"Química Medicinal e a inovação farmacêutica: experiência do LASSBio & INCT-INOFAR"

SIMQUIMED

II Simpósio de Química Medicinal da UNESP
São José do Rio Preto - SP / 08 a 12 de agosto de 2016

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Professor Titular -UFRJ

Laboratório de Avaliação e Síntese de Substâncias Bioativas

http://www.lassbio.icb.ufrj.br/

INCT inofar — Instituto Nacional de Ciência e Tecnologia de Fármacos e Medicamentos — www.inct-inofar.ccs.ufrj.br

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Química Medicinal

Índice

- Definição & *berço* da Química Medicinal;
- A inovação tecnológica & farmacêutica;
- O processo de *drug discovery* e a interdisciplinaridade*;*
- Os fármacos e o prêmio Nobel;
- Exemplos de importantes inovações farmacêuticas:

  AAS, penicilina, atorvastatina & imatinibe;
- Os fármacos do século 21;
- Exemplo "*de casa*" LASSBio/ICB-UFRJ & INCT-INOFAR:

  LASSBio-1819;
- Considerações finais.

LASSBio
Laboratório de Avaliação e Síntese de Substâncias Bioativas

inct
institutos nacionais de ciência e tecnologia
inofar

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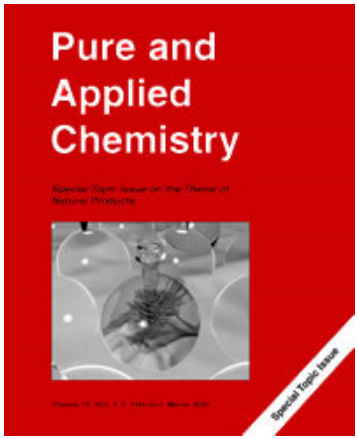
IUPAC - **Subcommittee Medicinal Chemistry & Drug Development**

Definição: Química Medicinal é a



disciplina que estuda os aspectos relacionados à *descoberta* ou *invenção* dos fármacos, os aspectos moleculares envolvidos em seu mecanismo de ação e aqueles que governam a *absorção*, *distribuição*, *metabolismo*, *eliminação* *toxicidade* (ADMET), incluindo a compreensão da relação entre a estrutura química e a atividade terapêutica (REA ou SAR).

Química Medicinal

Pure & Appl. Chem., Vol. 70, No. 5, pp. 1129–1143, 1998.
Printed in Great Britain.

Eur. J. Med. Chem., *31*, 747 (1996)

O *berço* da Química Medicinal

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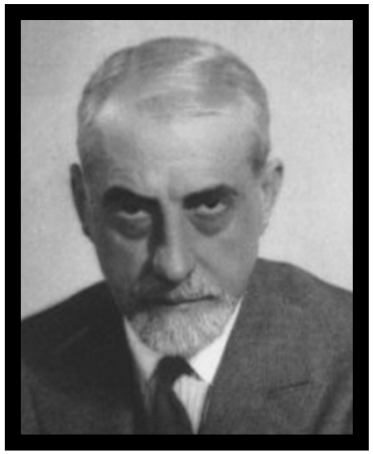
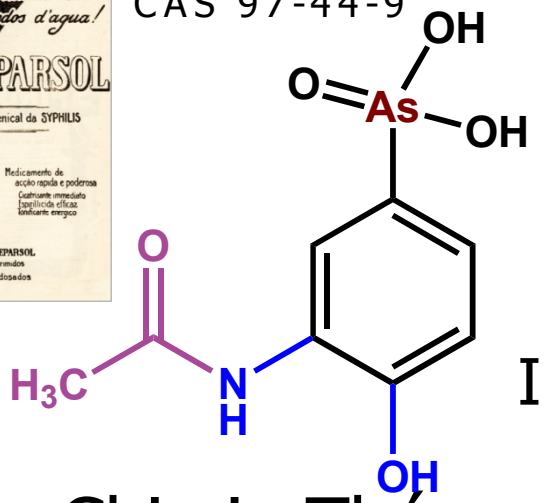


Ernest Fourneau
1872-1949

Stovarsol

CAS 97-44-9

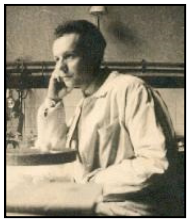


Institut Pasteur (1887)

1911- Laboratoire de Chimie Thérapeutique

Diretor: Emile Roux

1911-1944 – Jacques Tréfouël (1897-1977)
Théreze Tréfouël (1892-1978)
Germaine Benoit (1901-1983)
Federico Nitti (1903-1947)



Daniel Bovet
1907-1992 *

*Farmacêutico suiço
Doutor *h.c.* UFRJ

Prêmio Nobel de Fisiologia/Medicina 1957

Sulfonamidas, anti-histamínicos.

Curare: SAR

J-P Fourneau, « Ernest Fourneau foundateur de la Chimie Pharmaceutique française », *Revue de l´Histoire de la Pharmacie*, t.XXXIV, nº 275, 335-355

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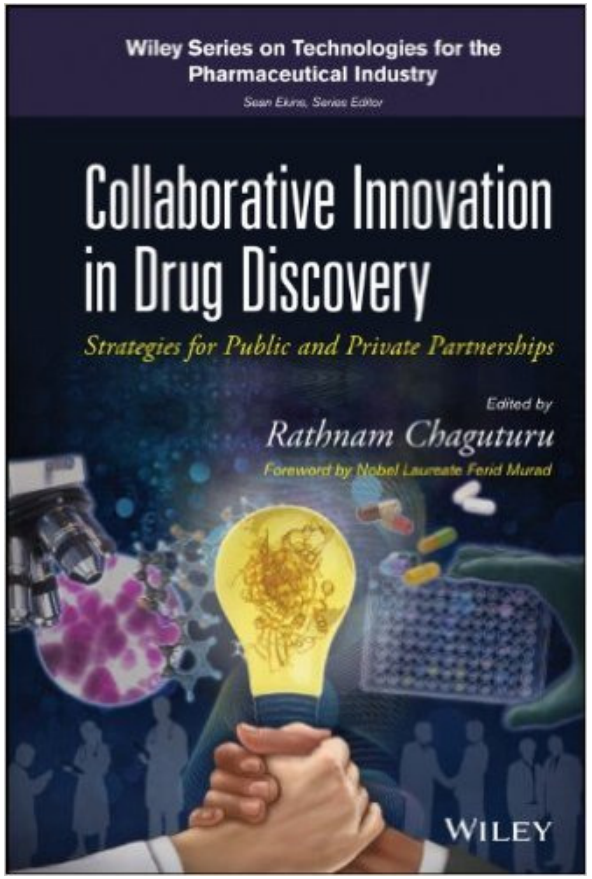
A inovação tecnológica



é o processo *mais* dinâmico da atividade industrial. Este dinamismo é acentuado na inovação farmacêutica que, mais do que qualquer outra, depende da efetiva interação entre

Ciência & Tecnologia.

CEO of iDDPartners, US

XXII Escola de Verão em Química Farmacêutica Medicinal
(LASSBio/ICB-UFRJ, 2016)

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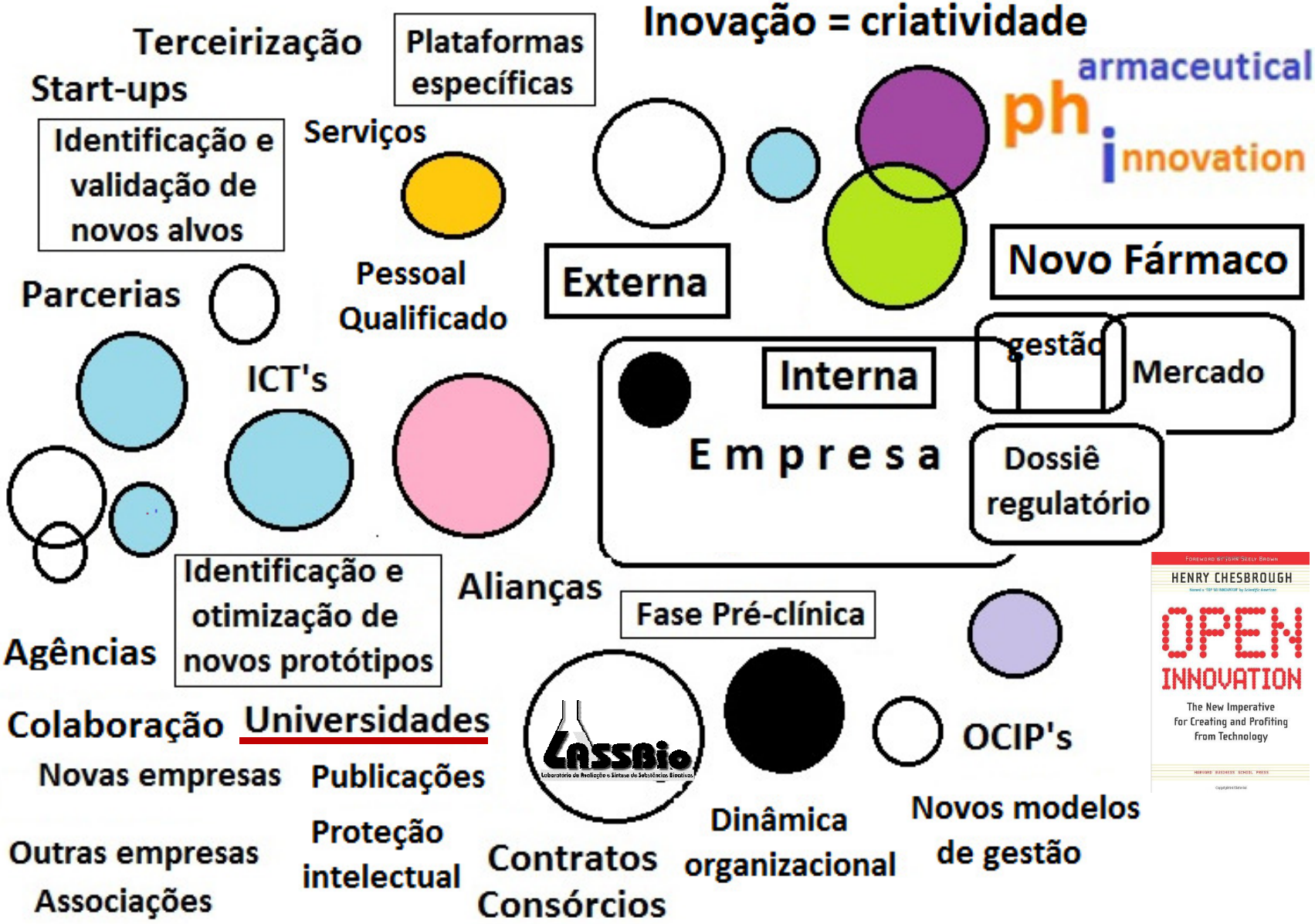
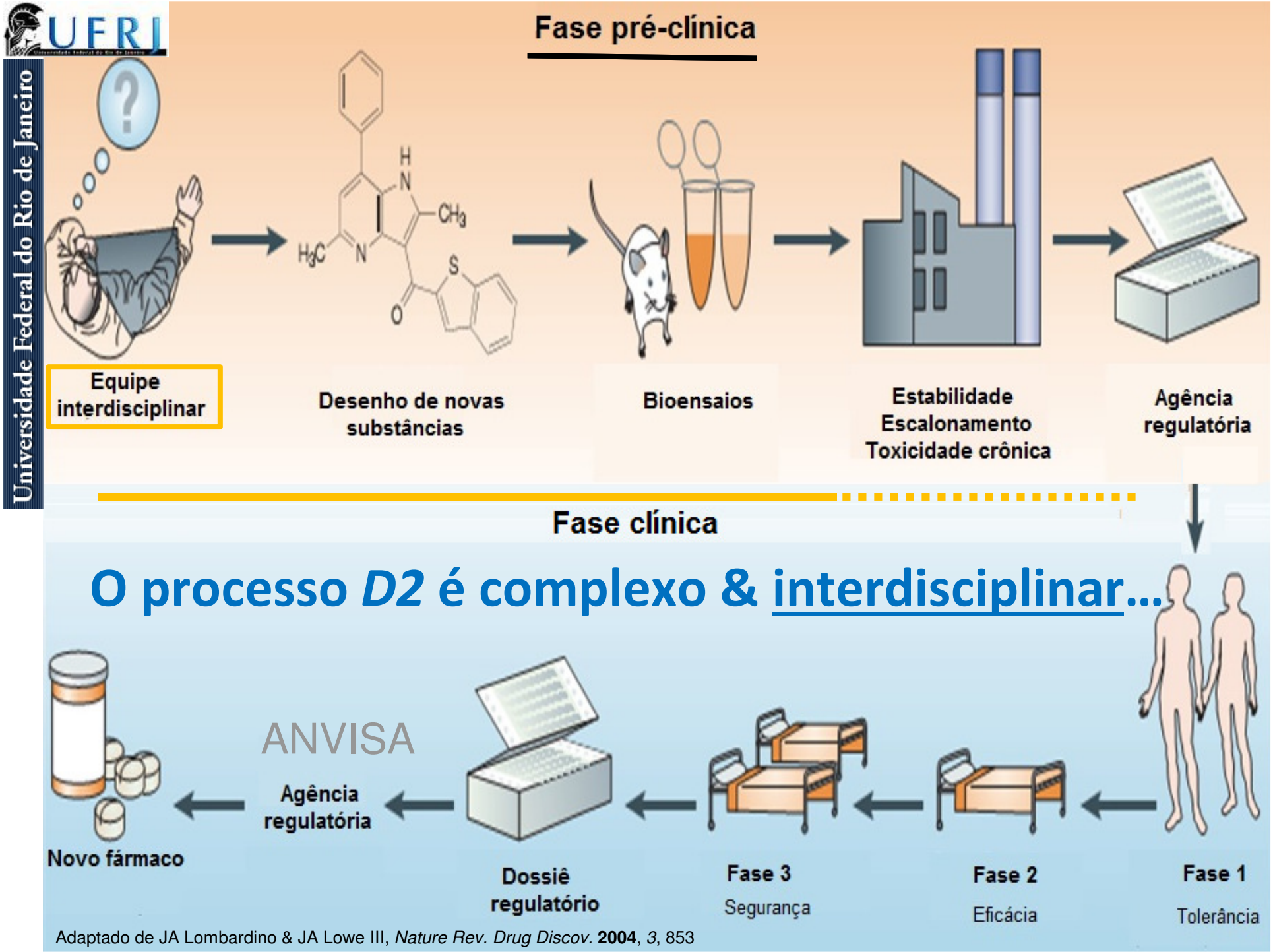
Impact Innovation Initiative
Ideas Inspiration

A inovação não espera...

A *gestão da inovação na indústria farmacêutica atual*





Adaptado de JA Lombardino & JA Lowe III, *Nature Rev. Drug Discov.* **2004**, *3*, 853

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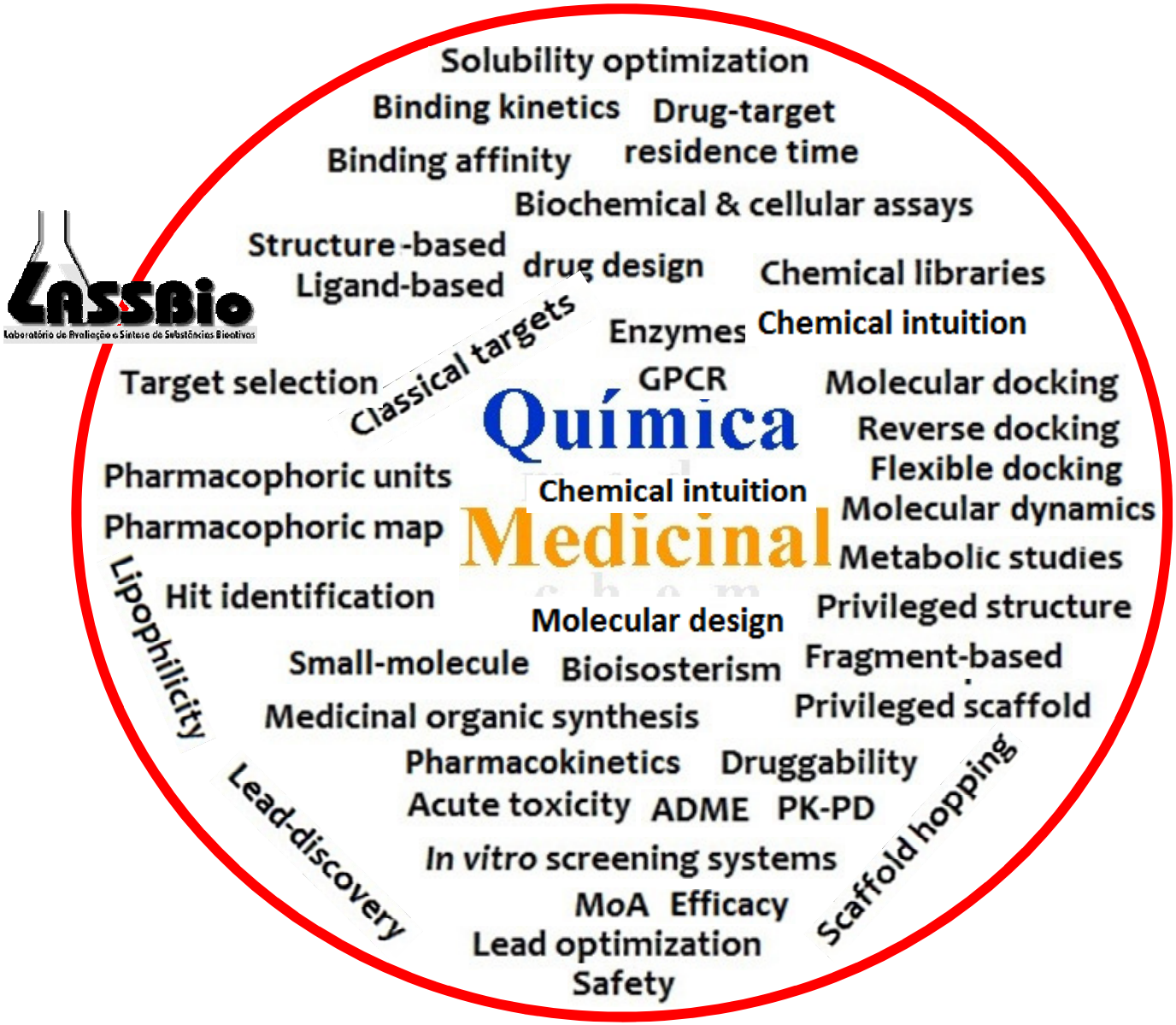
O processo de *drug discovery*



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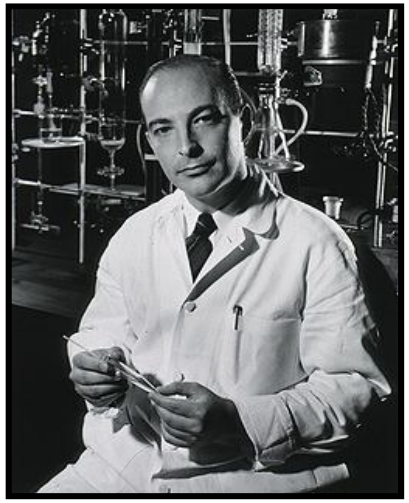
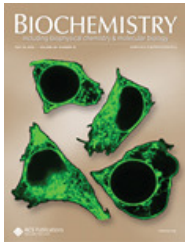
Prêmio Nobel, 1959



Arthur Kornberg (41)
1918-2007



1987

The Two Cultures: Chemistry and Biology[1]

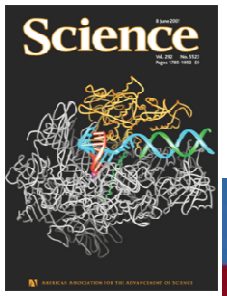
Arthur Kornberg

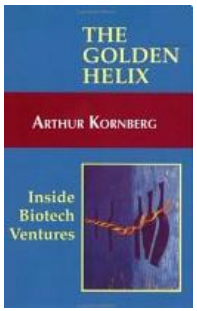
Department of Biochemistry, Stanford University, Stanford, California 94305

Received July 14, 1987

"Much of life can be understood in rational terms if expressed in the language of chemistry... the historical roots of chemistry and biology are intertwined in many places…

Pharmaceutical chemistry ***was until recently the bastion of organic chemistry… in the search for alternative or superior drugs for the treatment of various diseases..."***





Interdisciplinaridade

Tetrahedron **1987,** *26,* 6888-6891

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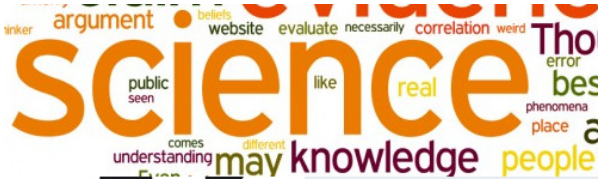

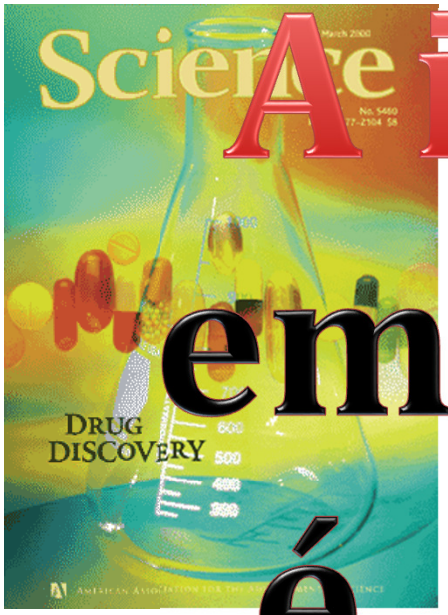

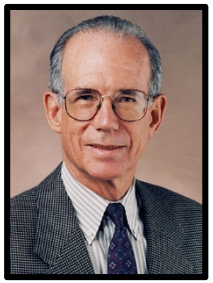

A inovação em fármacos é baseada em Ciência!

OnLine

- *Science* **2004**, *303*, 1713

(Donald Kennedy)

- *Science* **2000**, *287*, 1951

(Julia Uppenbrink, J. Mervis)

- *Science* **2005**, *309*, 728

(Jeffrey Mervis)

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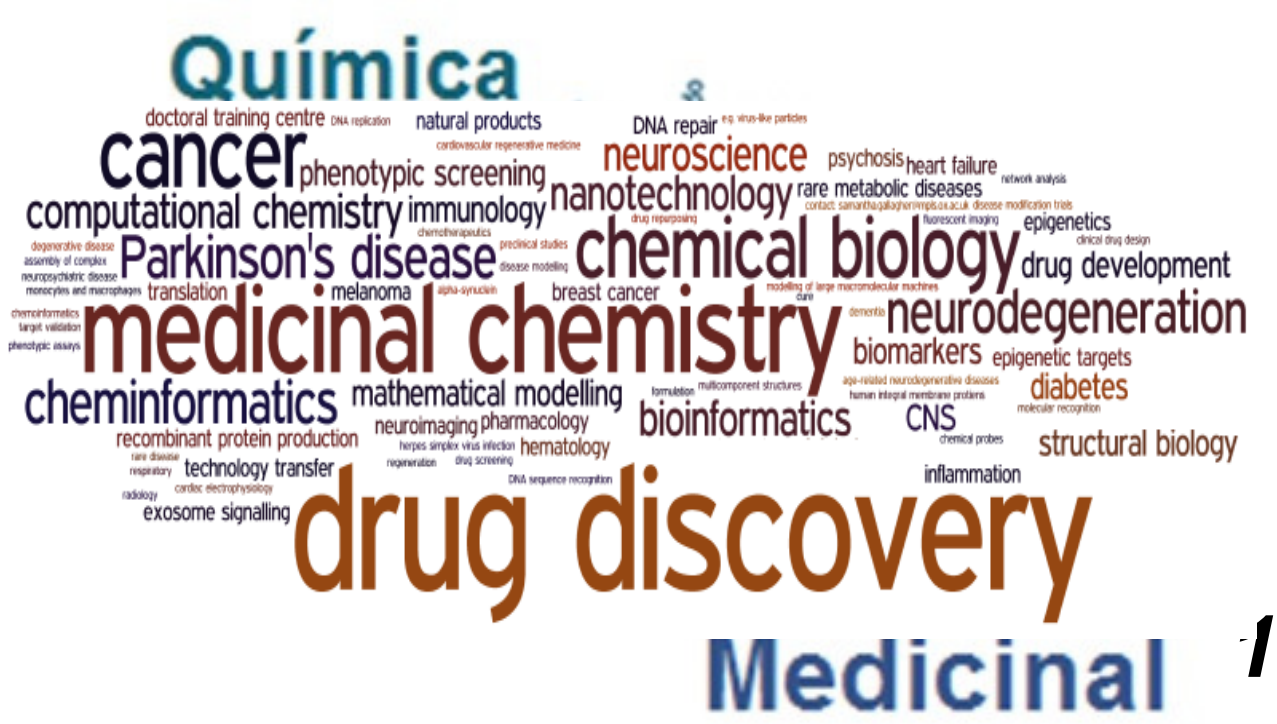
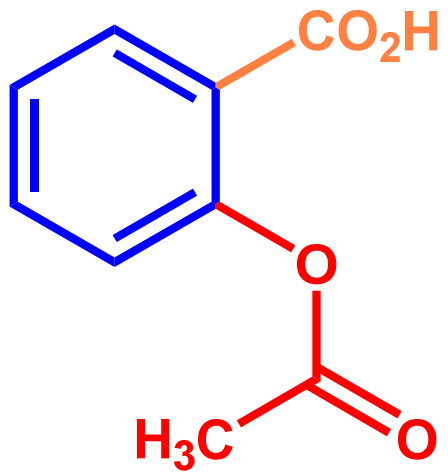




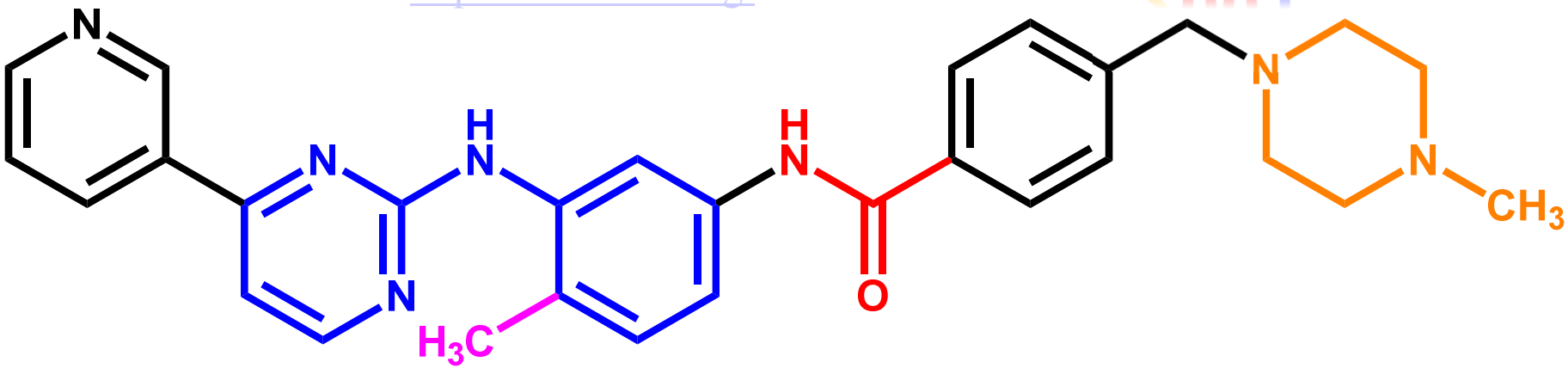
1889

112y

2001

CAS contém 116 milhões de substâncias químicas

https://www.cas.org/



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1901

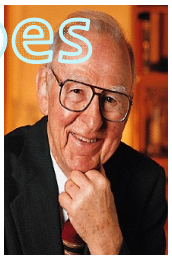
210 pesquisadores ganharam o Prêmio Nobel de Medicina de 1901 a 2015

171 pesquisadores ganharam o Prêmio Nobel de Química de 1901 a 2015

Alexander Fleming
Robert J. Lefkowitz

Emil Fischer
Sune K Bergström
George Hitchings
Ernest B Chain
Edwin G Krebs
Howard W. Florey

John R Vane



Dorothy C Hodgkin
Robert Robinson

Arieh Warshel
Brian K Kobilka
Gerhard Domagk

Martin Karplus
Gertrude B Elion
James W Black
Bengt I Samuelsson
Edmond H Fischer
Michael Levitt

2015

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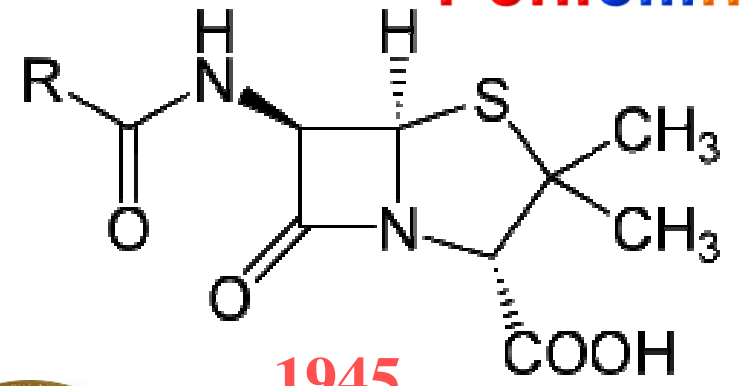
Os fármacos e o Nobel !

Penicilina



1945

Sune K. Bergström

(1916-2004)

John R. Vane

(1927-2004)

Howard W. Florey

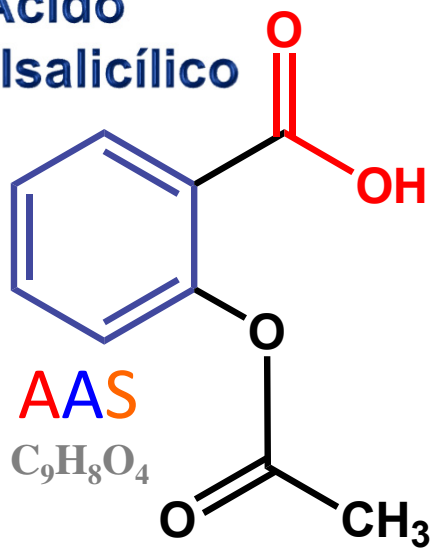
1898-1968

E. Boris Chain

1906-1979

1982

Ácido acetilsalicílico



AAS

$C_9H_8O_4$

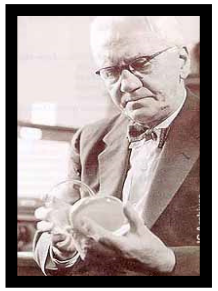
Bengt I. Samuelsson

(1934-)

1964

Dorothy C. Hodgkin

1910-1994



Alexander Fleming

1881-1955

Uma inovação bilionária: *as estatinas*

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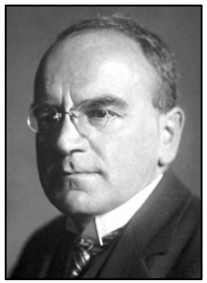
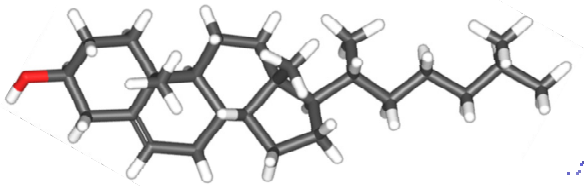


Heinrich Wieland
1877-1957

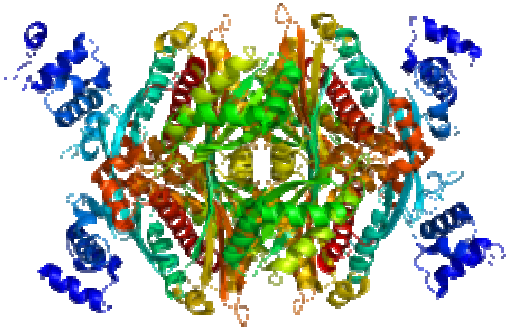
1927

Adolf Windaus
1876-1959

1928



colesterol

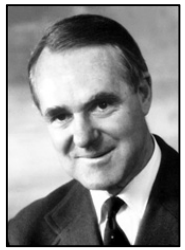


HMGCoAR

1964

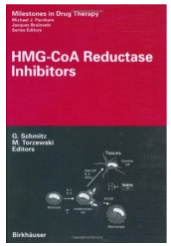
Konrad Bloch
1912-2000

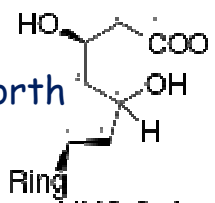
Feodor Lynen
1911-1979



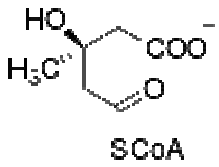
John Cornforth

1975

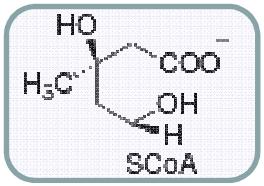




HMG CoA
Reductase inhibitor



HMG CoA



Mevaldyl CoA transition state intermediate

1985

LDL

Joseph L Goldstein

Michael S Brown

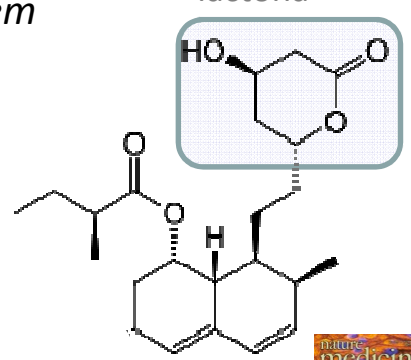
University of Texas, Dallas

Akira Endo

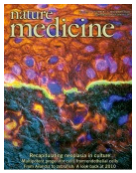
Albert Lasker Award
for Clinical
Medical Research, 2008*

A.Endo, *J Med Chem*
1985, *28*, 1

lactona



mevilonina



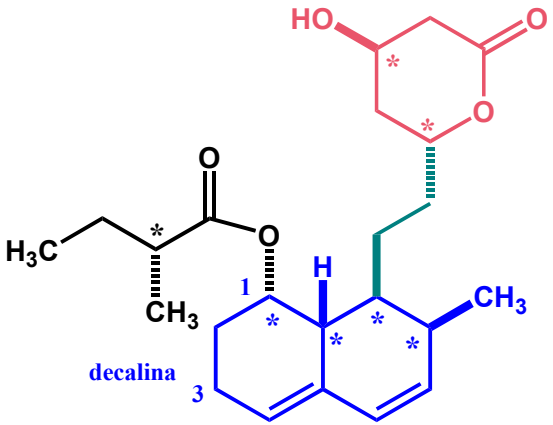
* A Endo, A gift from nature: the birth of the statins, *Nature Medicine* **2008**, *14*, 1050

A descoberta das estatinas

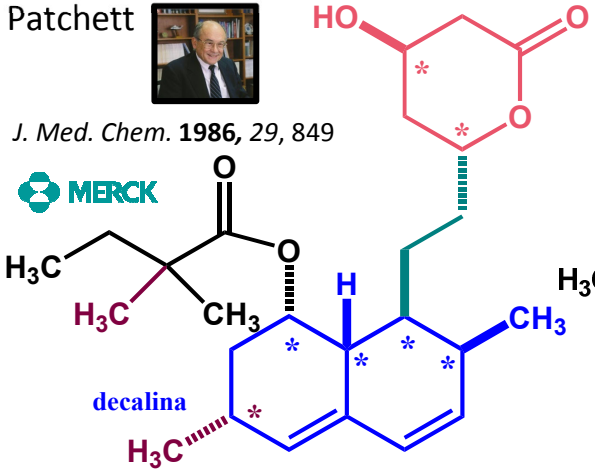
Universidade Federal do Rio de Janeiro

1976 -Arthur A. Patchett

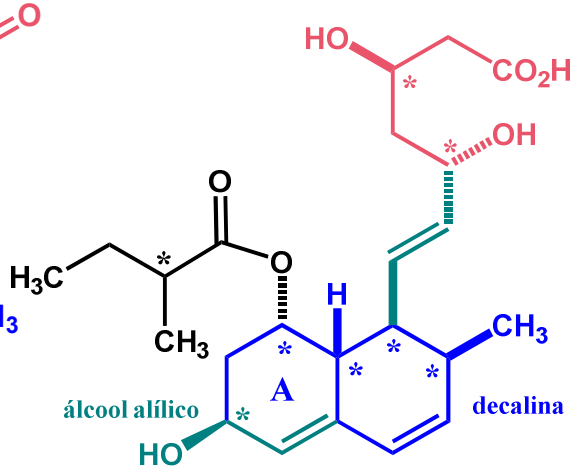
J. Med. Chem. **1986,** *29*, 849



compactina
1976

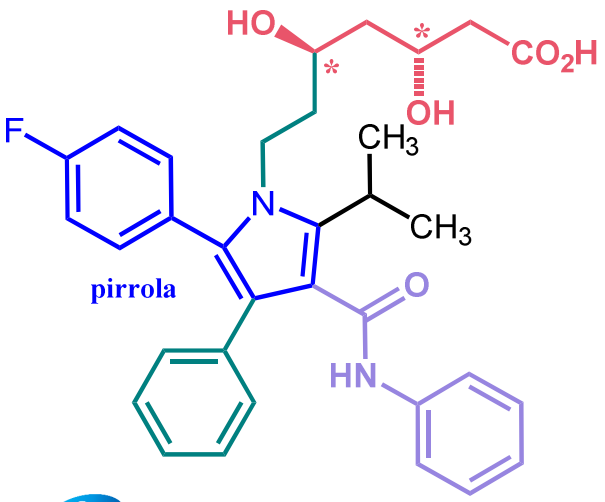


simvastatina
1986



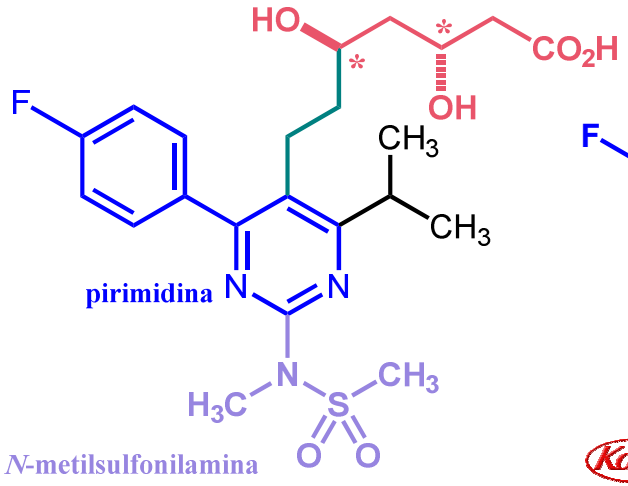
Daiichi-Sankyo

pravastatina
1988



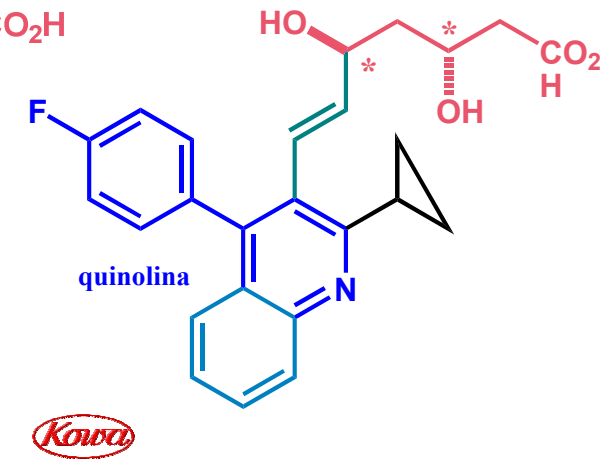
Pfizer

atorvastatina
1991



AstraZeneca

rosuvastatina
2004



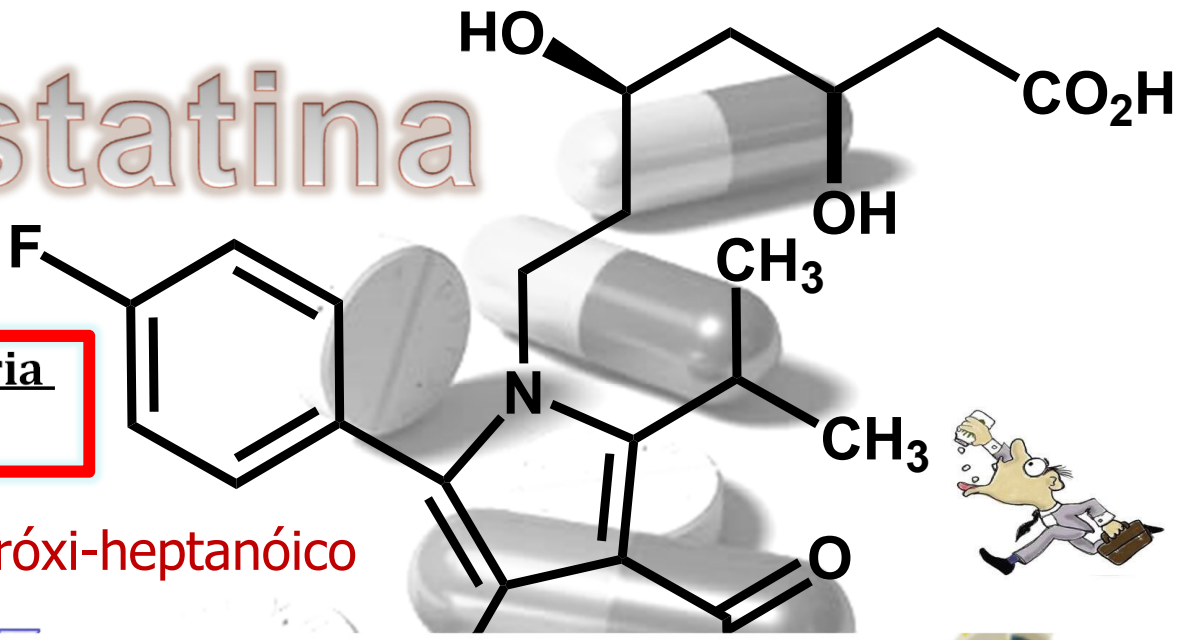
Kowa

pitavastatina
2009

"...In 2009, statins were used to treat *ca.* 30 milllion people."

PS Anderson, Reflexions on medicinal chemistry at Merck, West Point, *Annu Rept Med Chem* **2012**, *47*, 3

Atorvastatina



Maior *bestseller* da história dos fármacos

ácido (*N*-pirrol)-3,5-di-hidróxi-heptanóico

1991 ■

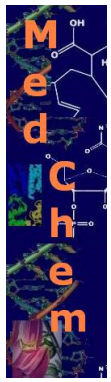
Qu

Me

Warn

Park I

■



Bruce D. Roth

2013 SCI Perkin Me

B. D. Roth, *Progr. Med.*

B. D. Roth, et al., *J. Med*

Organic & Biomolecular Chemistry

PAPER

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Cite this: *Org. Biomol. Chem.*, 2016, **14**, 2291

Received 12th December 2015,
Accepted 29th December 2015

DOI: 10.1039/c5ob02546j

www.rsc.org/obc

The total synthesis of calcium atorvastatin†

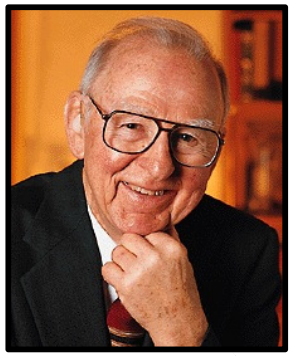
Luiz C. Dias,*[a] Adriano S. Vieira[a] and Eliezer J. Barreiro[b]

A practical and convergent asymmetric route to calcium atorvastatin (**1**) is reported. The synthesis of calcium atorvastatin (**1**) was performed using the remote 1,5-*anti* asymmetric induction in the boron-mediated aldol reaction of β-alkoxy methylketone (**4**) with pyrrolic aldehyde (**3**) as a key step. Calcium atorvastatin was obtained from aldehyde (**3**) after 6 steps, with a 41% overall yield.

Total de Vendas = *ca.* US$ 150 bilhões (1991-2011)

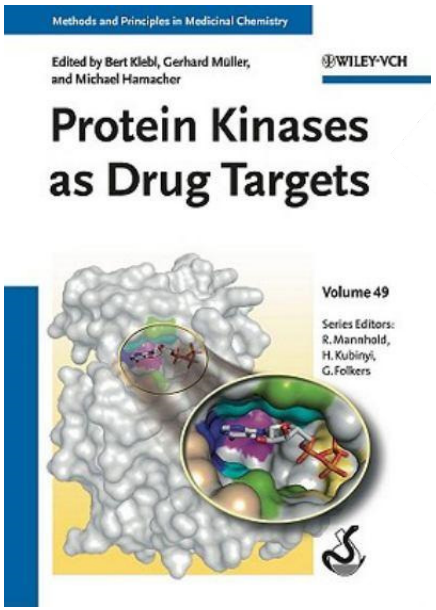
Tinibes: inibidores de TK's

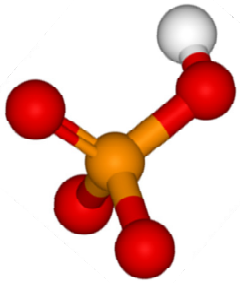
Edwin G Krebs
(1918 –2009)



1992

Edmond H Fischer
(1920)





kinoma

K Nawaz, RM Webster, The non-small-cell lung cancer drug market *Nature Rev. Drug Discov.* **2016**, *15*, 229; S. Aggarwal, Targeted cancer therapies, *Nature Rev. Drug Discov.* **2010**, *9*, 427; P. Cohen, Timeline: Protein kinases — the major drug targets of the twenty-first century? *Nature Rev. Drug Discov.* **2002**, *1*, 309.

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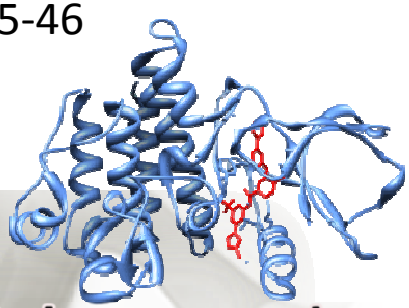
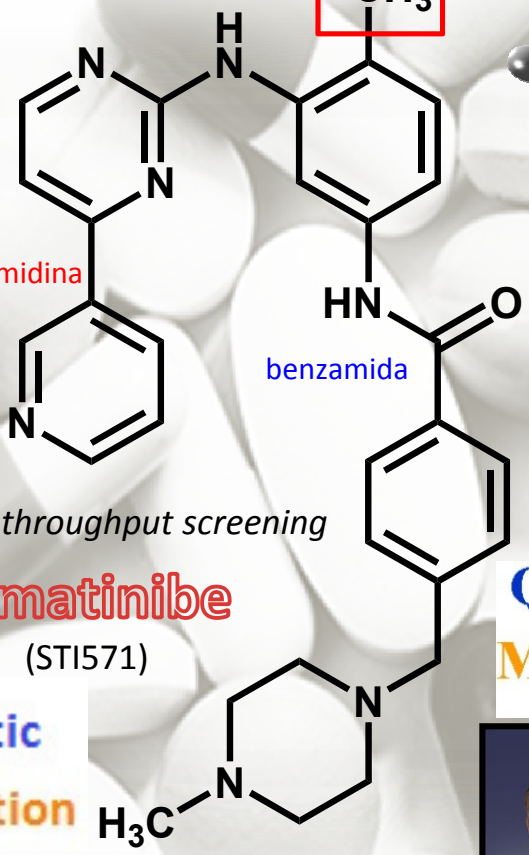
EJ Barreiro et al., *Chem. Rev.* **2011**, *111*, 5215-46

Novo padrão molecular

Estrutura cristalina da Abl cinase

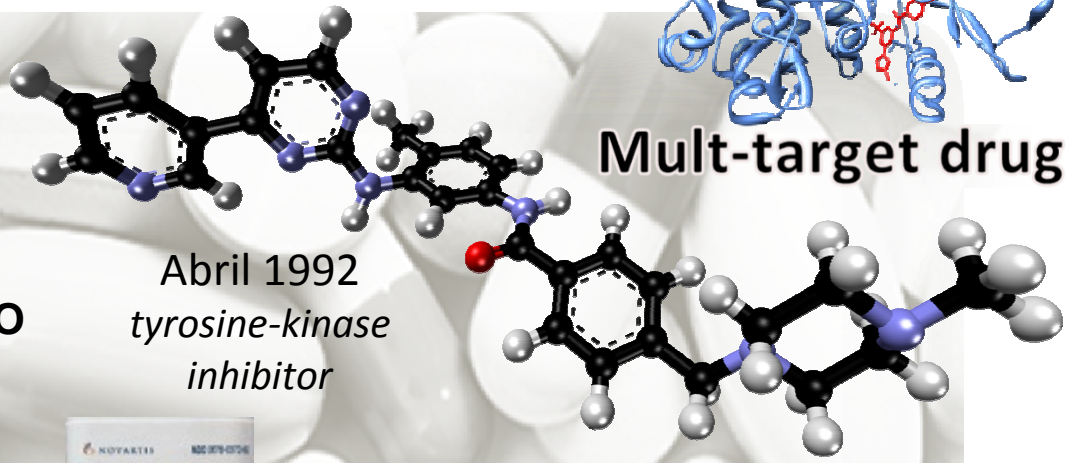


2001



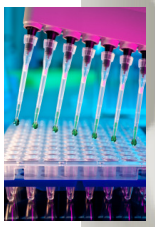
2-fenilaminopirimidina

benzamida



Mult-target drug

Abril 1992
tyrosine-kinase inhibitor



High throughput screening

imatinibe

(STI571)

Química Medicinal

1988 – Nicholas Lydon, Brian J. Druker & Charles L Sawyers &
1995 - Compound STI571 ++
2001 – Imatinib (Gleevec^{R}, Novartis)[link]

WW: US$ *ca.* 5.1 bi (2014)

therapeutic innovation

Leucêmia mieloide crônica (CML)

Ciba-Geigy
NOVARTIS

Nicholas B. Lydon
Blueprint Medicines Inc*

blueprint MEDICINES

OREGON HEALTH & SCIENCE UNIVERSITY

Brian J. Druker*
Blueprint Medicines Inc

HHMI HOWARD HUGHES MEDICAL INSTITUTE

Charles L. Sawyers**
Blueprint Medicines Inc

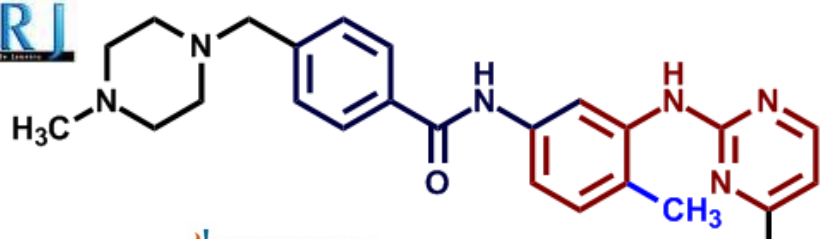
& 2009 - Lasker Foundation Clinical Award (*J. Clin. Invest*. **2009**, *119*, 2863)

* B. J. Druker has been awarded with the 2012 Japan Prize in Healthcare and Medical Technology;

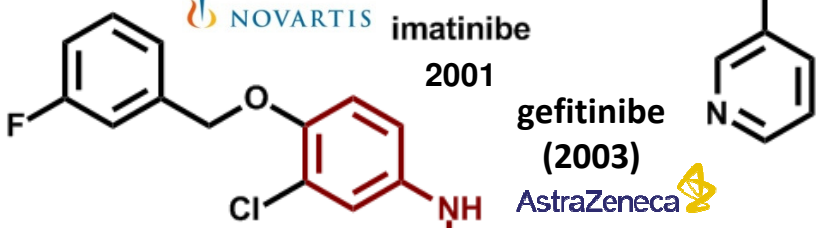
** C. L. Sawyers was named in 2011, Thomson Reuters Citation Laureate in Medicine;

Tinibes*

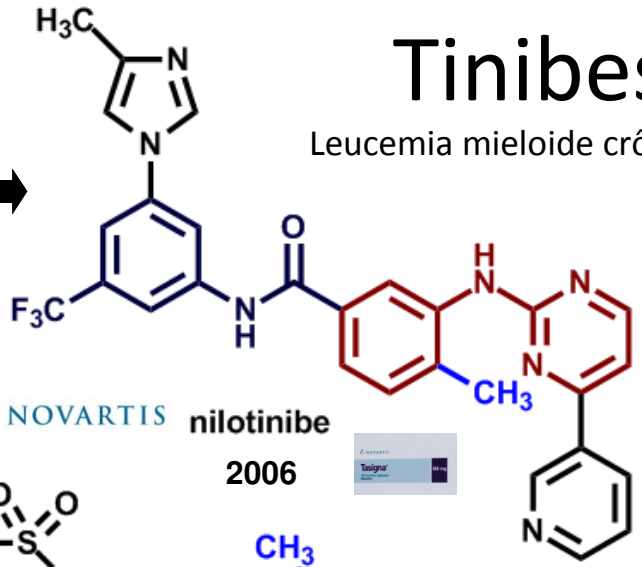
Leucemia mieloide crônica (CML)



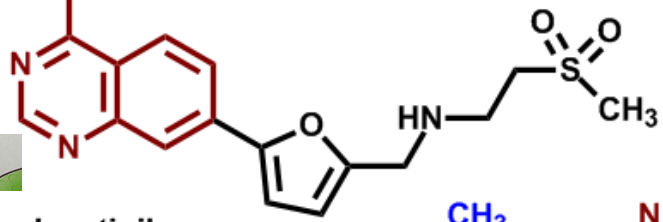
NOVARTIS imatinibe 2001



gefitinibe (2003) AstraZeneca



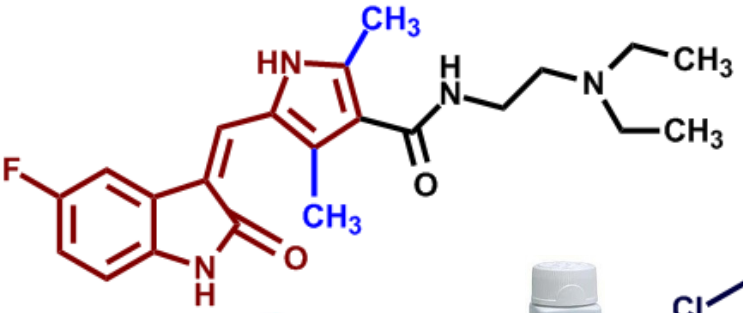
NOVARTIS nilotinibe 2006



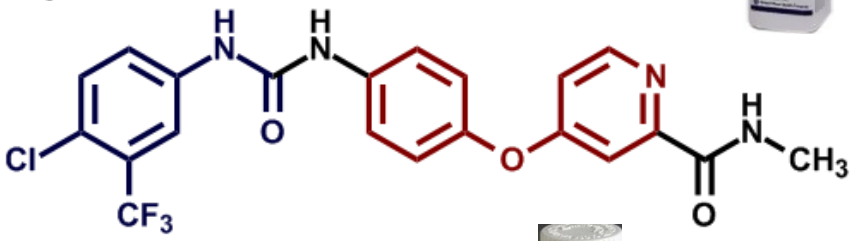
therapeutic innovation

gsk lapatinibe 2007

dasatinibe 2007



Pfizer sunitinibe 2006



Bayer sorafenibe 2007

12/2012- ponatinibe (Iclusig^{R}) CML
03/2015- pacritinibe JAK
08/2015- regorafenibe (Stivarga^{R}) coloretal
02/2016 – imatinibe genérico (US2/pill)

• Mercado mundial em 2014: US$ 20,2 bi*

* C. W. Lindsley, *ACS Med. Chem. Lett.* **2014**, *5*, 1066

Recente Inovação em Fármacos

- 1998 – Pharmasset Inc., New Jersey, EUA

PHARMASSET

medicinal chemistry

Professor Raymond F. Schinazi
& Professor Dennis C. Liotta

School of Medicine

Department of Chemistry

Pharmasset Co.

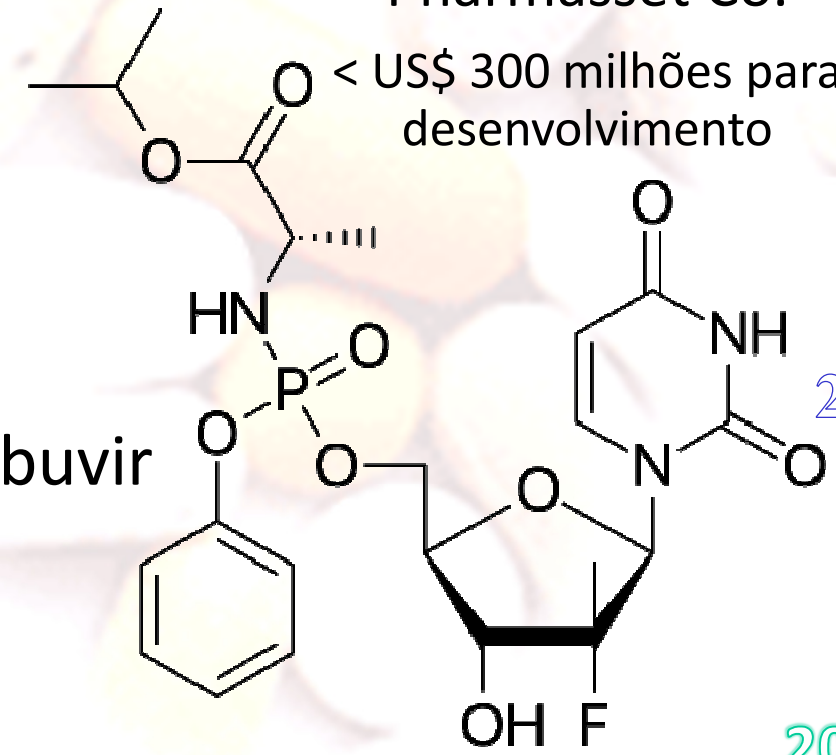
< US$ 300 milhões para desenvolvimento

GILEAD

Gilead Sciences

Fundada em 1987, Foster City, Califórnia, EUA

Compra a Pharmasset Co. em novembro de 2011 por US$ **11,2 bilhões**



Sofosbuvir

2013

ANVISA: 30 de mar de 2015

2013-5 BLOCKBUSTER DRUG

US$ 20,7 billion

Universidade Federal do Rio de Janeiro

Recente Inovação em Fármacos, contribuição da academia

TOP 10 PRODUCTS

DRUG NAME	TYPE	MARKETER	INDICATION	ESTIMATED 2015 SALE ($ BILLIONS)	% CHANGE FROM 2014
Humira	Antibody	AbbVie, Eisai	Inflammation	14.2	13
Ledipasvir/sofosbuvir	Small molecule	Gilead Sciences	Hepatitis C	13.9	554
Enbrel	Protein	Amgen, Pfizer, Takeda	Inflammation	8.7	-2
Remicade	Antibody	Janssen, Merck & Co.	Inflammation	8.3	-10
Rituxan	Antibody	Roche	Cancer	7.0	3
Lantus	Peptide	Sanofi	Diabetes	6.9	2
Avastin	Antibody	Roche, Chugai	Cancer	6.6	4
Herceptin	Antibody	Roche	Cancer	6.5	5
Sitagliptin	Small molecule	Merck & Co.	Diabetes	6.2	3
fluticasone/salmeterol	Small molecule	GlaxoSmithKline	Asthma	5.7	-11

NOTE: Foreign currencies converted at current exchange rates.

SOURCES: Company data, stock analysts, and C&EN estimates

C&EN 2015, Dec 07, 14

O mercado farmacêutico mundial em 2015: US$ 921 bi

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Química Medicinal

LASSBio

Laboratório de Avaliação e Síntese de Substâncias Bioativas

Cidade Universitária, ilha do Fundão,
Rio de Janeiro, RJ

Criado em 19/04/1994 Laboratório de Avaliação e Síntese de Substâncias Bioativas

ICB 50 anos INSTITUTO DE CIÊNCIAS BIOMÉDICAS UFRJ

Bioensaios

Bioensaios

A quimioteca com 2012 moléculas bioativas.

INCT inofar

Rev. Virtual Quim. 2013, 5, 266.

Molecular Modelagem

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FÁRMACOS DO SÉCULO 21

Novo paradigma do século 21

"Multi-target paradigm for
innovative ligand identification"

Universidade Federal do Rio de Janeiro

Química
med
Medicina
chem

Fármacos simples, não curam doenças complexas!

LASSBio
Laboratório de Avaliação e Síntese de Substâncias Bioativas

Doenças multifatoriais

O desenho racional de fármacos *multi-alvos* depende da capacidade de se combinarem fragmentos moleculares farmacofóricos, capazes de assegurarem o reconhecimento molecular pelos receptores envolvidos.

M L Bolognesi, A Cavalli, **Multitarg□t Drug Discov□ry** and Polypharmacology, *ChemMedChem* **2016**, *11*, 1190; A Anighoro et al., **Polypharmacology:** challenges and opportunities in drug dsicovery, *J. Med. Chem*. **2014**, *57,* 7874; JL Medina-Franco et al. Shifting from the single to the **multitarg□t paradigm** in drug discovery, *Drug Discov. Today* **2013**, *18,* 495; C Hiller, J Kühhorn, P Gmeiner, Class A G-Protein-Coupled Receptor (GPCR) Dimers and Bivalent Ligands, *J. Med. Chem.* **2013**, *56*, 6542; G Phillips, M Salmon, **Bifunctional compounds** for the treatment of COPD, *Annu. Rev. Med. Chem*. **2012**, *47*, 209; JR Morphy, CJ Harris, Eds., Designing multi-target drugs, RSC Publishing, 2012; E J Barreiro, C A M Fraga, **N□w insights for multifactorial dis□as□s th□rapy**…, *Curr Drug Therapy* **2008***, 3,* 1; K Strebhardt, A Ullrich, Paul Ehrlich's magic bullet concept: 100 years of progress. *Nat Rev Cancer* **2008**, *8*, 473.

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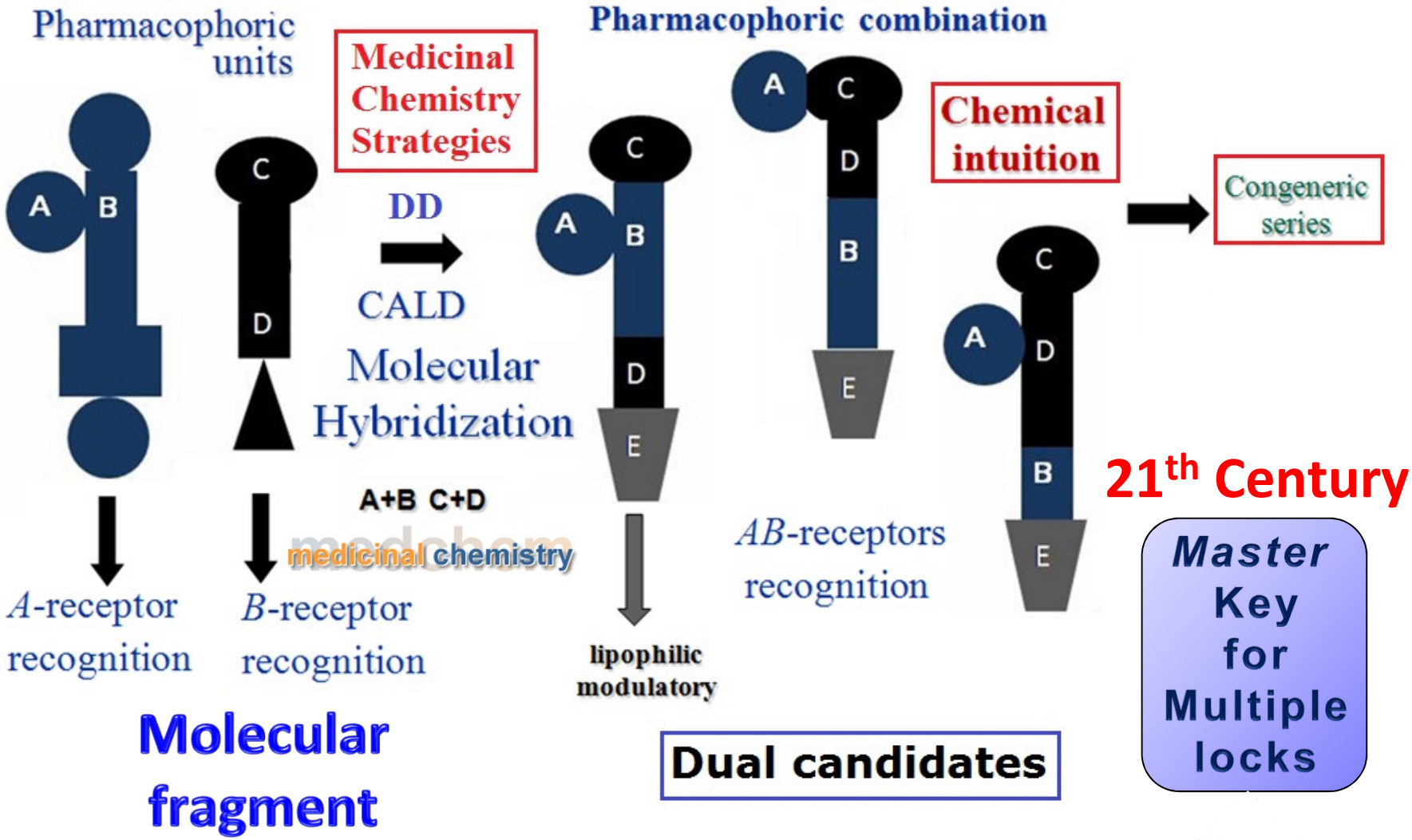
Rational design of multi target ligand



21th Century

***Master* Key for Multiple locks**

C Viegas-Jr, A Danuello, VS Bolzani, E J Barreiro, CAM Fraga, ***Molecular Hybridization***: *A useful tool in the design of new drug prototypes, Curr. Med. Chem.* **2007**, *14*, 1829

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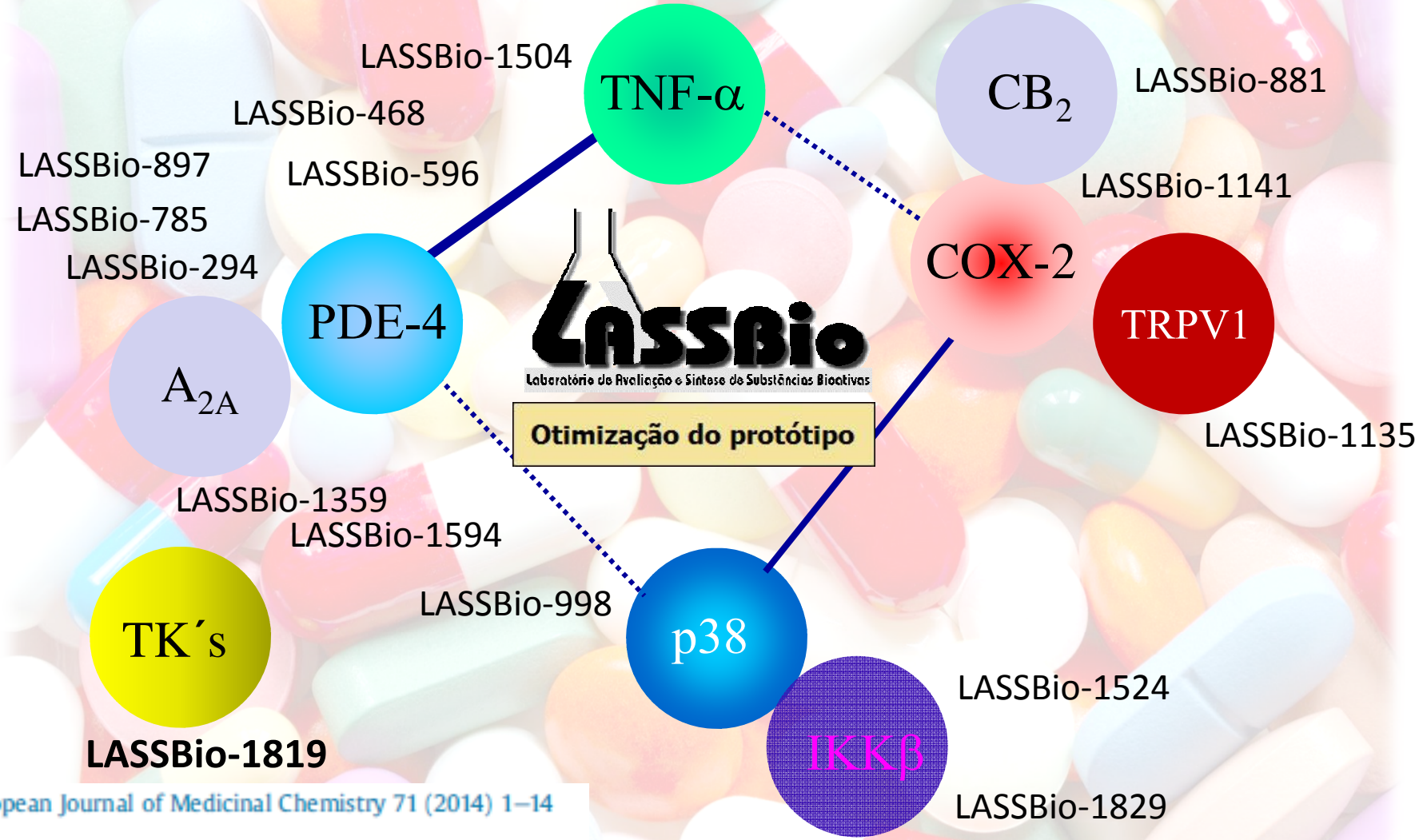
Novos protótipos de fármacos multialvos

Doenças multifatoriais não-transmissíveis crônico-degenerativas



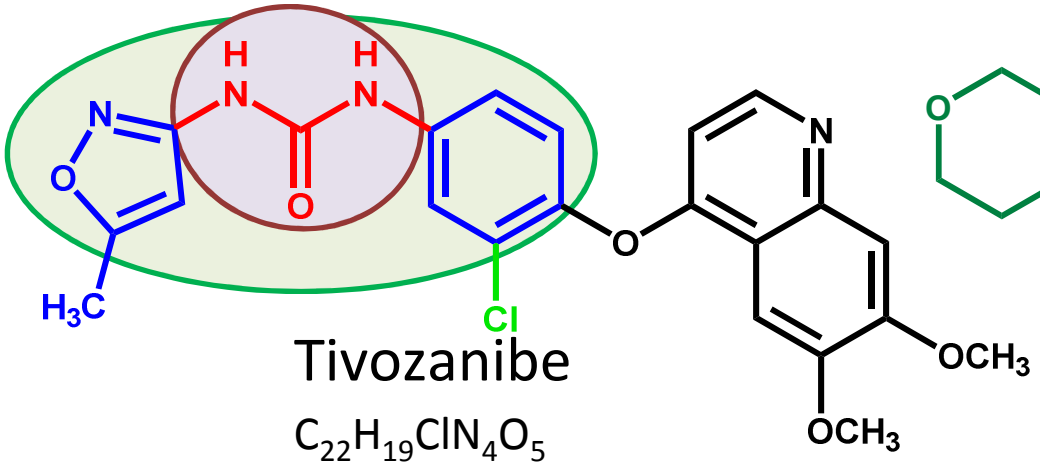
European Journal of Medicinal Chemistry 71 (2014) 1–14

Chimeric receptor model

Química Medicinal

Dual Ligand Design

Ligand for target-1: VEGFR-2



Tivozanibe

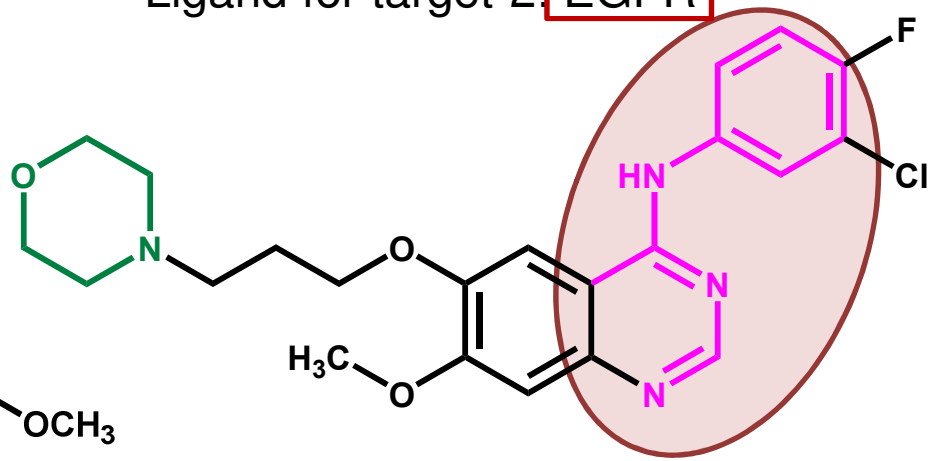
$C_{22}H_{19}ClN_4O_5$

VEGFR-1 = 30 nM
VEGFR-2 = 6,5 nM
VEGFR-3 = 15 nM

VEGFR tyrosine kinase inhibitor

2016

Ligand for target-2: EGFR



Gefitinibe

$C_{22}H_{24}ClFN_4O_3$

EGFR = 33 nM

2003

Originalidade

Dissecação Molecular: identificação de fragmentos farmacofóricos

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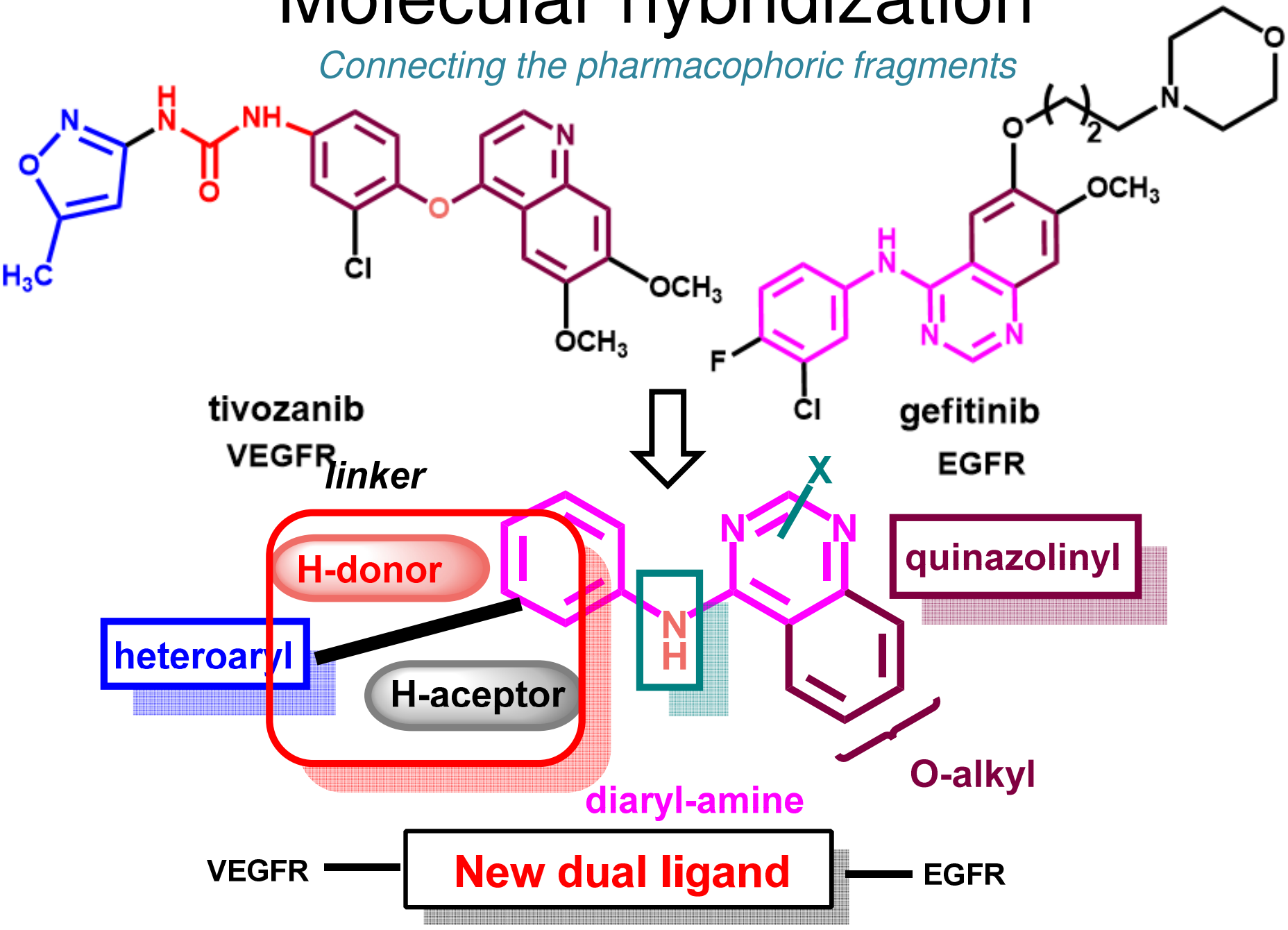
Molecular hybridization

Connecting the pharmacophoric fragments



Molecular design of new dual kinase inhibitor

From molecular docking studies

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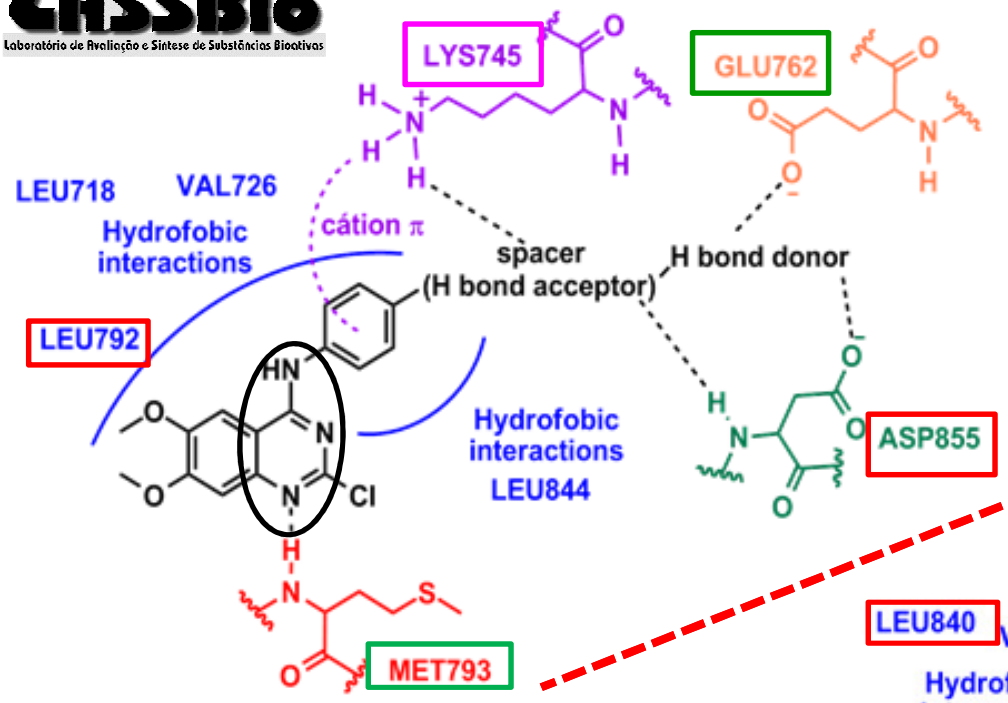
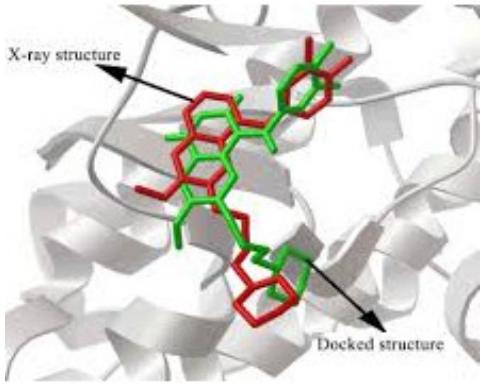
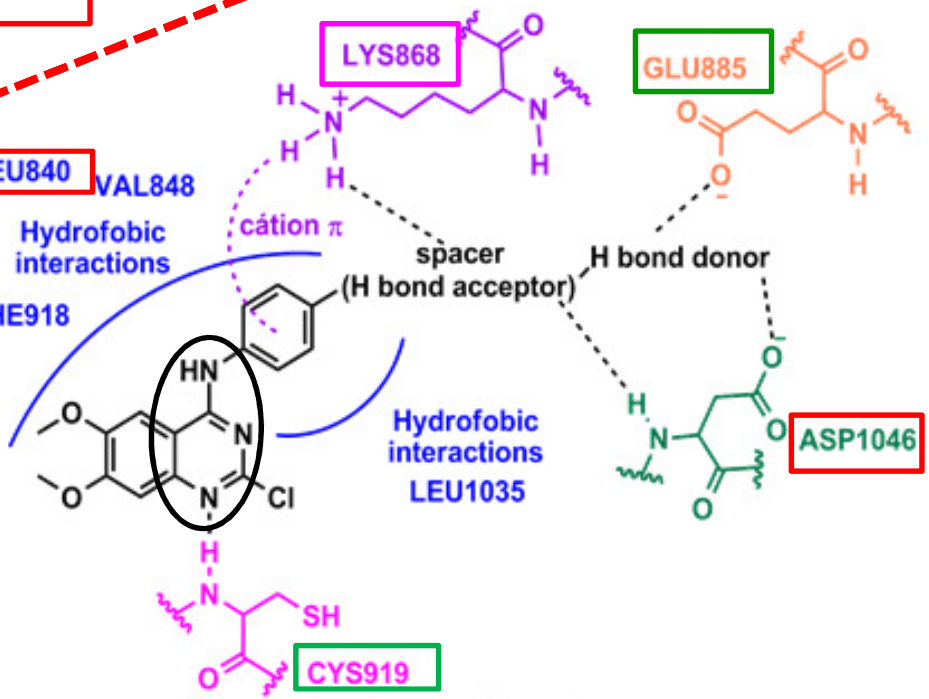
medicinal chemistry

Pharmacophoric map



EGFR





VEGFR-2

The synthesis of new quinazoline derivatives

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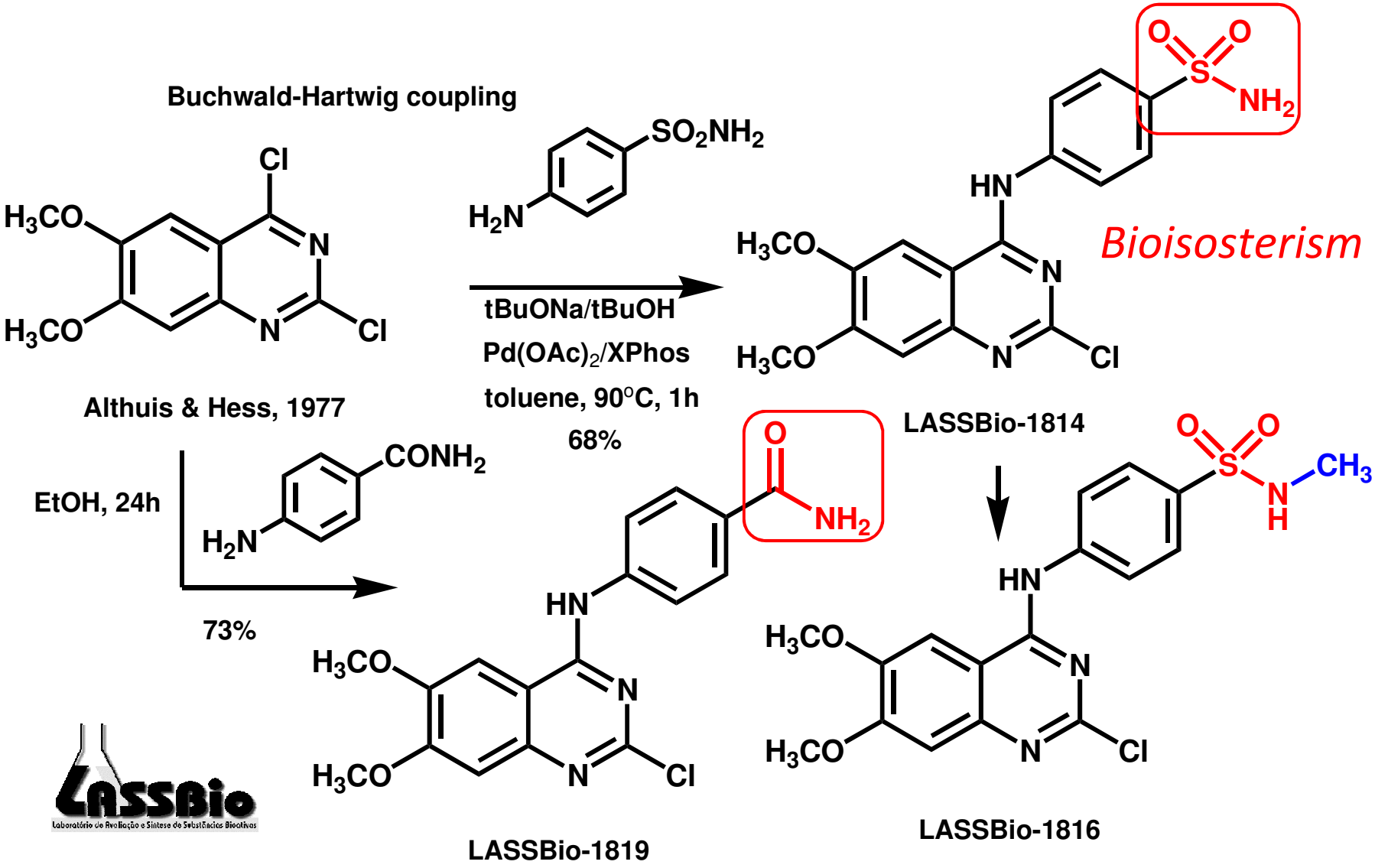

High overall yield; accessible starting material; scaleable-up

Binding assay of the congenere series

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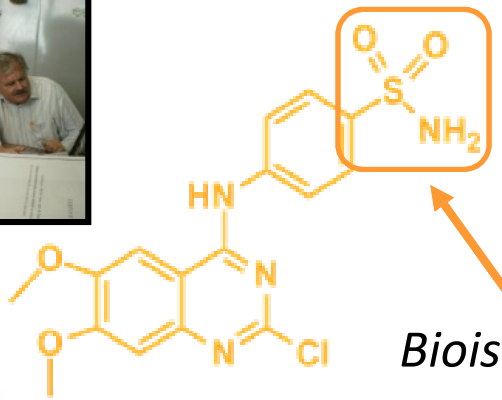
Química Medicinal

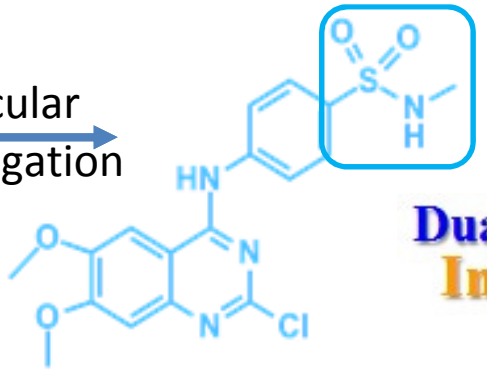
sulfonamide



LASSBio-1814
EGFR: IC_{50} = 2,37 µM
VEGFR-2: IC_{50} = 1,02 µM

Molecular homologation

N-methyl



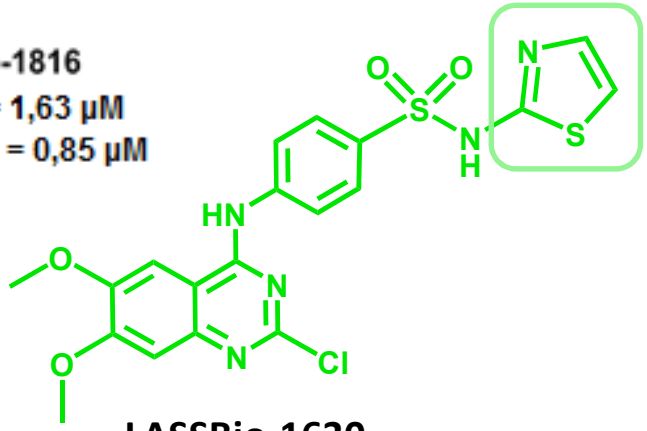
LASSBio-1816
EGFR: IC_{50} = 1,63 µM
VEGFR-2: IC_{50} = 0,85 µM

Dual Inhibitors

Dual

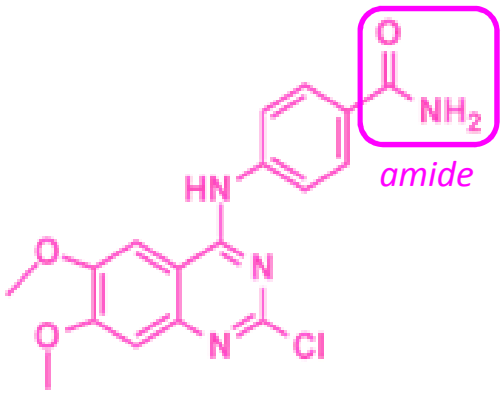
Bioisosterism

2-thiazolyl



LASSBio-1630
EGFRwt: IC_{50} = 9,70 µM
VEGFR-2: IC_{50} = 7,79 µM

amide



LASSBio-1819
EGFR: IC_{50} = 0,90 µM
VEGFR-2: IC_{50} = 1,17 µM

LASSBio
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ca. **16** new compounds in the congenere series

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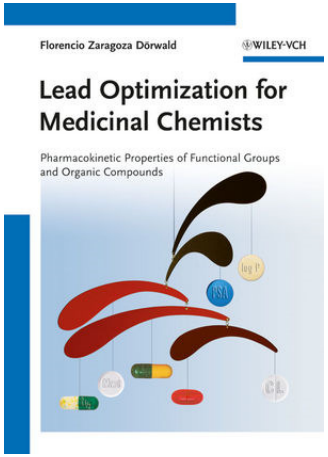
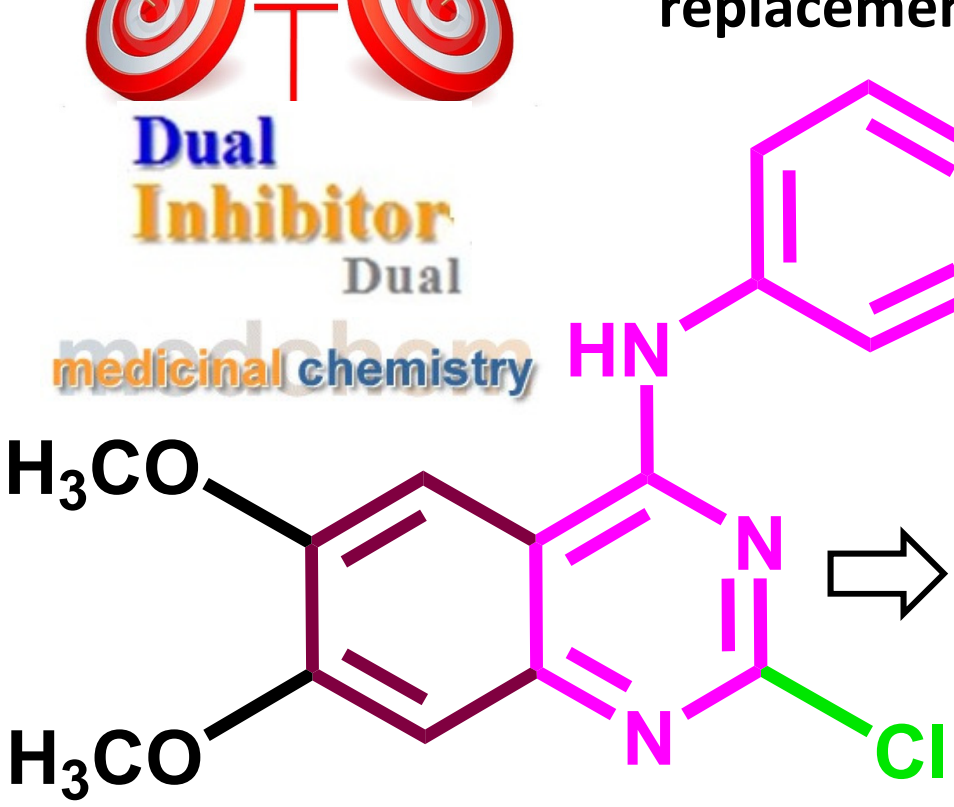
Dual Inhibitor

Dual medicinal chemistry

Isosteric replacement

carboxamide





$C_{17}H_{15}ClN_4O_3$

LASSBio-1819

Dual Ligand

Dual kinase activity

EGFRwt IC_{50} = 0,90 μM

VEGFR-2 IC_{50} = 1,17 μM

Novel molecular pattern

Lead Optimization

M. L. C. Barbosa, *Novos derivados quinazolínicos funcionalizados inibidores duais das tirosina cinases receptoras EGFR & VEGFR-2*, Tese Dr, Instituto de Química, UFRJ, 2013.

Universidade Federal do Rio de Janeiro

PEDIDO INTERNACIONAL PUBLICADO SOB O TRATADO DE COOPERAÇÃO EM MATÉRIA DE PATENTES (PCT)

(19) Organização Mundial da Propriedade Intelectual
Secretaria Internacional

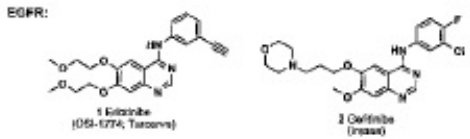
(43) Data de Publicação Internacional
31 de Julho de 2014 (31.07.2014)

WIPO | PCT

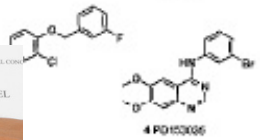
(10) Número de Publicação Internacional
WO 2014/113859 A1

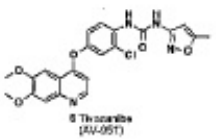
(54) Title : 2-CHLORO-4-ANILINO-QUINAZOLINE COMPOUNDS INHIBITING PROTEIN TYROSINE KINASES, PHARMACEUTICAL COMPOSITIONS COMPRISING THE SAME, METHOD FOR PRODUCING THE SAME AND TYROSINE KINASE INHIBITION METHOD

(54) Título : COMPOSTOS 2-CLORO-4-ANILINO-QUINAZOLINICOS INIBIDORES DE PROTEÍNAS TIROSINA CINASES, COMPOSIÇÕES FARMACÊUTICAS COMPREENDENDO OS MESMOS, PROCESSO PARA SUA PRODUÇÃO E MÉTODO PARA INIBIÇÃO DE TIROSINA CINASES



(57) Abstract : The present invention relates to 2-chloro-4-anilino-quinazoline derivatives with EGFR and/or VEGFR-2 protein tyrosine kinase inhibiting activity, to anti-tumour pharmaceutical compositions that comprise said compounds, and to methods for producing the same. The present invention further provides a method for treating solid tumours by inhibition of tyrosine kinases.





(72) Inventores : **BARREIRO, Eliezer Jesus;**
DE CASTRO BARBOSA, Maria Letícia;
MOREIRA LIMA, Lidia;
LAUFER, Stefan, Andreas;
RABELLO SANT'ANNA, Carlos Mauricio;
TESCH, Roberta;

Patent

UFRJ

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medicinal chemistry

Sample Issue

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Lead Optimization

LASSBio

Laboratório de Avaliação e Síntese de Substâncias Bioativas

Original article Volume 71, 7 January 2014, Pages 1–14

Novel 2-chloro-4-anilino-quinazoline derivatives as EGFR and VEGFR-2 dual inhibitors

Maria Letícia de Castro Barbosa[a, b], Lídia Moreira Lima[a, b], Roberta Tesch[a], Carlos Mauricio R. Sant'Anna[c], Frank Totzke[d], Michael H.G. Kubbutat[d], Christoph Schächtele[d], Stefan A. Laufer[a], Eliezer J. Barreiro[a, b]

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Maria Letícia de Castro Barbosa | Lídia Moreira Lima | ...

3. Design, synthesis and antiproliferative activity studies of novel 1,2,3-triazole–dithiocarbamate–urea hybrids
Ying-Chao Duan | Yi-Chao Zheng | ...

* Top-1 Poster Prize in **Frontiers in Medicinal Chemistry Congress**, 2014, Tübingen, GE

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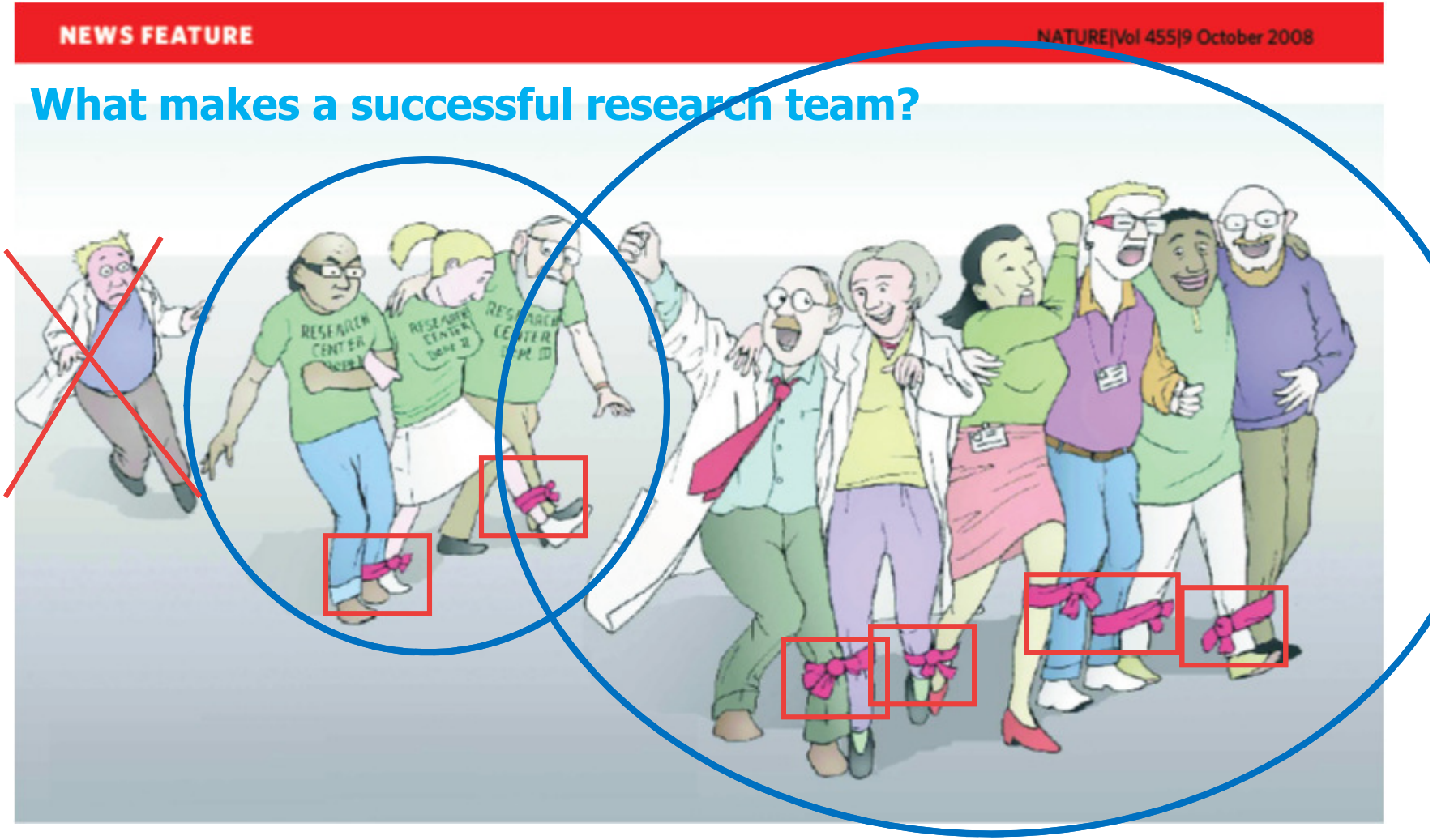
J. Whitfield, *Nature* **2008**, *455*, 720



W Masona, D J Watts, Collaborative learning in networks, *PNAS* **2012**, *109*, 764; M Williams, Productivity Shortfalls in Drug Discovery: Contributions from the Preclinical Sciences?, *JPET* **2011**, *336*, 3; R Guimera, B Uzzi, J Spiro, L A N Amaral, Team Assembly Mechanisms Determine Collaboration Network Structure and Team Performance, *Science* **2005**, *308*, 697.

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www.inct-inofar.ccs.ufrj.br/

English

Sábado, 23 de Julho de 2016

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- Pesquisadores
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- Proposta 2014 / Proposal 2014
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- Reuniões
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RIO DE JANEIRO

Braz Med Chem

THE 8TH IS COMING UP WITH NEW TRENDS IN MEDICINAL CHEMISTRY

BrazMedChem 2016

ESPAÇO TRANSPARÊNCIA

Confira o trabalho realizado pela equipe

Parceiros

INCT-*INOFAR*

Universidade Federal do Rio de Janeiro

Química Medicinal

LASSBio

Laboratório de Avaliação e Síntese de Substâncias Bioativas

16 ICT´s
30 grupos de pesquisa
5 empresas

UFC
bio TECHCELL
UFPB
UFAL
UNIFAL-MG
In Vitro Cells
UFG
UFMG
FIOCRUZ
UFMG
USP
UFRJ
UFRGS
UNIVERSIDADE FEDERAL DO RIO GRANDE DO SUL
UNIVERSITÄT TÜBINGEN
iCephA
SANOFI
unipampa
Universidade Federal do Pampa
Ciallyx
UFRRJ
LNCC
NORTEC QUÍMICA
CRISTÁLIA
UNICAMP
LNCC
BIOZEUS

Universidade Federal do Rio de Janeiro

Radical *Innovation*

medicinal chemistry

Studies of anti-inflammatory & analgesic effect of LASSBio-591, a new candidate of AIA drug.

LASSBio-UFRJ/FM-USP,RP

Studies of new oncolytic agent, dual inhibitor of kinases

LASSBio-UFRJ

WO2014113859

WO2013142935

Studies on design & discovery of new antidiabetes drug candidates.

LASSBio-UFRJ

BR102013012646-2

inct institutos nacionais de ciência e tecnologia

inofar

Discovery of novel anticancer drug candidates

LASSBio-UFRJ / FM-UFC

PCT/BR2013/000095

WO2013142935 A1

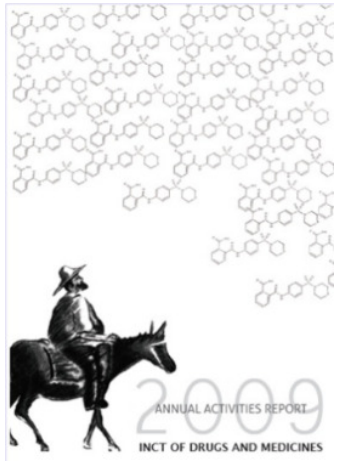
Studies on new drug candidate useful for neuropatic pain

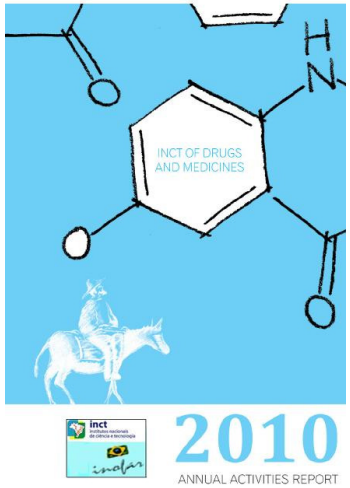
LASSBio-UFRJ / FM-USP, RP

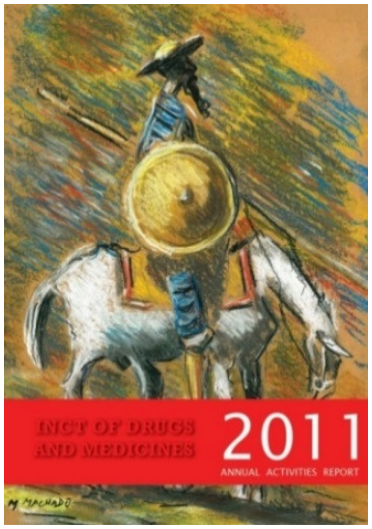
WO2012054996

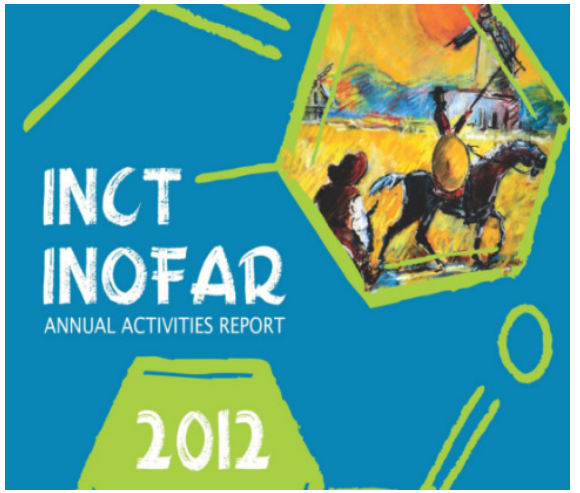
Annual Activities Report

Universidade Federal do Rio de Janeiro









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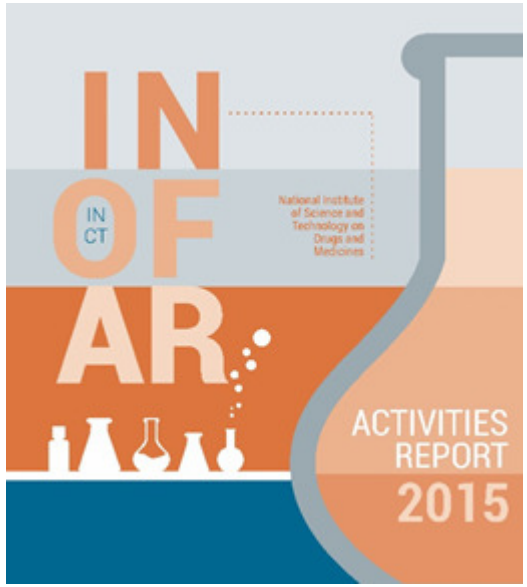
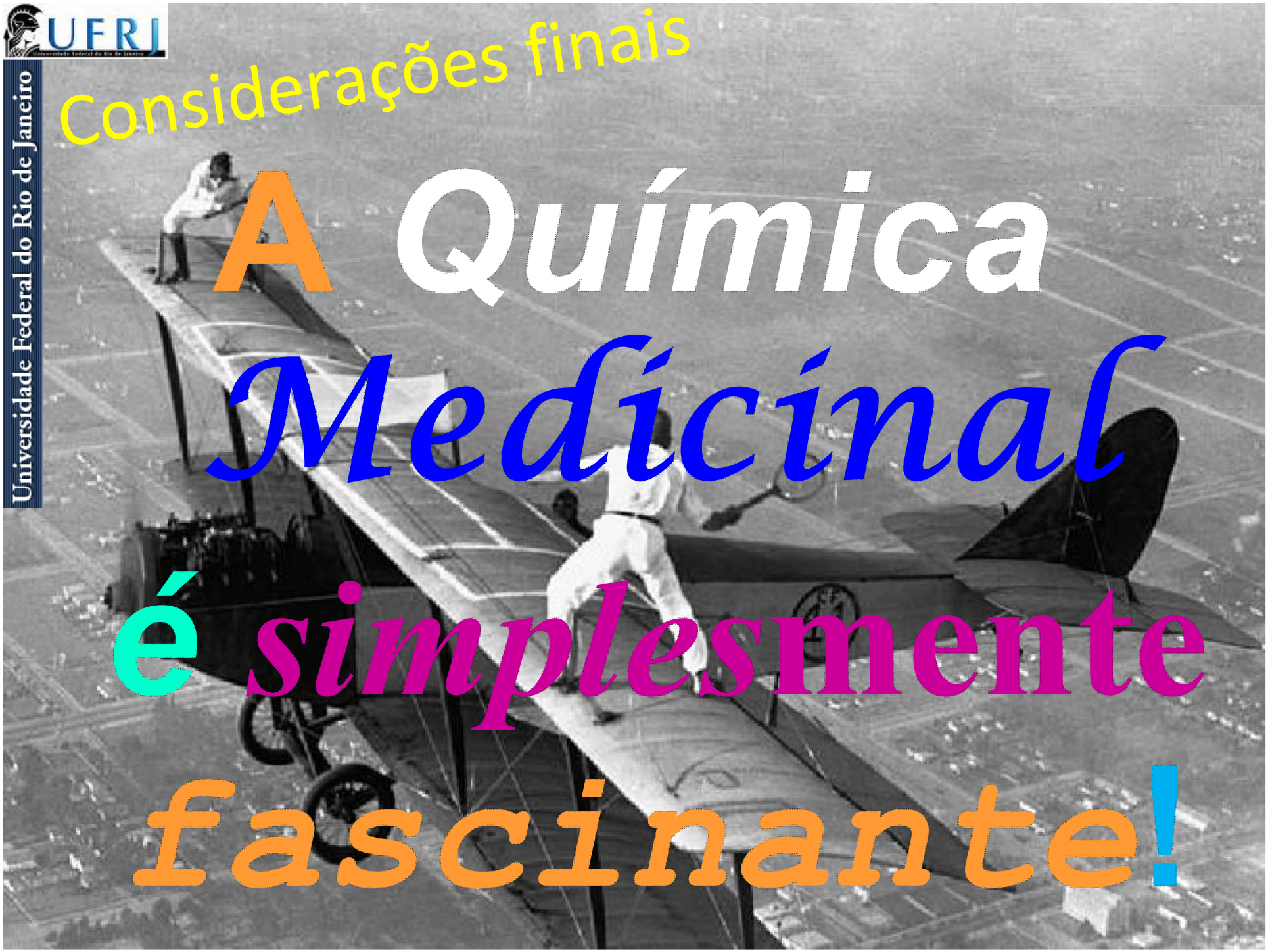


www.inct-inofar.ccs.ufrj.br/download/aar/2015.pdf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Considerações finais
A Química
Medicinal
é simplesmente
fascinante!

Universidade Federal do Rio de Janeiro

Considerações finais

Os medicamentos foram uma das *maiores* invenções do século 20 !

São moléculas que mudam o mundo!

UFRJ

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Convite

Universidade Federal do Rio de Janeiro

Conferências

Mini cursos

XXIII Escola de Verão

UFRJ LASSBio

em Química Farmacêutica e Medicinal

23-27 de janeiro de 2017

Inscrições 01/09/2016

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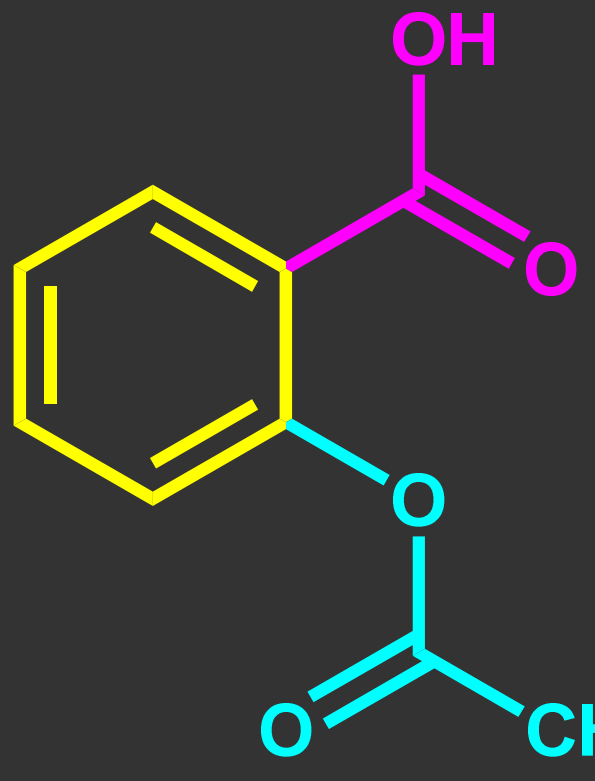
CONVITE

De fármacos e suas descobertas

Pretende-se tratar de temas, opiniões, comentários sobre a Ciência dos Fármacos, seu uso seguro e benefícios. Aspectos da formação qualificada de universitários e pós-graduandos nas Ciências dos Fármacos também são de interesse.



Um acetato famoso...

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Rio2016
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JOGOS PARALÍMPICOS
Muito
Obrigado!
Praia do Boqueirão, Saquarema, RJ
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