Elsevier
Life Science Solution
获取药物研发信息系列主题培训

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Agenda

- 7月8日
  - 15：00-15：10：Elsevier Life Science整体解决方案介绍
  - 15：10-16：30：物质结构/合成信息的获取与精炼
- 7月15日
  - 15：00-16：00：生物活性数据与文献的获取与提炼
- 7月22日
  - 15：00-16：00：药物毒理药理学文献的获取
- 7月29日
  - 15：00-16：00： Elsevier Life Science整体解决方案数据库使用答疑
- 8月5日
  - 15：00-16：00：如何将Elsevier Life Science整体解决方案贯穿药物研发的全流程

药物毒理药理文献的获取

涉及：RMC， Embase，PharmaPendium

Agenda

- 涉及具体结构的毒性数据的获取
- 涉及具体药物（上市，临床）的毒理药理文献的获取
- FDA/EMA审评文档中独立药理信息的获取与对比

RMC（Reaxys Medicinal Chemistry）

- RMC是建立在Reaxys平台上的，和药物化学数据有关的数据库。
  - 包含真实的，实验确证的，小分子化合物在不同生物体系中的相关实验数据
  - 是市场上最全的，最广泛的小分子生物活性数据库
  - 实验数据源自对学术全文，专利中的相关数据的摘取，以及来自GOSTAR数据库的相关数据，并将二者在底层数据上进行整合。
  - RMC中所提供的文献，包含所有摘录的相关信息和数据，可靠，可信

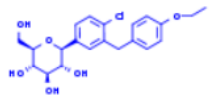
Patents Origin and starting date
• **>126 600 Patents** • US : 1971-present • EP : 1979-present • WO : 1978-present (English only) • Patents are coming from the A61K class mainly but not only.

Articles and Journals
• **>5000 Journals Covered** • **>353 400 Articles** • From 1980 to Present

Drugable Targets
• **>12 700 Drugable Targets**

Case 1：单一化合物生物活性数据的获取

1



dapagliflozin

$C_{21}H_{25}ClO_6$ 408.879 11966426 461432-26-8

Identification

Druglikeness

Bioactivity (All)

Physical Data - 52

Spectra - 54

Other Data - 351

Preparations - 81

Reactions - 398

Targets - 24

Documents - 217

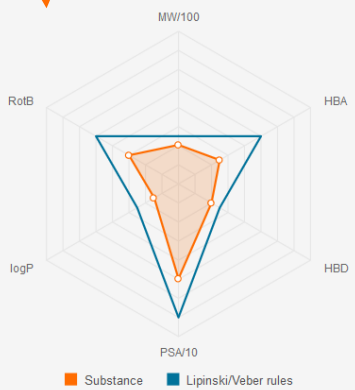
Druglikeness

Lipinski rules component

Molecular Weight	408.879
logP	2.937
HBA	5
HBD	4
Matching Lipinski Rules	4

Veber rules component

Polar Surface Area (PSA)	99.38
Rotatable Bond (RotB)	6
Matching Veber Rules	2



Bioactivity (All)

- In vitro: Efficacy - 261
- In vivo: Animal Model - 208
- Metabolism - 67
- Pharmacokinetic - 229
- Toxicity/Safety Pharmacology - 114

具体化合物的生物活性数据

- Bioactivity (All)
  - In vitro: Efficacy - 261
  - In vivo: Animal Model - 208
  - Metabolism - 67
  - Pharmacokinetic - 229
  - Toxicity/Safety Pharmacology - 114

RMC将全文中的数据全部提炼出来，同时对于用Mol为单位的数据进行标准化处理: pX=-lg(~mol)

In vitro: Efficacy - 261

Quantitative Results

Show/Hide columns

pX	Parameter	Value (qual)	Value (quant)	Unit	Biological Species	Action on target	Target	Tissue/Organ	Cell	Dose	Effect	Concomitants	Reference
9.91	amount (Glycogen)		50 - 175	pg/ml	Sprague Dawley rat			pancreas		20 µmol/l	antidiabetic agent		Wang, May-Yun; Yu, Xinxin; Lee, Young; McCorkle, Sara Kay; Chen, Shiuhwei; Li, Jianping; Wang, Zhao V.; (...) Unger, Roger H.; Roth, Michael G.[**Proceedings of the National Academy of Sciences of the United States of America**, **2017**, vol. 114, # 25, p. 6611 - 6616] Full Text Cited 10 times Details Abstract
9.84	pIC50 ([14c]Methyl-Alpha-D-Glucopyranoside Uptake)		9.84		human		Sodium/glucose cotransporter 2 [human]:Wild		COS-7 cell line			Radioligand: [14C]AMG	Ho, Low-Tone; Kulkarni, Suvarn S.; Lee, Jinq-Chyi[**Current Topics in Medicinal Chemistry**, **2011**, vol. 11, # 12, p. 1476 - 1512] Full Text Cited 9 times Details Abstract
9.84	pIC50		9.84		human		Sodium/glucose cotransporter 2 [human]:Wild		COS-7 cell line			Radioligand: ALPHA-D-(U-14C)-GLUCOPYRANOSIDE; Other compound: NACL;	Zhou, Huiqiang; Danger, Dana P.; Dock, Steven T.; Hawley, Lora; Roller, Shane G.; Smith, Chari D.; Handlon, Anthony L.[**ACS Medicinal Chemistry Letters**, **2010**, vol. 1, # 1, p. 19 - 23] Full Text Cited 35 times Details Abstract
9.31	IC50	=	0.49	nM	human	Inhibitor	Sodium/glucose cotransporter 2 [human]:Wild		CHO cell line				Lee, Suk Ho; Song, Kwang-Seop; Kim, Jong Yup; Kang, Misuk; Lee, Jun Sung; Cho, Seung-Hwan; Park, Hyun-Ju; Kim, Jeongmin; Lee, Jinhwa[**Bioorganic and Medicinal Chemistry**, **2011**, vol. 19, # 19, p. 5813 - 5832] Full Text Cited 17 times Details Abstract
9.31	IC50	=	0.49	nM	human	Inhibitor	Sodium/glucose cotransporter 2 [human]:Wild					Radioligand: [14C]Methyl-alpha-D-glucopyranoside	Lee, Jinhwa; Kang, Suk Youn; Song, Kwang-Seop; Lee, Junwon; Lee, Sung-Han[**Bioorganic and Medicinal Chemistry**, **2010**, vol. 18, # 16, p. 6069 - 6079] Full Text Cited 30 times Details Abstract
9.31	IC50 ([14c]Methyl-Alpha-D-Glucopyranoside Uptake)	=	0.49	nM	human		Sodium/glucose cotransporter 2 [human]:Wild		CHO cell line			Radioligand: [14C]AMG	Ho, Low-Tone; Kulkarni, Suvarn S.; Lee, Jinq-Chyi[**Current Topics in Medicinal Chemistry**, **2011**, vol. 11, # 12, p. 1476 - 1512] Full Text Cited 9 times Details Abstract
9.31	IC50	=	0.49	nM	human		Sodium/glucose cotransporter 2 [human]:Wild		CHO cell line			Substrate: [14C]AMG	Park, Eun-Jung; Kong, Younggyu; Lee, Jun Sung; Lee, Sung-Han; Lee, Jinhwa[**Bioorganic and Medicinal Chemistry Letters**, **2011**, vol. 21, # 2, p. 742 - 746] Full Text Cited 10 times Details Abstract

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具体化合物的毒性数据

- Bioactivity (All)
  - In vitro: Efficacy - 261
  - In vivo: Animal Model - 208
  - Metabolism - 67
  - Pharmacokinetic - 229
  - Toxicity/Safety Pharmacology

所有数据都提供原文链接，以保证数据的真实性。

Toxicity/Safety Pharmacology - 114

Quantitative Results

Show/Hide columns

pX	Parameter	Value (qual)	Value (quant)	Unit	Biological Species	Cell	Dose	Effect	Reference
9.25	amount (immunoreactive active insulin)		0.23	ng/ml	Akita mouse		0.1 mg/kg		Hatanaka, Takashi; Ogawa, Daisuke; Tachibana, Hiromi; Eguchi, Jun; Inoue, Tatsuyuki; Yamada, Hiroshi; Takei, Kohji ; Makino, Hirofumi; Wada, Jun[**Pharmacology Research and Perspectives, 2016**, vol. 4, # 4, art. no. E00239] Full Text ↗ Cited 24 times ↗ Details ❯ Abstract ❯
5	inhibition rate	Active				Hep-G2 cell line	10 µM	antineoplastic agent	STEINBERG, Gregory; TSAKIRIDIS, Theos; VILLANI, Linda - WO2016/134486, **2016**, A1 Full Text ↗ Details ❯ Abstract ❯
4.88	amount		0.15	mg/dl	Akita mouse		0.1 mg/kg		Hatanaka, Takashi; Ogawa, Daisuke; Tachibana, Hiromi; Eguchi, Jun; Inoue, Tatsuyuki; Yamada, Hiroshi; Takei, Kohji ; Makino, Hirofumi; Wada, Jun[**Pharmacology Research and Perspectives, 2016**, vol. 4, # 4, art. no. E00239] Full Text ↗ Cited 24 times ↗ Details ❯ Abstract ❯
4.6	IC50 (of viable colonies)		25.02	µM		NCI-H1299 cell line	0.1 - 100 µM	antineoplastic agent	STEINBERG, Gregory; TSAKIRIDIS, Theos; VILLANI, Linda - WO2016/134486, **2016**, A1 Full Text ↗ Details ❯ Abstract ❯
4.52	inhibition rate (of viable colonies)	Active				A-549 cell line	30 µM	antineoplastic agent	STEINBERG, Gregory; TSAKIRIDIS, Theos; VILLANI, Linda - WO2016/134486, **2016**, A1 Full Text ↗ Details ❯ Abstract ❯
4.52	inhibition rate (of viable colonies)	Active				NCI-H1299 cell line	30 µM	antineoplastic agent	STEINBERG, Gregory; TSAKIRIDIS, Theos; VILLANI, Linda - WO2016/134486, **2016**, A1 Full Text ↗ Details ❯ Abstract ❯
4.52	inhibition rate	Active				PC-3	30 µM	antineoplastic agent	STEINBERG, Gregory; TSAKIRIDIS, Theos; VILLANI, Linda - WO2016/134486, **2016**, A1 Full Text ↗ Details ❯ Abstract ❯

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Agenda

- 涉及具体结构的毒性数据的获取
- 涉及具体药物（上市，临床）的毒理药理文献的获取
- FDA/EMA审评文档中独立药理信息的获取与对比

什么是Embase

Embase

收录超过8,200期刊 / 3,500万条文献记录！

其中超过 2,900 种期刊在 Medline未收录

包含100%的MEDLINE内容*

对药物、疾病和医疗器械进行深度索引，主题性检索词是MEDLINE的两倍之多

强大的检索功能和过滤器，帮助精确查找最相关的结果

独特的信息管理功能帮助研究人员储存和修改复杂的检索策略，并可以和其他研究人员分享检索策略

独有的超过300万条会议摘要，自2009年开始已经收录超过9000个会议期刊的文摘

涵盖更多非英语类文献

Embase被众多国际性标准制定机构、研究机构推荐

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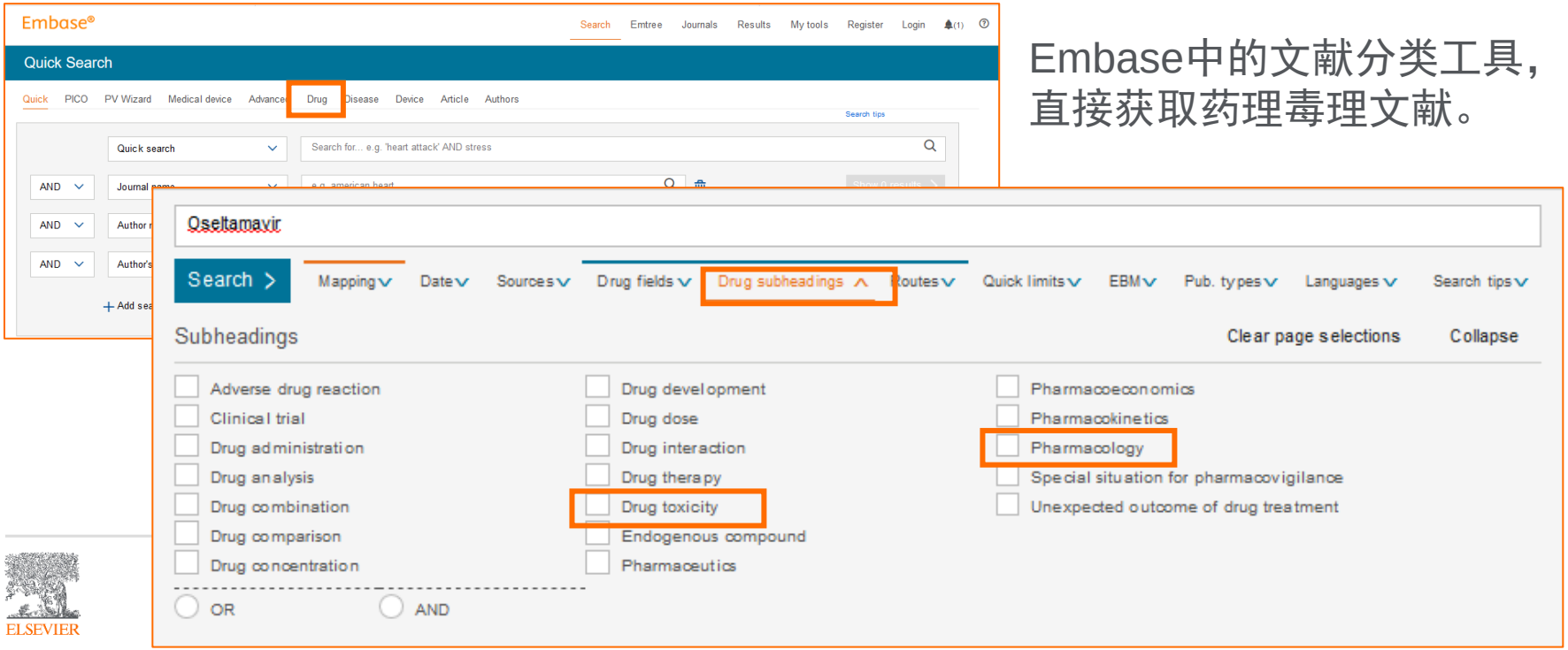
Case 2：具体药物（上市，临床）的毒理药理文献获取

- Oseltamavir药理学文献的获取



Embase中的文献分类工具，直接获取药理毒理文献。

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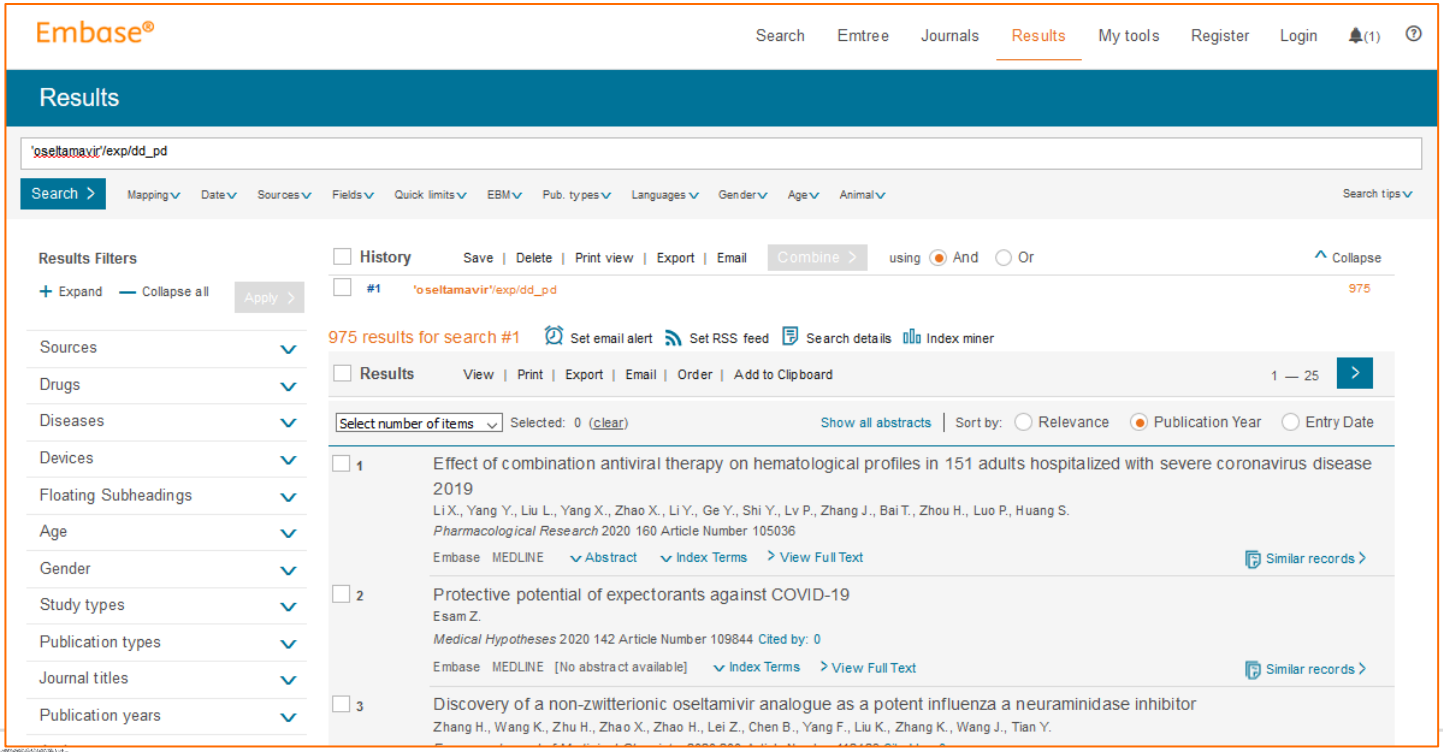
Embase中关于Oseltamavir的Pharmacology文献



如何获取临床药理，实验药理，（组织，器官，细胞）的文献

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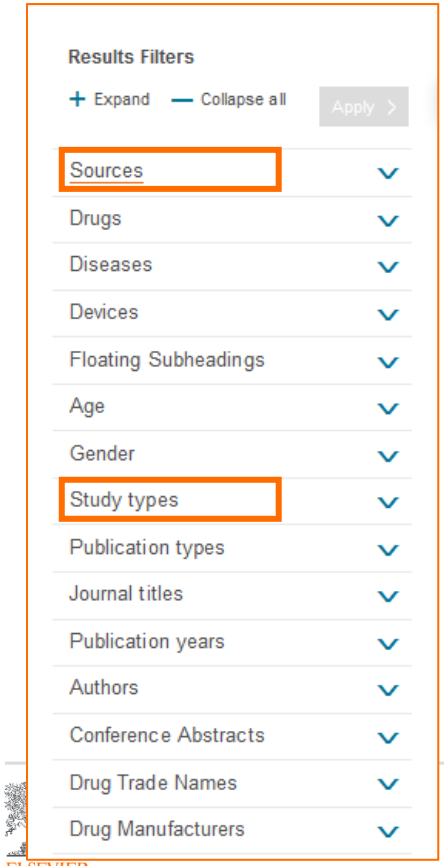
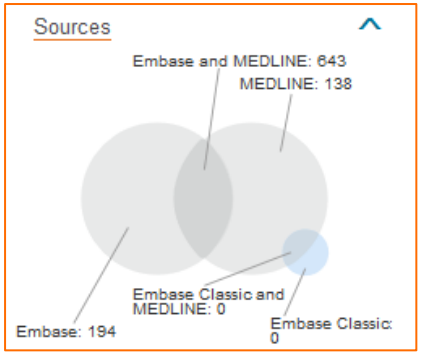
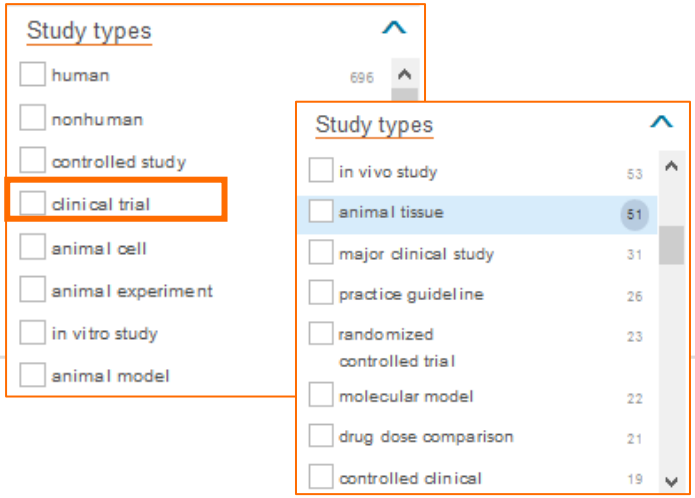
Embase中的分析







Tips：

Embase.com中完全包含Medline，所以在Embase.com至少有194篇文献是Medline中无法获取的

Tips：

Study Type分析，获取不同的研究对象文献。

其中的一篇临床药理文献

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Record Details

← Back to Results | Export | Send | Add to clipboard | Full record

Translated Title

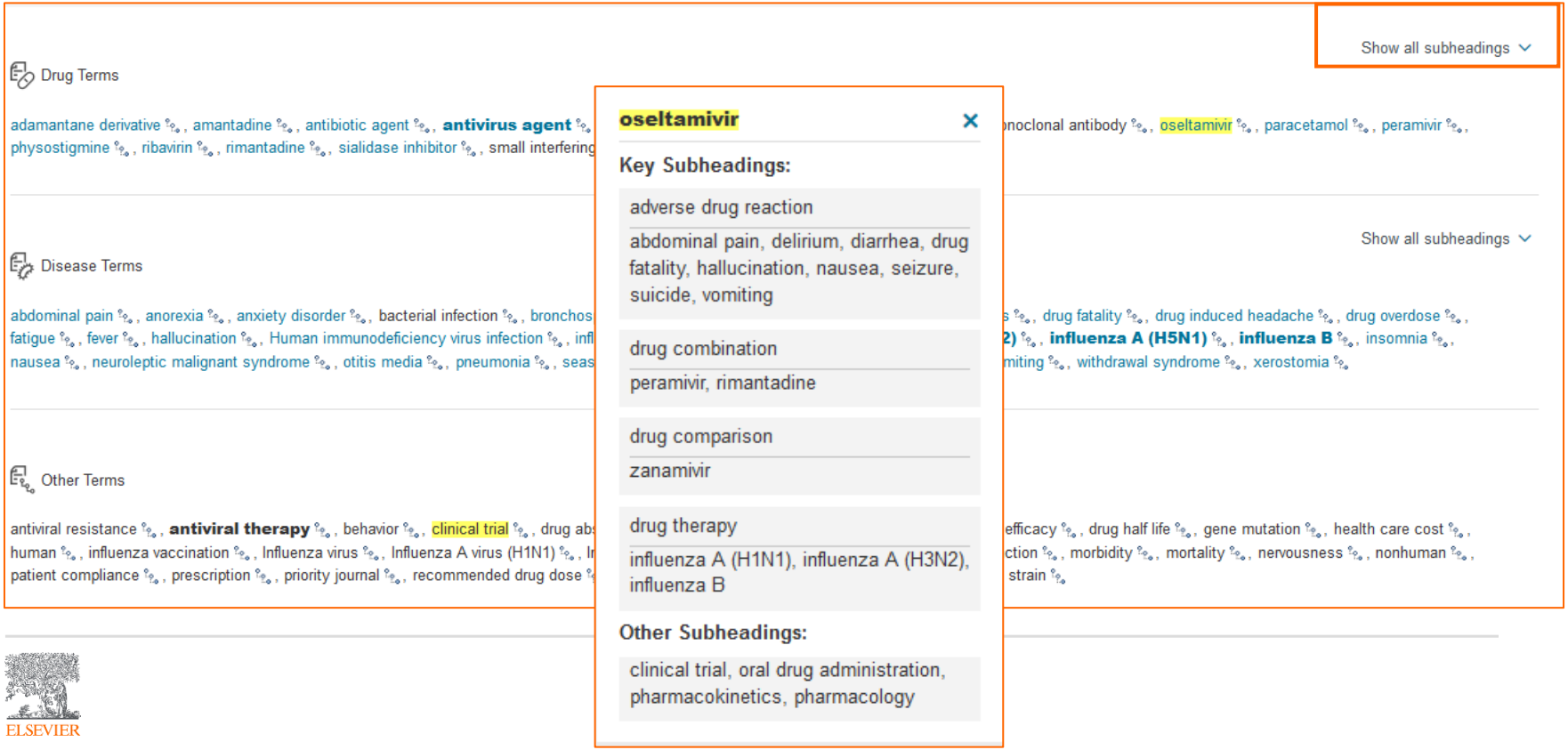
Antivirals for influenza: Strategies for use in pediatrics

Pediatric Drugs 2010 **12** :5 (285 - 299)

Translated Abstract

Influenza infection is annually responsible for significant morbidity and mortality, particularly among the very young and old. Recently updated guidelines recommend influenza vaccination of all children aged 6 months to 18 years; however, childhood vaccination remains underutilized. Furthermore, concerns over the reduced efficacy of vaccination in children have further heightened the need for effective treatment schemes. Antiviral therapies have emerged as attractive options in the battle against influenza infection. These agents include the adamantanes (amantadine and rimantadine) and neuraminidase inhibitors (zanamivir, oseltamivir, and peramivir). Broad-scale use of adamantane antivirals has been severely limited in recent years because of high resistance rates and their inability to cover influenza type B. Neuraminidase inhibitors cover influenza types A and B, and have been promulgated to first-line therapy because of historically low resistance rates and relatively infrequent side effects. Moreover, these agents are effective options in combating non-seasonal influenza strains, including H5N1 and pandemic 2009 H1N1. Oseltamivir may be particularly appealing for treating children since it is available in multiple oral dosage formulations, whereas commercially available zanamivir use is limited in young children because it requires inhalation. However, the emergence of resistance to oseltamivir among influenza A strains may limit its usefulness. Additional concerns with neuraminidase inhibitor use in pediatrics center around emerging reports, primarily from Japan, that have temporally linked oseltamivir to significant neuropsychiatric events in children of varying ages. Numerous novel antiviral agents are under development, but most are far from market approval. In addition to treating and preventing the initial burden of pediatric influenza infection, antiviral therapies may significantly reduce secondary bacterial infections (including pneumonia and otitis media), unnecessary antibiotic prescribing, and healthcare-associated costs.

Embase对这篇全文的提炼与索引



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Embase对这篇全文的提炼与索引

Drug Tradenames	das 181, flumadine, relenza, symmetrel, tamiflu
CAS Registry Numbers	amantadine 665-66-7 R , 768-94-5 R
	cyanovirin N 212132-87-1 Reaxys PubChem
	favipiravir 259793-96-9 Reaxys PubChem
	laninamivir 203120-17-6 Reaxys PubChem
	oseltamivir 196618-13-0 R , 204255-09-4 R , 204255-11-8 R
	paracetamol 103-90-2 Reaxys PubChem
	peramivir 229614-55-5 R , 229614-56-6 R , 229615-12-7 R
	physostigmine 57-47-6 R , 64-47-1 R
	ribavirin 36791-04-5 Reaxys PubChem
	rimantadine 13392-28-4 R , 1501-84-4 R
	taribavirin 119567-79-2 R , 40372-00-7 R
	zanamivir 139110-80-8 Reaxys PubChem

带有Reaxys标记的，可以直接跳转到Reaxys中查看结构，（如已经订购该数据库）

同样一条记录在Medline中的提炼

Format: Abstract Send to

Paediatr Drugs. 2010 Oct 1;12(5):285-99. doi: 10.2165/11532530-000000000-00000.

Antivirals for influenza: strategies for use in pediatrics.

Smith SM[1], Gums JG.

Author information

Abstract

Influenza infection is annually responsible for significant morbidity and m
updated guidelines recommend influenza vaccination of all children aged
remains underutilized. Furthermore, concerns over the reduced efficacy
for effective treatment schemes. Antiviral therapies have emerged as att
agents include the adamantanes (amantadine and rimantadine) and neu
Broad-scale use of adamantane antivirals has been severely limited in re
to cover influenza type B. Neuraminidase inhibitors cover influenza types
because of historically low resistance rates and relatively infrequent side
combating non-seasonal influenza strains, including H5N1 and pandemic
treating children since it is available in multiple oral dosage formulations,
young children because it requires inhalation. However, the emergence
its usefulness. Additional concerns with neuraminidase inhibitor use in pe
Japan, that have temporally linked oseltamivir to significant neuropsychia
antiviral agents are under development, but most are far from market ap
of pediatric influenza infection, antiviral therapies may significantly reduc
otitis media), unnecessary antibiotic prescribing, and healthcare-associa

PMID: 20799758 DOI: 10.2165/11532530-000000000-00000

[Indexed for MEDLINE]

Publication type, MeSH terms, Substances

Publication type

Review

MeSH terms

Adamantane/adverse effects
Adamantane/pharmacology
Adamantane/therapeutic use
Animals
Antiviral Agents/adverse effects
Antiviral Agents/pharmacology
Antiviral Agents/therapeutic use*
Child
Drug Therapy, Combination
Humans
Influenza, Human/drug therapy*
Neuraminidase/antagonists & inhibitors
Orthomyxoviridae/drug effects
Orthomyxoviridae/enzymology
Pediatrics/methods*

Substances

Antiviral Agents
Neuraminidase
Adamantane

Medline的索引给出的信息极少，全文花了大篇幅介绍Oseltamavir，但是在其索引中却看不到

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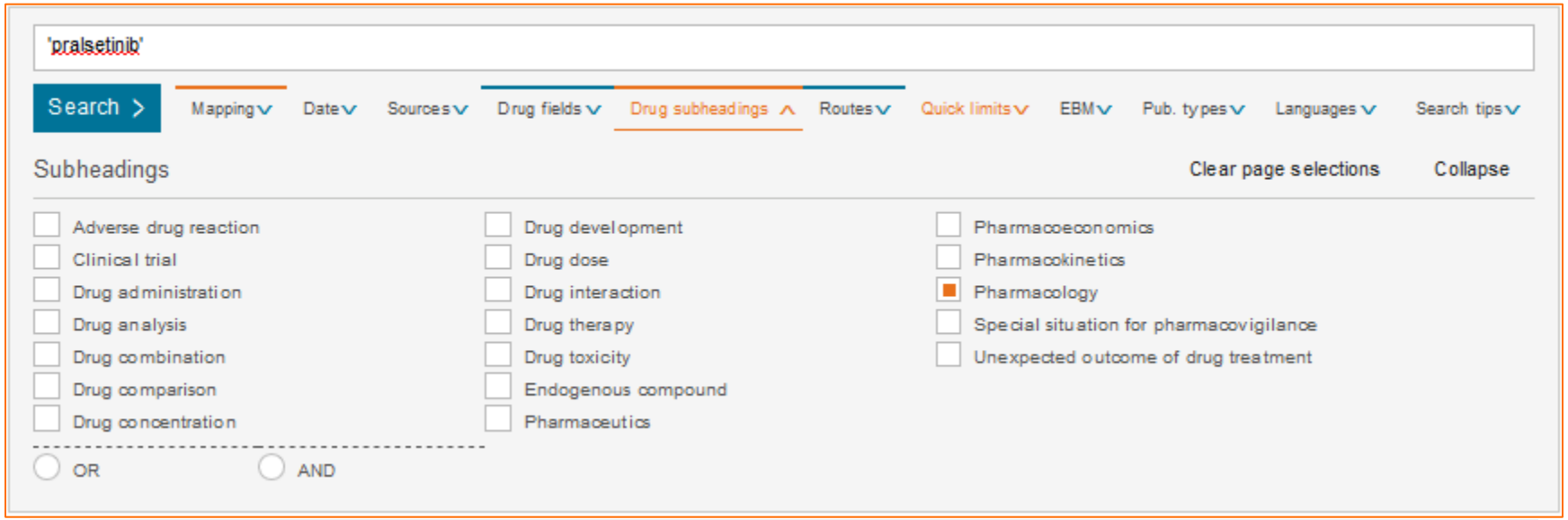
Case 3：临床在研药物毒理药理文献的获取

- pralsetinib（BLU-667）药理文献获取（RET抑制剂）



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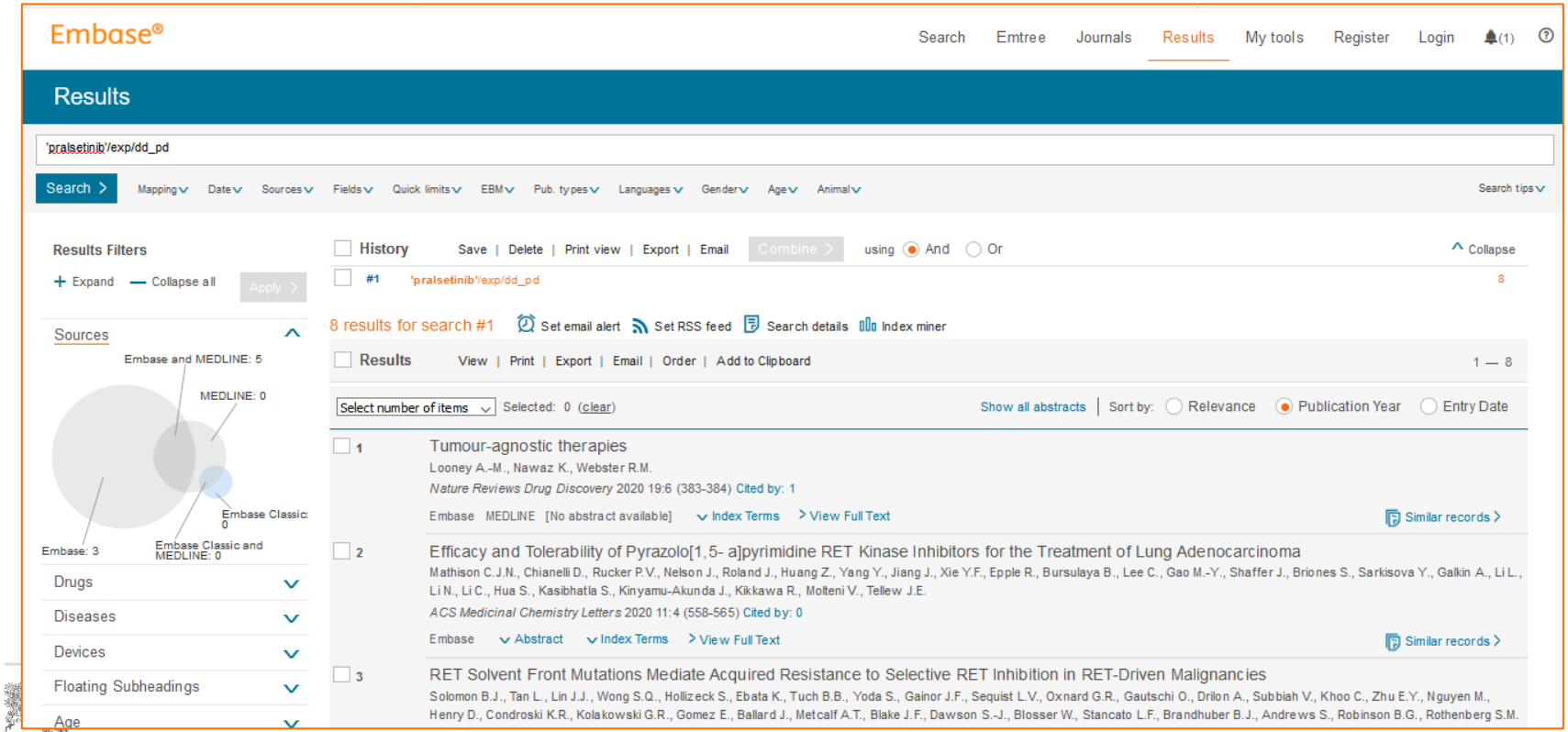
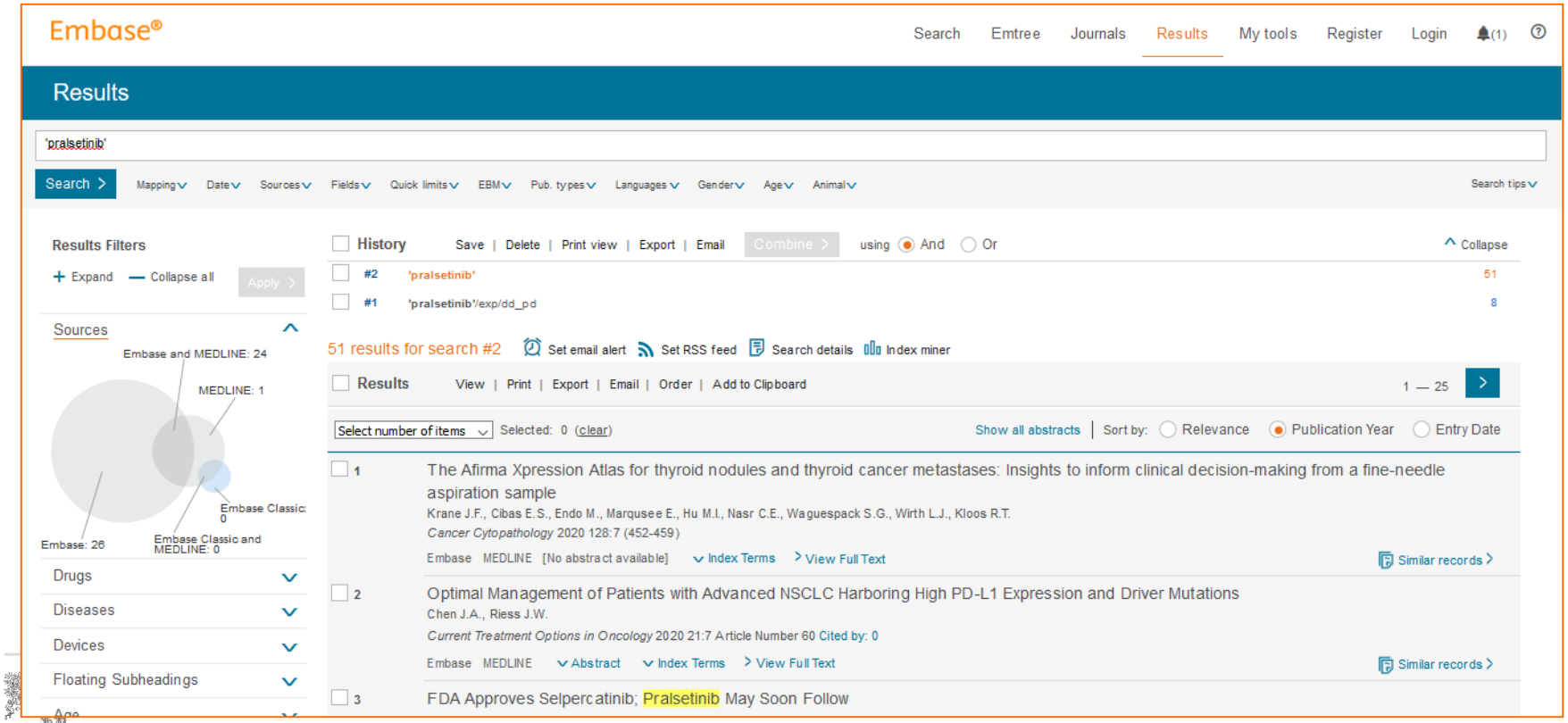
Embase中的结果—pralsetinib的药理学文献



Embase中的结果—pralsetinib的全部文献



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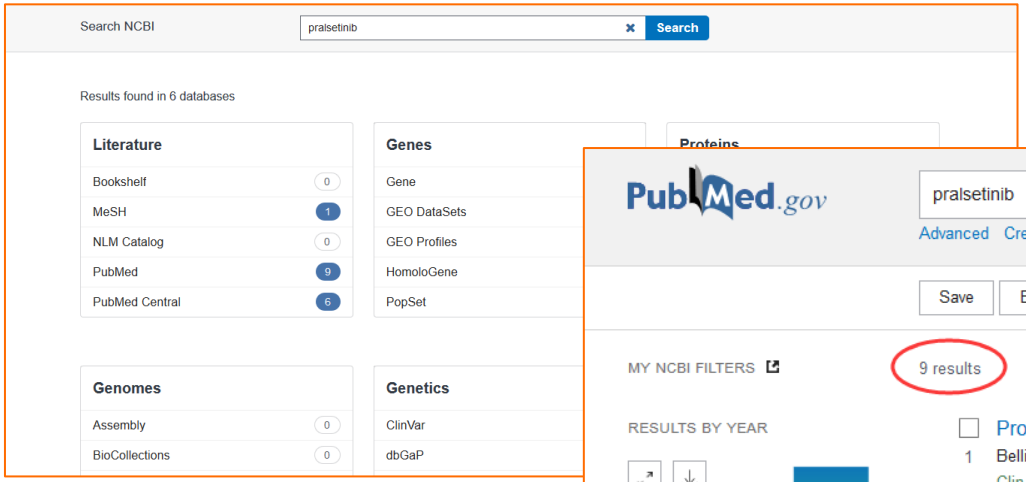
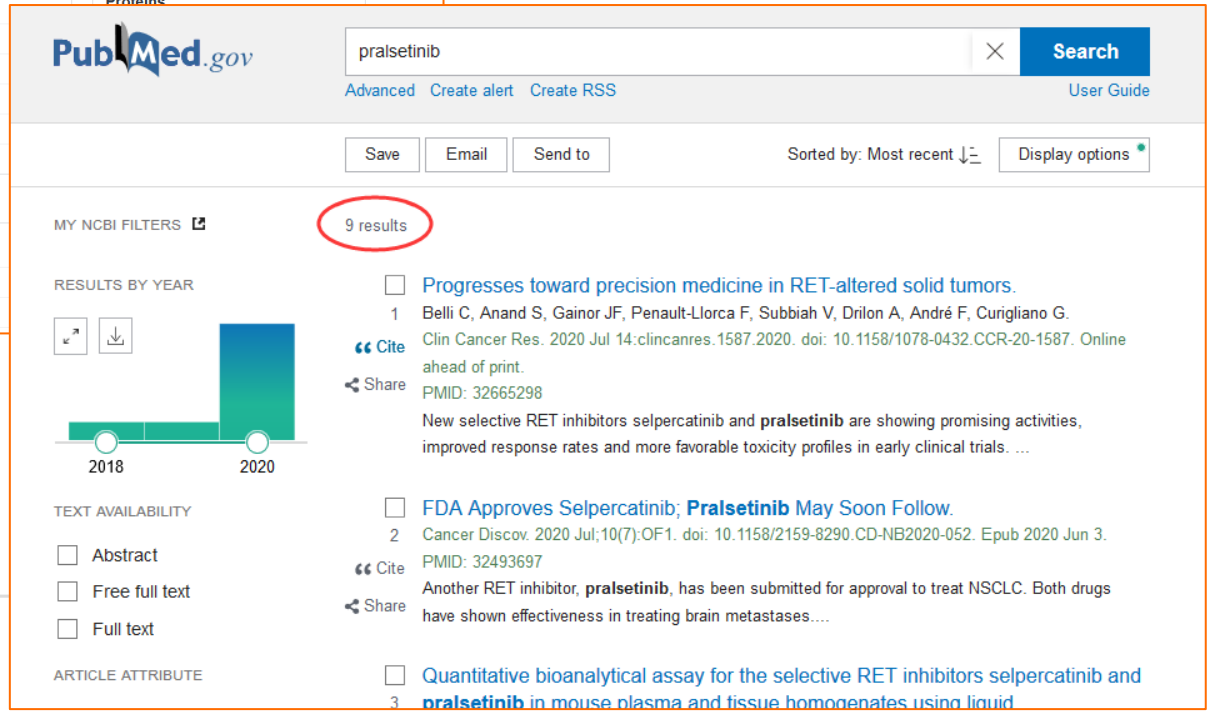
同样的检索，Medline中却只能获取……





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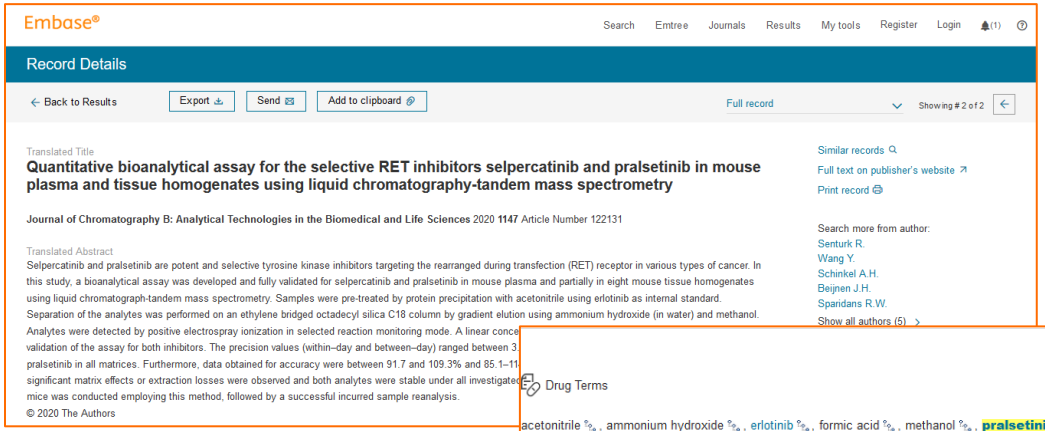
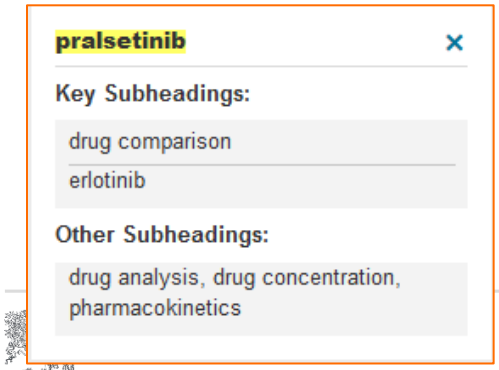
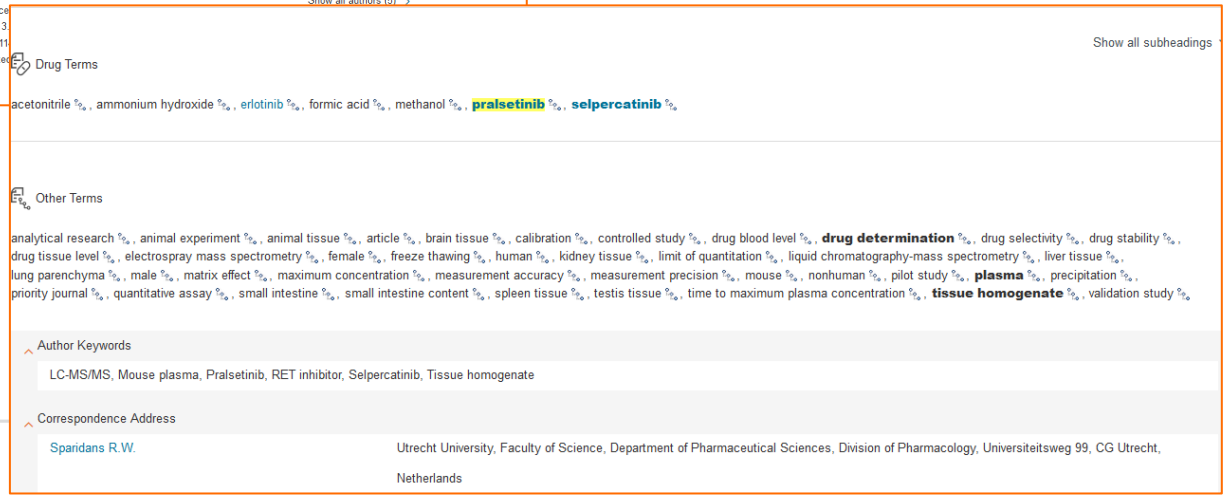
同一条记录在Embase和Medline中的记录—Embase



Embase中的索引从全文出发，直接给出药物在文献中涉及的研究与对比对象，不良反应等





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同一条记录在Embase和Medline中的记录—Medline

Quantitative bioanalytical assay for the selective RET inhibitors selpercatinib and pralsetinib in mouse plasma and tissue homogenates using liquid chromatography-tandem mass spectrometry

Rahime Şentürk [1], Yaogeng Wang [2], Alfred H Schinkel [3], Jos H Beijnen [4], Rolf W

Affiliations + expand

PMID: 32416592 DOI: 10.1016/j.jchromb.2020.122131

Free article

同一条记录在Medline中，却没有索引。

Abstract

Selpercatinib and pralsetinib are potent and selective tyrosine kinase inhibitors targeting the rearranged during transfection (RET) receptor in various types of cancer. In this study, a bioanalytical assay was developed and fully validated for selpercatinib and pralsetinib in mouse plasma and partially in eight mouse tissue homogenates using liquid chromatograph-tandem mass spectrometry. Samples were pre-treated by protein precipitation with acetonitrile using erlotinib as internal standard. Separation of the analytes was performed on an ethylene bridged octadecyl silica C18 column by gradient elution using ammonium hydroxide (in water) and methanol. Analytes were detected by positive electrospray ionization in selected reaction monitoring mode. A linear concentration range of 2-2000 ng/ml was used for the validation of the assay for both inhibitors. The precision values (within-day and between-day) ranged between 3.4 and 10.2% for selpercatinib and 3.1-14.6% for pralsetinib in all matrices. Furthermore, data obtained for accuracy were between 91.7 and 109.3% and 85.1-114.1% for selpercatinib and pralsetinib, respectively. No significant matrix effects or extraction losses were observed and both analytes were stable under all investigated conditions. Finally, a pilot study for selpercatinib in mice was conducted employing this method, followed by a successful incurred sample reanalysis.

Keywords: LC-MS/MS; Mouse plasma; Pralsetinib; RET inhibitor; Selpercatinib; Tissue homogenate.

ELSEVIER

Agenda

- 涉及具体结构的毒性数据的获取
- 涉及具体药物（上市，临床）的毒理药理文献的获取
- FDA/EMA审评文档中毒理药理信息的获取与对比

PharmaPendium(www.pharmapendium.com)

- PharmaPendium是唯一提供上市药物，临床前与临床，药效，药物安全与药代动力学、药物代谢与转运酶，药物不良反应报告等数据的一站式平台；同时还收录此领域的权威期刊书籍内容，如Meyler副反应大全和Mosby用药参考等，助力药物筛选和研发进程。

FDA & EMA所有的approval package（FDA: 1938年- 今， EMA: 1995年— 今）

2.29M+ FDA 审评文件	200K+ EMA 审评文件	9.45M+ FDA 药物不良反应报告	673K+ FDA 咨询委员会会议档案

Extracted Data:	PK Module	MET Module	FDA AERS	Efficacy Module	DDI Risk
4450 种药物的可检索信息	1.6M+ 药代动力学信息	305K+ 药物代谢与转运酶信息	1.66M+ 药物安全信息	2.45M+ 药效信息	115K+ 生物活性信息

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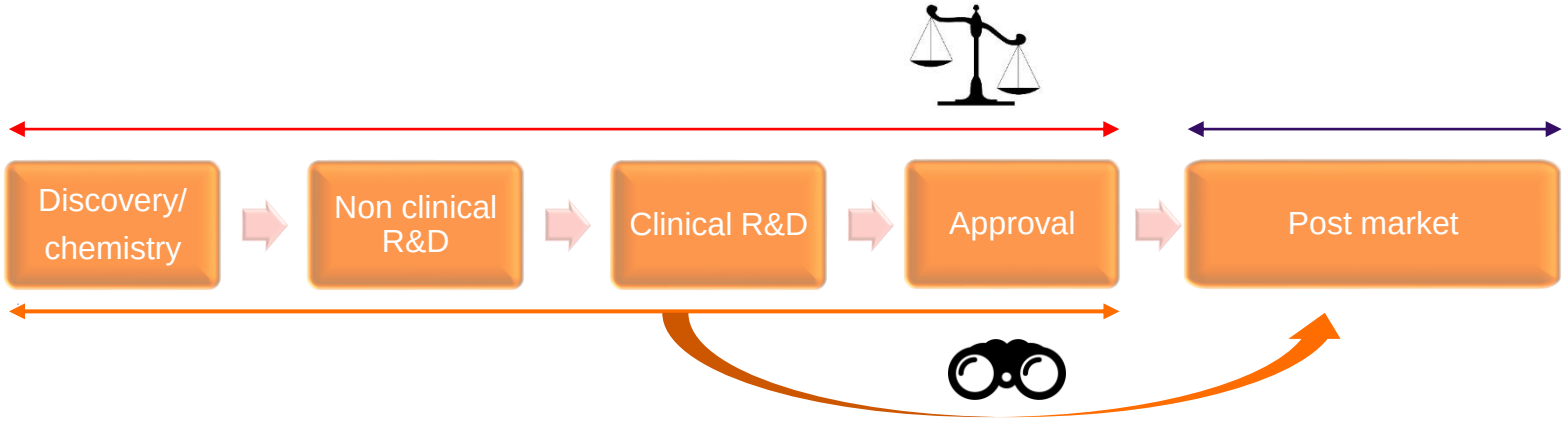
PharmaPendium的主要用途

报批：监管机构将安全性、有效性和可交付性与已上市药品进行比较（风险/效益分析）

只有当药物的性能优于市场上已经上市的药物时，才会批准使用



因此，在开发和批准过程中，您需要充分了解已上市药品的监管数据！！

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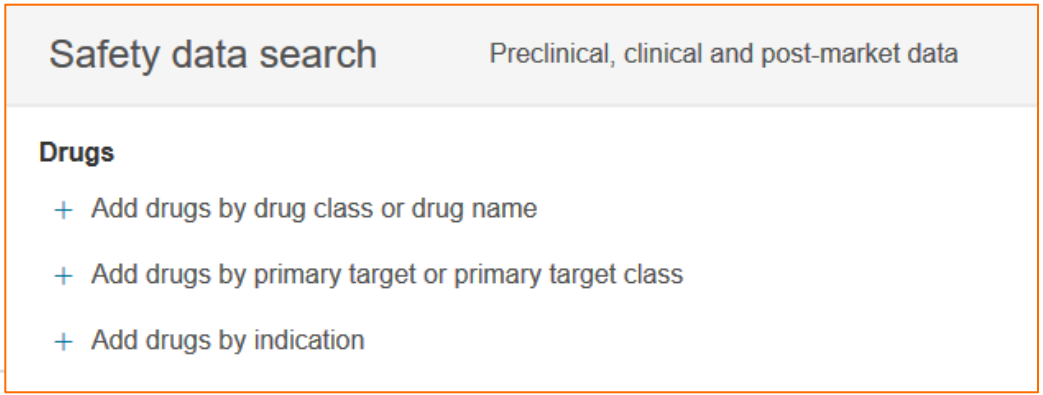
Case 4：FDA/EMA审评文档中毒理药理信息的获取

- 案例要求与背景：
  - 正在开发一个作用域CDK靶点的药物
  - 市场要的CDK药物的QT延长数据如何？
  - 数据影响：监管见解、竞争情报/定位、动物模型选择和安全基准



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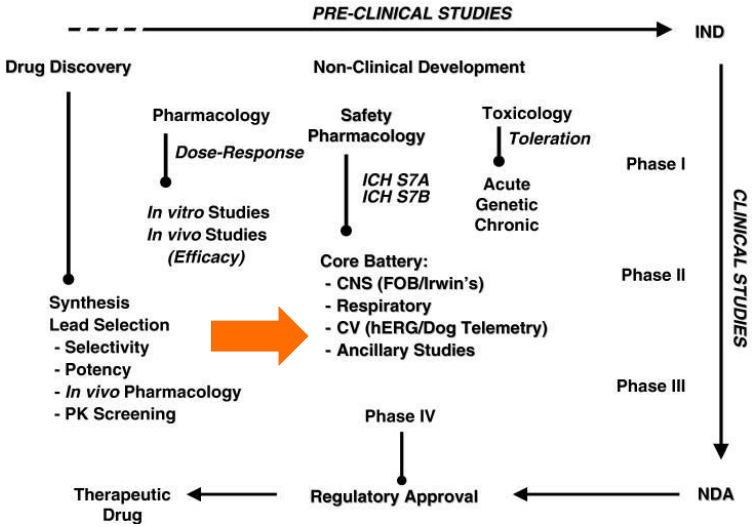
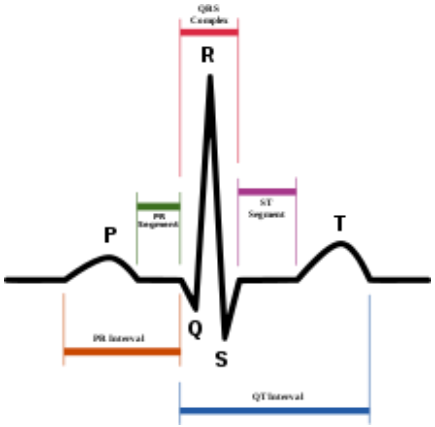
安全药理学——QT延长研究

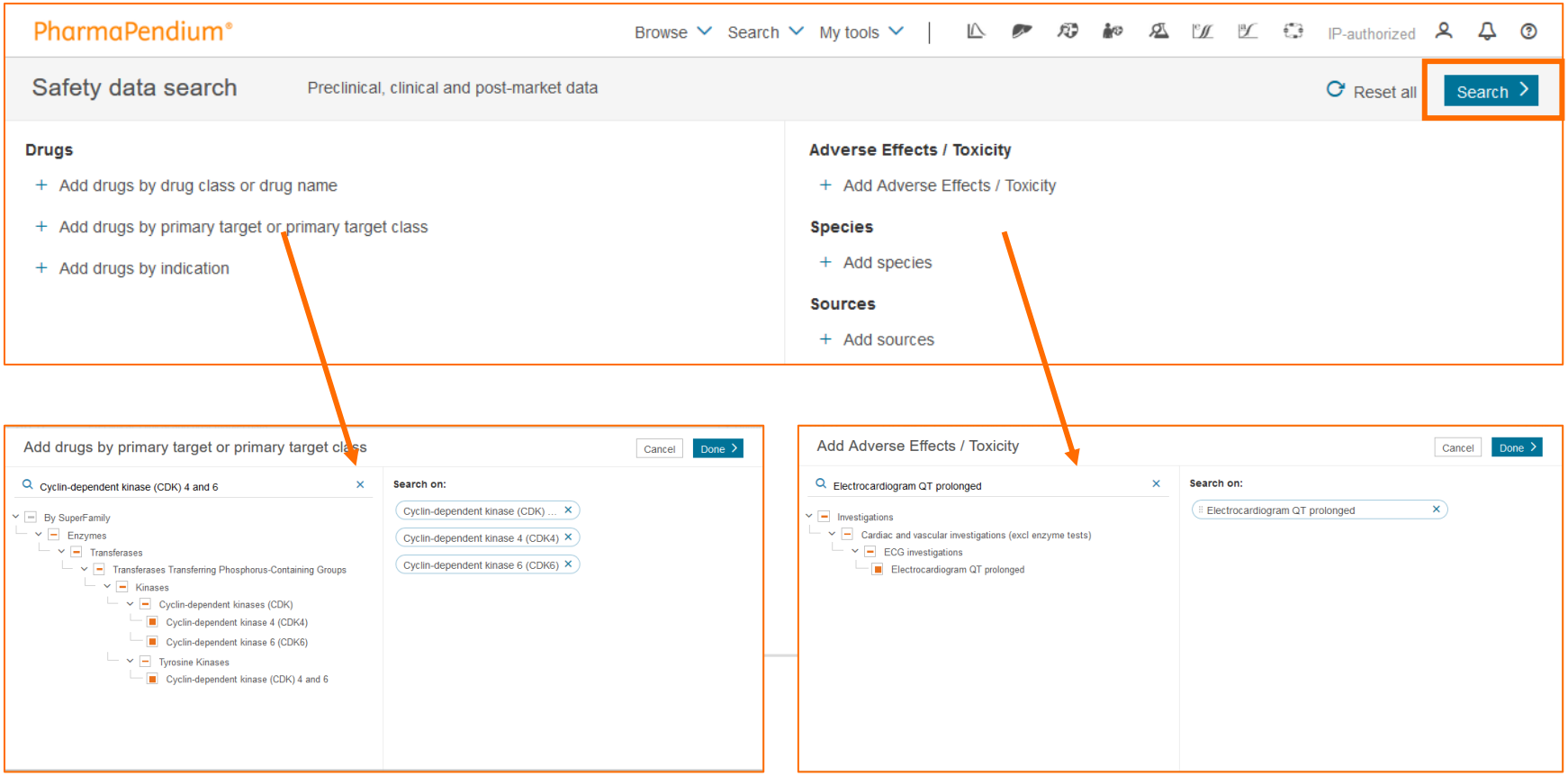


QT间期是测量心脏电周期中Q波开始和T波结束之间的时间。QT间期延长是室性快速心律失常（如尖端扭转）的潜在危险因素，也是猝死的危险因素

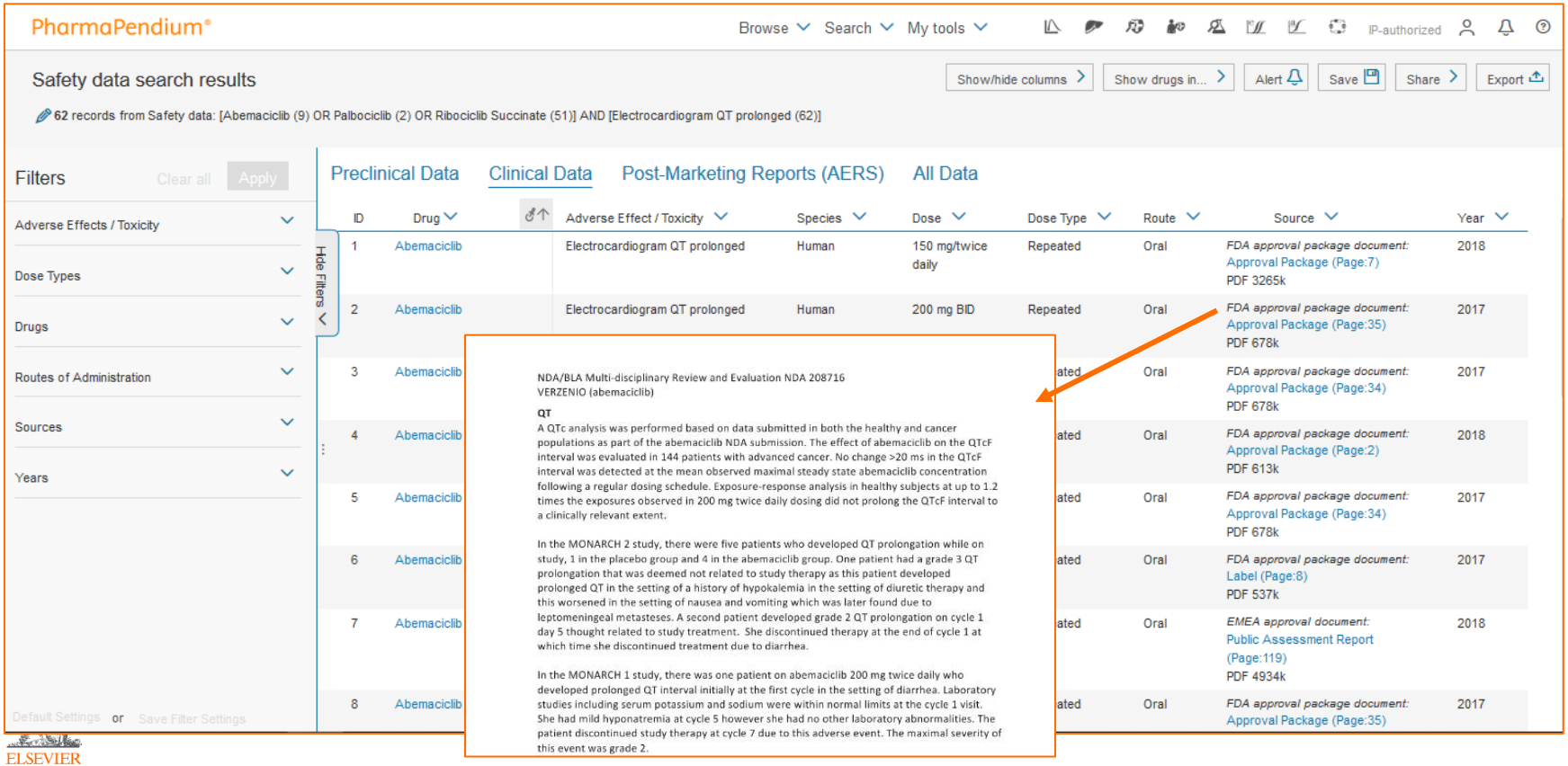


自2005年以来，FDA和EMA要求在一项彻底的QT（TQT）研究中评估几乎所有新的分子实体，以确定药物对QT间期的影响。

Pharmapendium中的检索

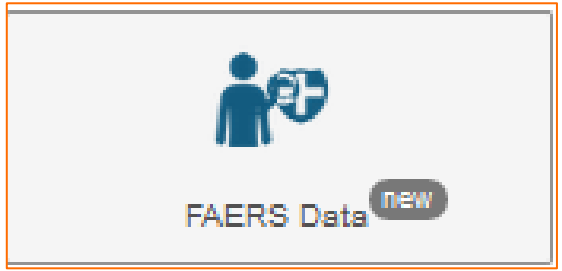


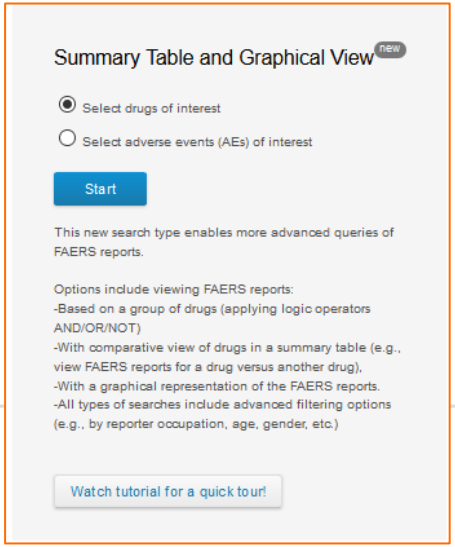
最后的结果



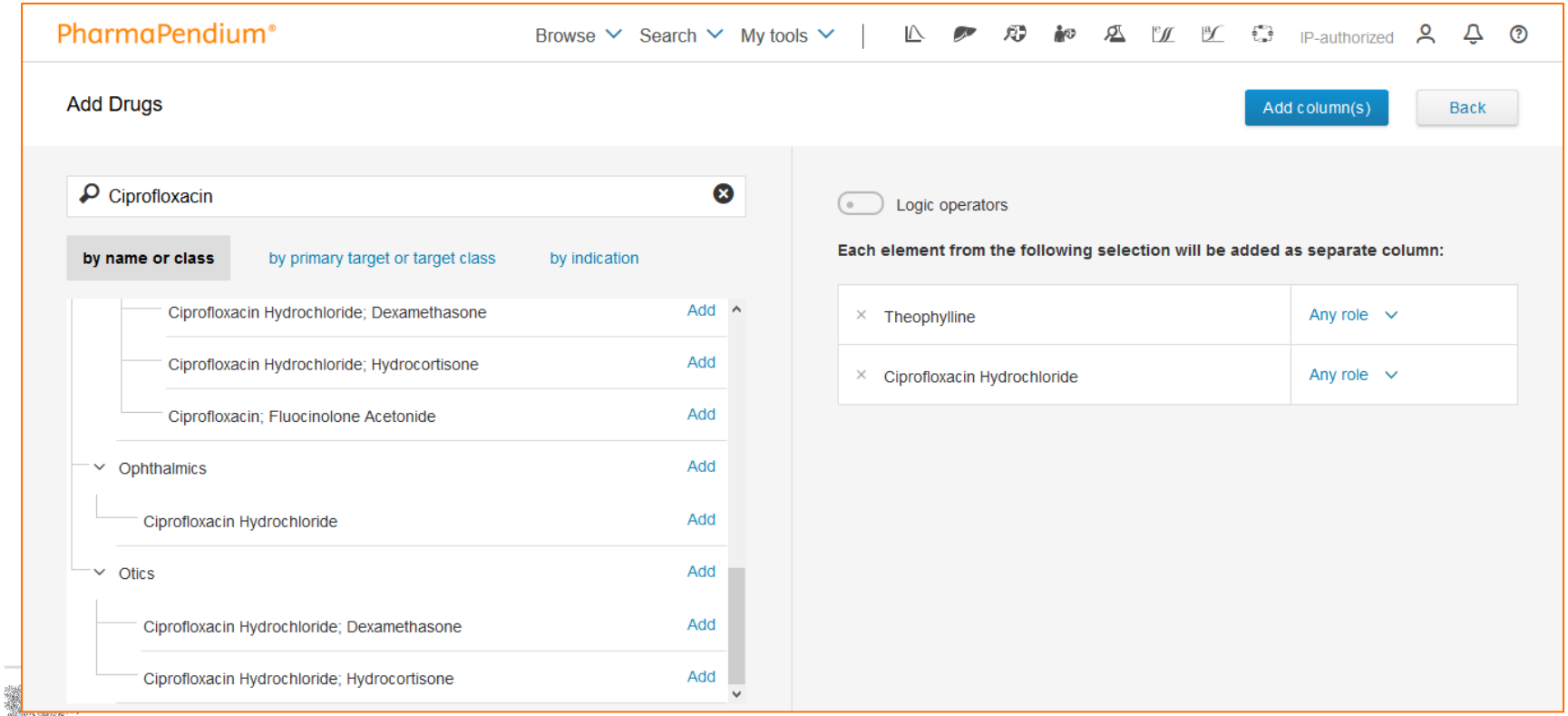
Case 5：DDI数据的查询

- 案例要求与背景：
  - 正在开发COPD的药物，该药物与Theophylline性质很像
  - 我的药物会经常与Ciprofloxacin合用
  - 那么Theophylline和Ciprofloxacin之间是否存在药物相互作用的上市后药代动力学证据？
  - 数据影响：设置正确的测试，降低开发风险并优化标签





Pharmapendium中的检索（依次添加Theophylline与Ciprofloxacin）



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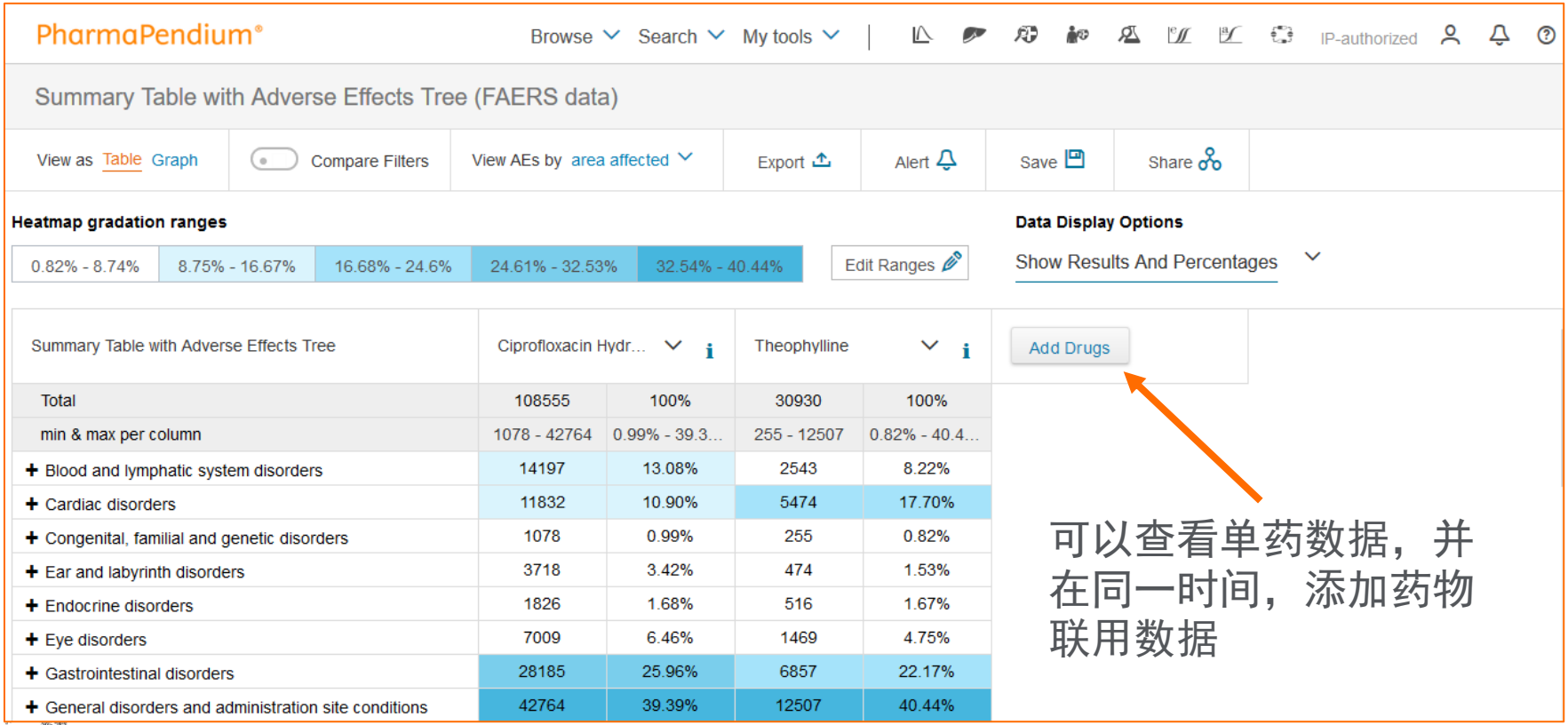
Pharmapendium中结果



可以查看单药数据，并在同一时间，添加药物联用数据

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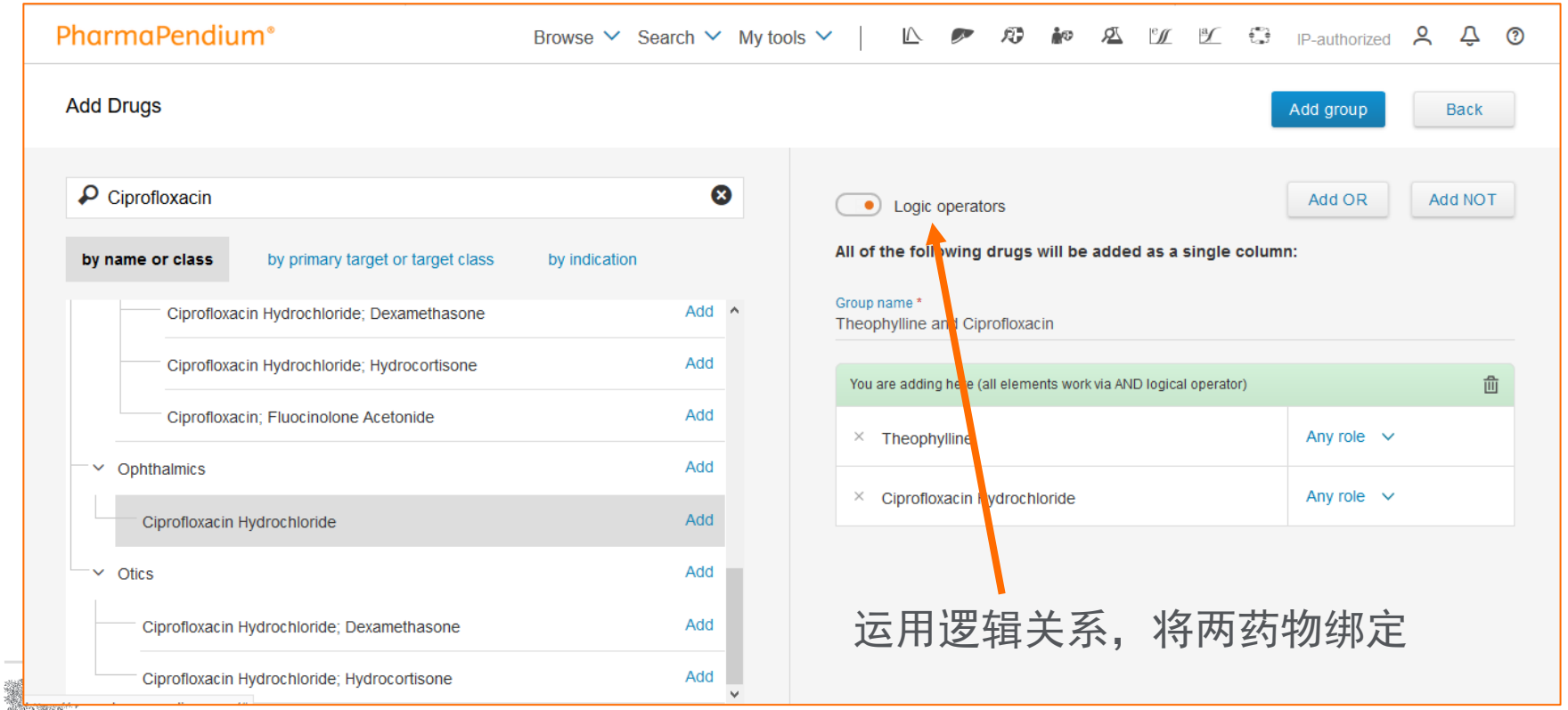
继续添加两药联用的数据



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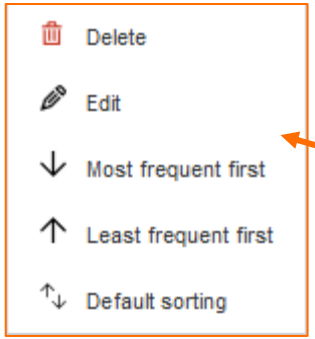
继续添加两药联用的数据



PharmaPendium

Browse Search My tools

Summary Table with Adverse Effects Tree (FAERS data)

View as Table Graph | Compare Filters | View AEs by area affected | Export | Alert | Save | Share

Heatmap gradation ranges

0.39% - 8.91% | 8.92% - 17.44% | 17.45% - 25.97% | 25.98% - 34.5% | 34.51% - 43.04%

Edit Ranges

Data Display Options: Show Results And Percentages

Summary Table with Adverse Effects Tree	Theophylline and Ci...		Ciprofloxacin Hydr...		Theophylline		Add Drugs
Total	776	100%	108555	100%	30930	100%	
min & max per column	3 - 334	0.39% - 43.04%	1078 - 42764	0.99% - 39.39%	255 - 12507	0.82% - 40.44%	
+ General disorders and administration site conditions	334	43.04%	42764	39.39%	12507	40.44%	
+ Infections and infestations	289	37.24%	27561	25.39%	7024	22.71%	
+ Respiratory, thoracic and mediastinal disorders	256	32.99%	17507	16.13%	10669	34.49%	
+ Nervous system disorders	233	30.03%	27773	25.58%	7611	24.61%	
+ Gastrointestinal disorders	232	29.90%	28185	25.96%	6857	22.17%	
+ Investigations	220	28.35%	21915	20.19%	8175	26.43%	
+ Renal and urinary disorders	195	25.13%	17096	15.75%	3588	11.60%	
+ Psychiatric disorders	178	22.94%	15630	14.40%	4586	14.83%	
+ Cardiac disorders	170	21.91%	11832	10.90%	5474	17.70%	
+ Skin and subcutaneous tissue disorders	159	20.49%	19684	18.13%	3824	12.36%	
+ Blood and lymphatic system disorders	134	17.27%	14197	13.08%	2543	8.22%	
+ Metabolism and nutrition disorders	132	17.01%	12036	11.09%	3772	12.20%	
+ Musculoskeletal and connective tissue disorders	122	15.72%	23251	21.42%	4218	13.64%	

单药使用，与联用的不良对比

用柱状图查看直接对比


PharmaPendium
Browse
Search
My tools
Summary Table with Adverse Effects Tree (FAERS data)
View as Table Graph
Compare Filters
View AEs by area affected
Export
Alert
Save
Share
You are here > All effect classes
0%
5%
10%
15%
20%
25%
30%
35%
40%
45%
Blood and lymphatic system disorders
Cardiac disorders
Congenital, familial and genetic disorders
Ear and labyrinth disorders
Endocrine disorders
Eye disorders
Gastrointestinal disorders
General disorders and administration site...
Hepatobiliary disorders
Immune system disorders
Infections and infestations

药物毒理药理学文献的获取

- RMC从大量文献和专利中摘取和物质生物活性相关的数据，帮助科研人员获得标准化，规范化，格式化的数据列表及参考文献
- PharmaPendium帮助全面获取上市药物的监管数据，可以为实验方案的设计，产品定位提供全方位的数据支持
- Embase是全球最大的生物医药文献类数据库，也是最大的毒理药理学数据库，其内部的三级索引体系，为科研人员快速获取文献，提供了强大的工具支持
- Elsevier Life Science培训中心
  - https://www.elsevier.com/zh-cn/rd-solutions/pharma-and-life-sciences-solutions/life-sciences-online-training-center

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Thank you