

フッ素系医薬のレビュー

(公財)相模中央化学研究所

井上 宗宣

2021年7月2日

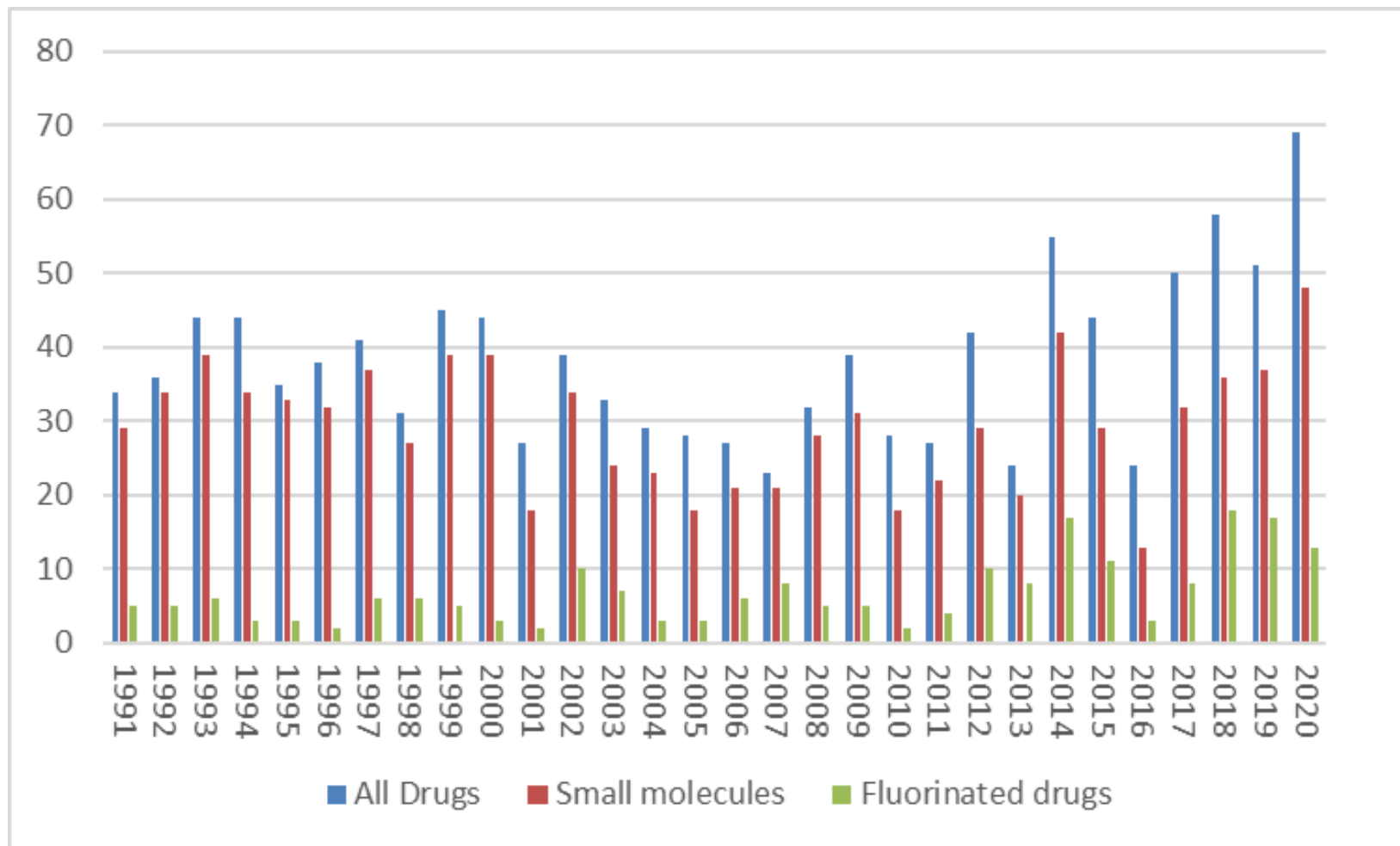
inoue@sagami.or.jp

世界の新薬数と含フッ素医薬数(1991～2020)

30年間で1141品目の新薬(うち887品目が低分子)が上市
含フッ素新薬は204品目(新薬中の約18%、低分子中の約23%)*

*(Annual Reports in Medicinal Chemistryより(2014年まで)、

KEGG DRUG HP(http://www.kegg.jp/kegg/drug/drug_ja.html)より(2015年以降、日米欧のみ))



全含フッ素医薬農薬数

・含フッ素医薬の全構造(2019年迄)

Munenori Inoue, M, Yuji Sumii, Norio Shibata. Contribution of Organofluorine Compounds to Pharmaceuticals. *ACS Omega*, **2020**, 5, 10633-10640. (open access)

<https://pubs.acs.org/doi/10.1021/acsomega.0c00830>

(2020年までに承認された全フッ素医薬数:353)

・含フッ素農薬の全構造(2019年迄)

Yuta Ogawa, Etsuko Tokunaga, Osamu Kobayashi, Kenji Hirai, Norio Shibata. Current Contributions of Organofluorine Compounds to the Agrochemical Industry. *iScience* **2020**, 23 (9) , 101467. (open access)

<https://www.sciencedirect.com/science/article/pii/S2589004220306593?via%3Dihub>

(2021年6月までに上市された全フッ素農薬数:除草剤:115;殺菌剤:65;殺虫剤:94)

2021年度フッ素相模セミナー資料(相模中研平井作成)より

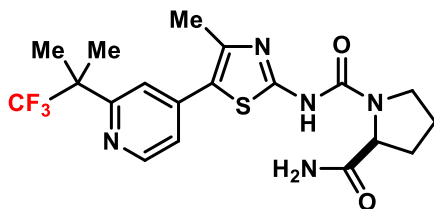
含フッ素医薬の構造

2020年12月31日までに353品の含フッ素医薬が承認されている。

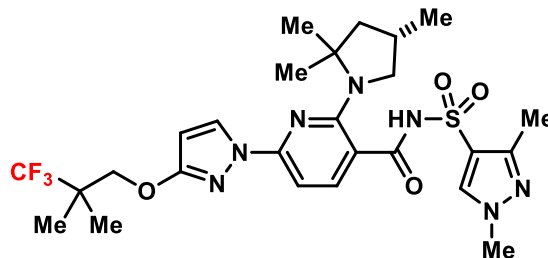
[illegible]

2019年承認含フッ素医薬

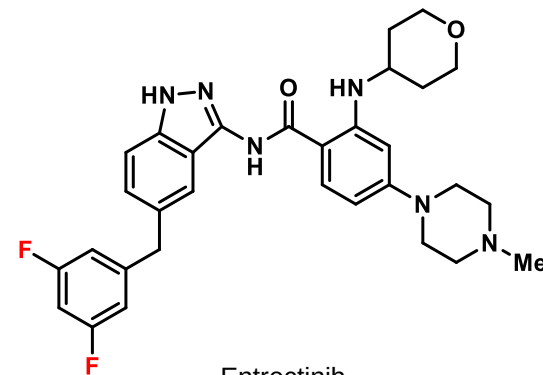
2019年: 下記含フッ素医薬品(17品目)が認可



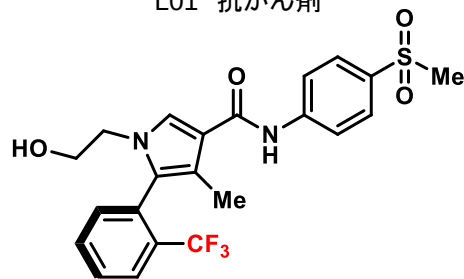
Alpelisib
L01 抗がん剤



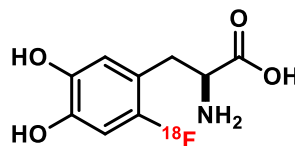
Elexacaftor
CFTR調節薬



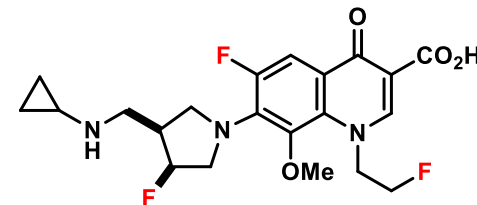
Entrectinib
L01 抗がん剤



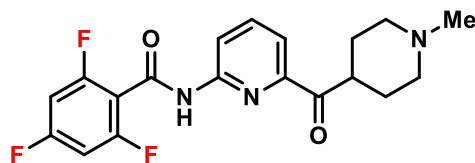
esaxerenone
C 降圧薬
非ステロイド選択的
ミネラルコルチコイド受容体(MR)拮抗薬



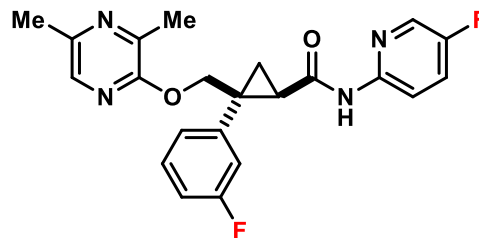
fluorodopa (F18)
Vがん検出用診断用放射性医薬品



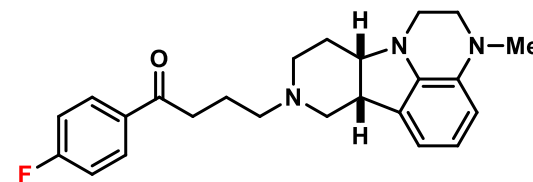
Lascufloxacin
J01 抗菌薬



Lasmiditan
抗片頭痛薬



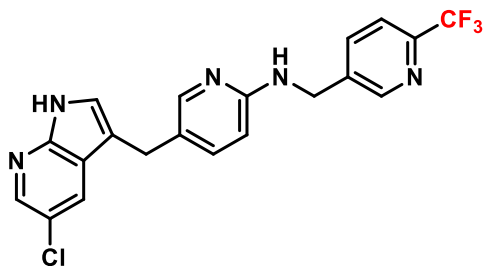
lemborexant
催眠薬



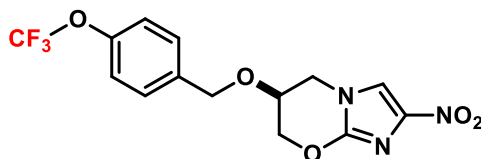
Lumateperone
統合失調症治療薬

2019年承認含フッ素医薬

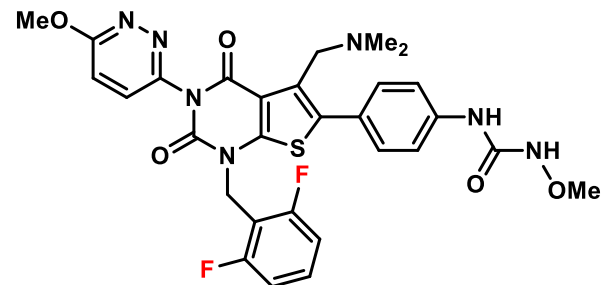
2019年: 下記含フッ素医薬品(17品目)が認可



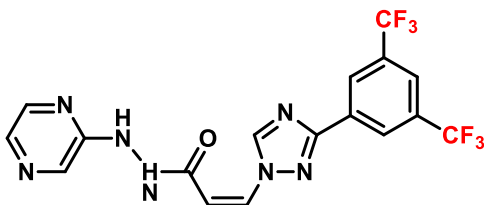
Pexidartinib
L01 抗がん剤



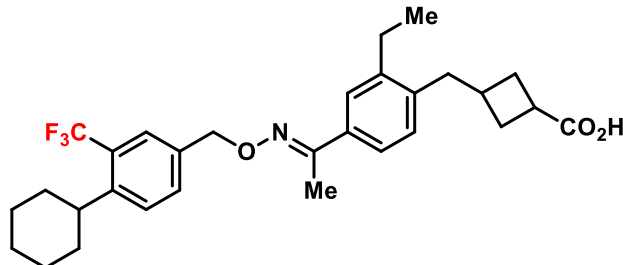
Pretomanid
JO4 抗結核薬



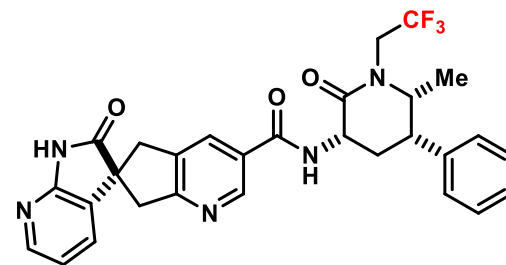
relugolix
L01 子宮筋腫治療薬



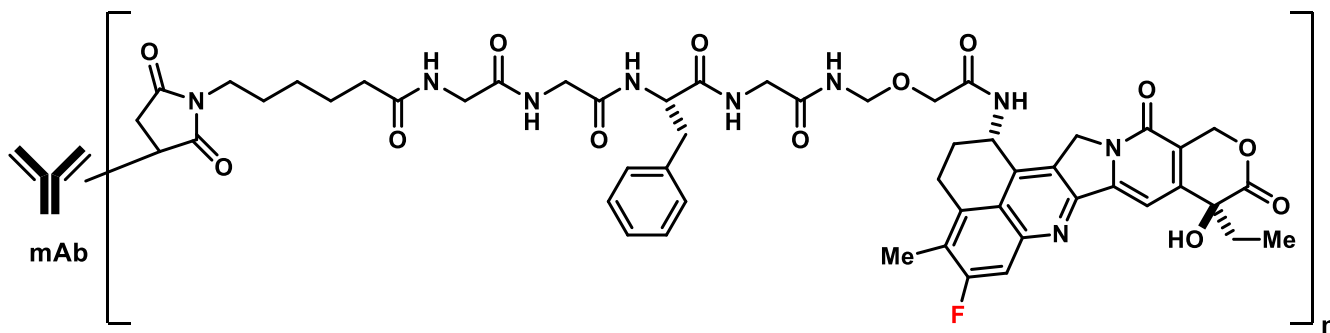
Selinexor
L01 抗がん剤



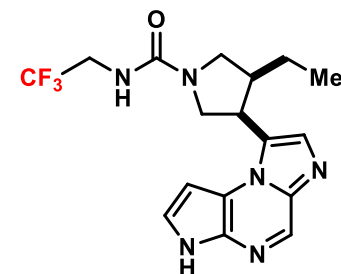
siponimod
L04
多発性硬化症治療薬



Ubrogепant
抗片頭痛薬



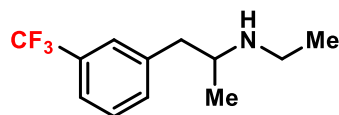
trastuzumab deruxtecan
L01 抗がん剤



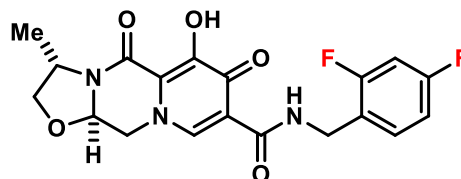
Upadacitinib
L04 抗リウマチ薬

2020年承認含フッ素医薬

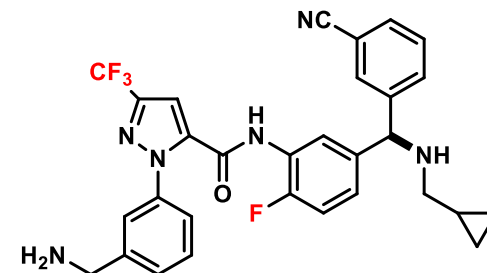
2020年：下記含フッ素医薬品（14品目）が認可（Fenfluramineは新薬とせず）



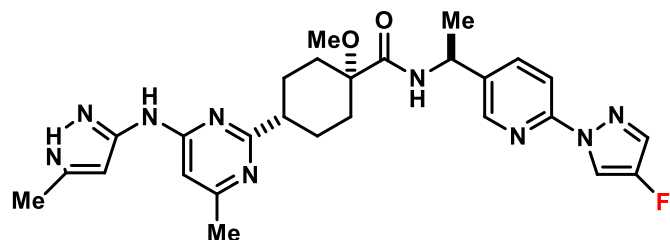
Fenfluramine
N05
(新薬としてはカウントせず)



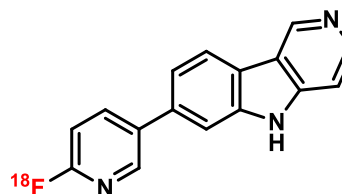
Cabotegravir
J05抗ウイルス薬



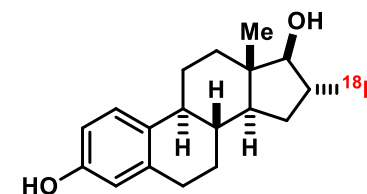
Berotralstat
血管浮腫治療薬



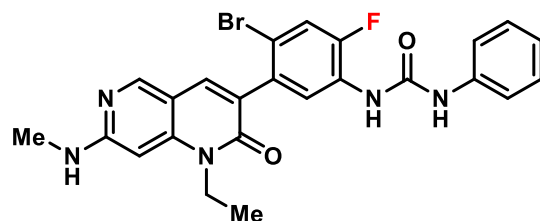
Pralsetinib
L01 抗がん剤



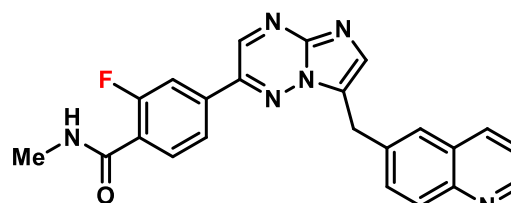
Flortaucipir F 18
Ⅴ アルツハイマー病



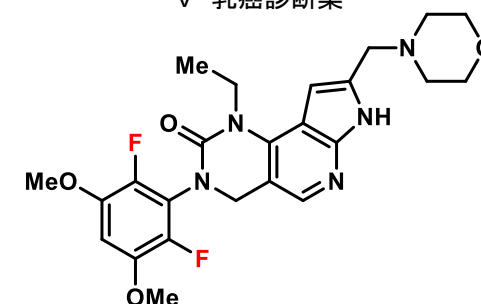
Fluoroestradiol F18
Ⅴ 乳癌診断薬



Ripretinib
L01 抗がん剤



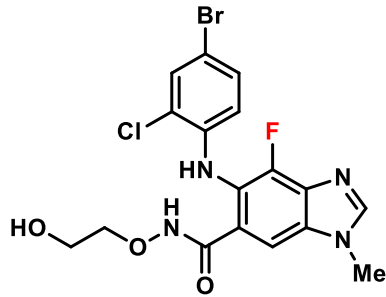
Capmatinib
L01 抗がん剤



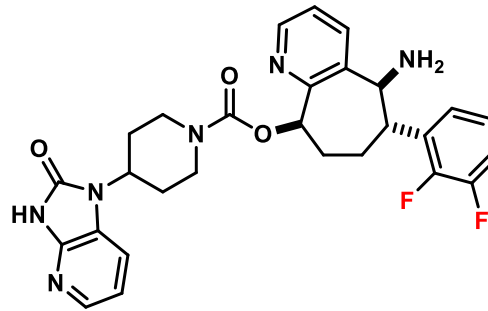
Pemigatinib
L01 抗がん剤

2020年承認含フッ素医薬

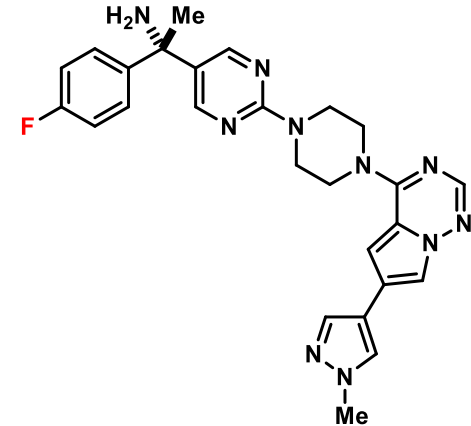
2020年: 下記含フッ素医薬品(13品目)が認可



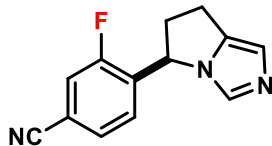
Selumetinib
L01 抗がん剤



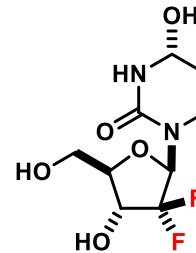
Rimegepant
抗片頭痛薬



Avapritinib
L01 抗がん剤



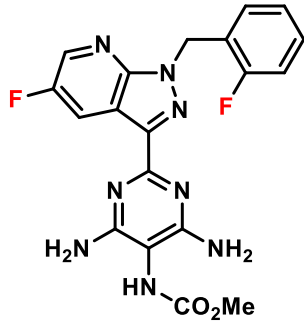
Osilodrostat
H02 クッシング症候群治療薬



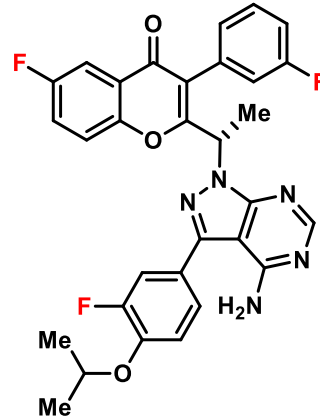
Cedazuridine
L01 抗がん剤

2021年承認含フッ素医薬

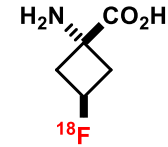
2021年：下記含フッ素医薬品（4品目）が認可



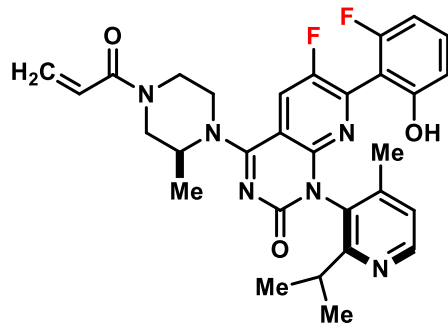
Vericiguat
C01血管拡張薬



Umbralisib
L01 抗がん剤



fluciclovine F-18
V がん診断薬



Sotorasib
L01 抗がん剤

医薬品のATC分類

Anatomical Therapeutic Chemical Classification by WHO

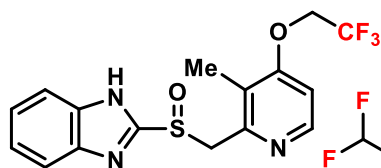
- A: alimentary tract and metabolism
(消化器官用薬、代謝器官用薬)
- B: blood and blood forming organs
(血液・体液用薬)
- C: cardiovascular system
(循環器官用薬)
- D: dermatologicals
(外皮用薬)
- G: genito-urinary system and sex hormones
(泌尿生殖器官用薬、性ホルモン剤)
- H: systemic hormonal preparations, excluding sex hormones and insulins
(性ホルモン及びインスリンを除いたホルモン剤)
- J: anti-infectives for systemic use
(抗感染症剤)
- L: antineoplastic and immunomodulating agents
(抗癌剤、免疫調節薬)
- M: musculo-skeletal system
(筋骨格系薬)
- N: nervous system
(神経系用薬)
- P: antiparasitic products, insecticides and repellents
(寄生動物に対する薬)
- R: respiratory system
(呼吸器官用薬)
- S: sensory organs
(感覚器官用薬)
- V: various
(その他)

A:消化器官用薬・代謝器官用薬

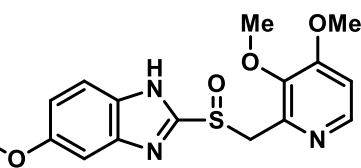
A02: 消化性潰瘍治療薬

制酸剤
H₂-受容体アンタゴニスト

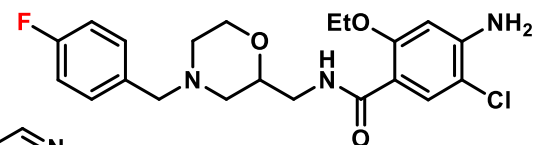
⇒ プロトンポンプ阻害剤



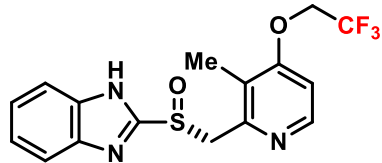
lansoprazole (J)
1992



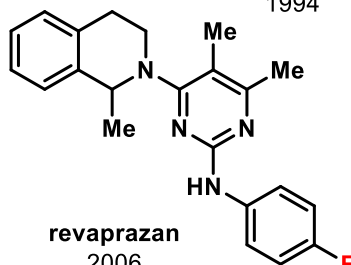
pantoprazole
1994



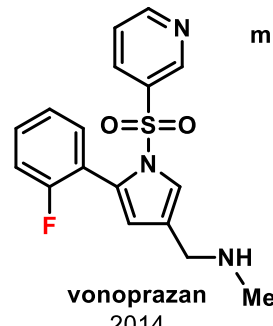
mosapride (J)
1998
慢性胃炎



dexlansoprazole
2009



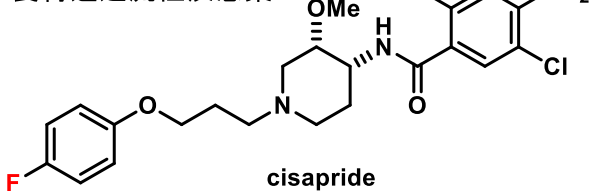
revaprazan
2006



vonoprazan
2014

A03: 腸

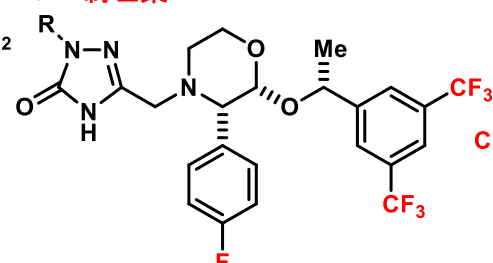
食胃道逆流性疾患薬



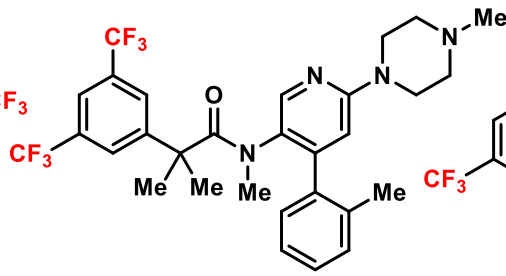
cisapride
1988

(使用されているが、瑚的)

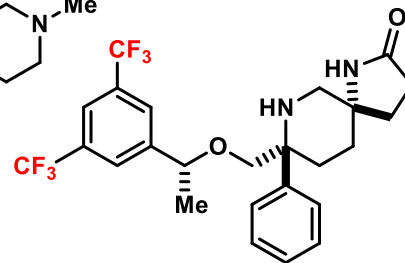
A04: 制吐薬



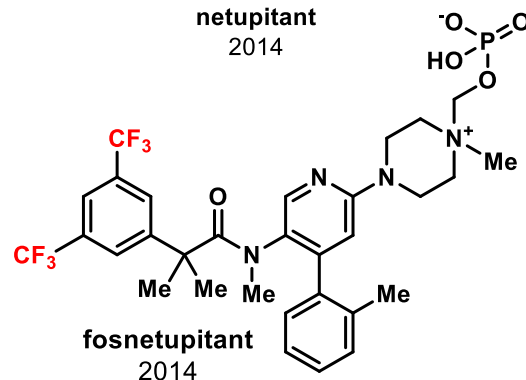
aprepitant (J) (R = H)
2003
fosaprepitant
(R = P(O)(OH)₂)
2008



netupitant
2014



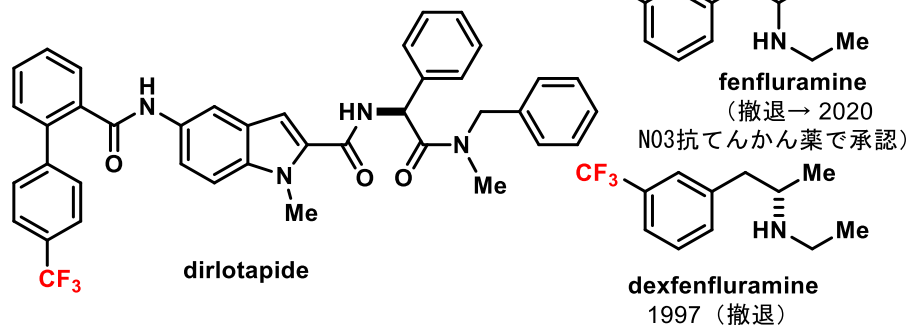
rolapitant
2015



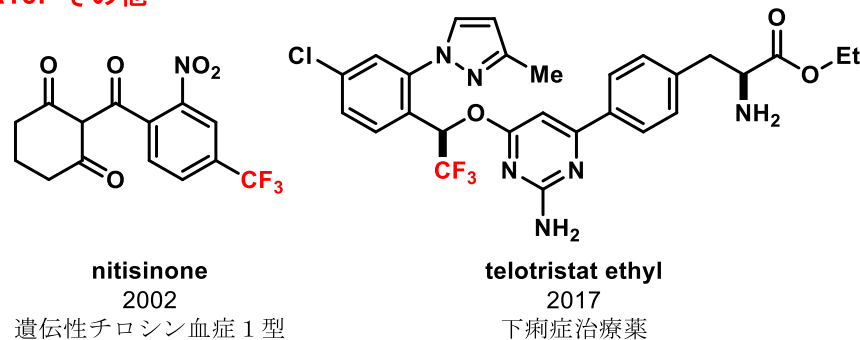
fosnetupitant
2014

A:消化器官用薬・代謝器官用薬

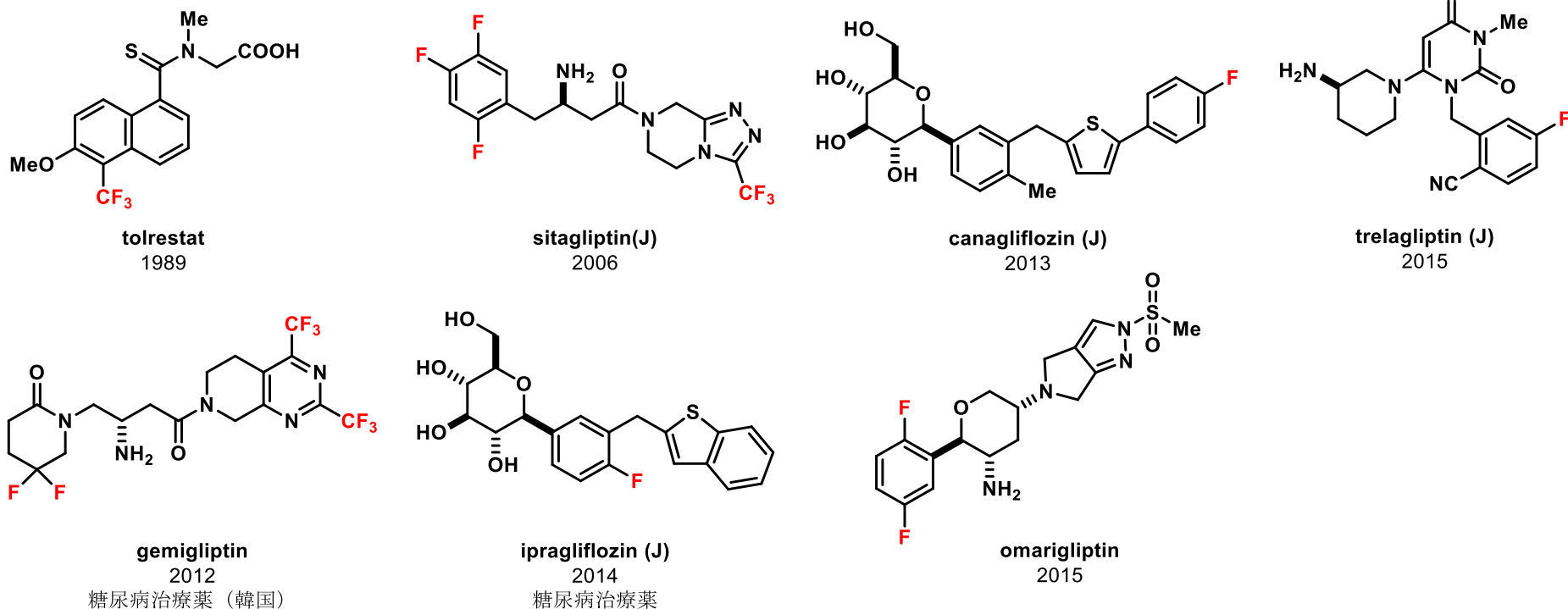
A08: 抗肥満薬



A16: その他

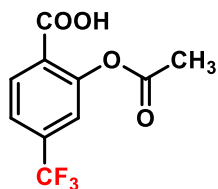


A10: 糖尿病治療薬

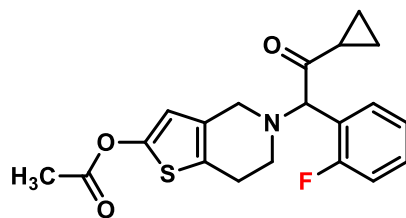


B:血液・体液用薬

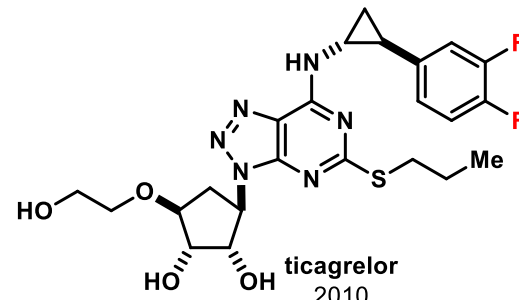
B01: 抗血栓症



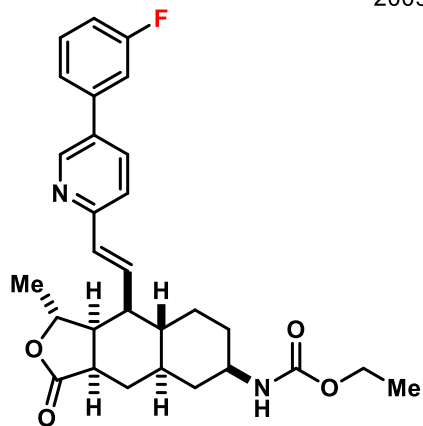
triflusal



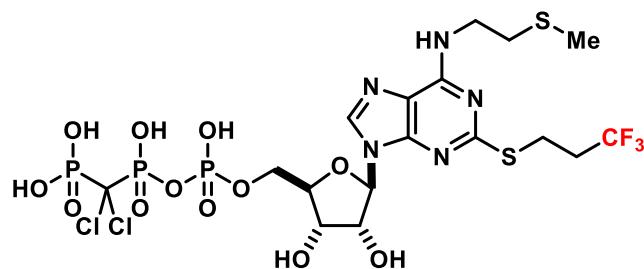
prasugrel
2009



ticagrelor
2010

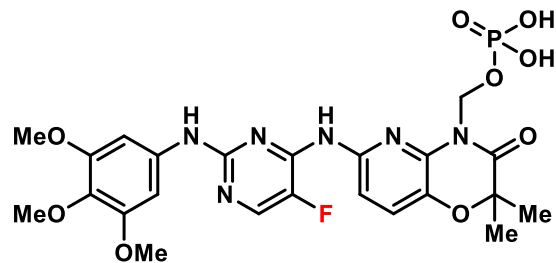


vorapaxar
2014



cangrelor
2015

B02:

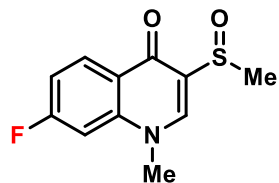


fostamatinib
2018

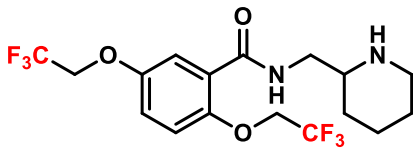
血小板減少症治療薬

C:循環器官用薬

C01: 心臓病治療

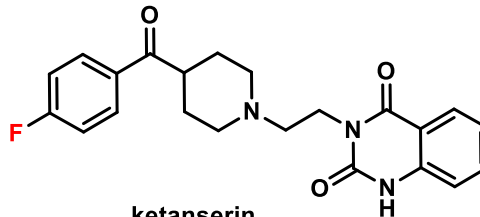


flosequinan
1992
血管拡張剤

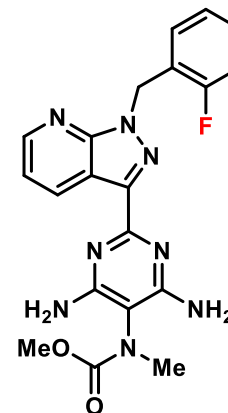


flecainide (J)
抗不整脈薬

C02: 血圧降下剤

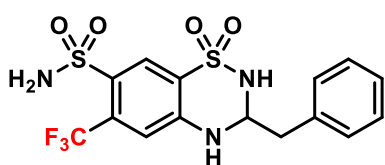


ketanserin
1985
5HT₂ & α 受容体
遮断薬

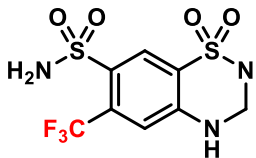


riociguat (J)
2013
高血圧症薬

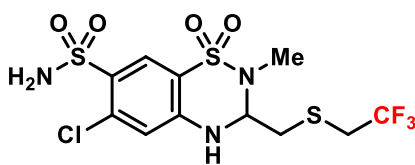
C03: 利尿薬



bendroflumethiazide

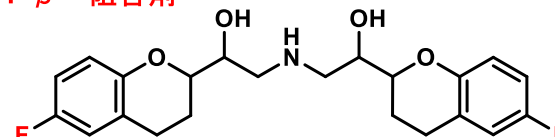


hydroflumethiazide

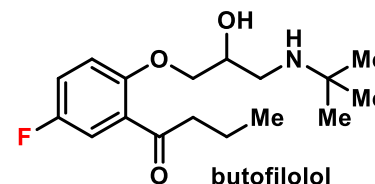


polythiazide

C07: β-阻害剤

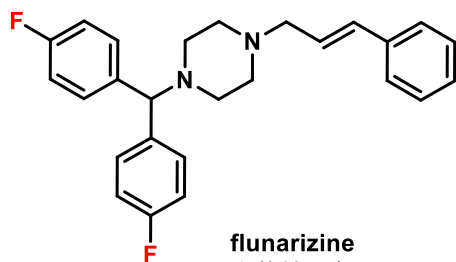


nebivolol
1997
血圧降下剤

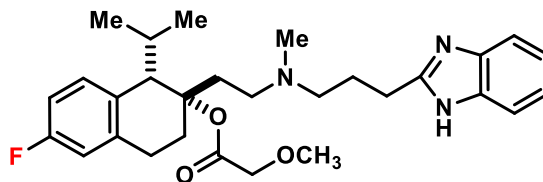


butofilolol
血圧降下剤

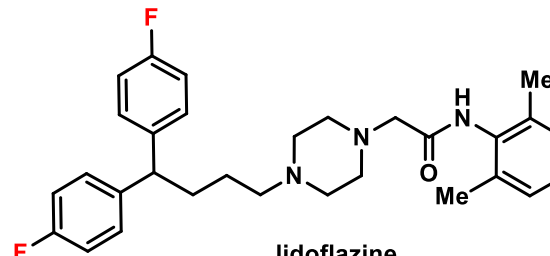
C08: カルシウムチャンネル阻害剤



flunarizine
血管拡張剤



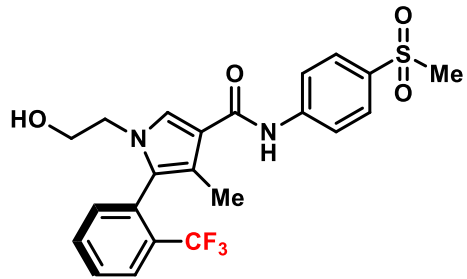
mibefradil
1997(withdrawn in 1998)
血圧降下剤



lidoflazine

C:循環器官用薬

分類不明



esaxerenone

2019

降圧薬

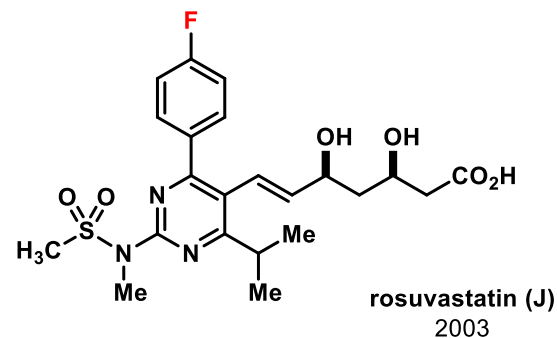
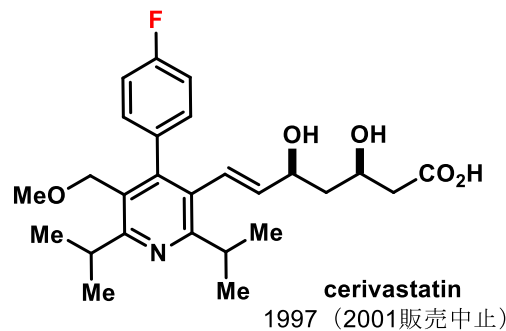
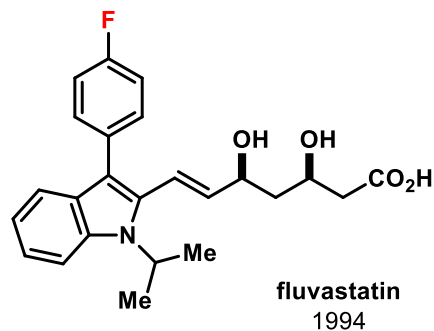
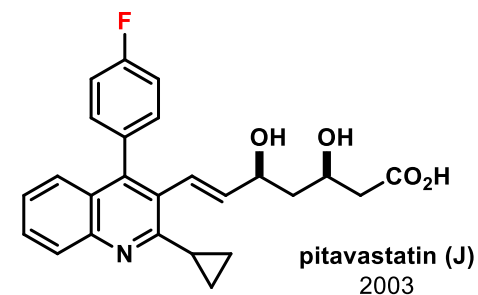
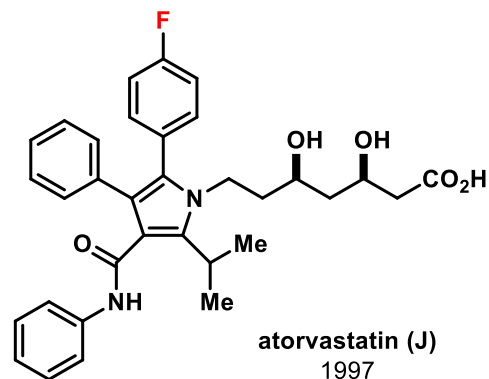
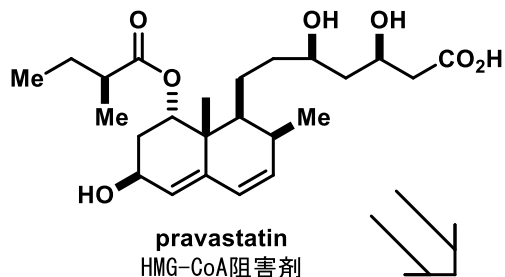
非ステロイド選択的

ミネラルコルチコイド受容体 (MR) 拮抗薬

C:循環器官用薬(抗高脂血症用薬)

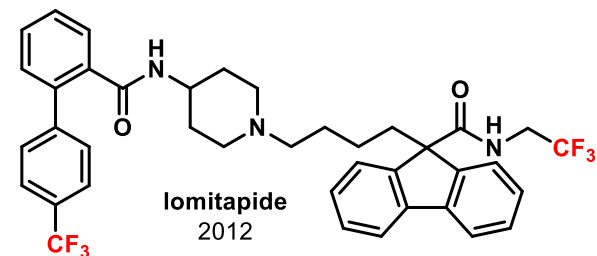
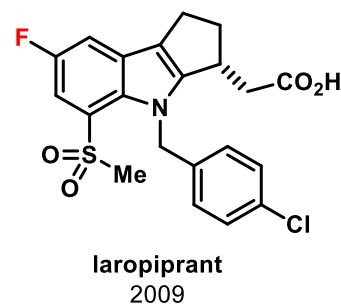
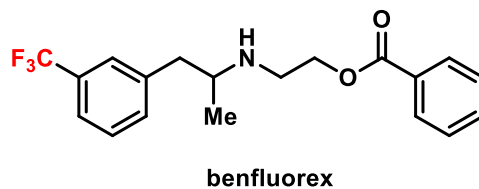
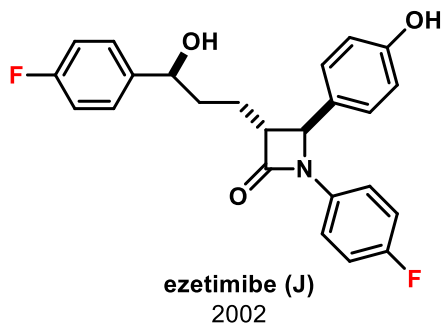
C10 高脂血症用薬

C10-1 プラバスタチン誘導体



C10-2 その他

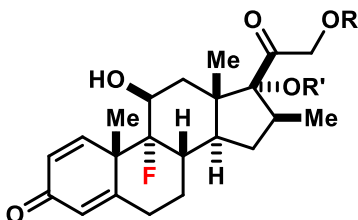
コレステロール吸収阻害剤



D07:副腎皮質ステロイド(抗炎症薬)－1

9位フッ素化体

17-オール



betamethasone (J) ($R = R' = H$)

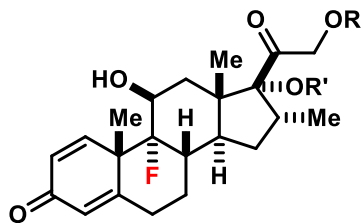
betamethasone acetate ($R = Ac$, $R' = H$)

betamethasone butyrate propionate ($R = C(O)Et$, $R' = C(O)Pr$)

betamethasone dipropionate ($R = R' = C(O)Et$)

betamethasone sodium phosphate ($R = P(O)(ONa)_2$, $R' = H$)

betamethasone valerate ($R = H$, $R' = C(O)Bu$)



dexamethasone (J) ($R = R' = H$)

dexamethasone acetate ($R = Ac$, $R' = H$)

dexamethasone cipeclate ($R = C(O)\text{-cyclopropyl}$, $R' = C(O)\text{-cyclohexyl}$)

dexamethasone sodium phosphate ($R = P(O)(ONa)_2$, $R' = H$)

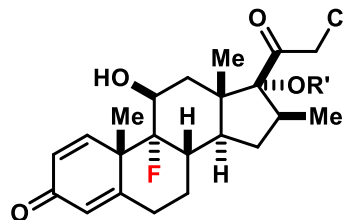
dexamethasone linoleate ($R = \text{linoleoyl}$, $R' = H$)

dexamethasone metasulfobenzoate sodium (J) ($R = C(O)\text{-(}m\text{-SO}_3\text{Na)Ph}$, $R' = H$)

dexamethasone palmitate (J) ($R = C(O)C_{15}H_{31}$, $R' = H$)

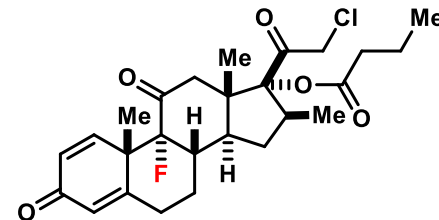
dexamethasone propionate (J) ($R = R' = C(O)Et$)

dexamethasone valerate (J) ($R = H$, $R' = C(O)Bu$)

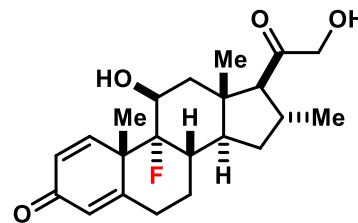


clobetasol ($R' = H$)

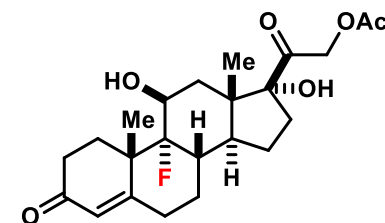
clobetasol propionate (J) ($R' = C(O)Et$)



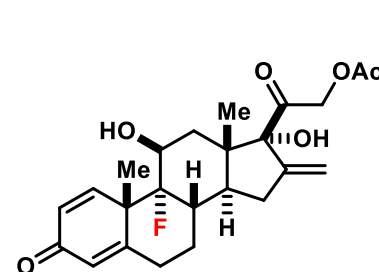
clobetasone butyrate (J)



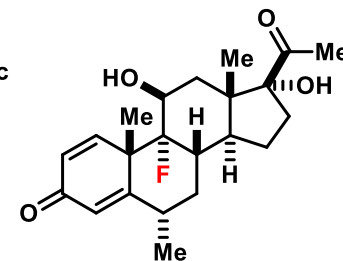
desoximetasone



fludrocortisone acetate (J)



flupredniden acetate

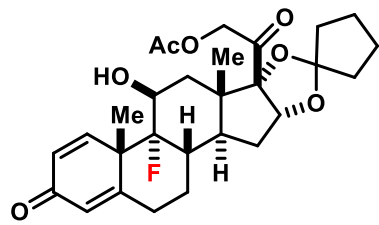


fluorometholone (J)

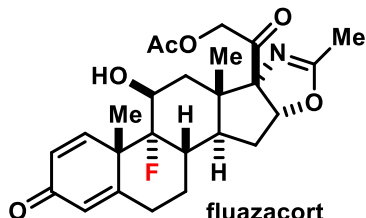
D07:副腎皮質ステロイド(抗炎症薬)－1

9 位フッ素化体

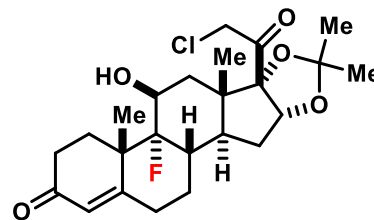
16, 17-ジオール



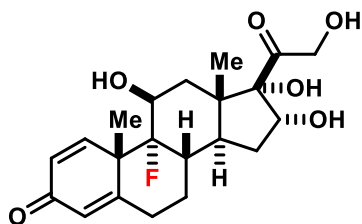
amcinonide (J)



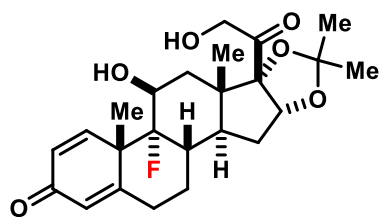
fluazacort



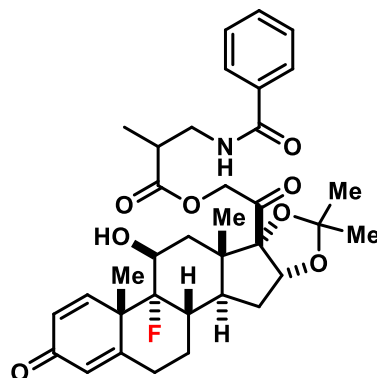
halcinonide (J)



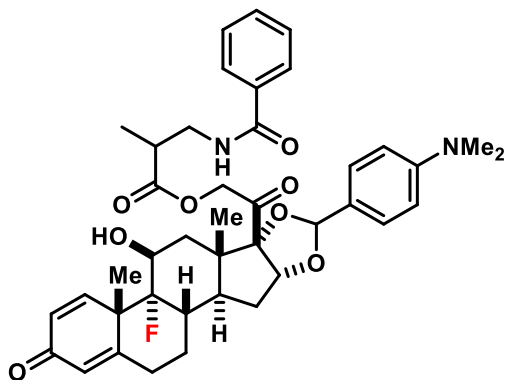
triamcinolone (J)



triamcinolone acetonide (J)

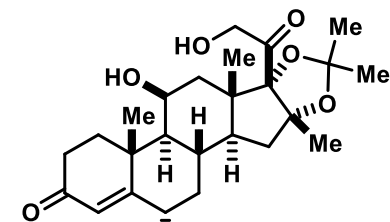


triamcinolone benetonide

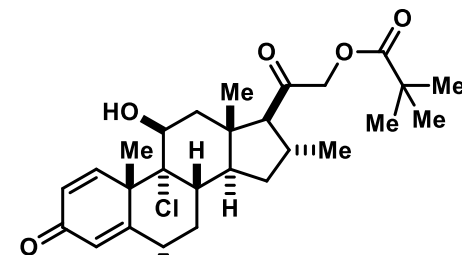


triamcinolone aminobenzal
benzamidoisobutyrate

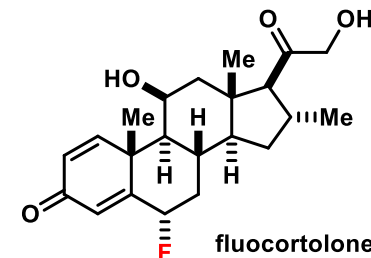
6 位フッ素化体



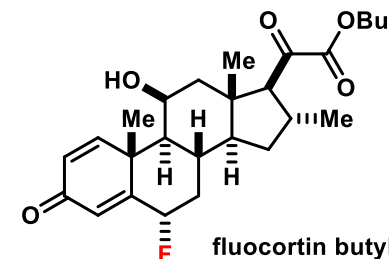
fludroxycortide (J)



clocortolone pivalate



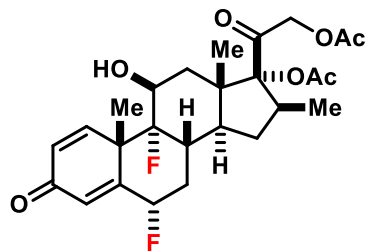
fluocortolone



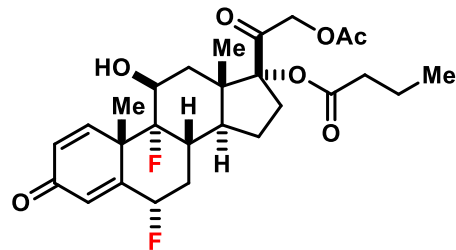
fluocortin butyl

D07:副腎皮質ステロイド(抗炎症薬)－2

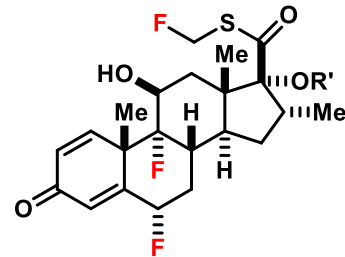
6, 9 位ジフッ素化体



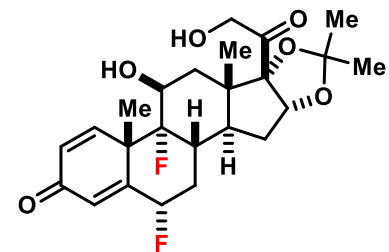
diflorasone diacetate



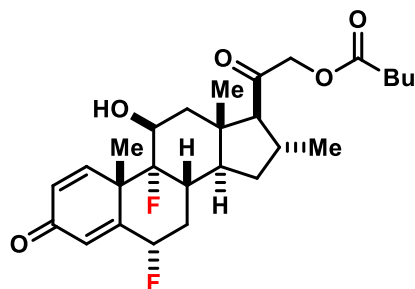
difluprednate (J)
1986



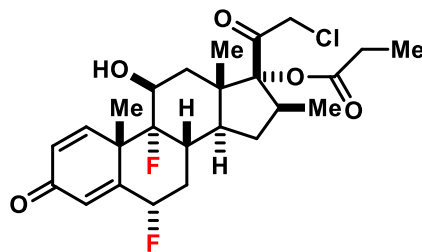
fluticasone propionate (J) ($R' = C(O)Et$)
fluticasone furoate ($R' = C(O)-2\text{-furanyl}$,
2007)



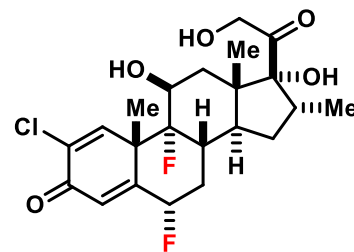
fluocinolone acetonide (J)



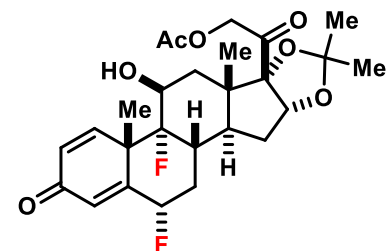
diflucortolone valerate



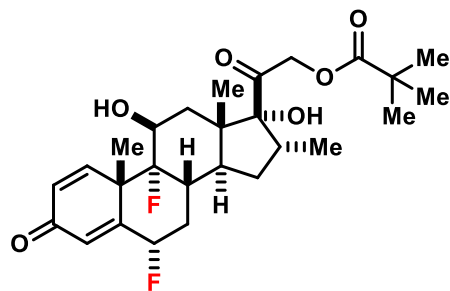
ulobetasol propionate
(halobetasol propionate)



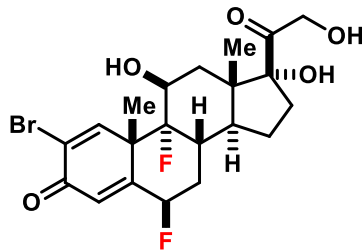
halometasone
1983



fluocinonide (J)



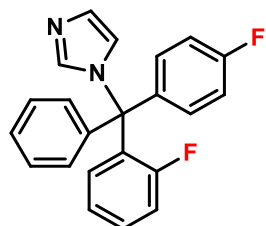
flumethasone pivalate (J)



halopredone

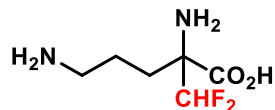
D:その他皮膚薬、G:泌尿器官用薬、H:ホルモン剤

D01: 抗菌剤



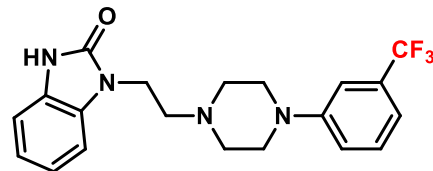
flutrimazole
1995

D11: 他の皮膚用薬



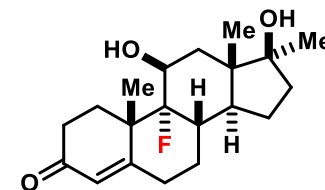
eflornithine
多毛症用薬

G02: 婦人科用薬



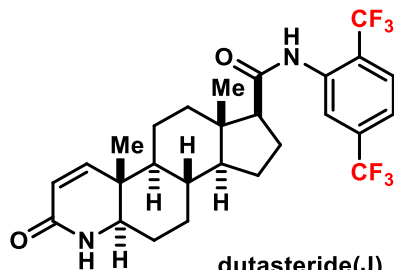
flibanserin
2015
性的欲求低下障害 (女性)

G03: 性ホルモン剤

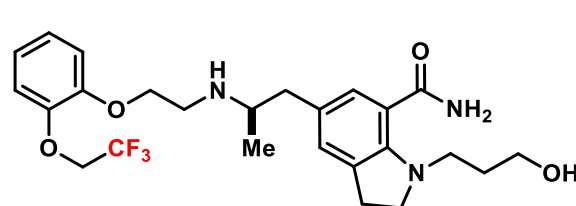


fluoxymesterone

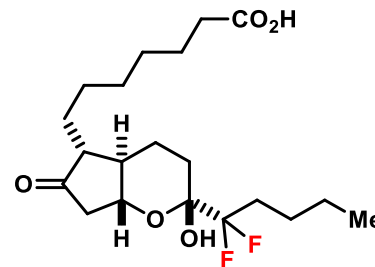
G04: 泌尿器系薬



dutasteride(J)
2002
前立腺肥大症

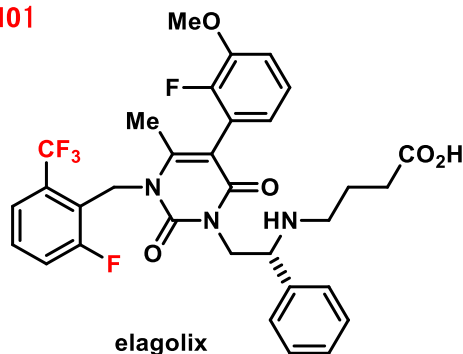


silodosin (J)
2006
排尿障害改善剤



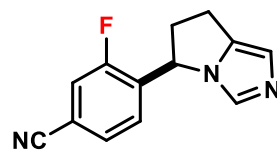
lubiprostone
2006
便秘薬

H01



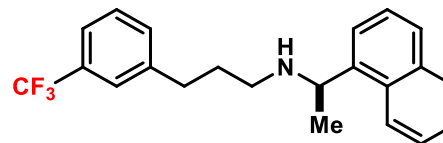
elagolix
2018
子宮内膜症治療薬

H02

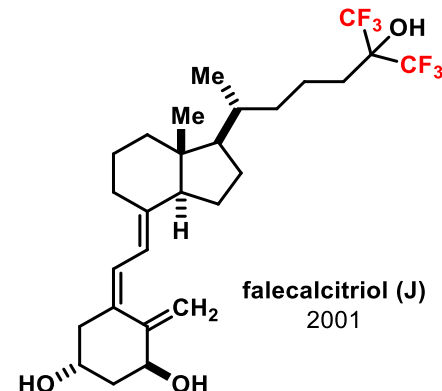


osilodrostat
2020

H05: 副甲状腺機能亢進症



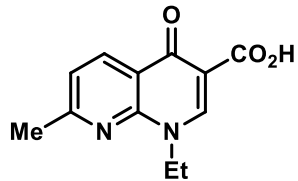
cinacalcet (J)
2004



falecalcitriol (J)
2001

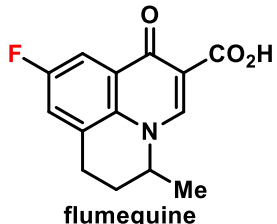
J01:抗菌剤(キノロン系)ー1

オールドキノロン

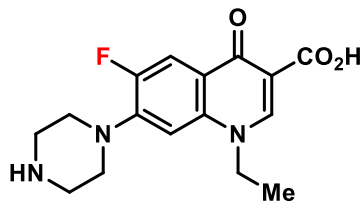


nalidixic acid

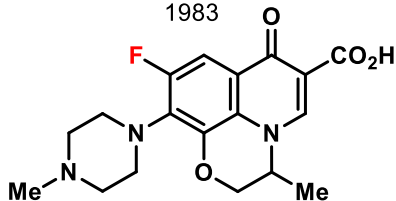
抗菌スペクトルの拡大
↓
6位フッ素導入



flumequine

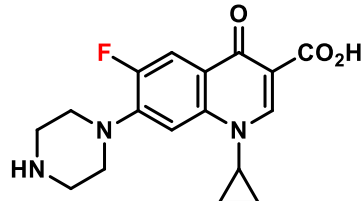


norfloxacin (J)
1983



ofloxacin (J)
1985

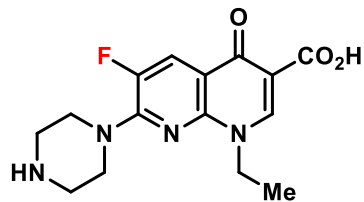
代表的なニューキノロン



ciprofloxacin (J)

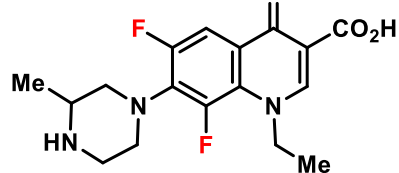
1986

1位シクロプロピル基は
グラム陰性菌に対する
抗菌力アップ



enoxacin (J)

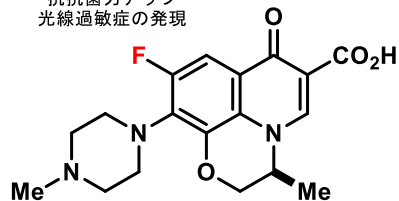
1986



lomefloxacin (J)

1989

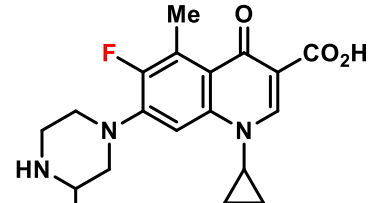
8位フッ素原子の導入は
抗菌力アップ
光線過敏症の発現



levofloxacin (J)

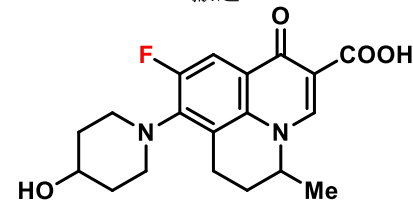
1993

その他のニューキノロン



grepafloxacin

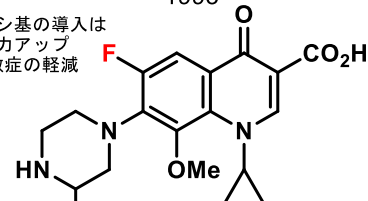
撤退



nadifloxacin (J)

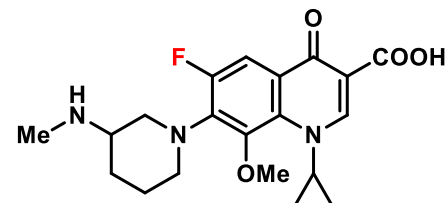
1993

8位メトキシ基の導入は
抗菌力アップ
光線過敏症の軽減



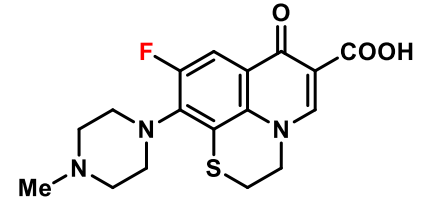
gatifloxacin (J)

1999



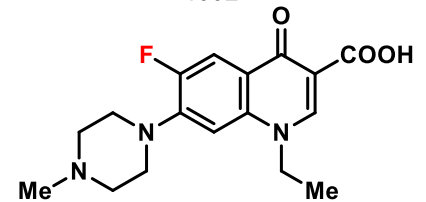
balofloxacin

(韓国のみ)



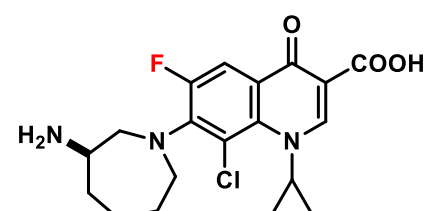
rufloxacin

1992



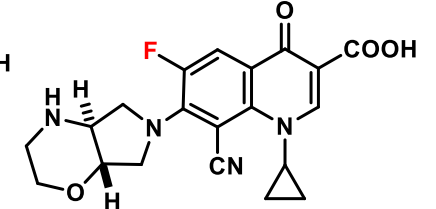
pefloxacin

1985



besifloxacin

2009

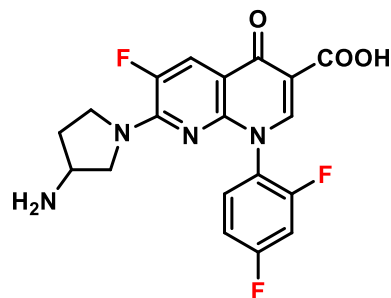


finafloxacin

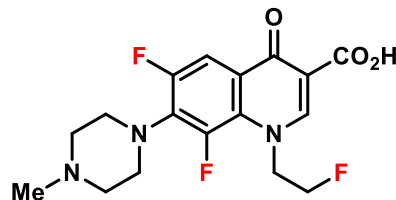
2014

J01:抗菌剤(キノロン系)ー2

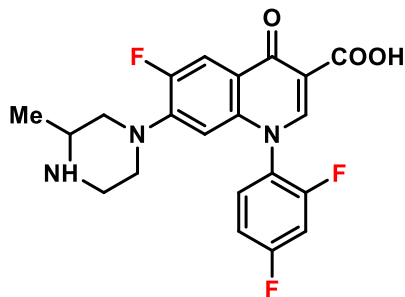
1 位置換基にフッ素原子の導入



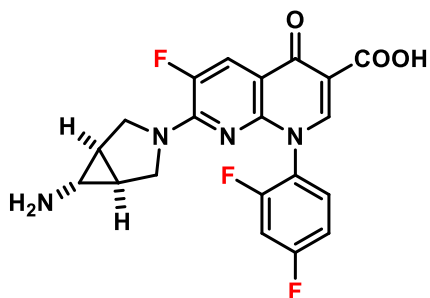
tosufloxacin (J)
1990



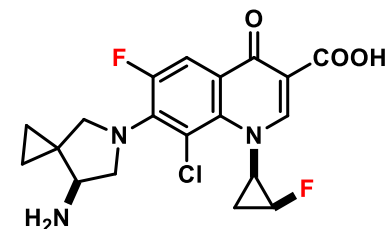
fleroxacin (J)
1992



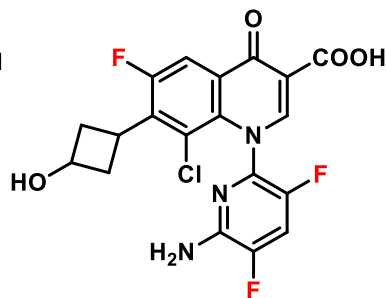
temafloxacin
1991 (その後撤退)



trovafloxacin
1998 (その後撤退)

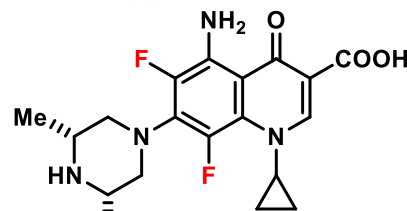


sitafloxacin (J)
2008

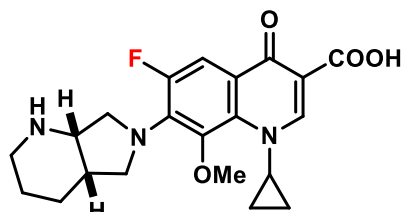


delafloxacin
2017

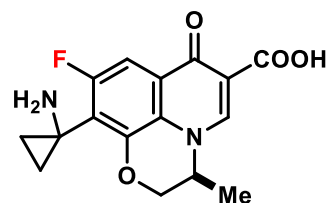
7 位置換基の改変



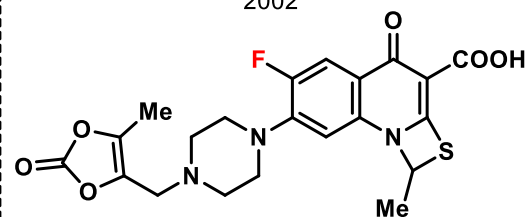
sparfloxacin (J)
1993



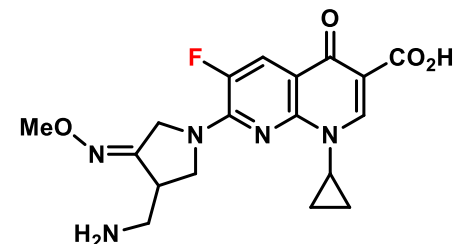
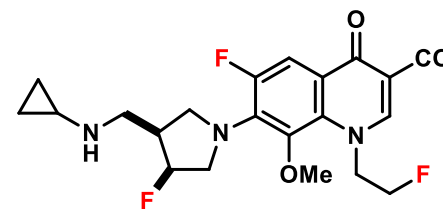
moxifloxacin (J)
1999



pazufloxacin (J)
2002

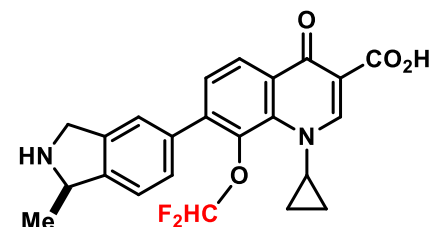


prulifloxacin (J)
2002



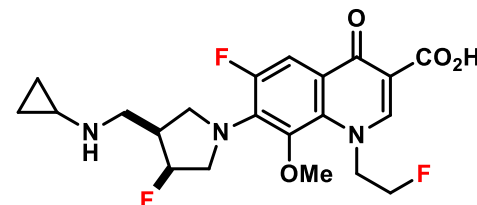
gemifloxacin
2003

6 位脱フッ素体



garenoxacin (J)
2007

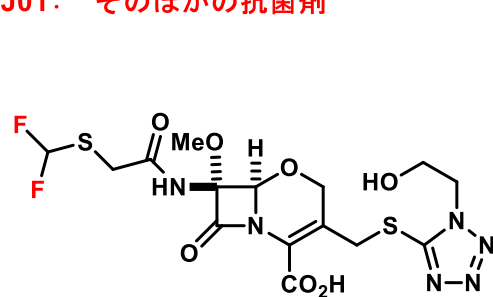
その他



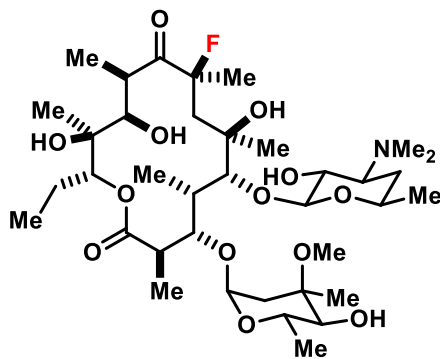
lascafloracin
2019

J01:抗菌剤(その他)

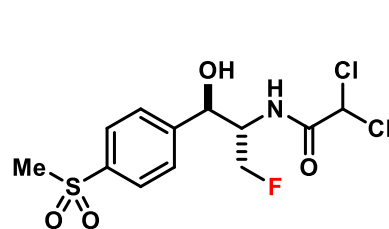
J01: そのほかの抗菌剤



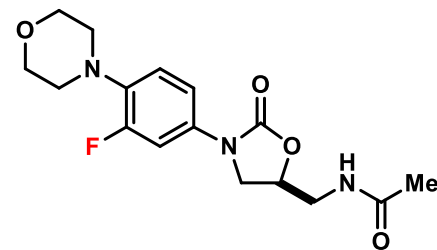
flomoxef (J)
1988



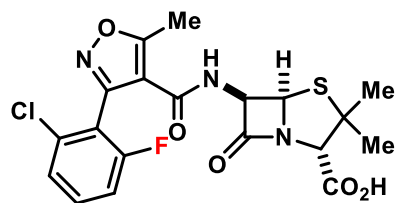
flurithromycin
1997



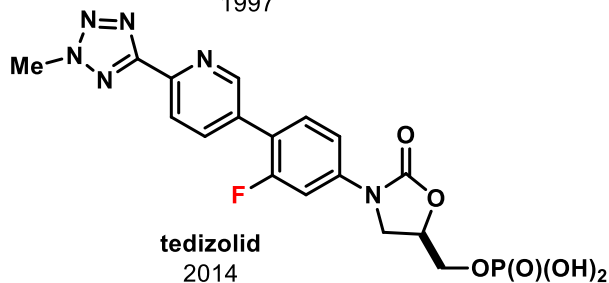
florfenicol (J)



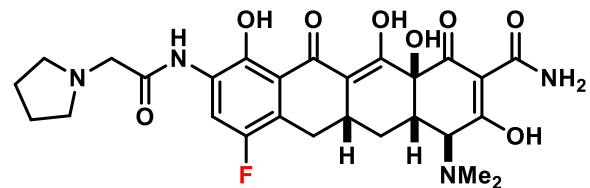
linezolid
2000



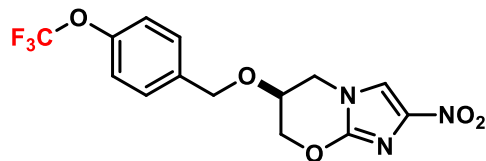
flucloxacillin



tedizolid
2014



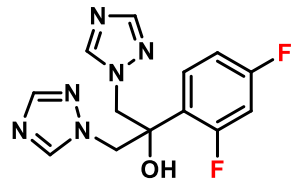
eravacycline
2018



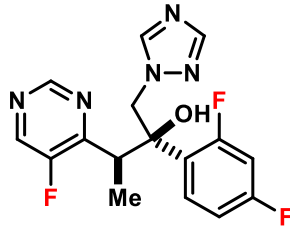
pretomanid
2019

J02:抗真菌薬, J04:抗マイコバクテリア薬

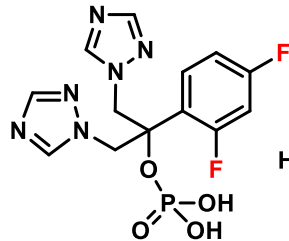
J02: 抗真菌薬



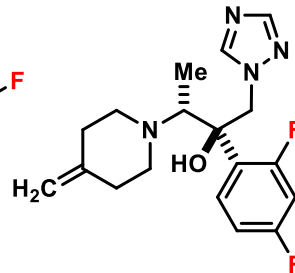
fluconazole (J)
1989



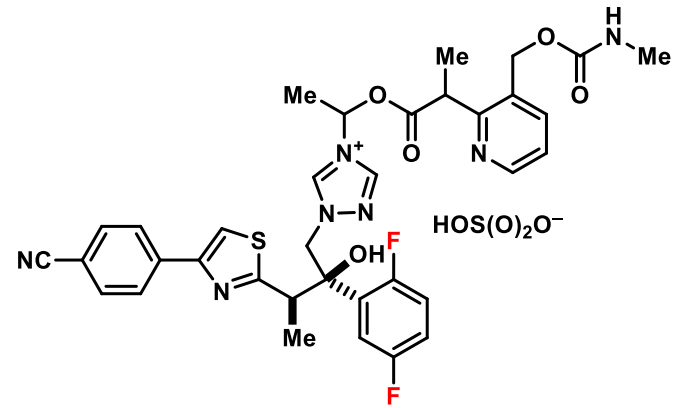
voriconazole (J)
2002



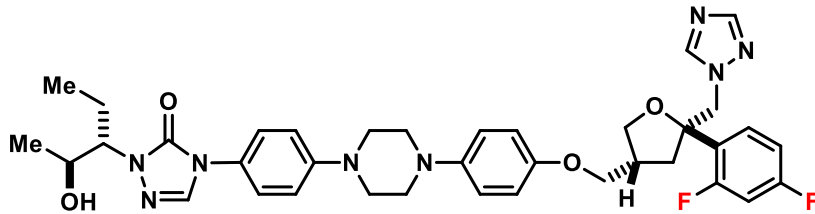
fosfluconazole (J)
2003



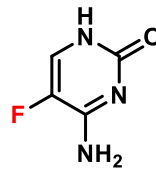
efinaconazole (J)
2013
ATC分類なし



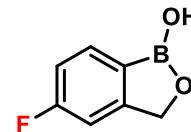
isavuconazonium sulfate
2015



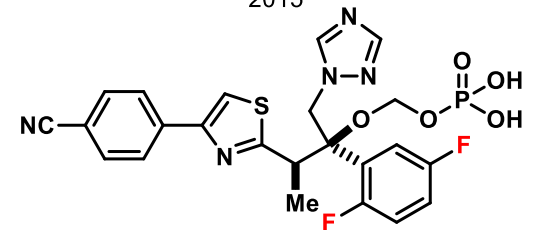
posaconazole
2006



flucytosine (J)

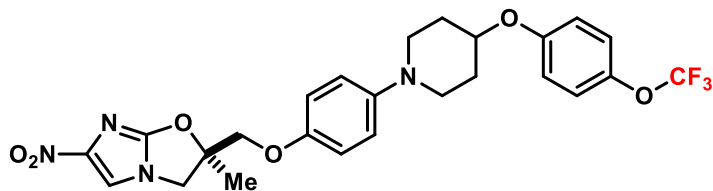


tavaborole
2014



fosravuconazole
2018

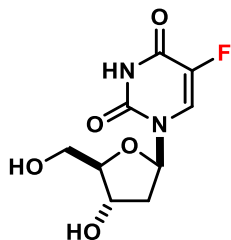
J04: 抗マイコバクテリア薬



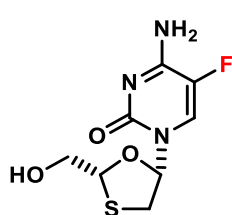
delamanid
2014

J05:抗ウイルス薬

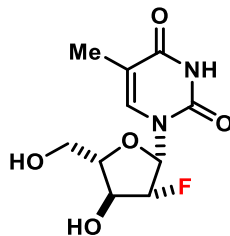
J05: 抗ウイルス薬



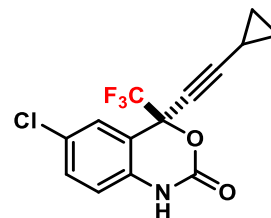
floxuridine
1970



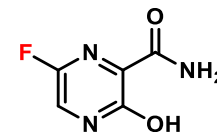
emtricitabine (J)
2003
anti-HIV



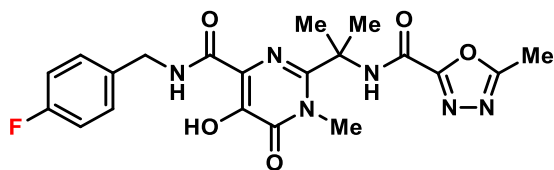
clevudine
2007



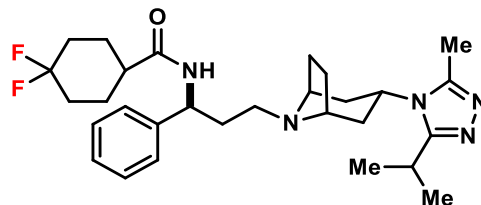
efavirenz (J)
1998
anti-HIV



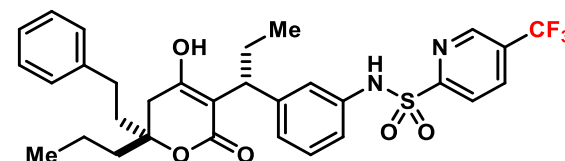
favipiravir
2014



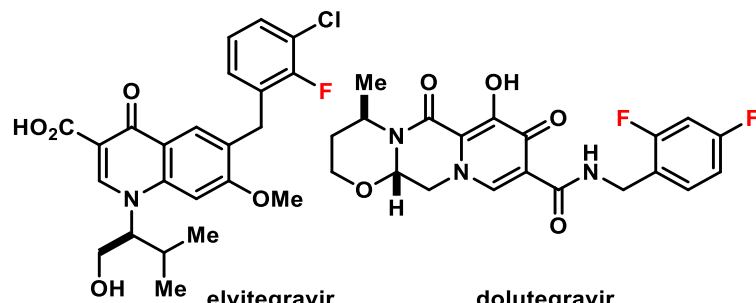
raltegravir
2007
anti-HIV



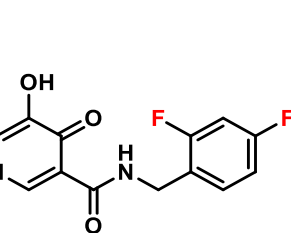
maraviroc (J)
2007
anti-HIV



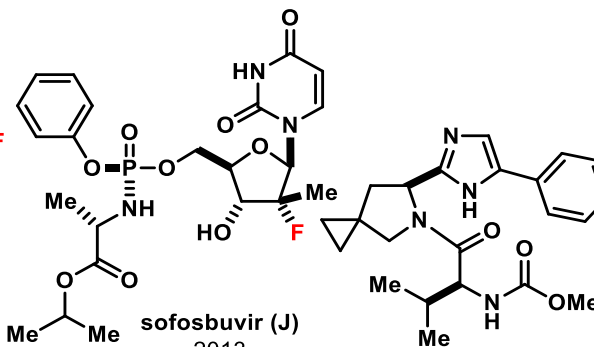
tipranavir
2005
anti-HIV



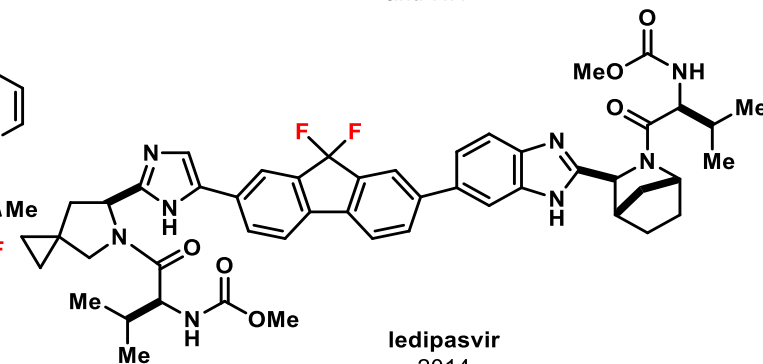
elvitegravir
2013
anti-HIV



dolutegravir
2013
anti-HIV



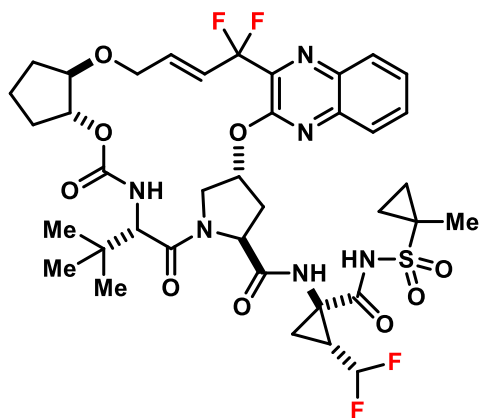
sofosbuvir (J)
2013
HCV治療薬



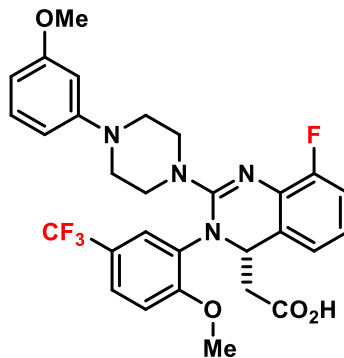
ledipasvir
2014
HCV治療薬

J05:抗ウィルス薬

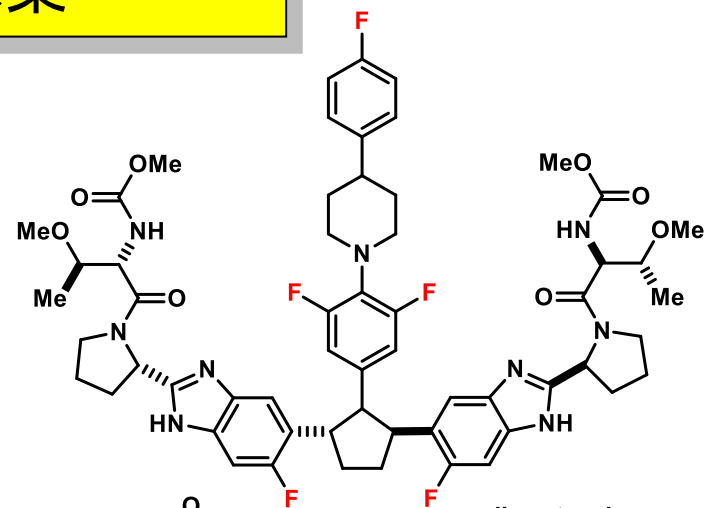
J05: 抗ウィルス薬



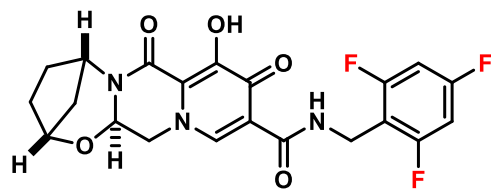
glecaprevir
2017



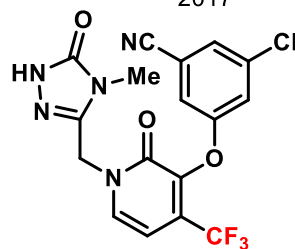
letemovir
2017



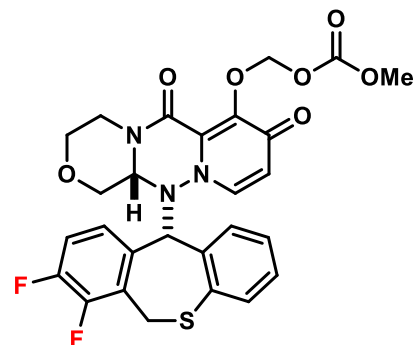
pibrentasvir
2017



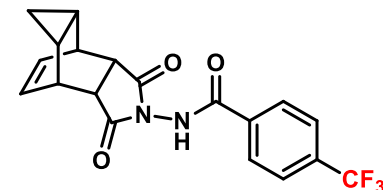
bictegravir
2018



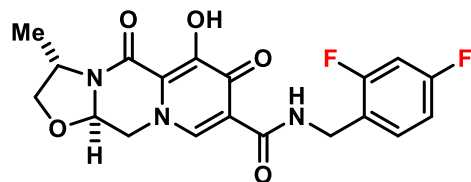
doravirine
2018



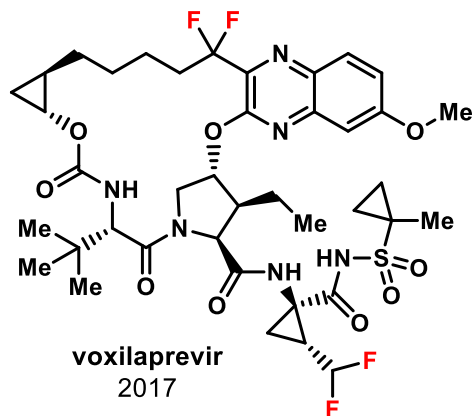
baloxavir marboxil
2018



tecovirimat
2018



cabotegravir
2020

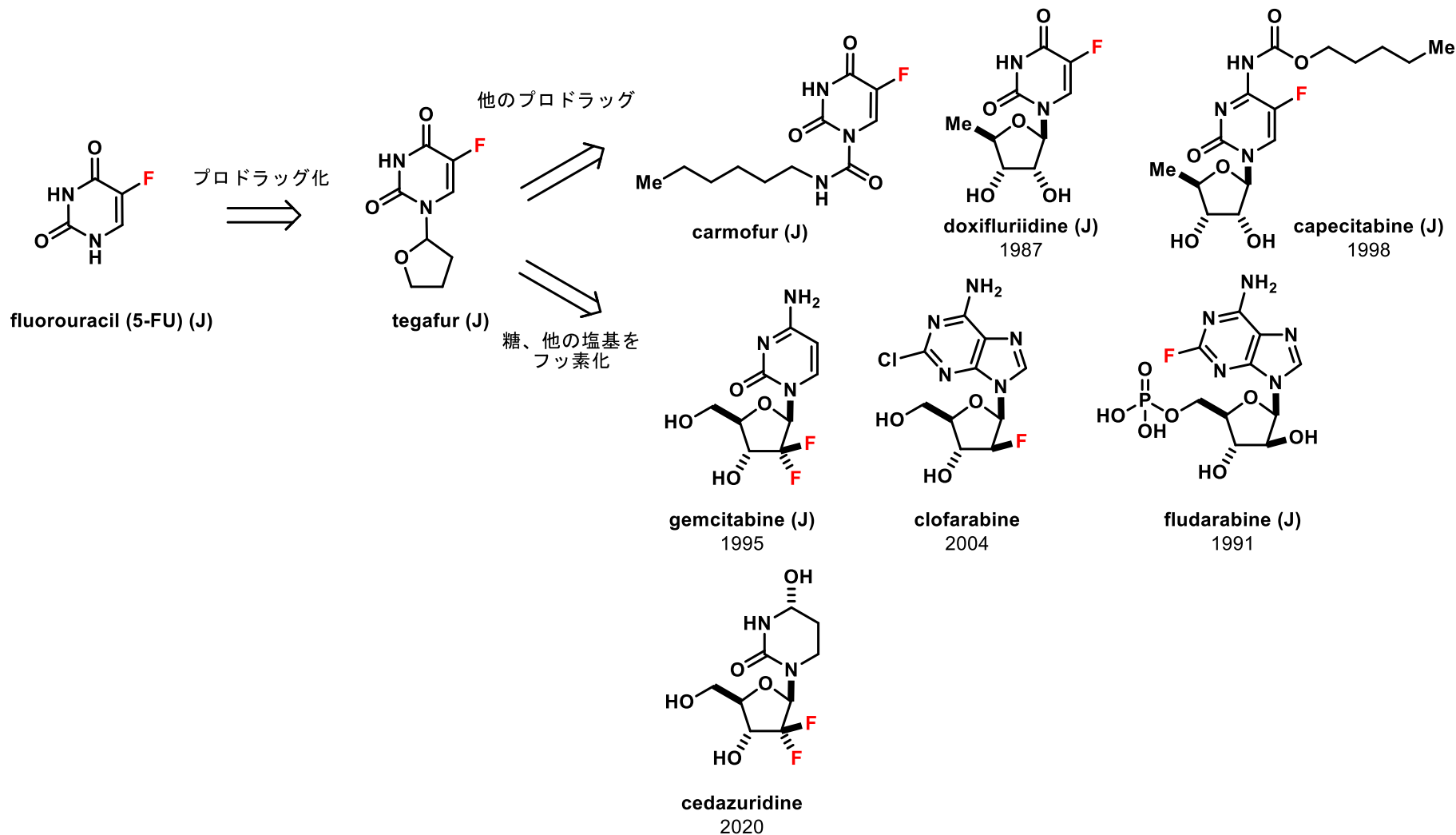


voxilaprevir
2017

L:抗癌剤(核酸医薬)

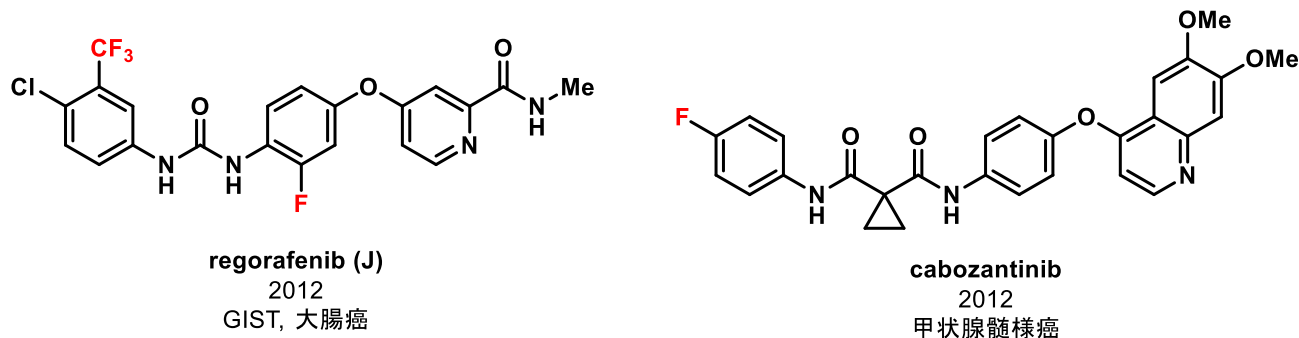
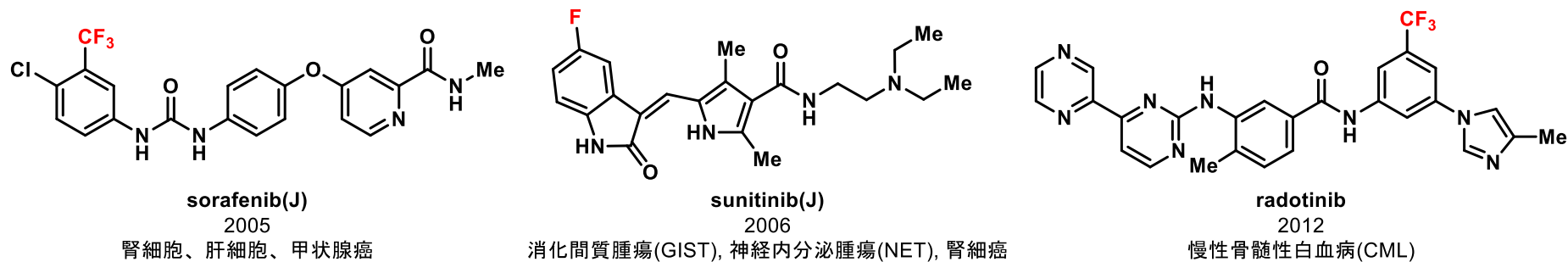
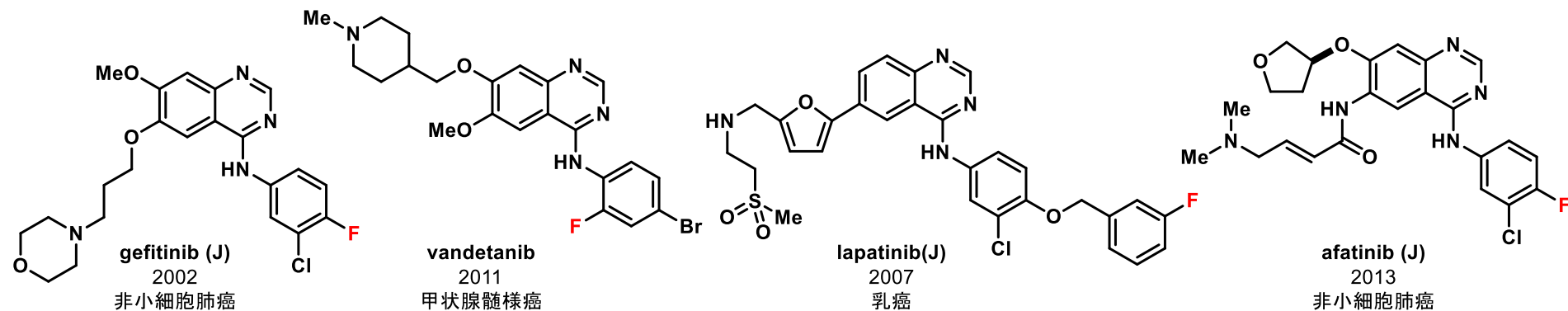
L01: 抗癌剤

L01 フッ化核酸誘導体



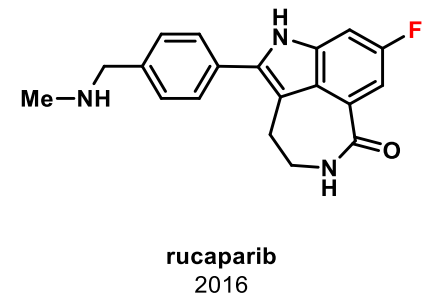
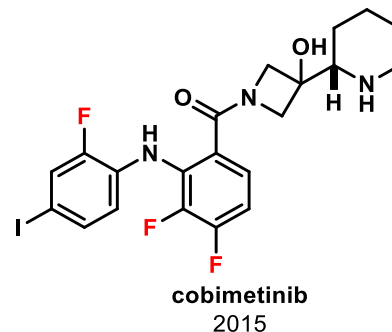
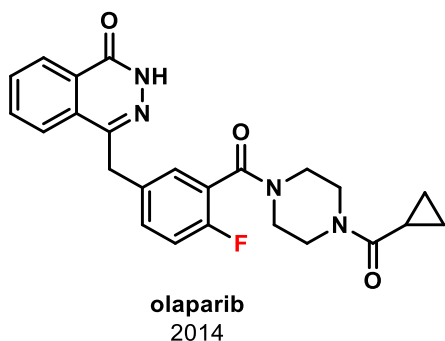
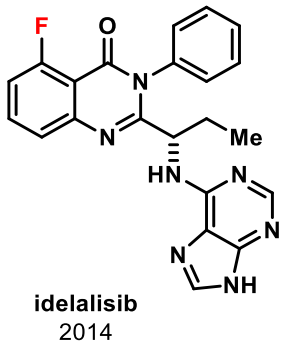
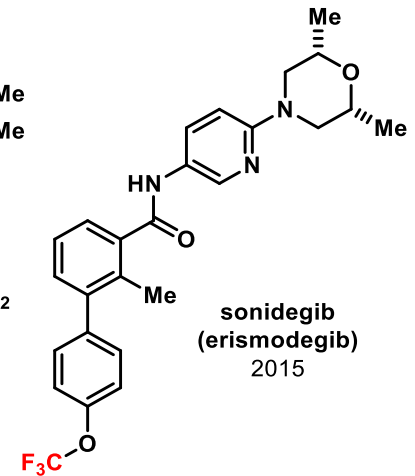
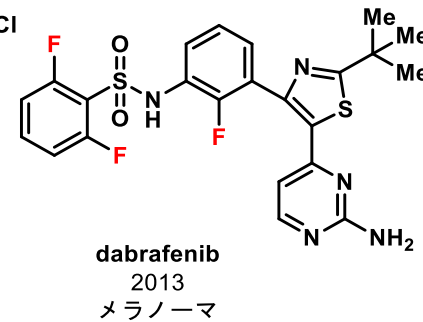
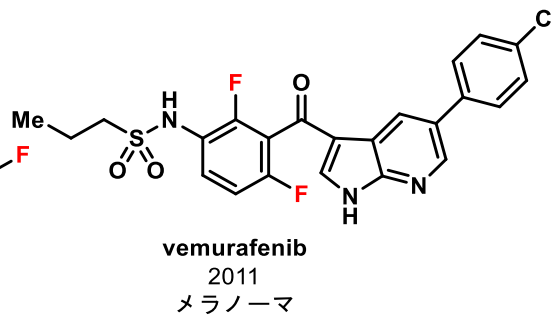
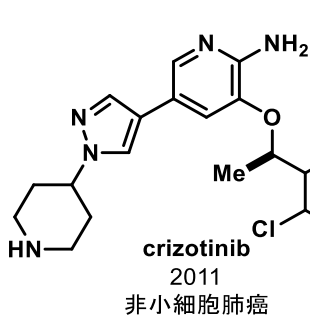
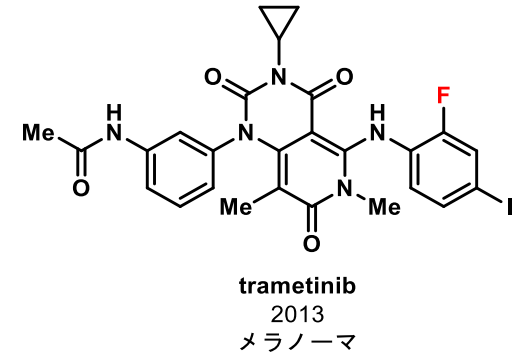
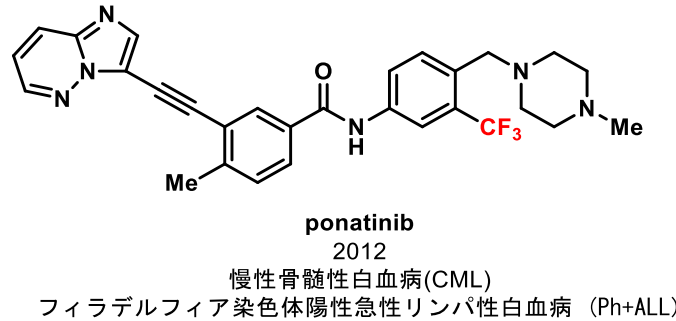
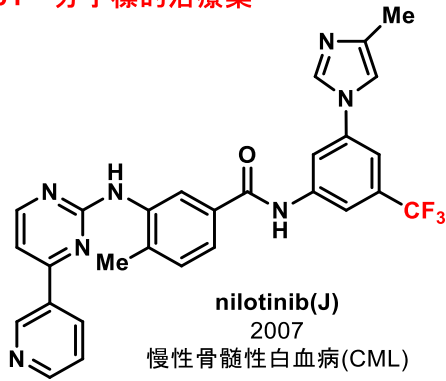
L:抗癌劑(分子標的治療藥)

L01 分子標的治療藥



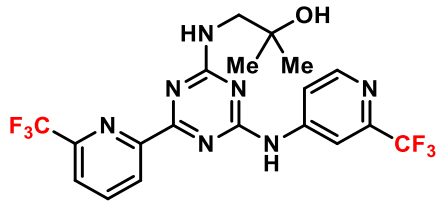
L:抗癌剤(分子標的治療薬)

L01 分子標的治療薬

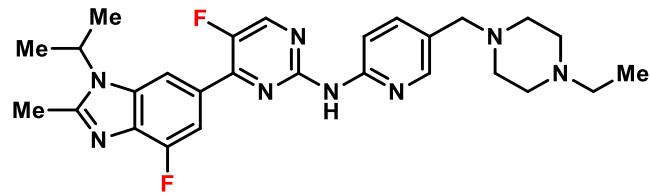


L:抗癌劑(分子標的治療藥)

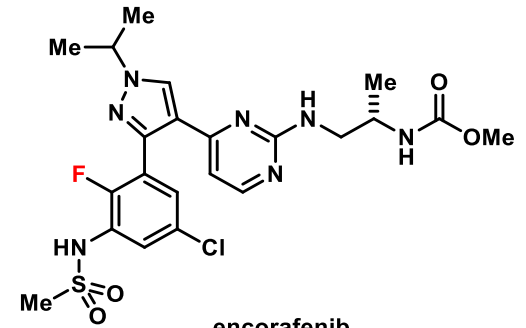
L01 分子標的治療藥



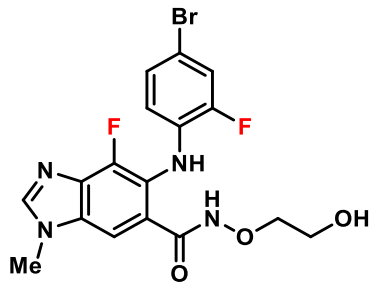
enasidenib
2017



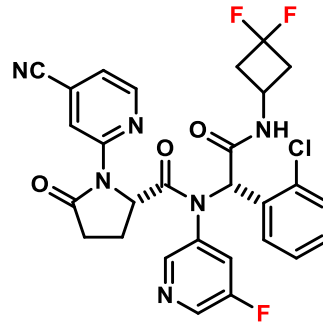
abemaciclib
2017



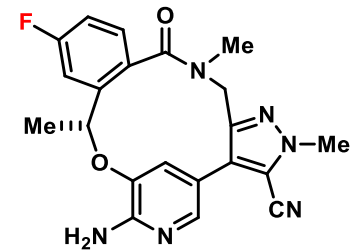
encorafenib
2018



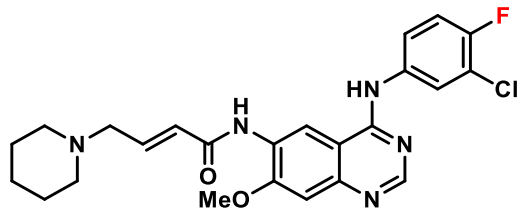
binimetinib
2018



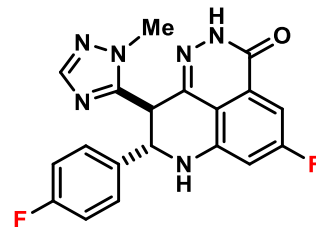
ivosidenib
2018



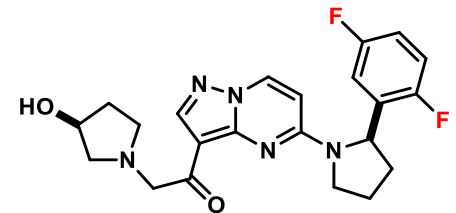
lorlatinib
2018



dacomitinib
2018



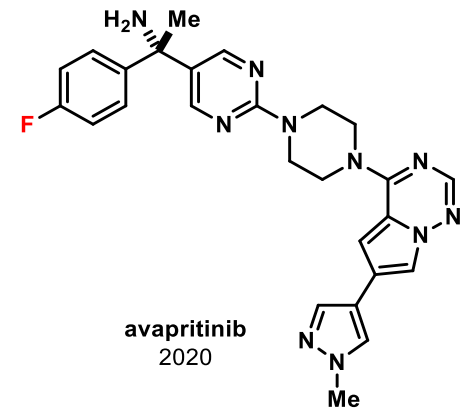
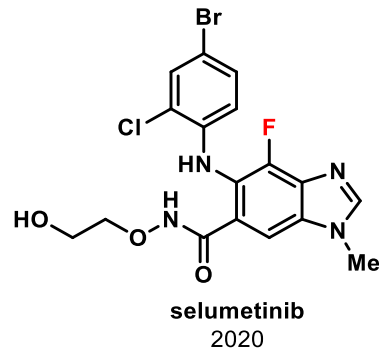
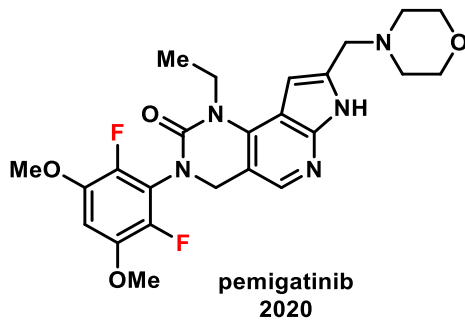
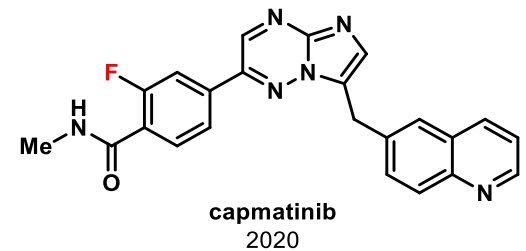
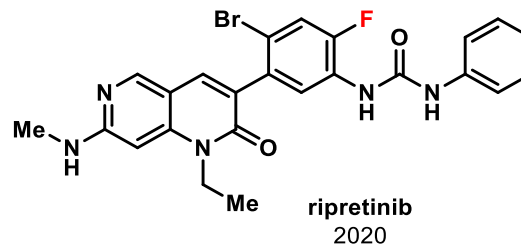
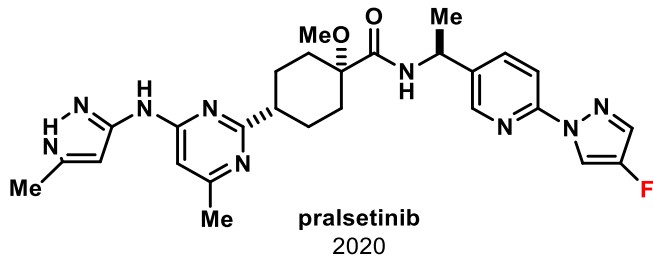
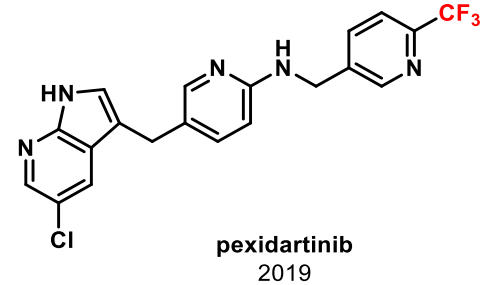
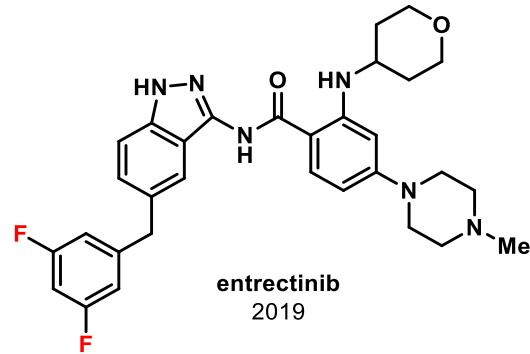
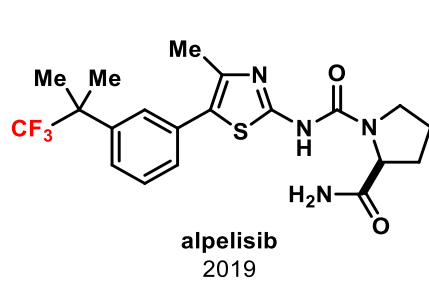
talazoparib
2018



larotrectinib
2018

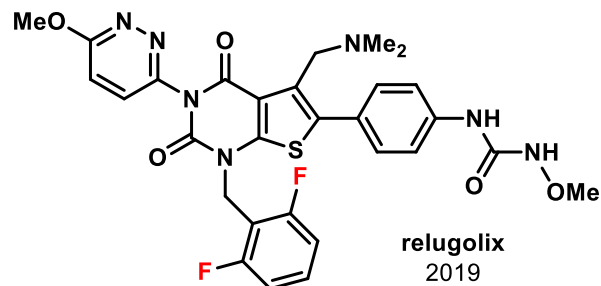
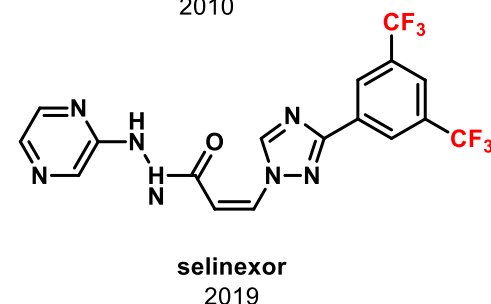
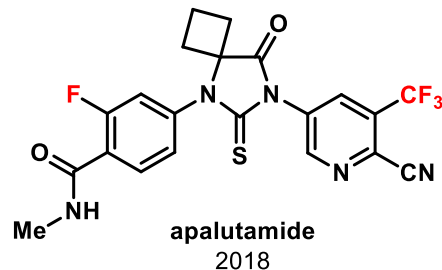
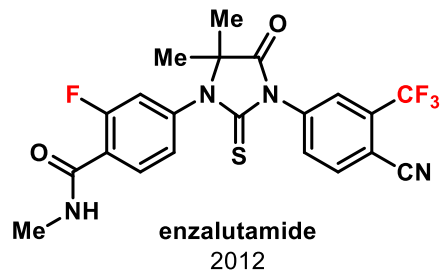
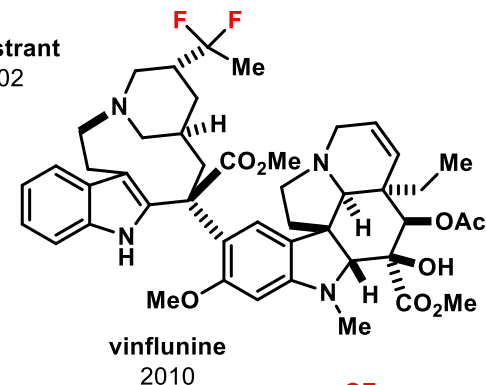
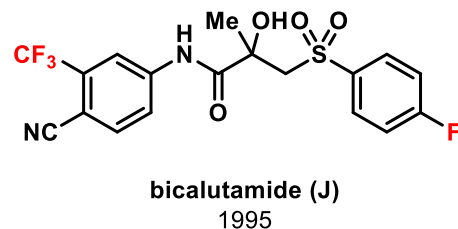
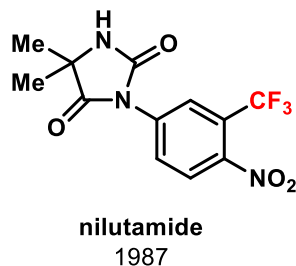
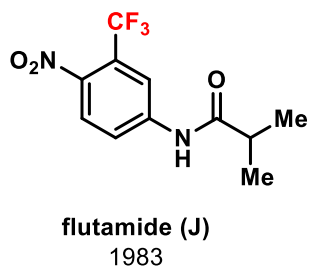
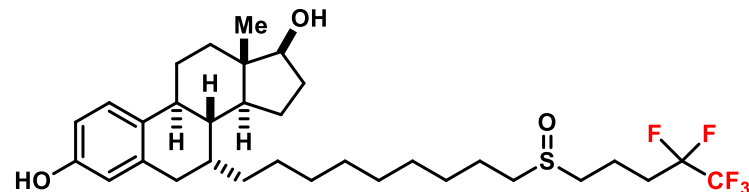
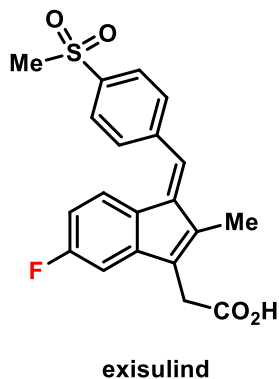
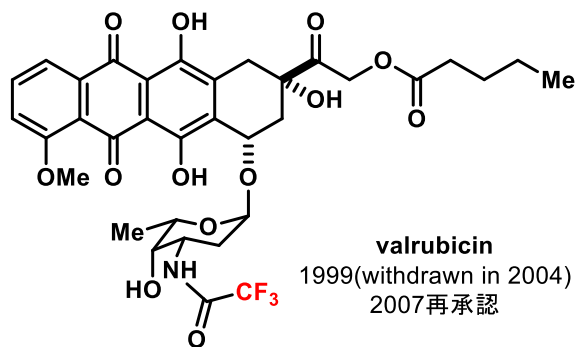
L:抗癌劑(分子標的治療藥)

L01 分子標的治療薬



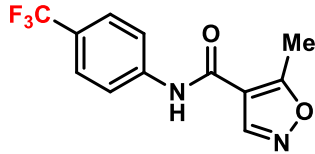
L:その他の抗癌剤と免疫抑制剤

L01.02: そのほかの抗癌剤

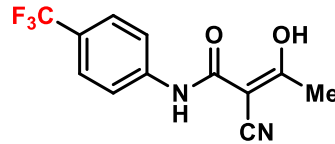


L:その他の抗癌剤と免疫抑制剤

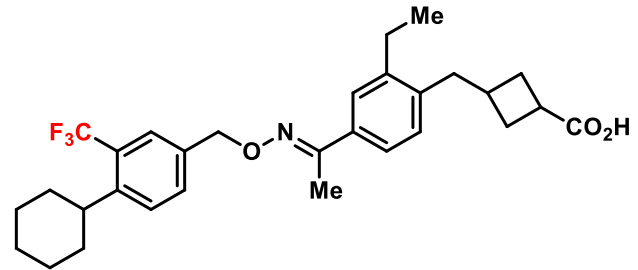
L04: 免疫抑制剤



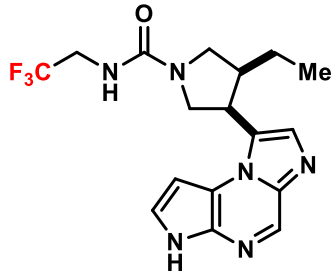
leflunomide (J)
1998
抗リウマチ薬



teriflunomide
2012



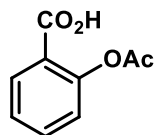
siponimod
2019
多発性硬化症治療薬



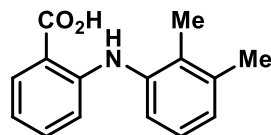
upadacitinib
2019

M01:非ステロイド系抗炎症剤、M09:その他の骨格系疾患治療薬

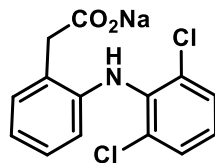
M01: NSAIDs (非ステロイド系抗炎症薬)



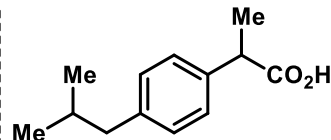
aspirin



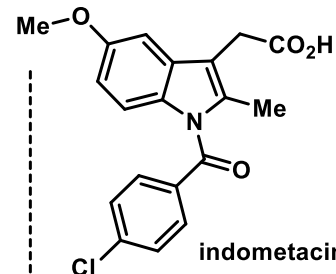
mefenamic acid



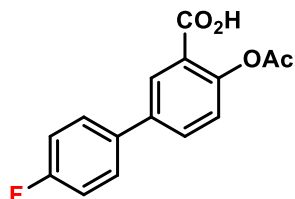
diclofenac sodium



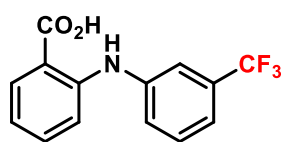
ibuprofen



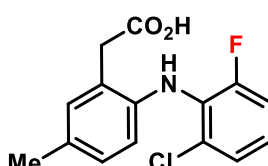
indometacin



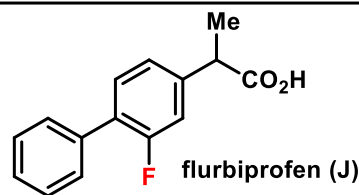
flufenisal



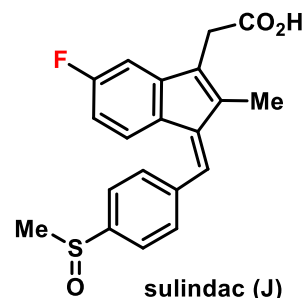
flufenamic acid (J)



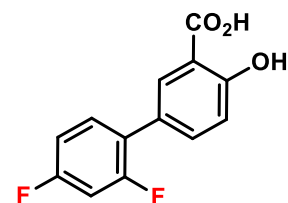
lumiracoxib
2003



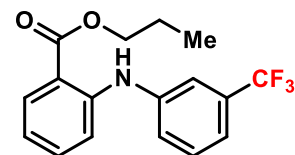
flurbiprofen (J)



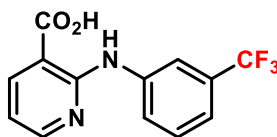
sulindac (J)



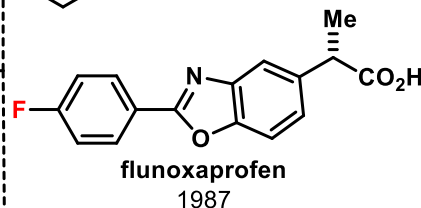
diflunisal



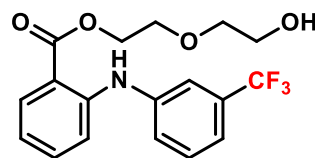
ufenamate (J)



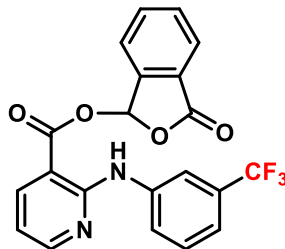
niflumic acid



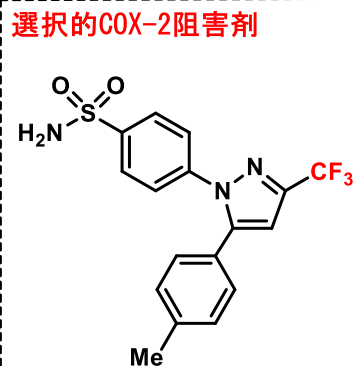
flunoxaprofen
1987



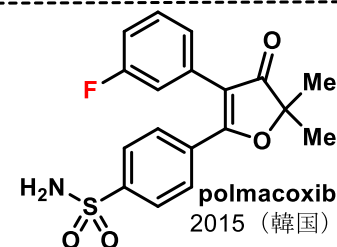
etofenamate



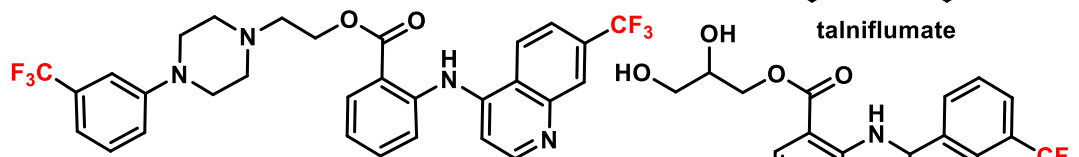
talniflumate



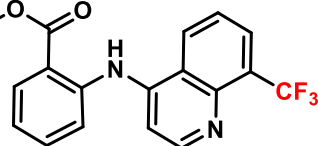
celecoxib (J)
1999
抗リウマチ剤



polmacoxib
2015 (韓国)



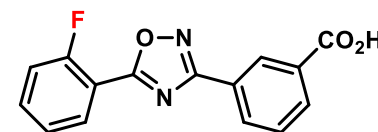
antrafenine
(replaced by other drugs)



floctafenine

選択的COX-2阻害剤

M09: その他の骨格系疾患治療薬



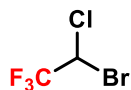
ataluren
2014

筋ジストロフィー治療薬

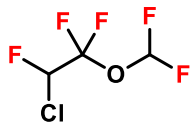
N:神経系薬(麻酔、鎮痛、抗てんかん薬)

N01: 麻醉藥

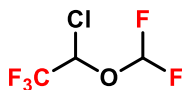
吸入麻醉藥



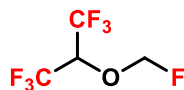
halothane (J)
1956



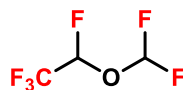
enflurane (J)
1972



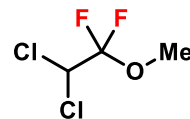
isoflurane (J)
1981



sevoflurane (J)
1990

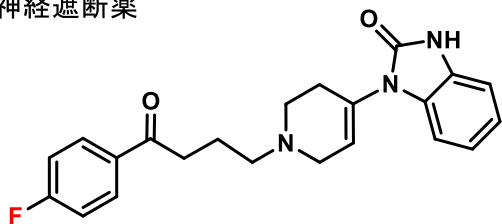


desflurane
1992



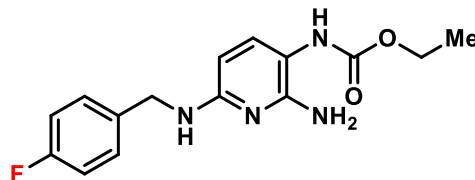
methoxyflurane
withdrawn

神經遮断薬



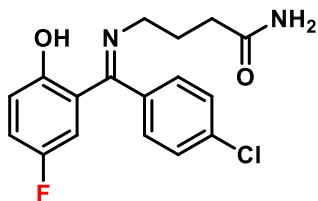
droperidol (J)

N02：鎮痛藥

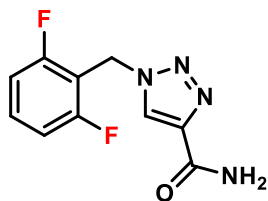


flupirtine
1985

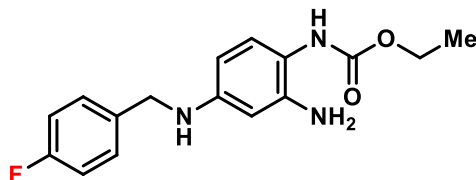
N03: 抗てんかん薬



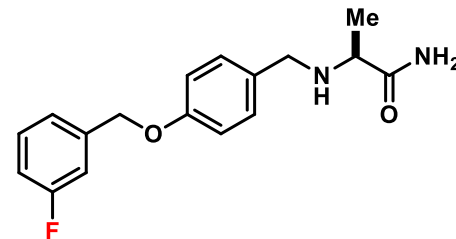
progabide
1985



rufinamide
2007

ezogabine
2011

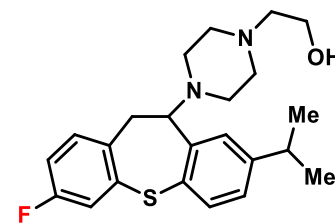
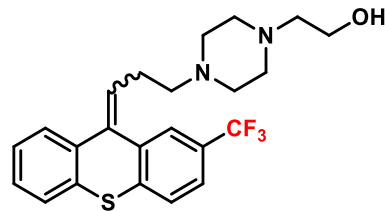
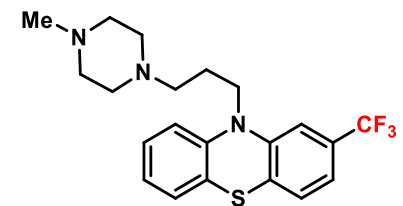
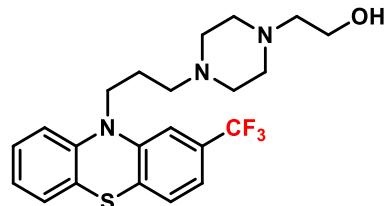
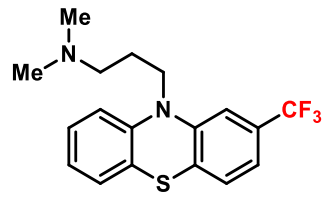
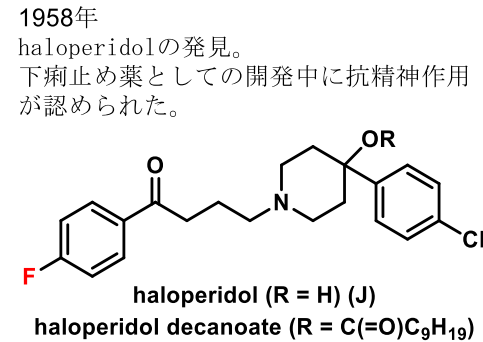
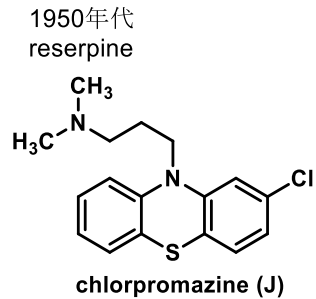
N04: 抗パーキンソン病薬



safinamide
2015

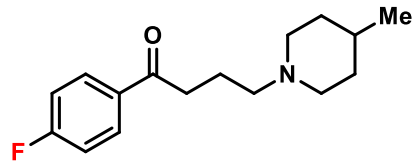
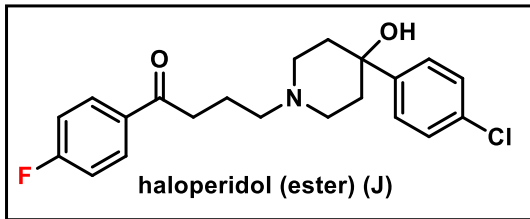
N05A:神経系薬(統合失調症治療薬)

N05A: 統合失調症治療薬

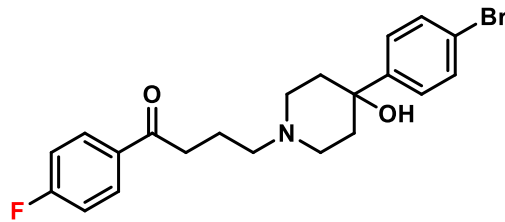


N05A:神経系薬(統合失調症治療薬)

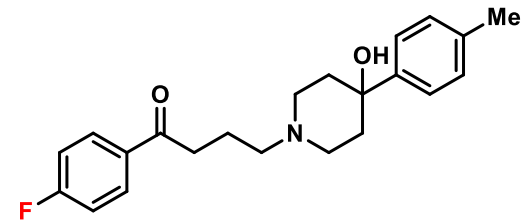
N05A: 統合失調症治療薬



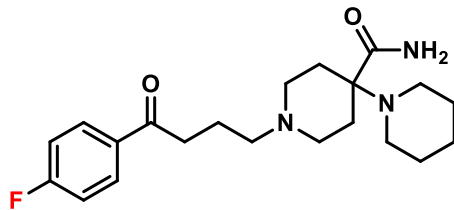
melperone



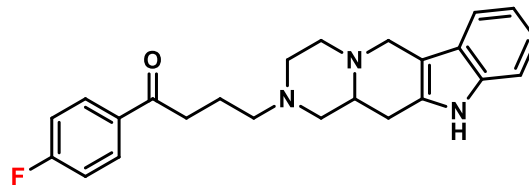
bromperidol (J)



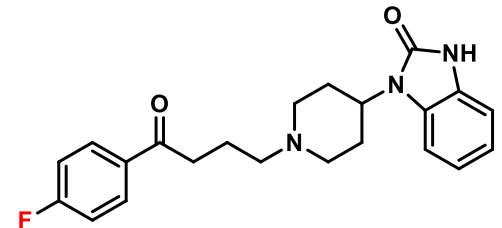
moperone (J)



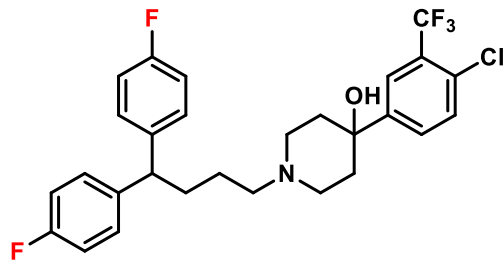
pipamperone (J)



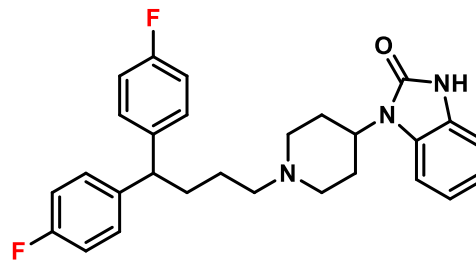
biriperone



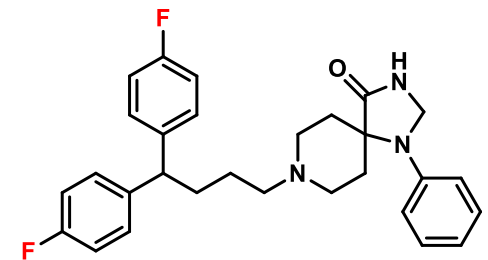
benperidol (J)



penfluridol



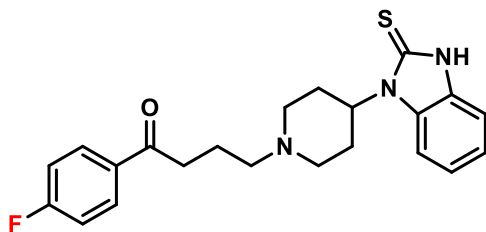
pimozide (J)



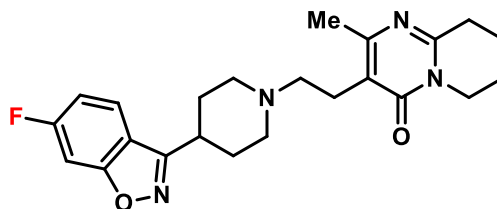
fluspirilene

N05A:神經系藥(統合失調症治療藥)

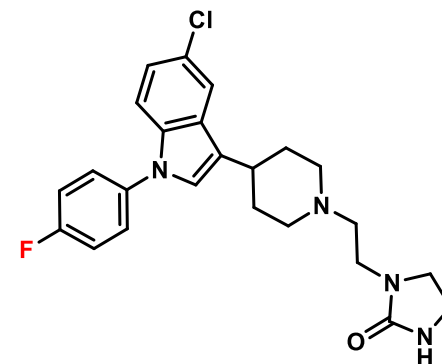
N05A: 統合失調症治療藥



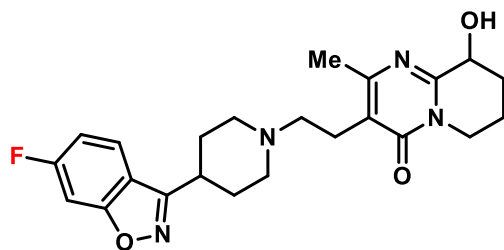
timiperone (J)
1984



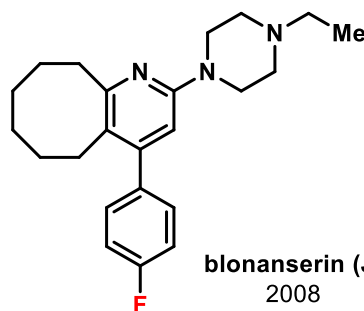
risperidone (J)
1993



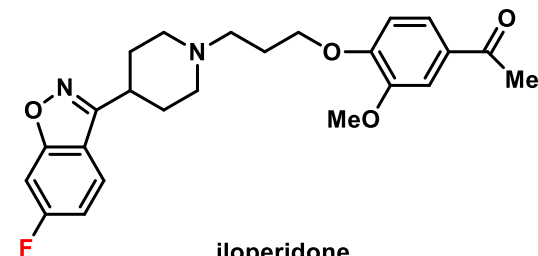
sertindole
1996



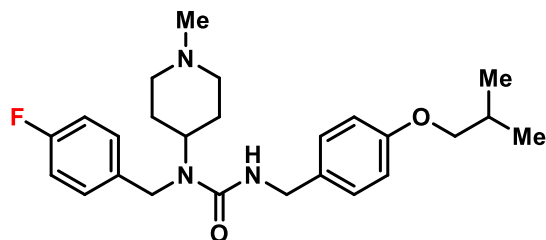
paliperidone (J)
2007



blonanserin (J)
2008



iloperidone
2011

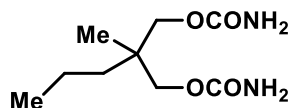


pimavanserin
2016

N05B,C:神經系藥(抗不安藥、催眠藥)

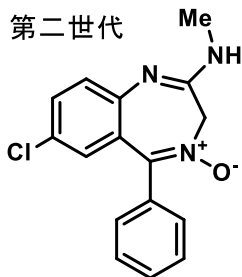
N05B: 抗不安藥

第一世代

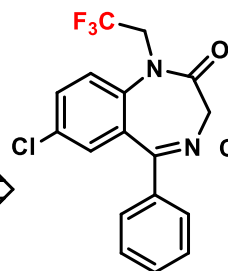


meprobamate

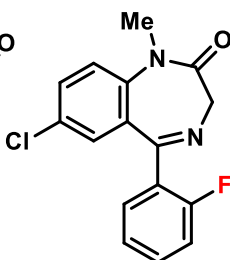
第二世代



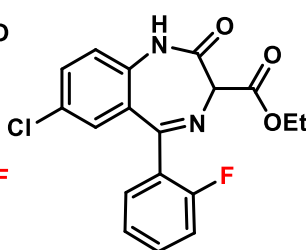
chlordiazepoxide



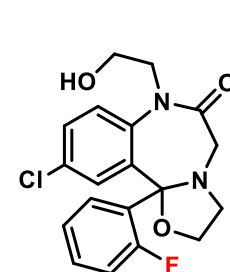
halazepam



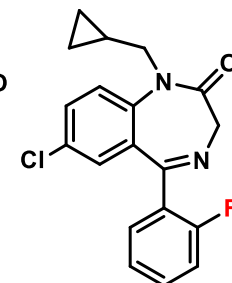
fludiazepam (J)



ethyl loflazepate (J)

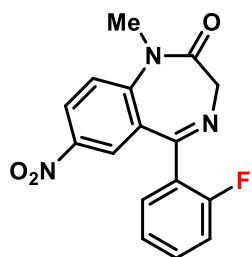


flutazolam (J)
1984

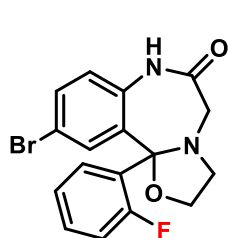


flutoprazepam (J)
1986

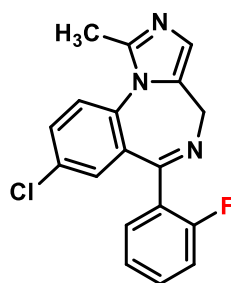
N05C: 催眠藥



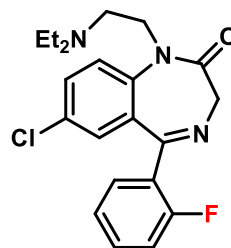
flunitrazepam (J)



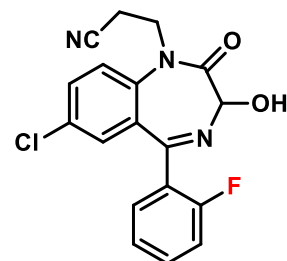
haloxazolam (J)



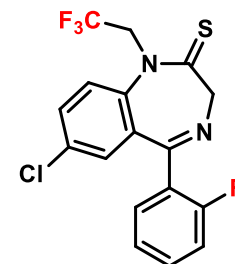
midazolam (J)



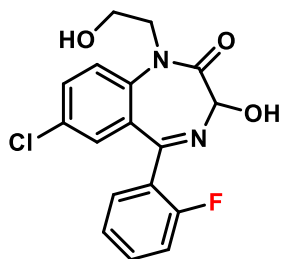
flurazepam (J)



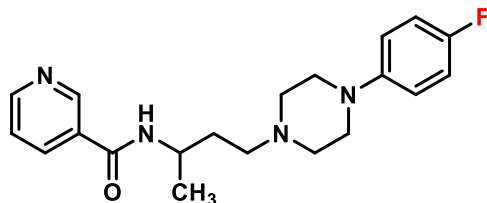
cinolazepam
1993



quazepam (J)
1985



doxefazepam
1985



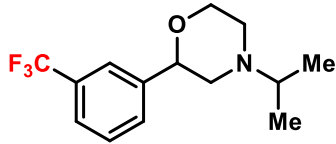
niaprazine

N06,07:神経系薬(抗うつ薬、その他)

N06: 抗うつ薬

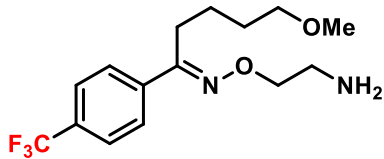
第一世代 三環系抗うつ薬

第二世代 三環系抗うつ薬、四環系抗うつ薬、その他

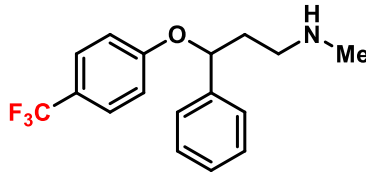


oxaflozane
1982 (フランス)

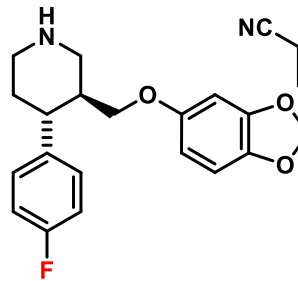
第三世代 SSRI (選択的セロトニン再取り込み阻害薬)



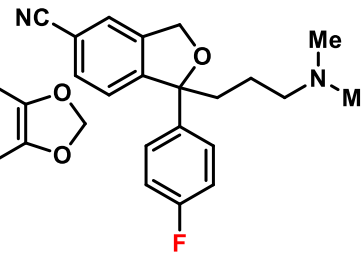
fluvoxamine (J)
1983



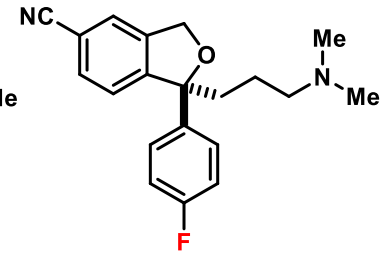
fluoxetine (Prozac)
1986



paroxetine (J)
1991



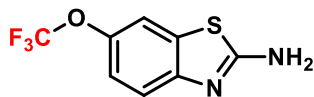
citalopram
1989



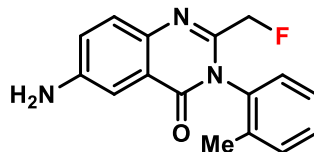
escitalopram
2002

第四世代 SNRI (セロトニン・ノルアドレナリン再取り込み阻害薬)

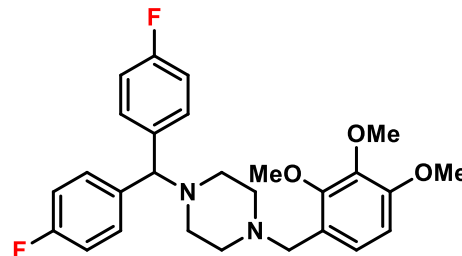
N07: その他



riluzole (J)
1996
筋萎縮性側索硬化症



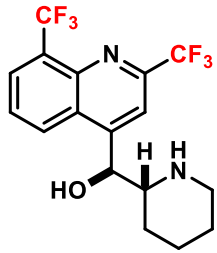
afloqualone (J)
1983
筋緊張性疾患治療薬



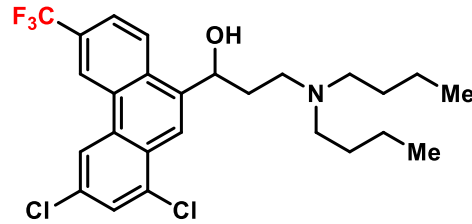
lomerizine (J)
1999
片頭痛治療薬

P:抗寄生虫剂

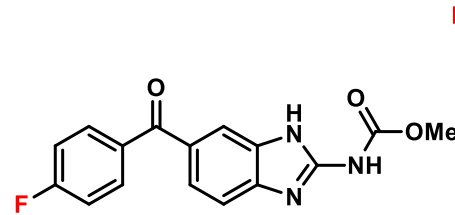
P01: 抗原虫薬



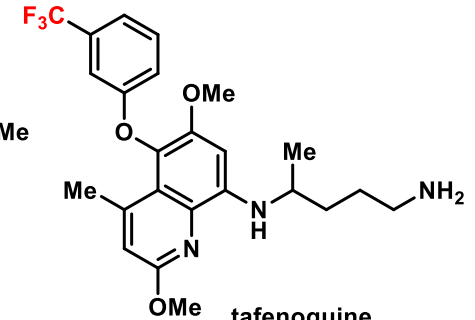
mefloquine (J)
1985
抗マラリア剤



halofantrine
1988
抗マラリア剤



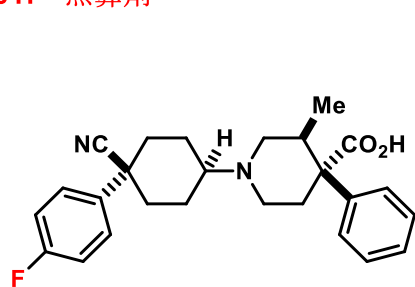
flubendazole
1980
駆虫薬



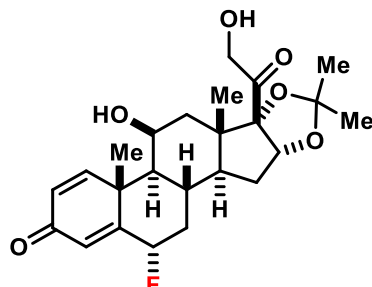
tafenoquine
2018
抗マラリア剤

R:呼吸器官用薬

R01: 点鼻剤

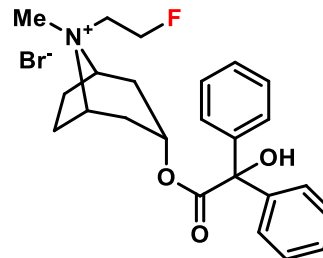


levocabastine (J)
1991

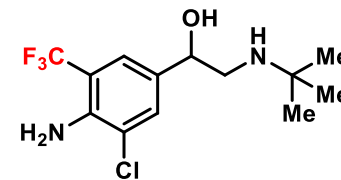


flunisolide

気管支拡張剤

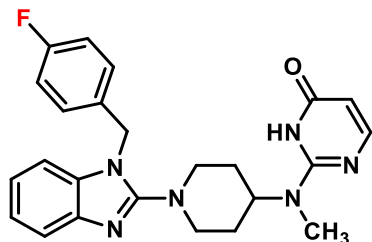


flutropium bromide
1988

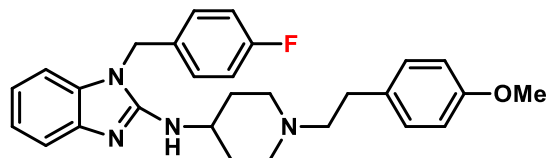


mabuterol (J)
1986

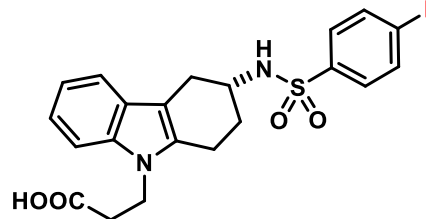
気管支喘息・アレルギー性鼻炎



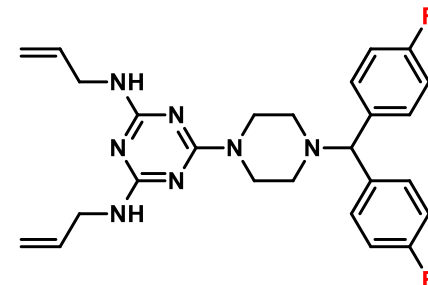
mizolastine
1998



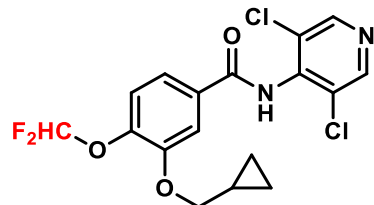
astemizole
1983
(殆どの国から撤退)



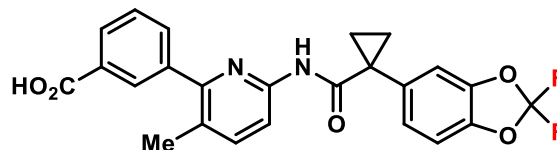
ramatroban (J)
2000



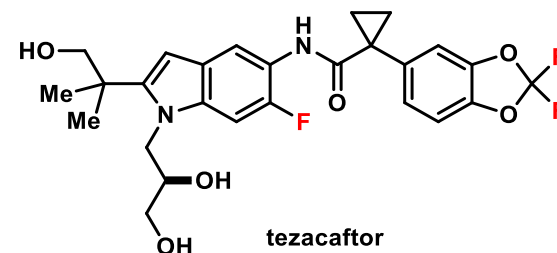
almitrine



roflumilast
2010



lumacaftor
2015

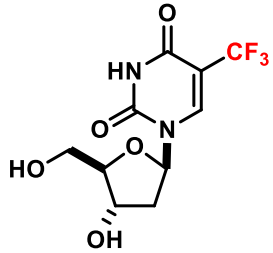


tezacaftor
2018

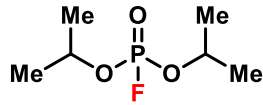
R07: 嚢胞性線維症治療薬

S:感覚器官用薬

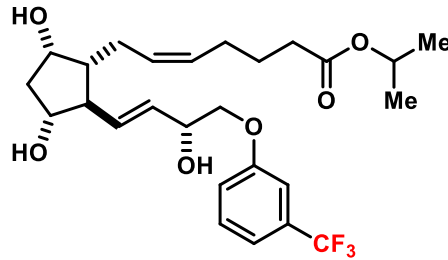
S01: 眼科用薬



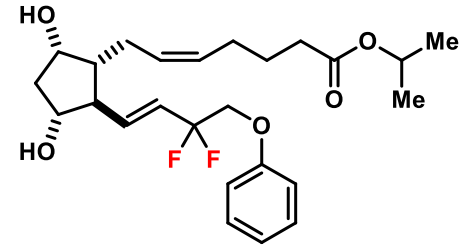
trifluridine



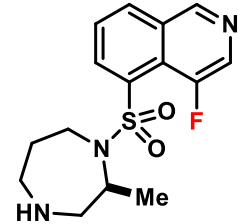
diisopropyl fluorophosphate



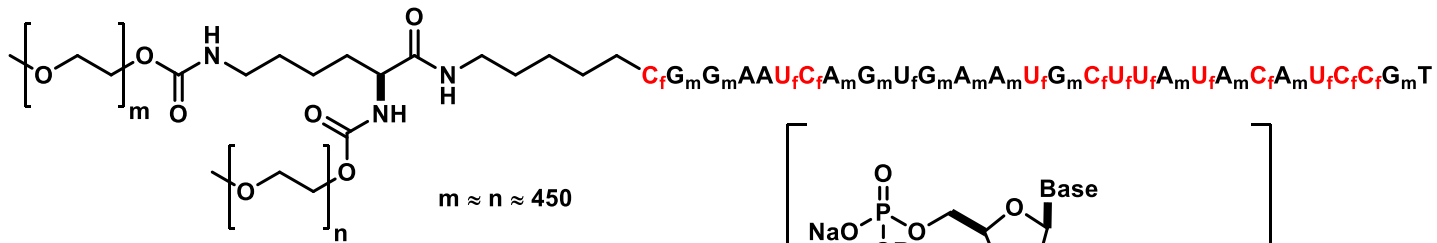
travoprost (J)
2001
緑内障治療薬



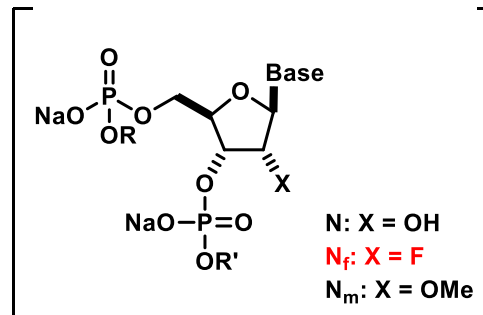
tafluprost (J)
2008
緑内障用剤



ripasudil
2014
緑内障治療薬

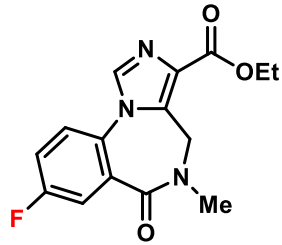


pegaptanib
2004



V:その他

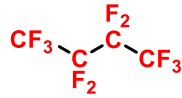
V: その他



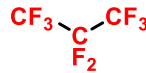
flumazenil
1987
解毒剤



sulfur hexafluoride
網膜はく離の手術



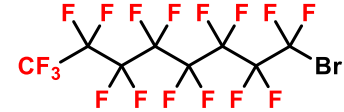
perflubutane (J)
1999
造影剤



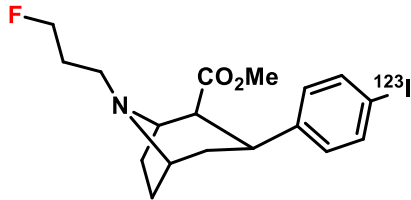
optison



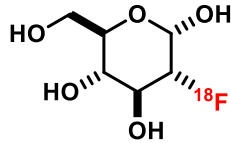
perflexane
造影剤



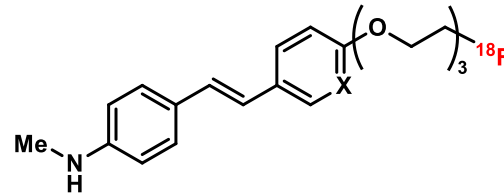
perflubron
1993
造影剤



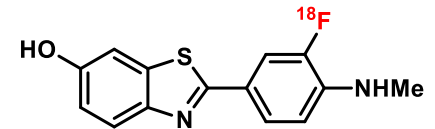
ioflupane (123I)
2000
診断薬 (パーキンソン病)



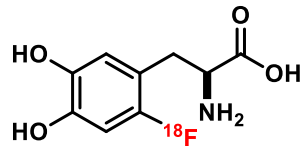
fludeoxyglucose F18
診断薬 (がん)



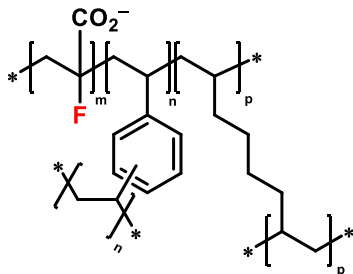
florbetapir (18F) (X = N)
2012
florbetaben (18F) (X = CH)
2014
診断薬 (アルツハイマー)



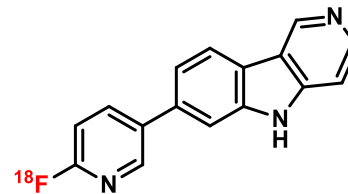
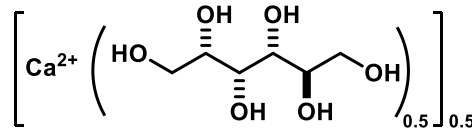
flutemetamol (18F)
2013
診断薬 (アルツハイマー)



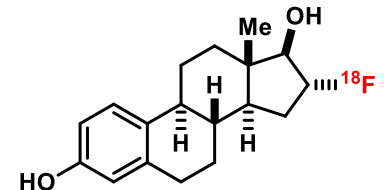
fluorodopa F18
2019



patiomer
2015
カリウム吸着薬



flortaucipir F 18
2020
診断薬 (アルツハイマー)



Fluoroestradiol F18
2020
診断薬 (乳がん)

未分類

