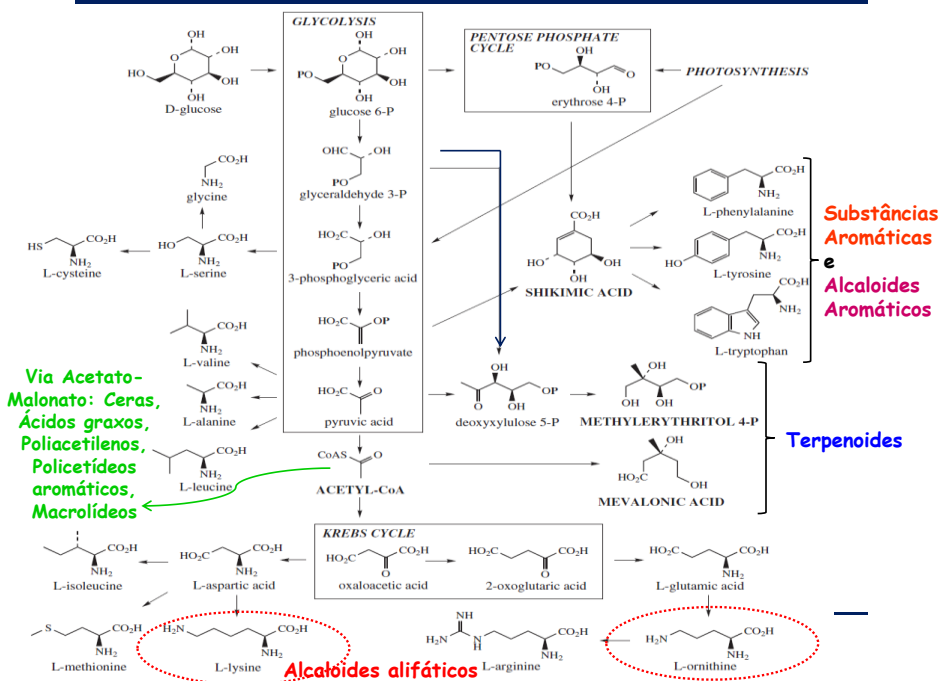


Alcaloides derivados de Aminoácidos Aromáticos: tirosina, triptofano e ácido antranílico

Prof. Marcelo J. Pena Ferreira



ALCALOIDES

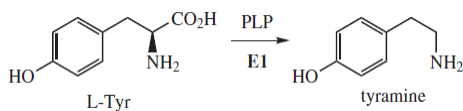
- ✓ Substâncias que apresentam o átomo de N na estrutura
- ✓ N e um fragmento da estrutura são oriundos do aminoácido precursor
- ✓ Podem apresentar caráter básico, se possuir função amina na estrutura; amidas conferem caráter neutro

PSEUDOALCALOIDES

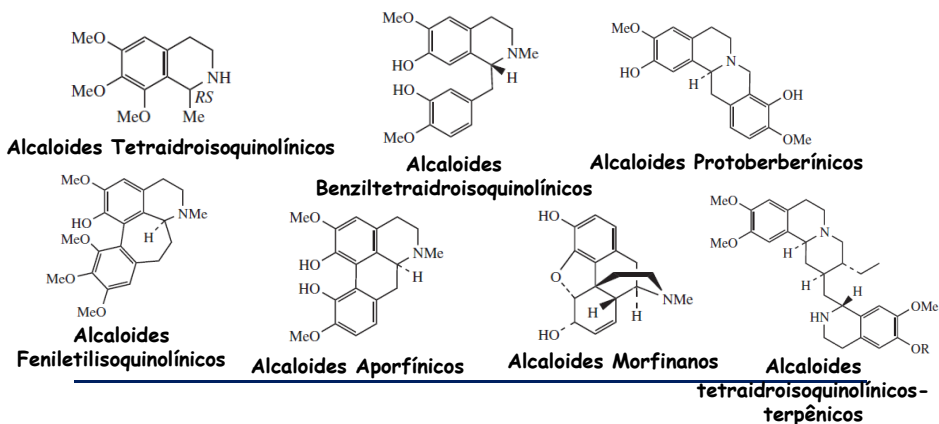
- ✓ N é obtido por transaminação: incorpora o N do aa.
- ✓ Restante da estrutura: obtida através da via do Ac-Mal, MEV, MEP ou chiquimato.

ALCALOIDES DERIVADOS DA TIROSINA

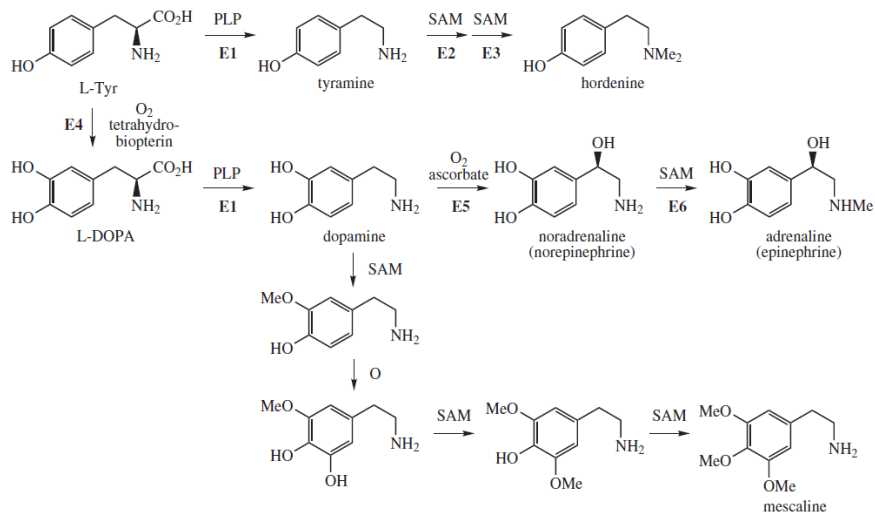
Bloco construtor:



Exemplos das classes de componentes formadas:



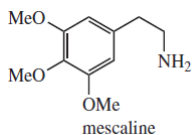
1. FENILETILAMINAS



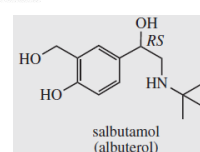
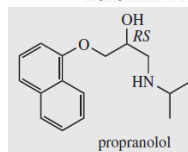
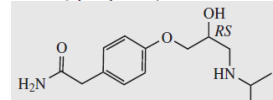
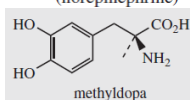
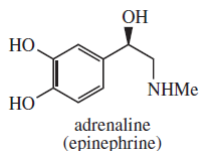
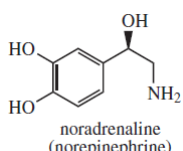
E1: aromatic L-amino acid decarboxylase
 (tyrosine decarboxylase; DOPA decarboxylase)
 E2: tyramine *N*-methyltransferase
 E3: *N*-methyltyramine *N*-methyltransferase

E4: tyrosine hydroxylase
 E5: dopamine β -monoxygenase
 E6: phenylethanolamine *N*-methyltransferase

1. FENILETILAMINAS

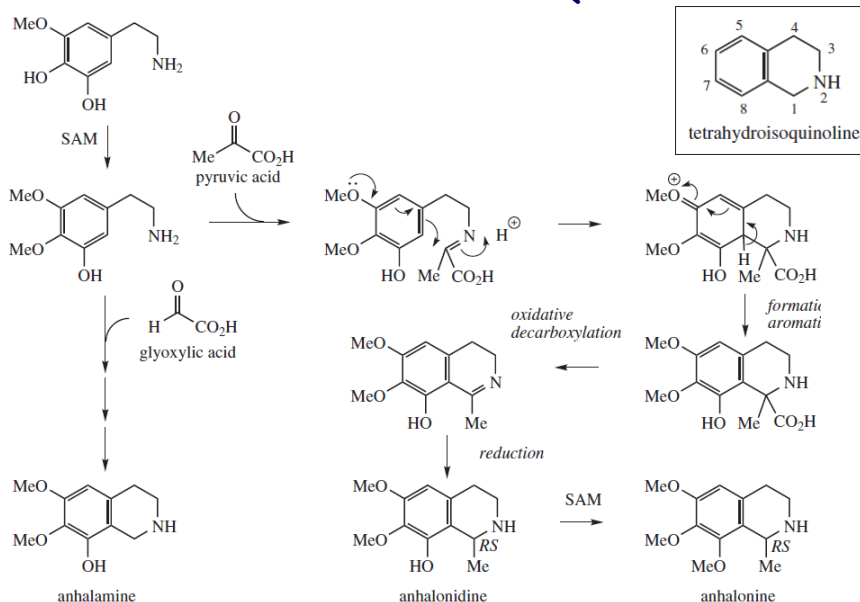


✓ propriedades psicoativas e alucinógenas

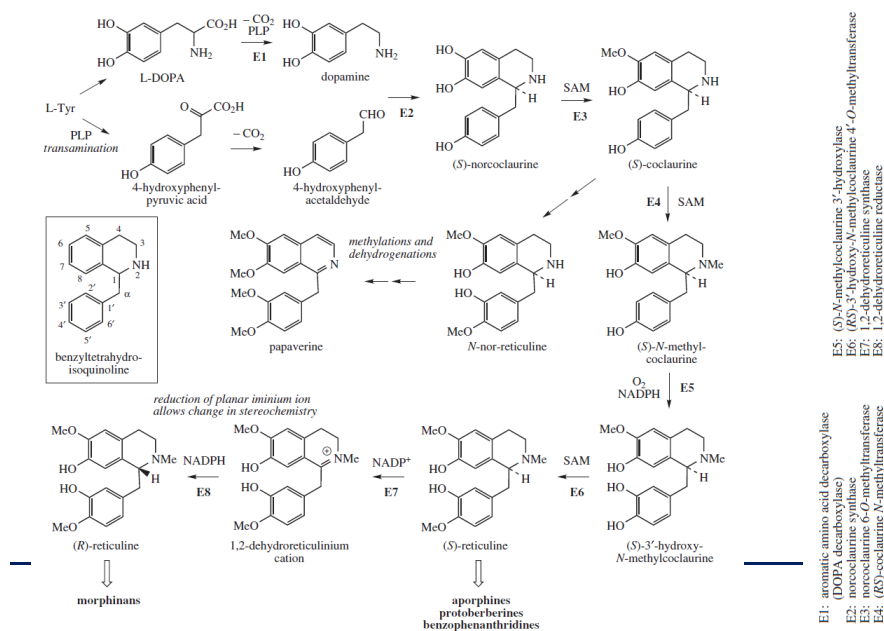


✓ potente vasoconstritor periférico e do músculo liso, respect.; usado na restauração pressão arterial (hipotensão) e contração músculo cardíaco

2. ALCALOIDES TETRAIDROISOQUINOLÍNICOS

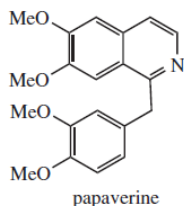


3. ALCALOIDES BENZILTETRAIDROISOQUINOLÍNICOS

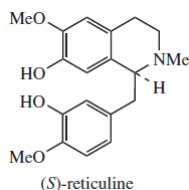




Papaver somniferum - Papaveraceae



Papaverina: vasodilatador na insuficiência circulatória cerebral e relaxante musculatura lisa.

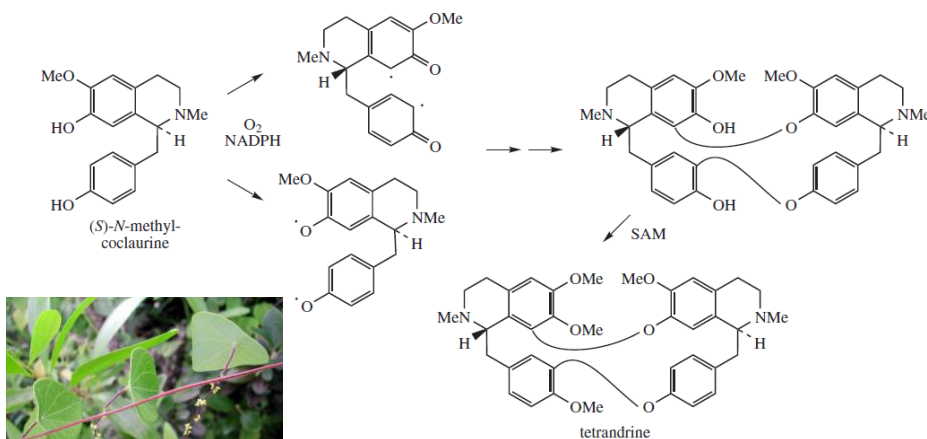


Formada OGM em *E.coli* incorporando genes de *Coptis japonica* (Ranunculaceae) e de bactérias que codificam monoamino oxidase que converte dopamina em aldeído.

Reticulina: efeitos analgésico, espasmolítico e antibacteriano

4. ALCALOIDES BIS-BENZILTETRAIDROISOQUINOLÍNICOS

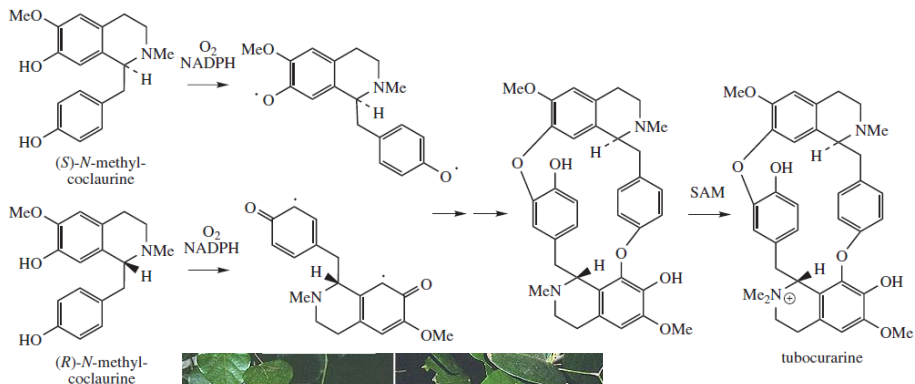
Formados por acoplamento oxidativo entre duas unidades de benziltetrahydroisoquinolínico.



Stephania tetrandra - Menispermaceae

Habilidade de bloquear canais de Ca²⁺: aplicações em desordens cardiovasculares

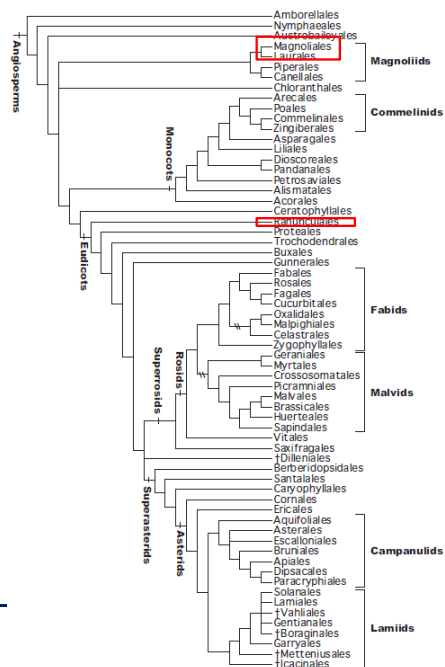
4. ALCALOIDES BIS-BENZILTETRAIDROISOQUINOLÍNICOS



Chondodendron tomentosum - Menispermaceae

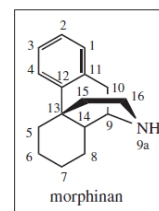
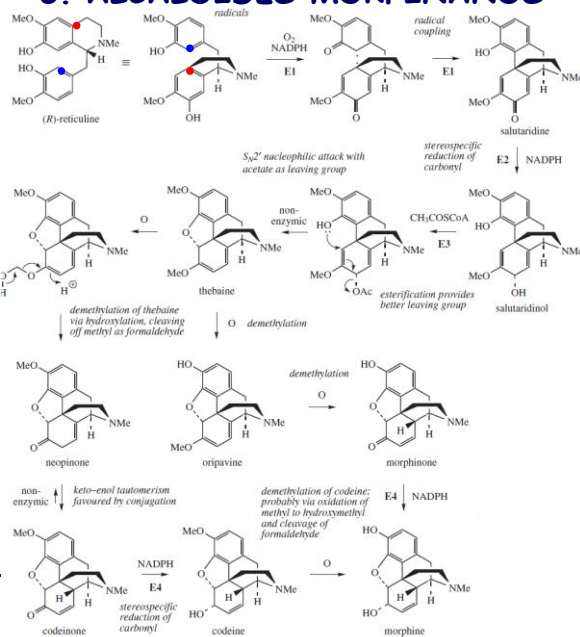
Fontes de curare. Nativas da floresta amazônica. Curares: paralisam a musculatura estriada. Usados em cirurgia do tronco.

DISTRIBUIÇÃO DOS ALCALOIDES BENZILTETRAIDROISOQUINOLÍNICOS

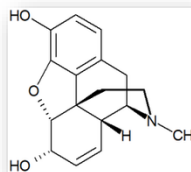
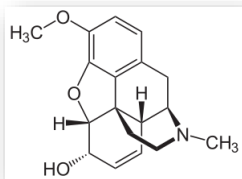


5. ALCALOIDES MORFINANOS

Formados por acoplamento oxidativo orto-para da reticulina



Papaver somniferum - Papaveraceae
papoula

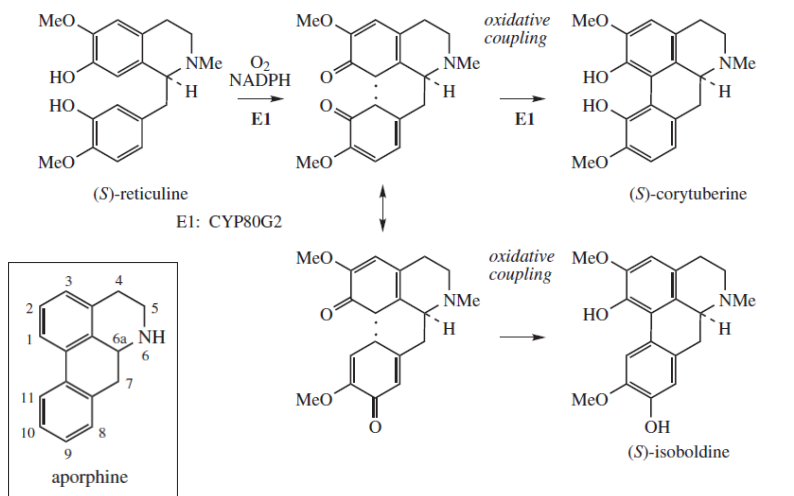


Codeína: analgésico e antitússico.

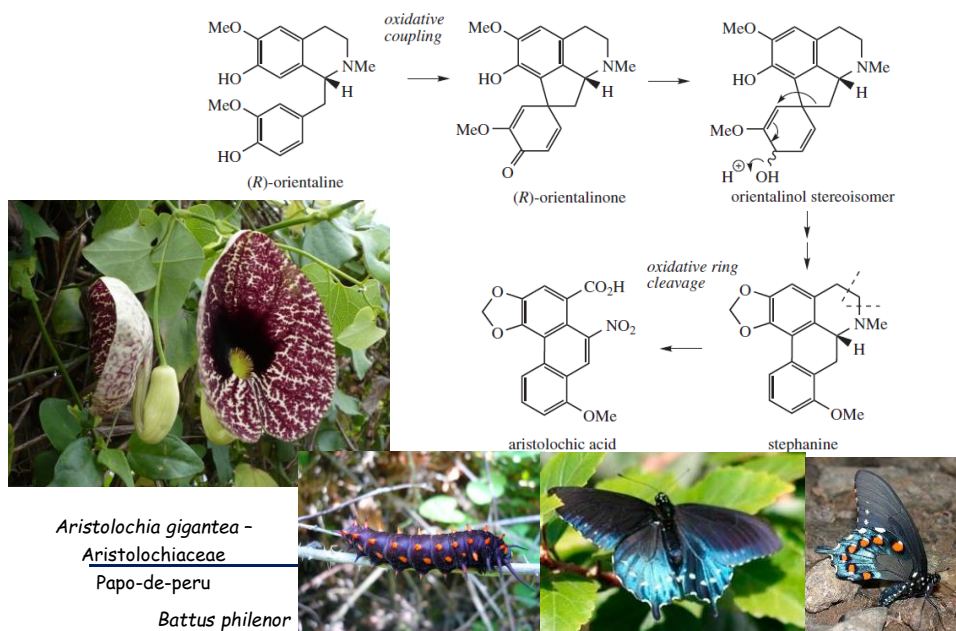
Morfina: usada mundialmente como analgésico.

6. ALCALOIDES APORFÍNICOS

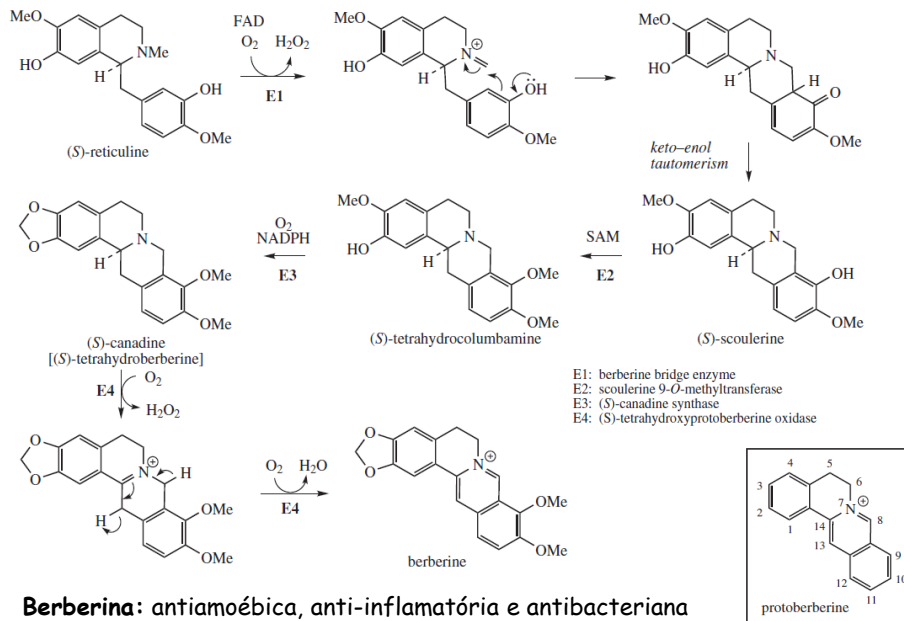
Formados por acoplamento oxidativo *orto-orto* da reticulina



6. ALCALOIDES APORFÍNICOS

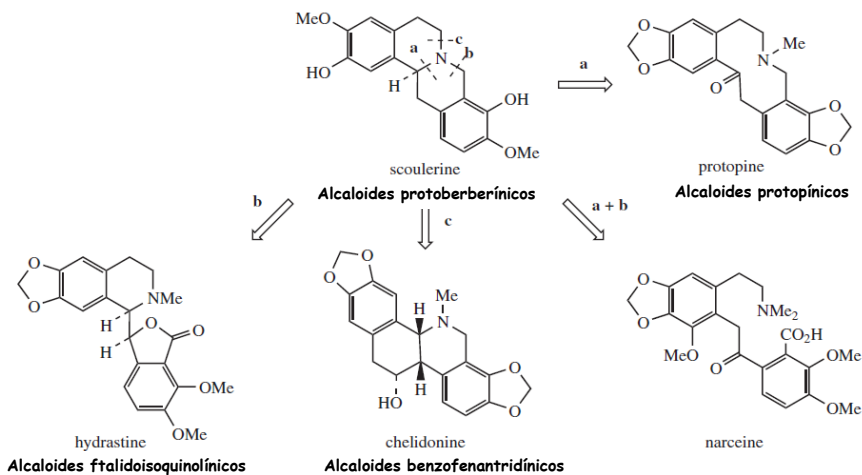


7. ALCALOIDES PROTOBERBERÍNICOS



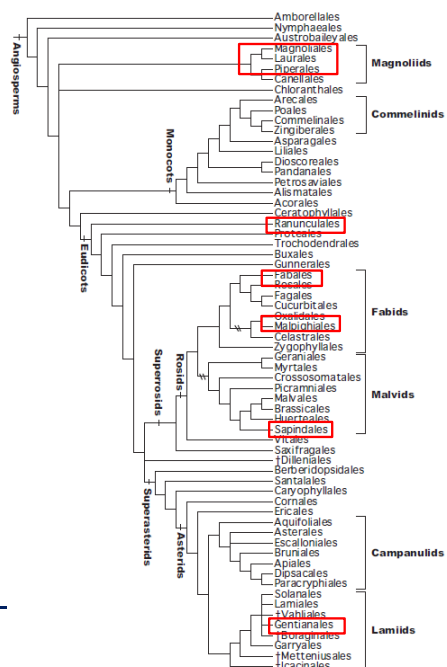
Berberina: antiamoébia, anti-inflamatória e antibacteriana

8. ALCALOIDES DERIVADOS DOS PROTOBERBERÍNICOS



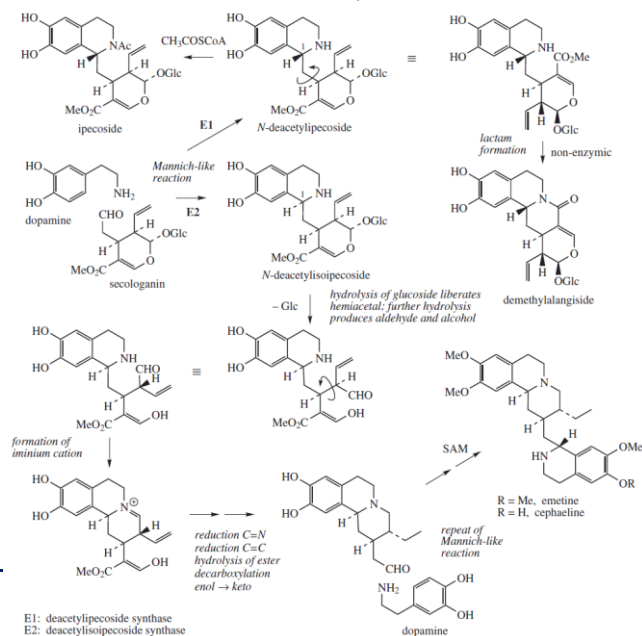
BIB 5754 – Produtos Naturais I: Biossíntese e Distribuição em Espécies Vegetais

DISTRIBUIÇÃO DOS ALCALOIDES BENZILISOQUINOLÍNICOS MODIFICADOS



BIB 5754 – Produtos Naturais I: Biossíntese e Distribuição em Espécies Vegetais

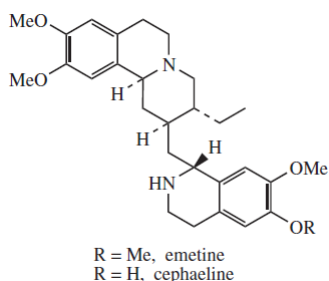
9. ALCALOIDES TETRAIDROISOQUINOLÍNICOS-TERPÊNICOS



9. ALCALOIDES TETRAIDROISOQUINOLÍNICOS-TERPÊNICOS

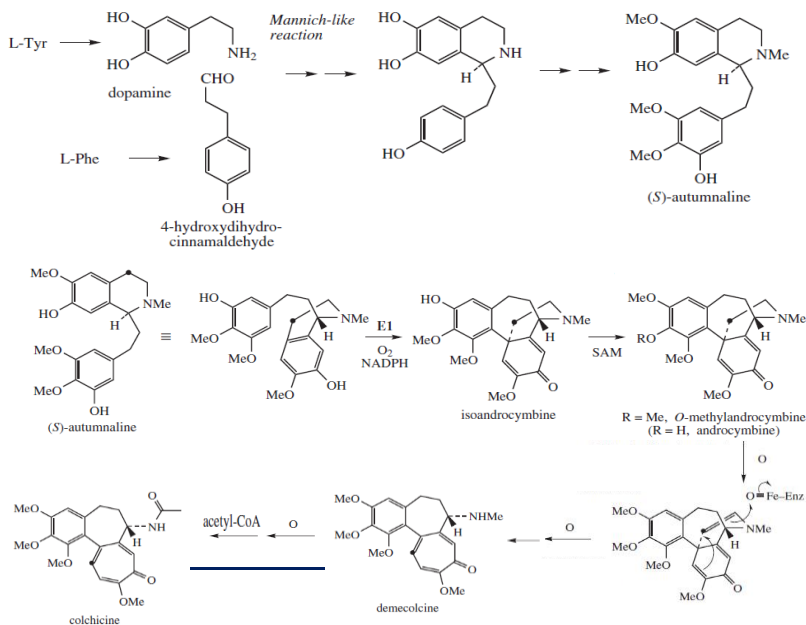


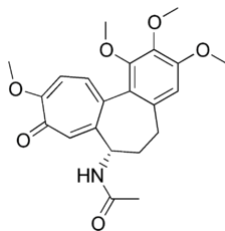
Psychotria ipecacuanha (Ipeca ou ipecacuanha): folhas e raízes



- ✓ Proporção 2:1 emetine e cephaeline, resp.
- ✓ Uso: antiamebóticos
- ✓ Apresentam ação emética
- ✓ Empregados em envenenamento por medicamentos ou overdose

10. ALCALOIDES FENILETILISOQUINOLÍNICOS





Colchicina: tratamento da gota
Potencial uso antitumoral



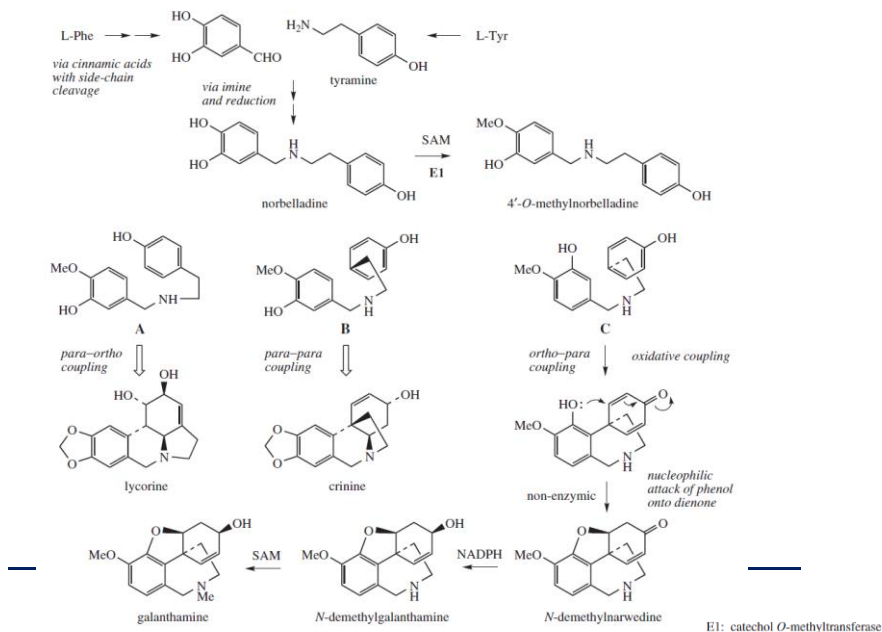
Colchicum autumnale - Colchicaceae

- ✓ Inibe a polimerização das proteínas do fuso mitótico, cessando a divisão celular na metáfase
- ✓ Empregada na realização do cariótipo da célula
- ✓ Potencial uso antitumoral



Gloriosa superba - Colchicaceae

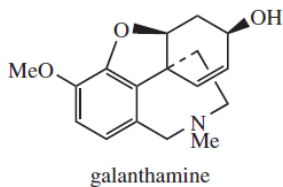
11. ALCALOIDES DE AMARYLLIDACEAE





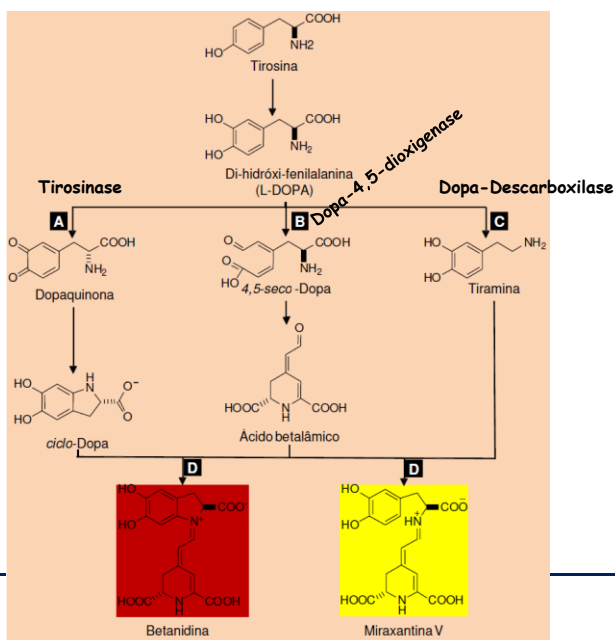
Copyright: F. Action Photostudio - Hillegom, Netherlands
WWW.F-VIEWS.COM

Leucojum aestivum - Amaryllidaceae



Atua como inibidor competitivo e reversível da acetilcolinesterase, melhorando significativamente a função cognitiva no tratamento de Alzheimer.

12. BETALAÍNAS

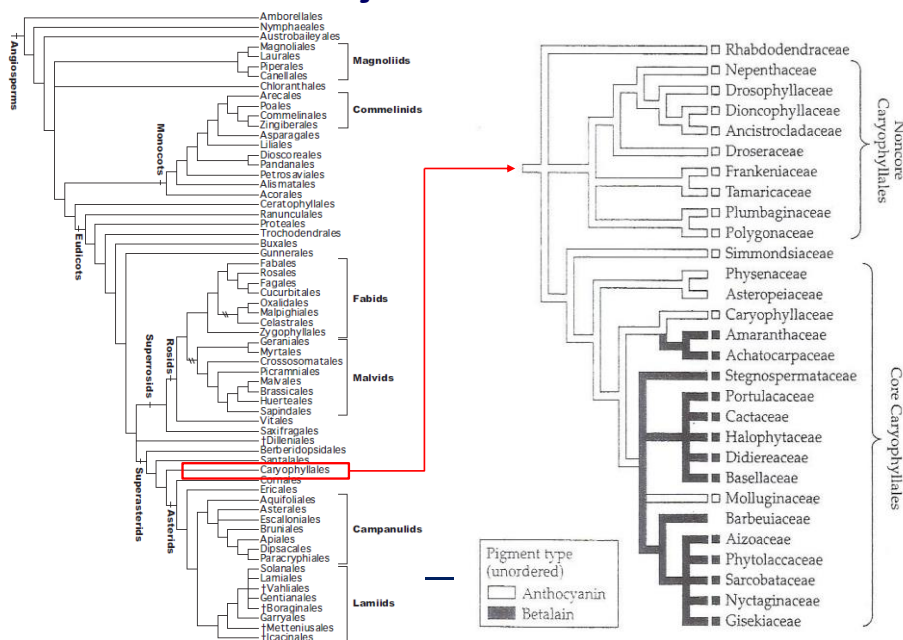


12. BETALAÍNAS



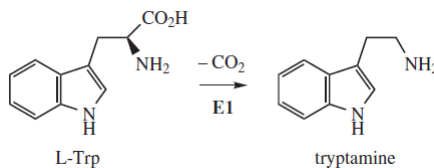
Alimentos	Cor	Quantidade
balas	rosa	0,1 %
bebidas em pó seco	framboesa	1,5 %
bebidas em pó seco	morango	1,2 %
bebidas em pó seco	groselha	1,0 %
coquetéis de framboesa	vermelha	2,0 %
embutidos	rosa-marrom	600 mg/100 g
geleias de framboesa	vermelha	0,2 %
iogurte de morango	rosa-rosa	0,09 %
presunto cozido	rosa	0,17 %
recheio de biscoitos	rosa	0,28 %
recheio de biscoitos	chocolate	1,6 %
sorvetes	rosa	0,25 %

DISTRIBUIÇÃO DAS BETALAÍNAS

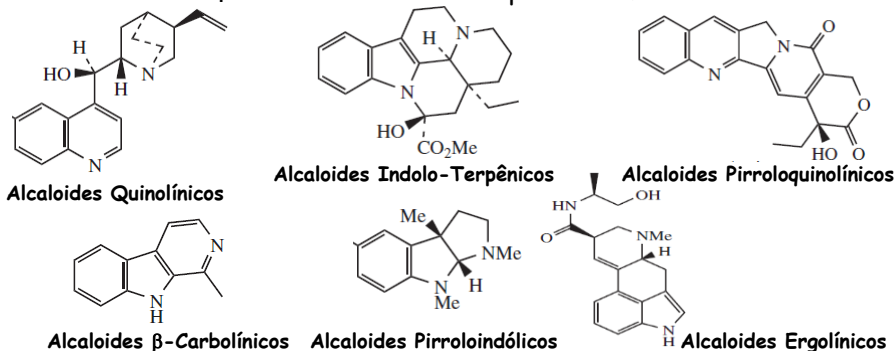


ALCALOIDES DERIVADOS DO TRIPTOFANO

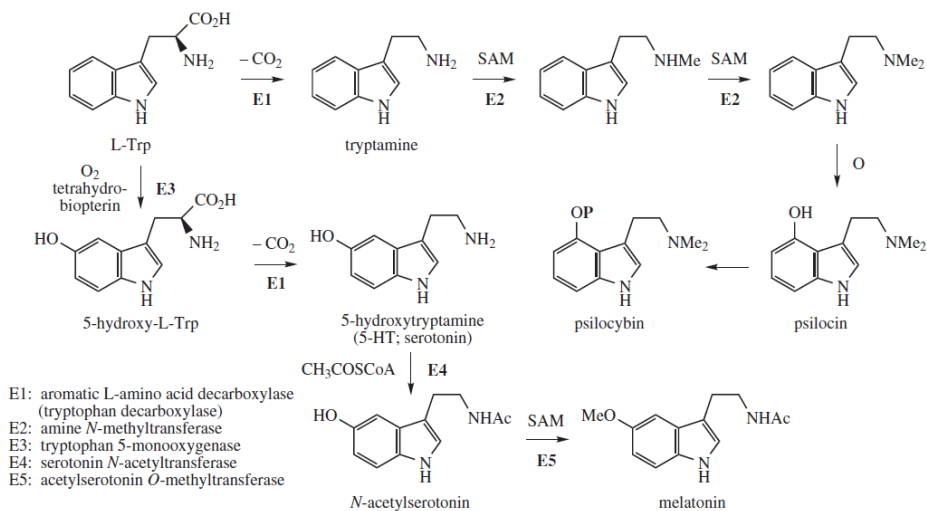
Bloco construtor:



Exemplos das classes de componentes formadas:



1. ALCALOIDES INDÓLICOS SIMPLES

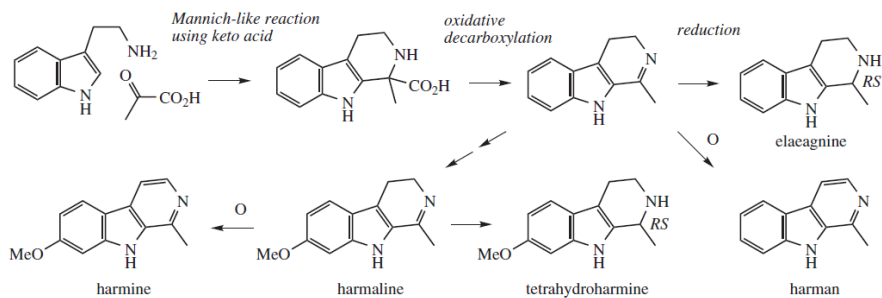
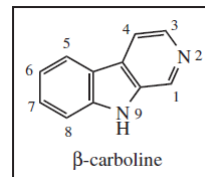


Derivados N- e N,N-disubstituídos são vastamente distribuídos em plantas

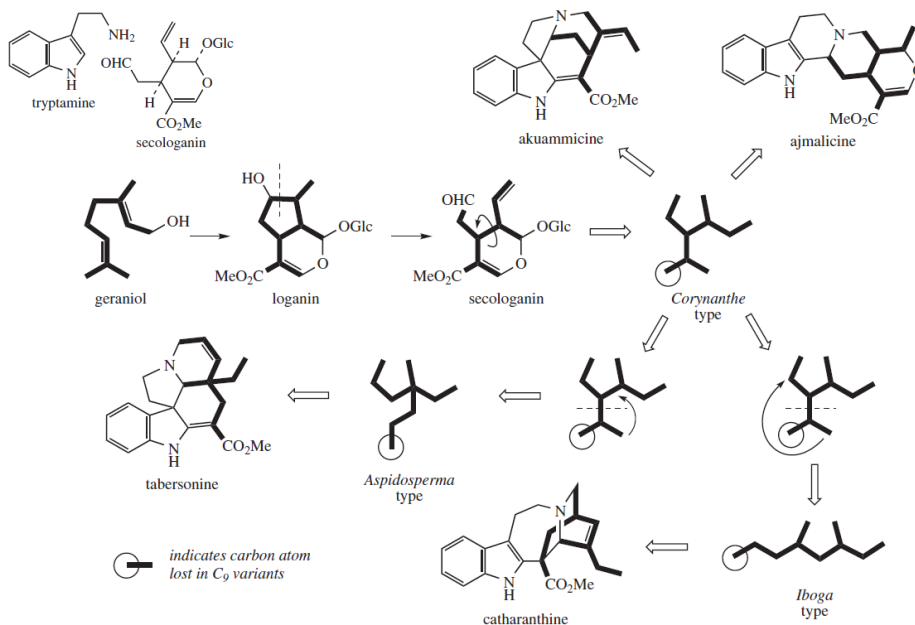
2. ALCALOIDES β -CARBOLÍNICOS

✓ Caracterizados pela formação de um novo anel heterocíclico de 6 membros com a cadeia lateral da triptamina

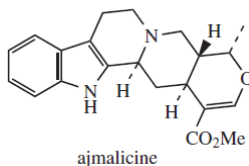
✓ Propriedades psicoativas



3. ALCALOIDES INDOLO-TERPÊNICOS

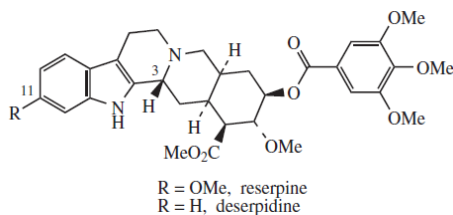


3. ALCALOIDES INDOLO-TERPÊNICOS : *Corynanthe*



Empregado em:

- ✓ arritmia cardíaca
- ✓ antihipertensivo



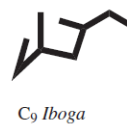
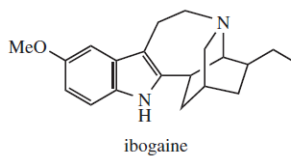
Rauwolfia serpentina - Apocynaceae

- ✓ Antihipertensivo e tranquilizante suave
- ✓ Raízes e rizomas: usados como antídoto para venenos de serpentes

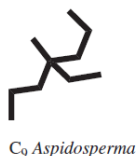
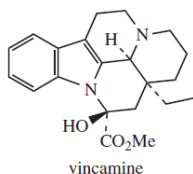
3. ALCALOIDES INDOLO-TERPÊNICOS: *Iboga* e *Aspidosperma*



Tabernanthe iboga - Apocynaceae

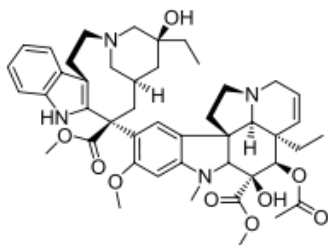


- ✓ Estimulante do SNC
- ✓ Tratamento da quimiodependência



Vinca major - Apocynaceae

- ✓ Clinicamente usado como vasodilatador



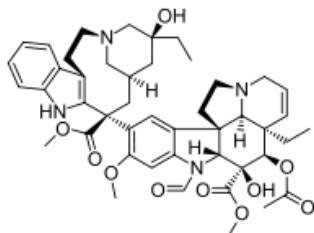
Vimblastina: doença de Hodgkin

Vincristina: antitumoral variado

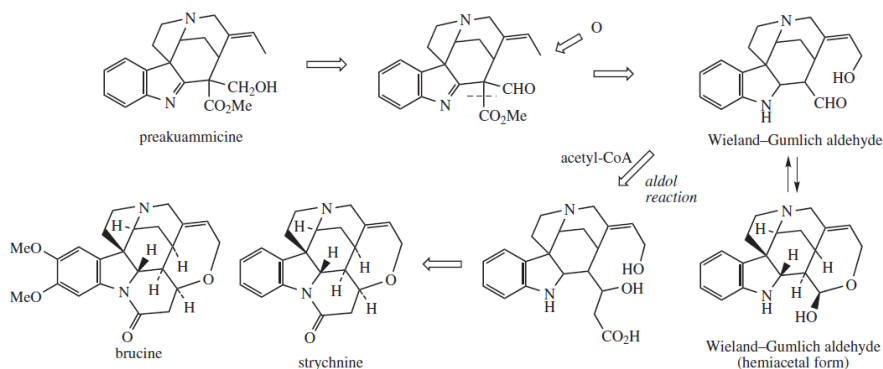


Catharanthus roseus (L.) G. DON
© Thomas Schaefer

Catharanthus roseus - Apocynaceae



3. ALCALOIDES INDOLO-TERPÊNICOS: *Strychnos*

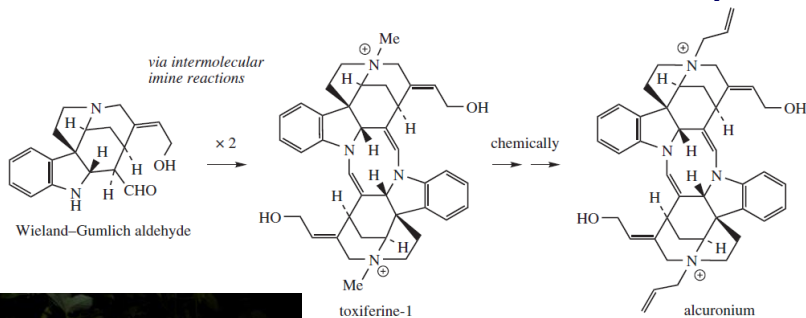


Strychnos nux-vomica - Loganiaceae

- ✓ Extremamente tóxicos
- ✓ Afeta o SNC causando convulsões
- ✓ Sementes contém 1,5-5,0%



3. ALCALOIDES INDOLO-TERPÊNICOS: *Strychnos*

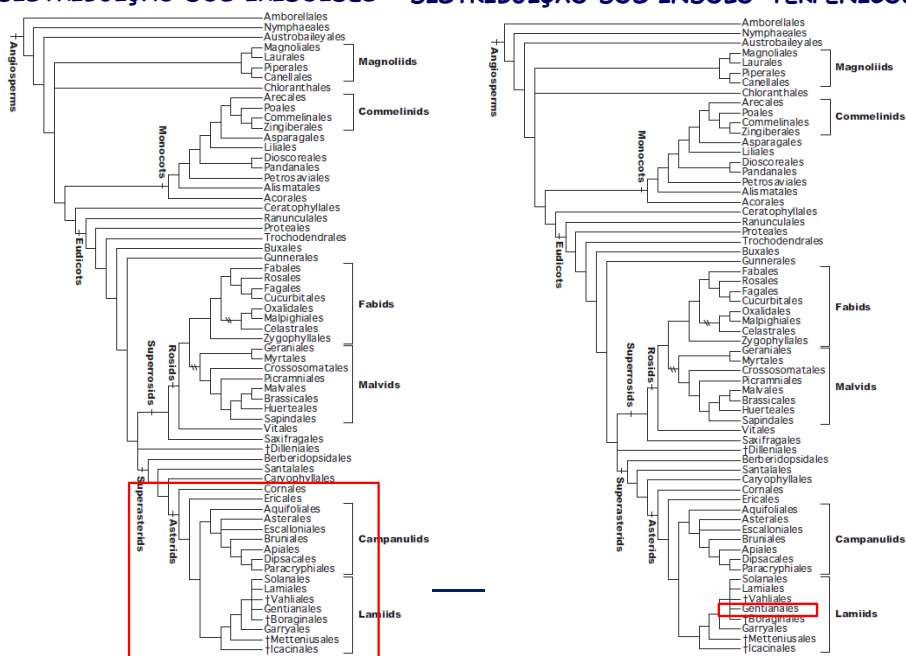


- ✓ Relaxantes do músculo esquelético
- ✓ Empregados nos Curaros

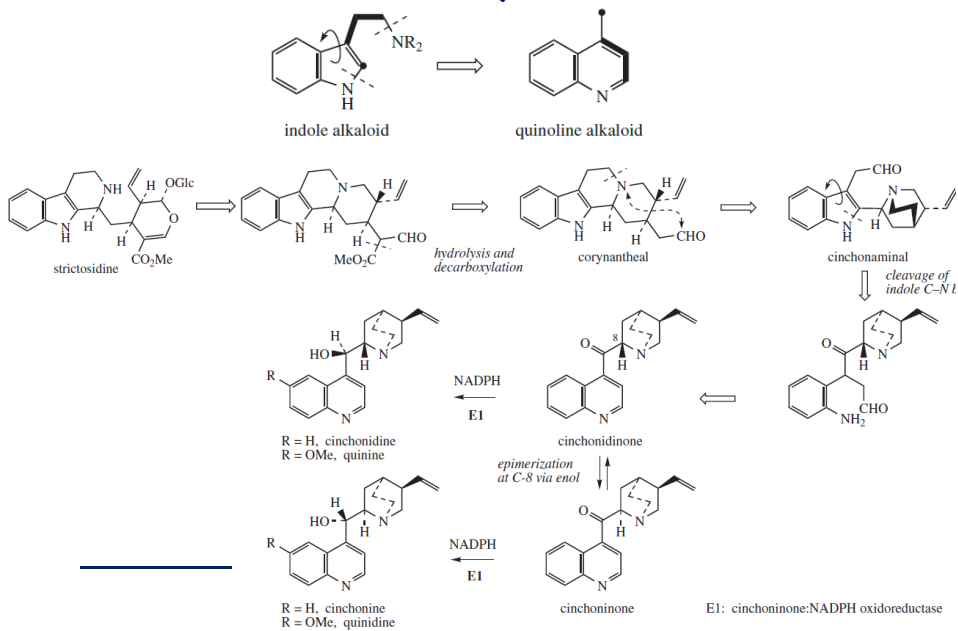


Toxiferina: fármaco de *Strychnos toxifera* (Loganiaceae)

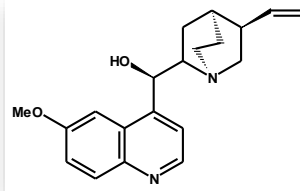
DISTRIBUIÇÃO DOS IRIDOIDES DISTRIBUIÇÃO DOS INDOLO-TERPÊNICOS



4. ALCALOIDES QUINOLÍNICOS

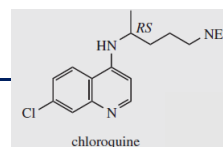


Cinchona sp. - Rubiaceae

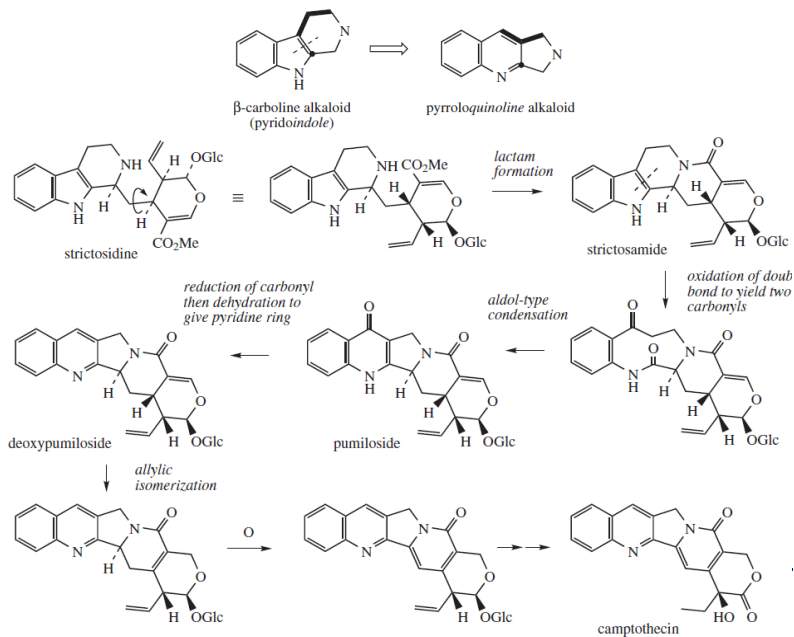


Quinina: usada como antimalárico.

Derivado: cloroquina



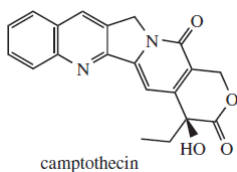
5. ALCALOIDES PIRROLOQUINOLÍNICOS



5. ALCALOIDES PIRROLOQUINOLÍNICOS



Camptotheca acuminata - Nyssaceae

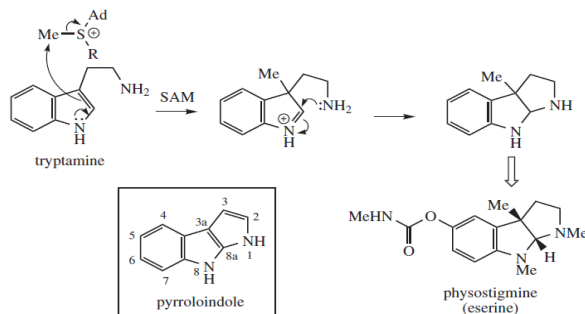


camptothecin

- ✓ Atividade antitumoral
- ✓ Inibição da enzima topoisomerase I
- ✓ Atua contra *Trypanossoma* e *Leishmania*



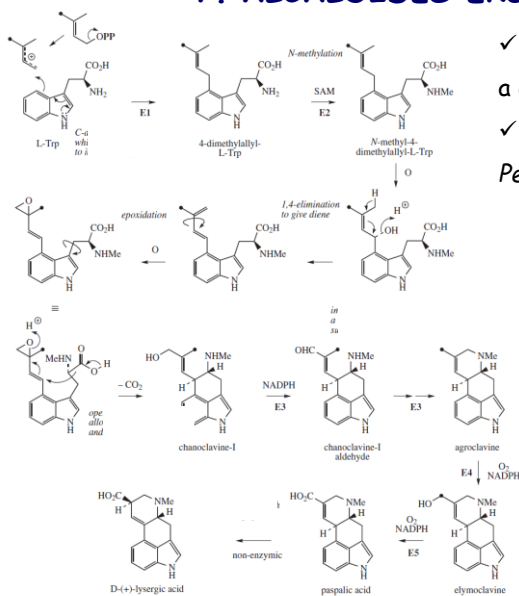
6. ALCALOIDES PIRROLOINDÓLICOS



Physostigma venenosum - Fabaceae

- ✓ Inibidor reversível da acetilcolinesterase
- ✓ Reduz pressão ocular: usado no tratamento do glaucoma juntamente com a pilocarpina
- ✓ Raros na natureza: plantas, algas e anfíbios

7. ALCALOIDES ERGOLÍNICOS



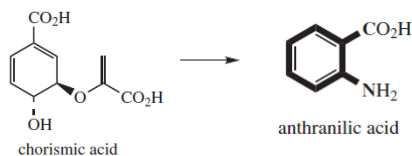
- ✓ Produzidos por fungos associados a espécies de Convolvulaceae
- ✓ *Aspergillus*, *Claviceps* e *Penicillium*

- ✓ Uso em medicina: Cesarianas
- ✓ Efeito vasoconstritor

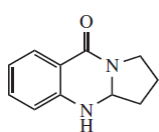
E1: dimethylallyltryptophan synthase
 E2: dimethylallyltryptophan N-methyltransferase
 E3: chanoclavine-I cyclase
 E4: agroclavine 17-monoxygenase
 E5: elymoclavine 17-monoxygenase

ALCALOIDES DERIVADOS DO ÁCIDO ANTRANÍLICO

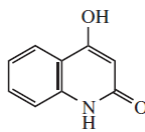
Bloco construtor:



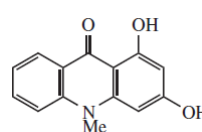
Exemplos das classes de componentes formadas:



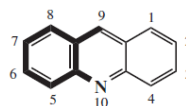
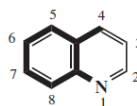
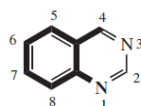
Alcaloides Quinazolínicos



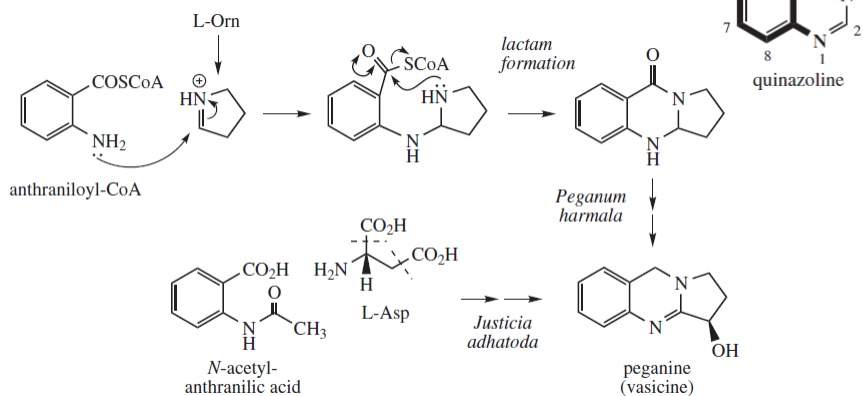
Alcaloides Quinolínicos



Alcaloides Acridínicos



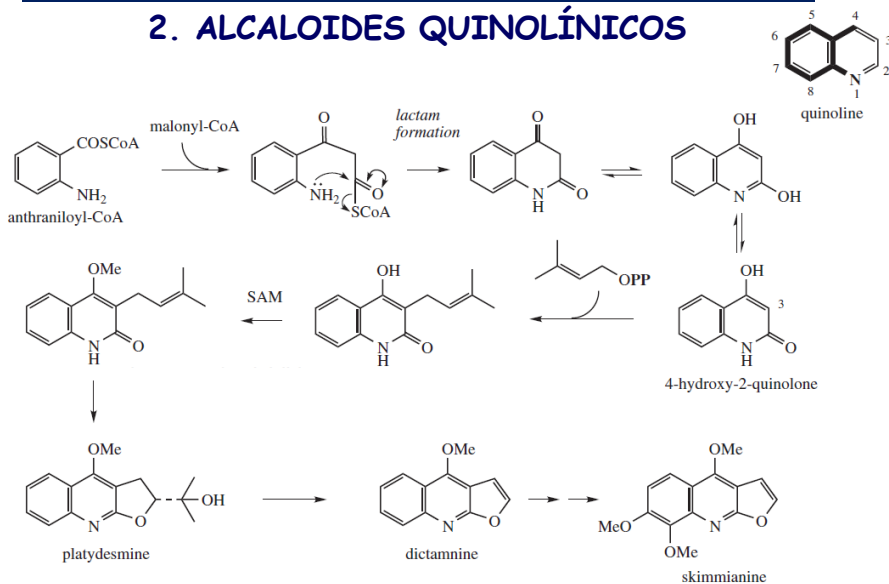
1. ALCALOIDES QUINAZOLÍNICOS



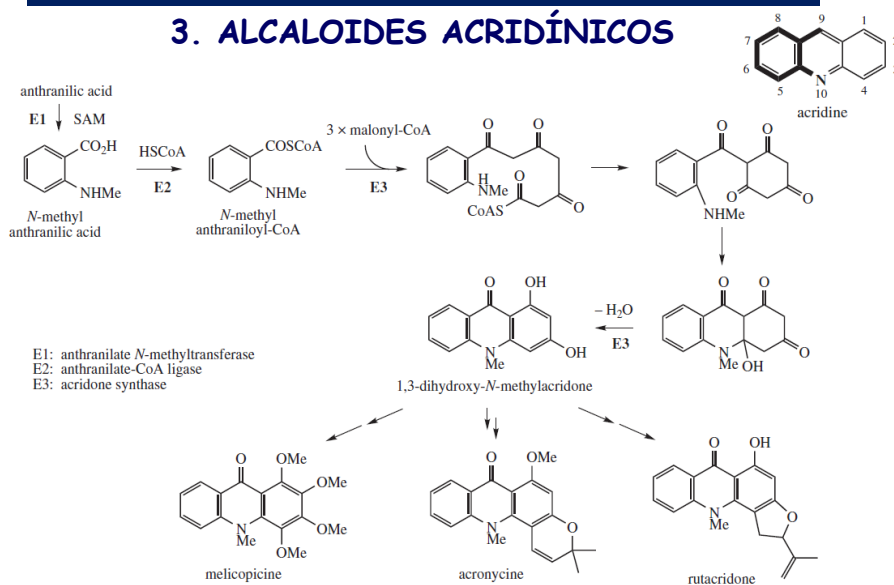
Justicia adhatoda - Acanthaceae

- ✓ Uso: Broncodilatador
- ✓ Derivados usados em veterinária

2. ALCALOIDES QUINOLÍNICOS



3. ALCALOIDES ACRIDÍNICOS





Ruta graveolens - Rutaceae

- ✓ Usada como erva medicinal e mágica
 - ✓ Ingestão por artistas: "melhoravam" sua criatividade e visão
 - ✓ Símbolo de pesar, tristeza e arrependimento
 - ✓ Católicos usam raminhos para aspergir água benta sobre os fiéis
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