL  
DE FARMÁCIA  
DO ESTADO DE SÃO PAULO

## XX Congresso Farmacêutico de São Paulo

# III SIMPÓSIO “FRONTEIRAS NAS CIÊNCIAS FARMACÊUTICAS” 10 e 11 de Outubro de 2019

Da bancada ao ZETTABYTE: desenvolvimento de medicamentos orientados por tecnologia e Inteligência Artificial (IA).

Dr. Leonardo Teixeira  
[leonardo.teixeira@icf.com.br](mailto:leonardo.teixeira@icf.com.br)