



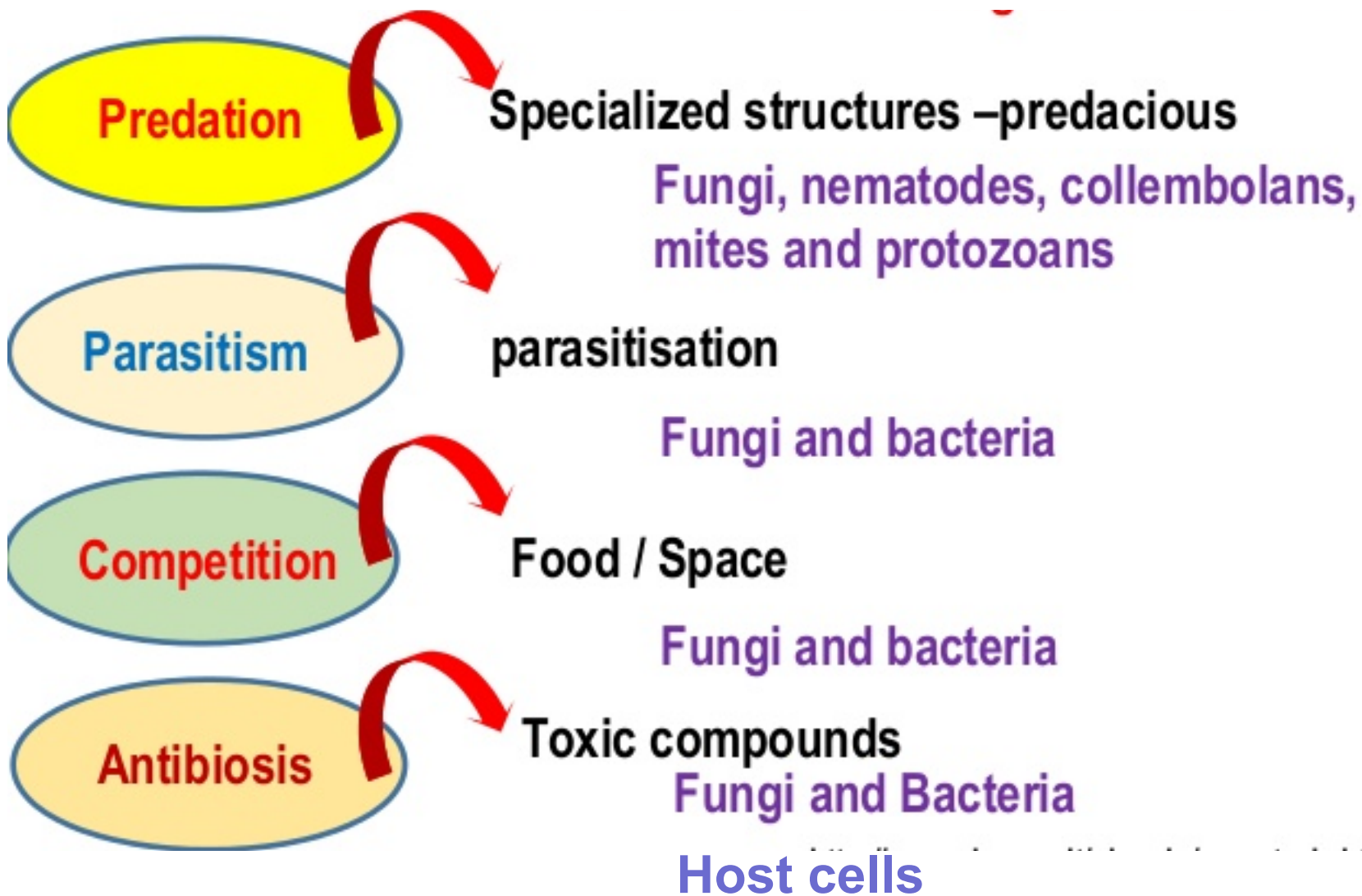
Instituto de ciências
biomédicas

Antibiose

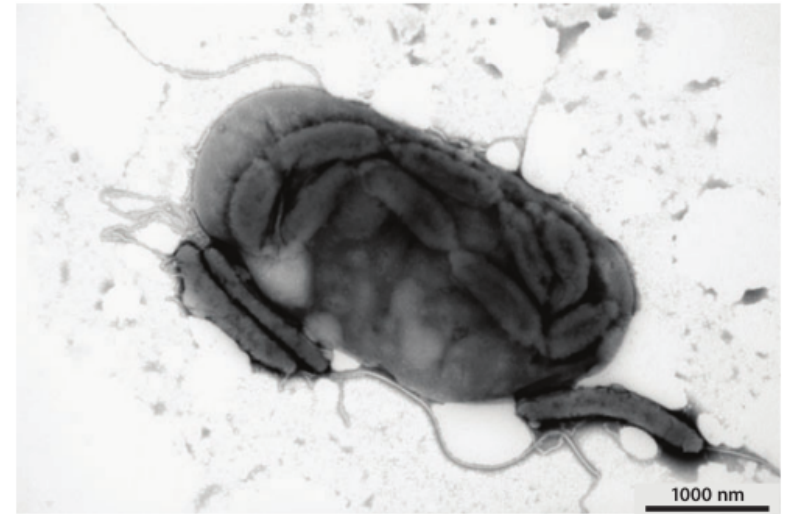
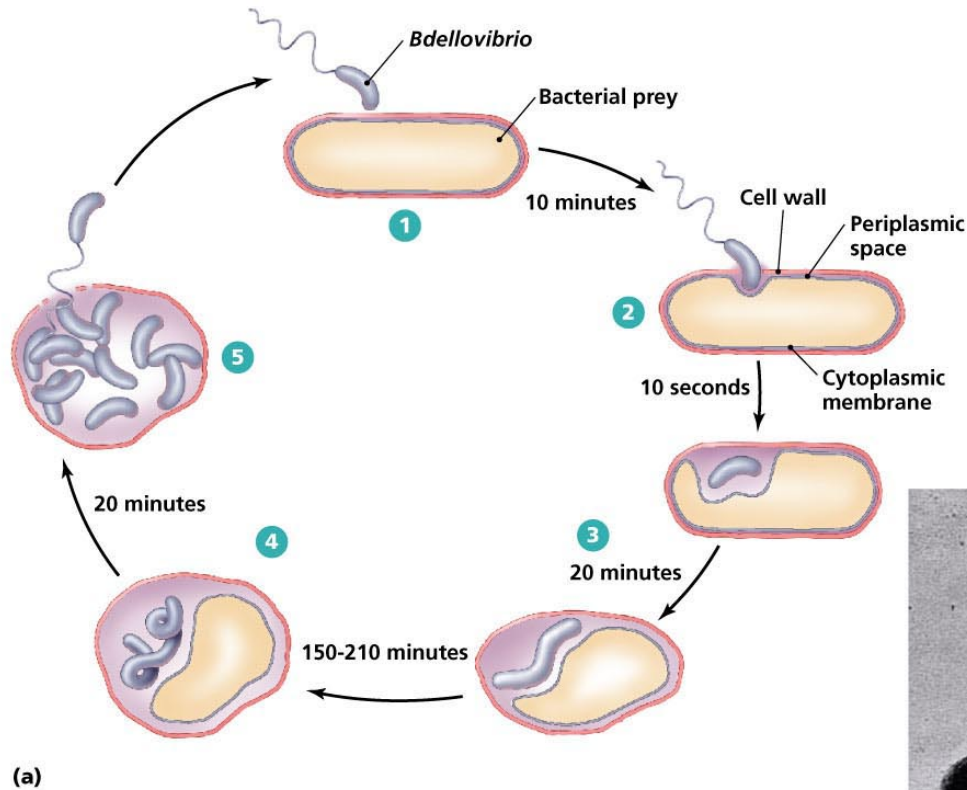
Gabriel Padilla
gpadilla@icb.usp.br

2020

Mecanismos envolvidos em interações microbianas



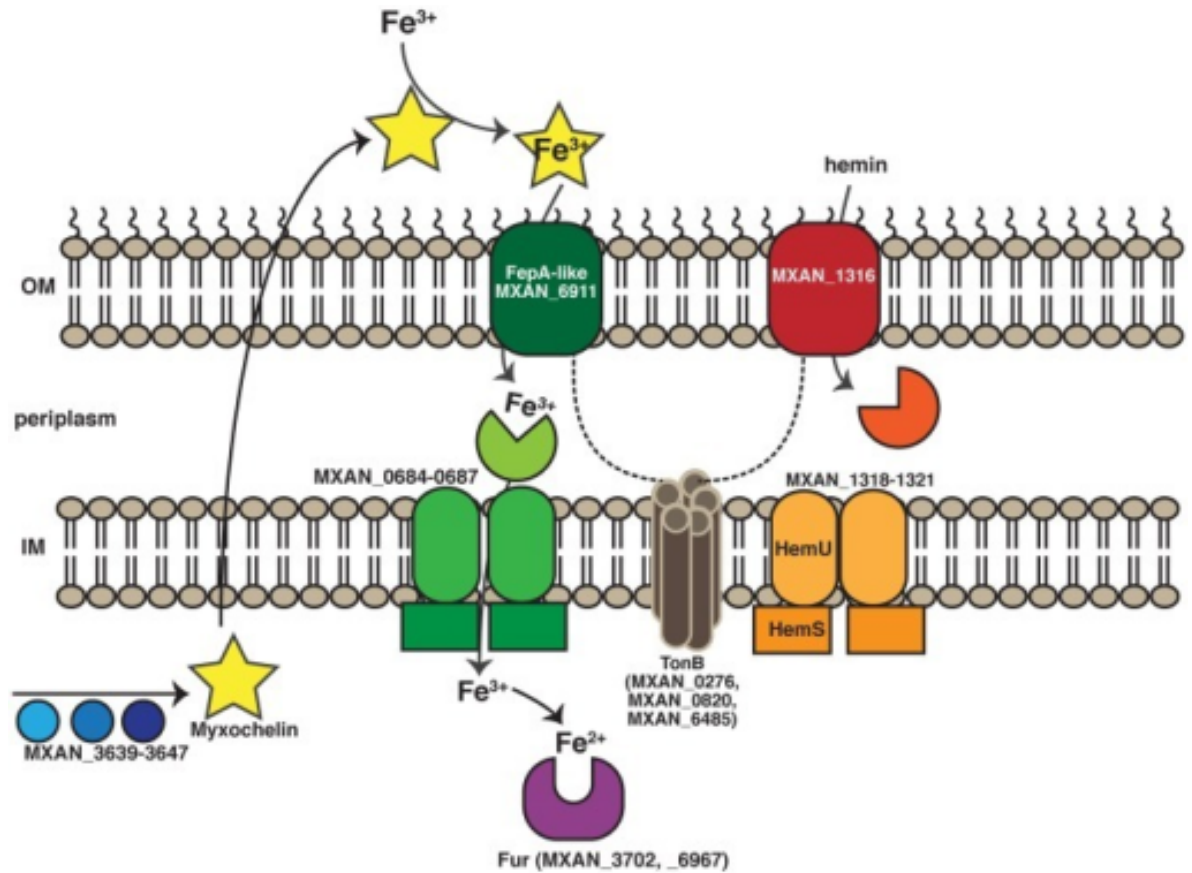
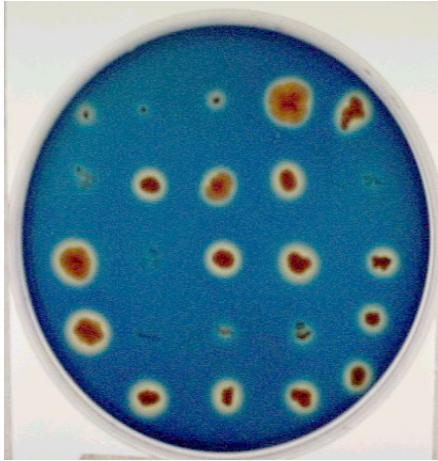
Mecanismos envolvidos na interação - predação



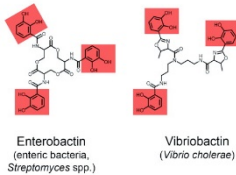
Copyright © 2006 Pearson Education, Inc., publishing as Benjamin Cummings.

Bdellovibrio bacteriovorus

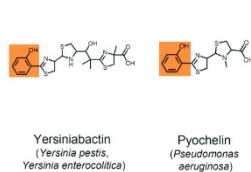
Competição microbiana - sideróforos



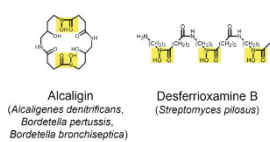
Catecholate Type



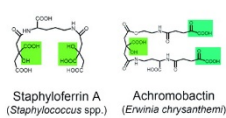
Phenolate Type



Hydroxamate Type

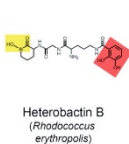


Carboxylate Type

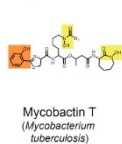


Mixed Types

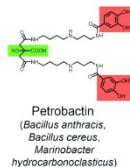
Catecholate-Hydroxamate



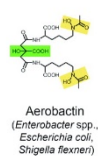
Phenolate-Hydroxamate



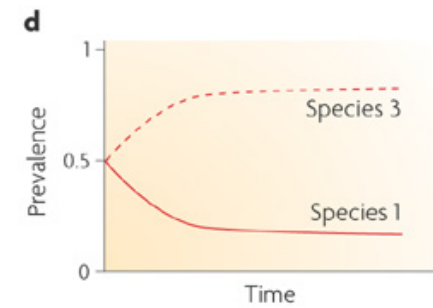
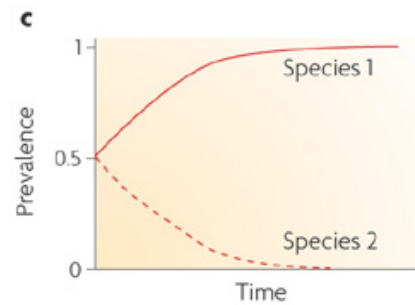
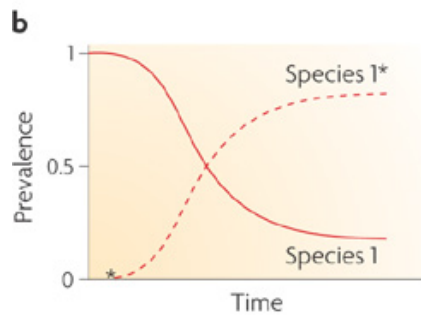
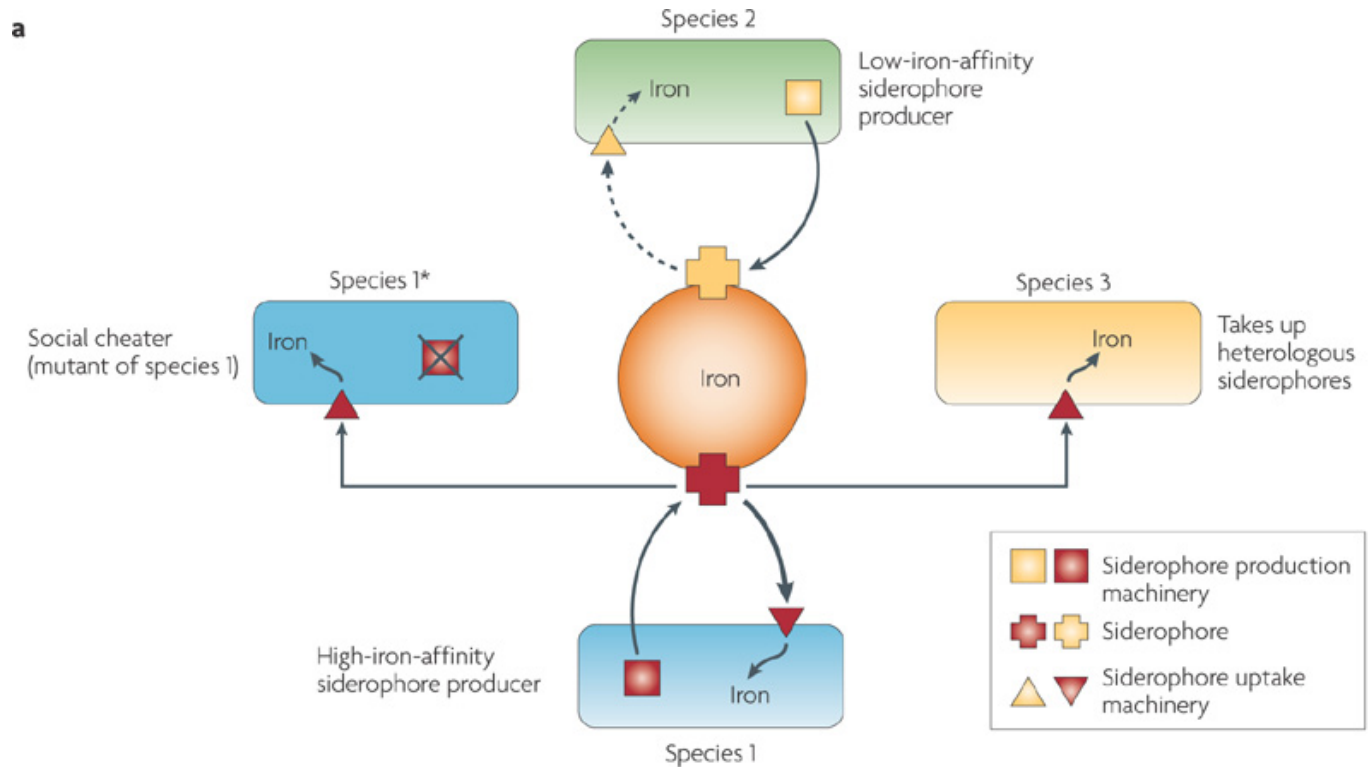
Citrate-Catecholate



Citrate-Hydroxamate

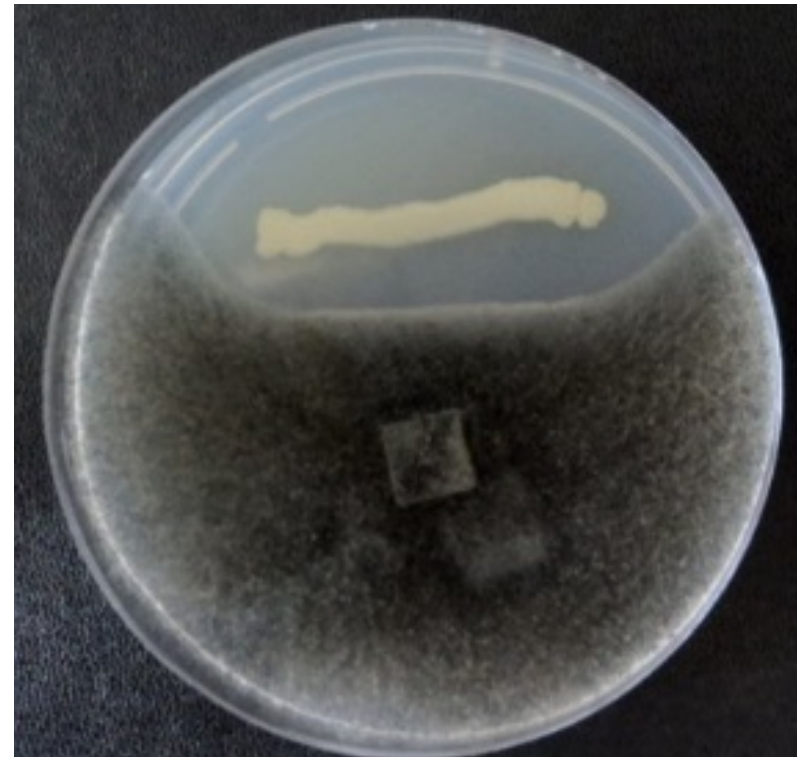
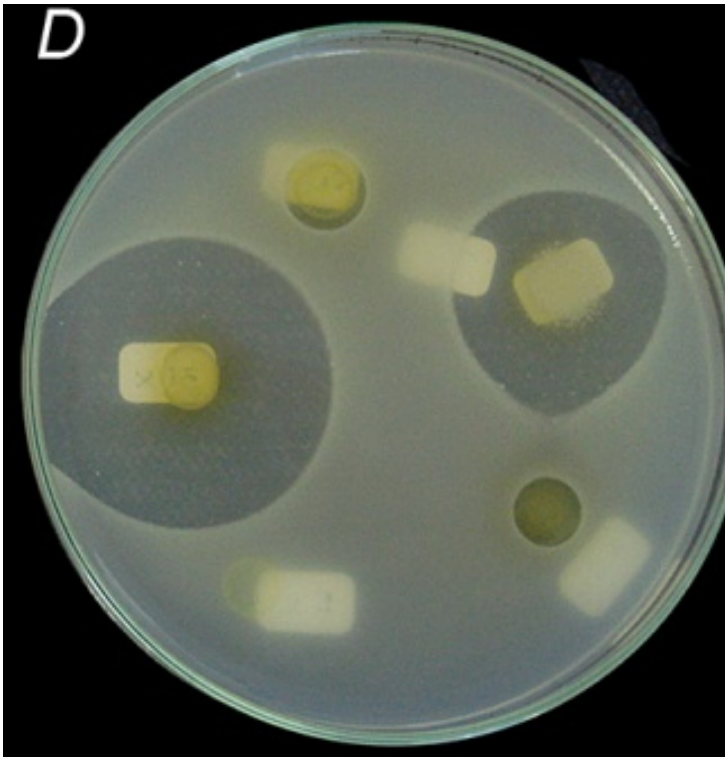


Competição microbiana - Sideróforos



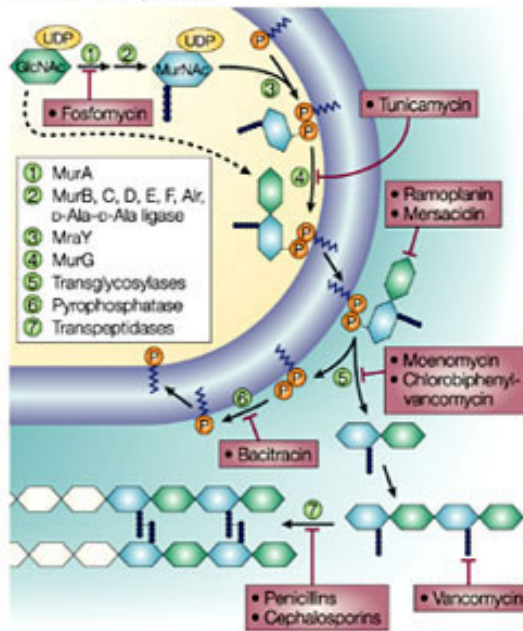
Antibiose

Antibiose é um tipo de interação entre dois ou mais micro-organismos, que resulta em um ambiente negativo para um ou mais destes indivíduos. Para isso estes micro-organismos utilizam da capacidade de produção de compostos químicos que atuam sobre o crescimento e sobrevivência da outra espécie.

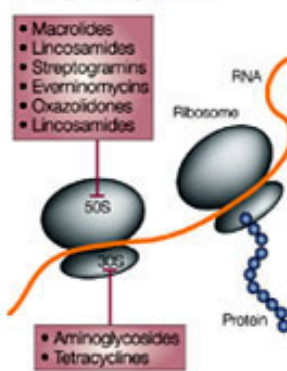


Antibióse – mecanismos de ação

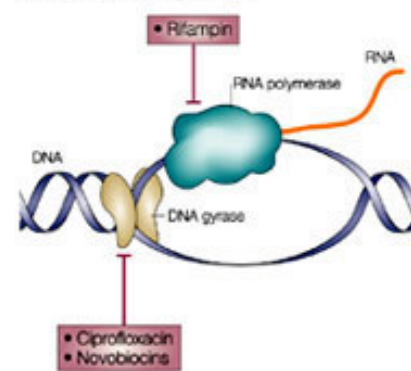
a Cell wall biosynthesis



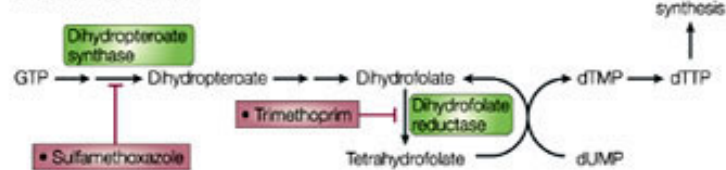
b Protein biosynthesis



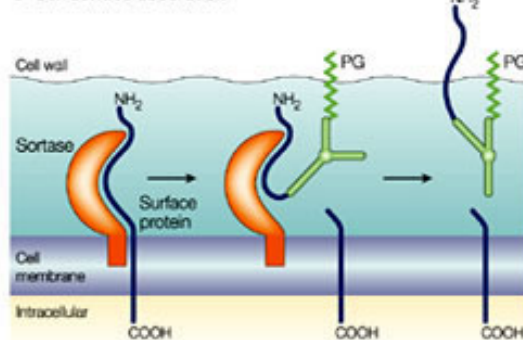
c DNA and RNA replication



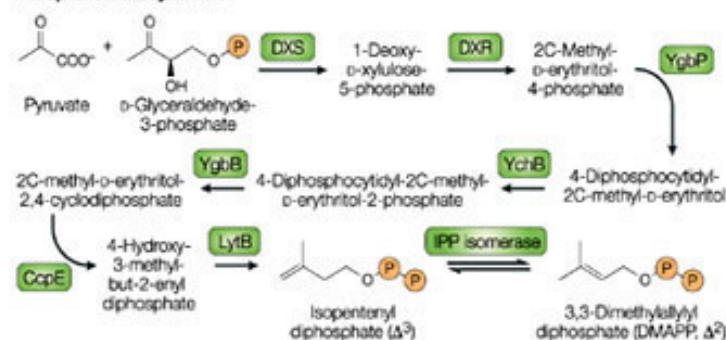
d Folate metabolism



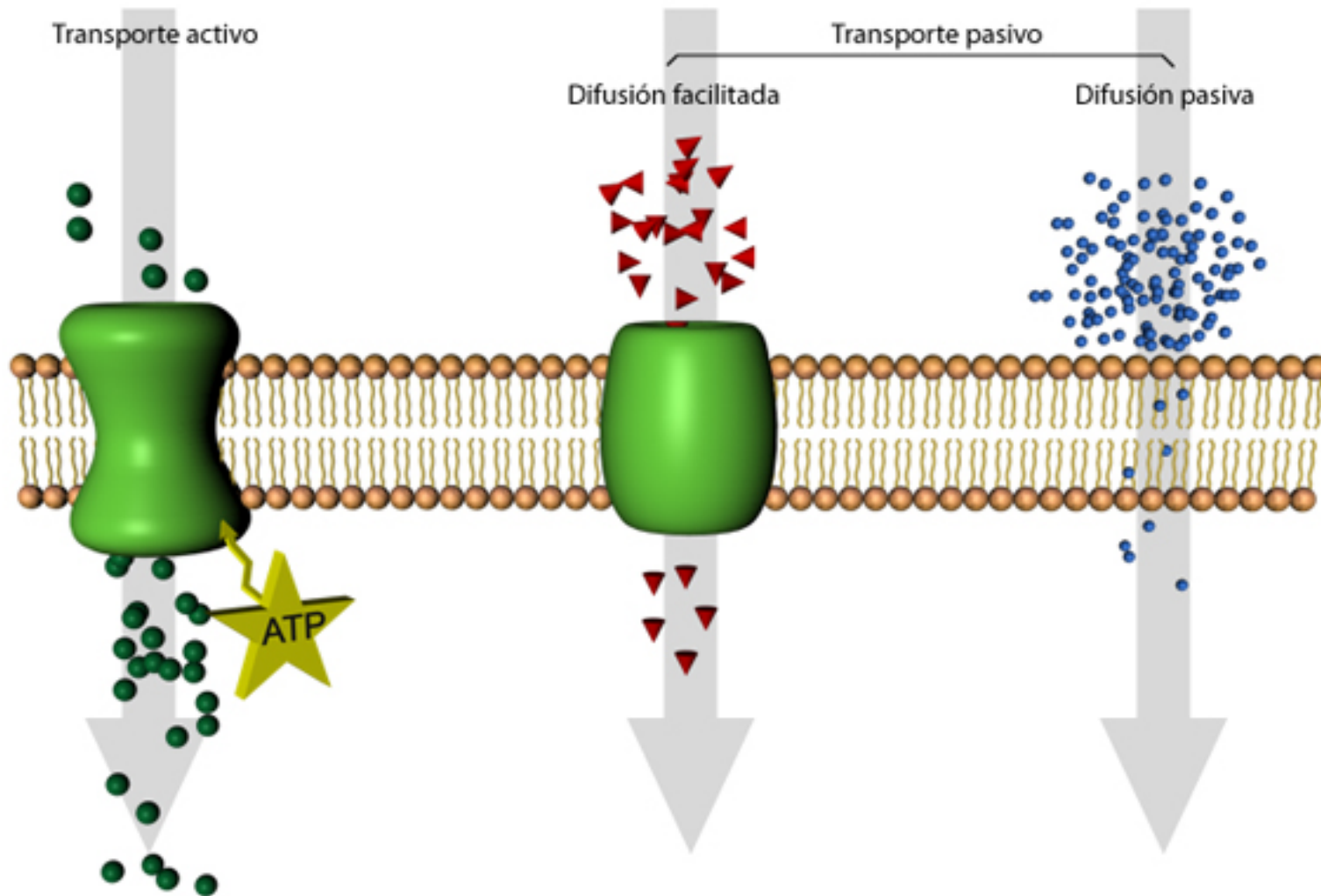
e Cell surface decoration



f Isoprenoid biosynthesis

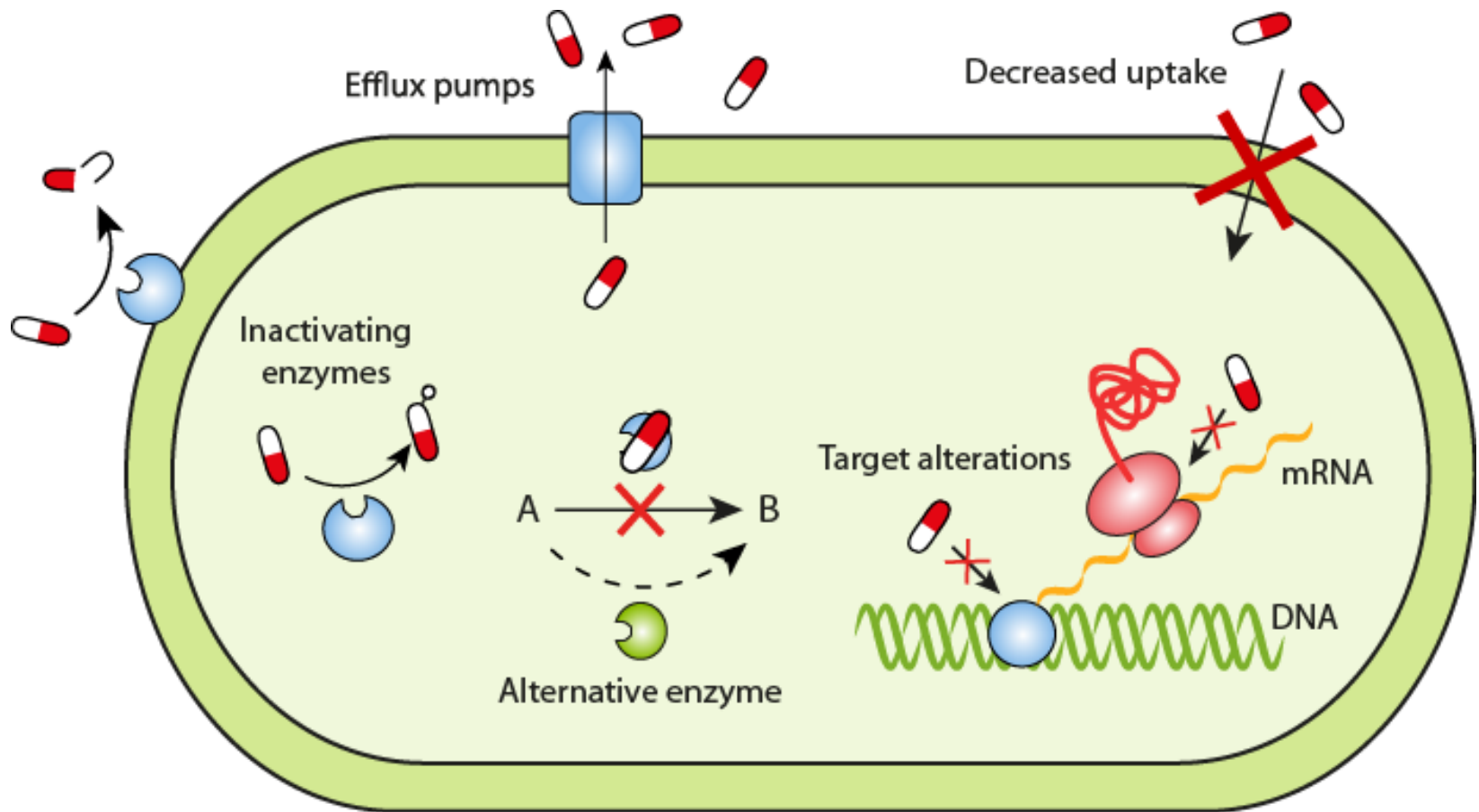


Funções da Membrana Plasmática - transporte



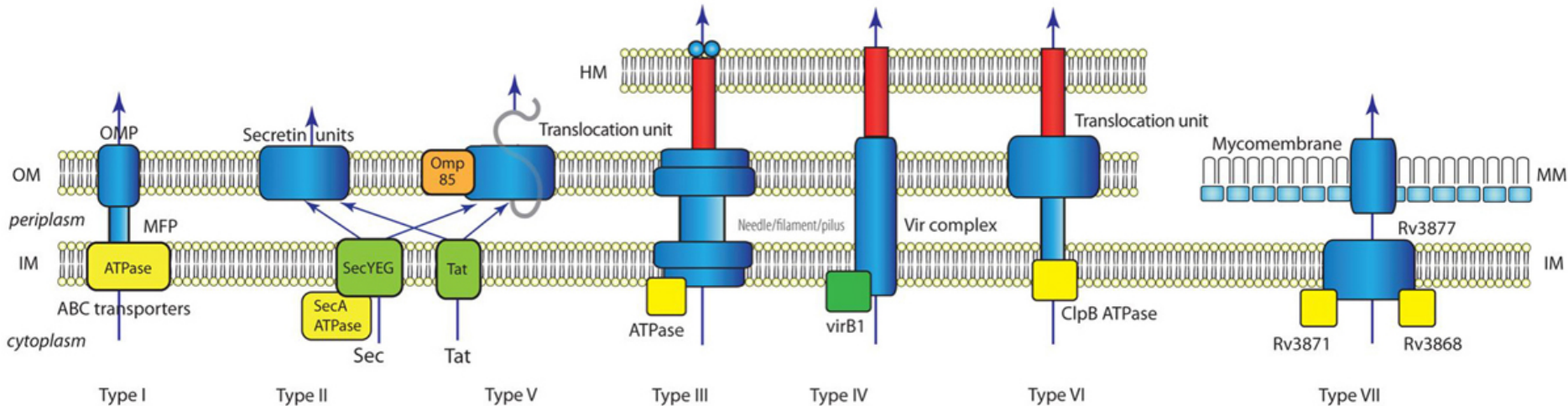
Transportes de solutos e efluxo de drogas

Funções da Membrana Plasmática



Mecanismos de resistência a drogas

Funções da Membrana Plasmática – Sistemas de secreção



HM: membrana do hospedeiro

OM: membrana externa

IM: membrana interna

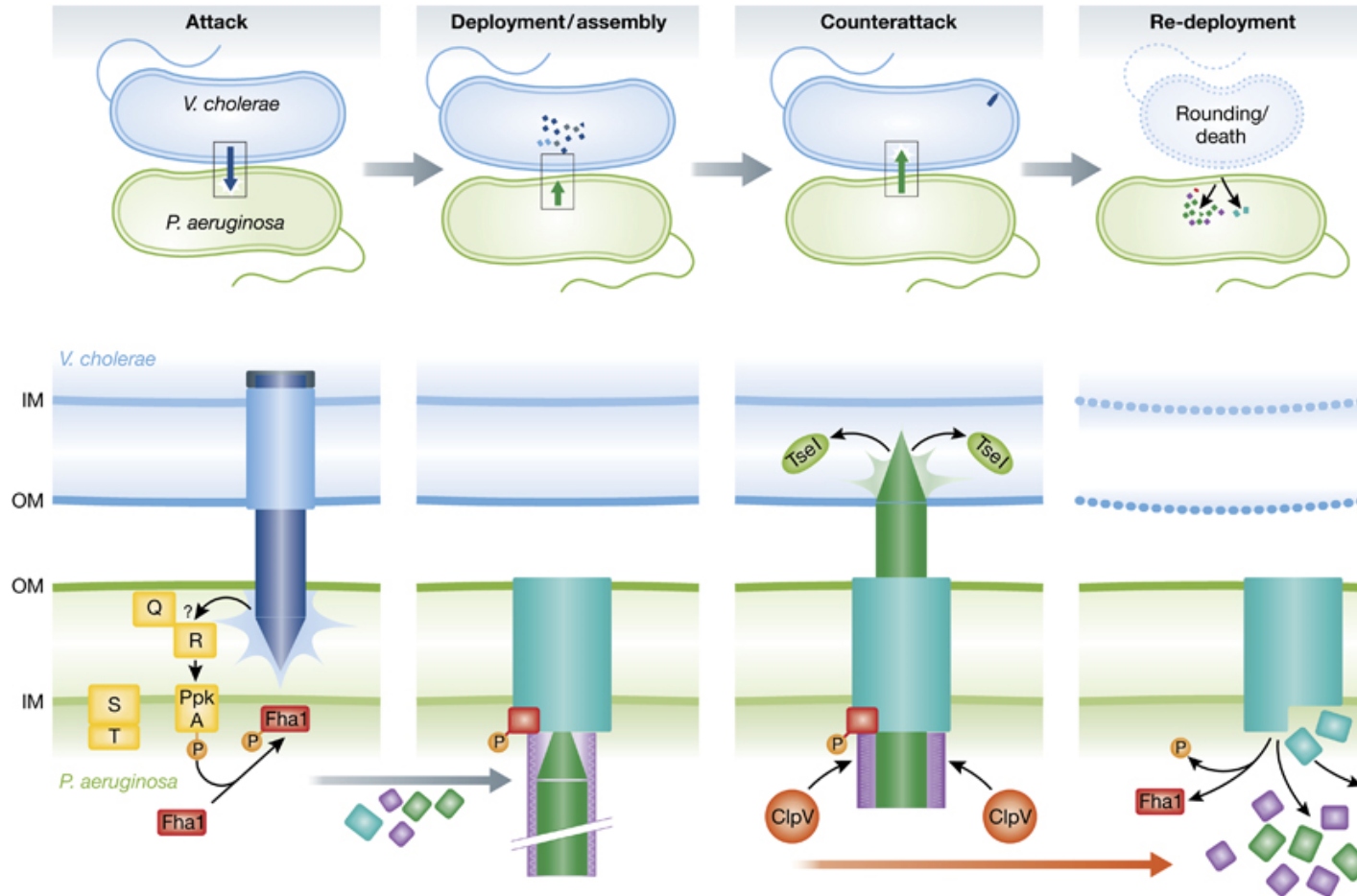
MM: micomembrana (Mycobacterium)

OMP: Proteína da membrana externa

MFP: proteína de fusão à membrana

ATPases e chaperonas= amarelo

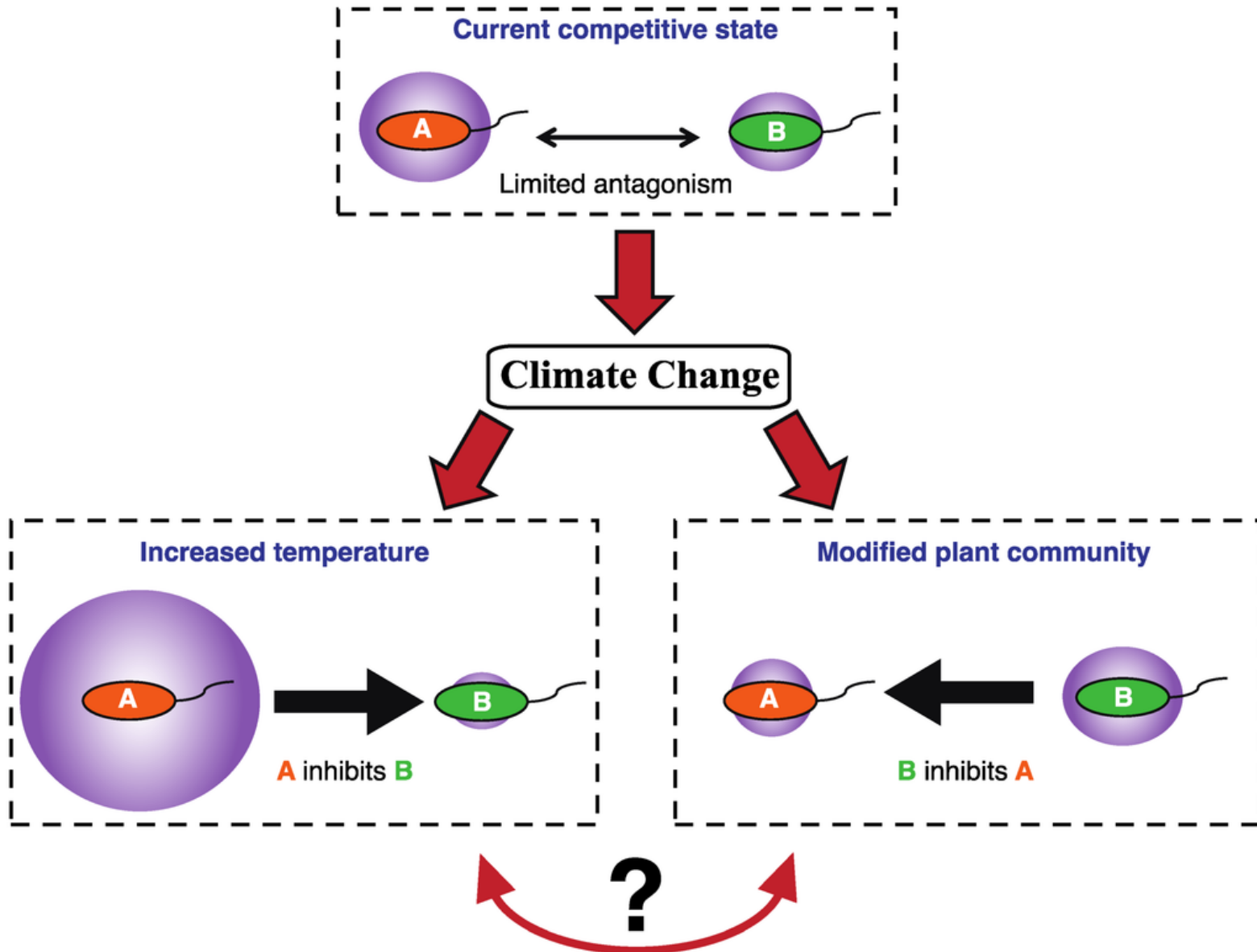
Antibiose - Sistema de Secreção do tipo 6 (T6SS)



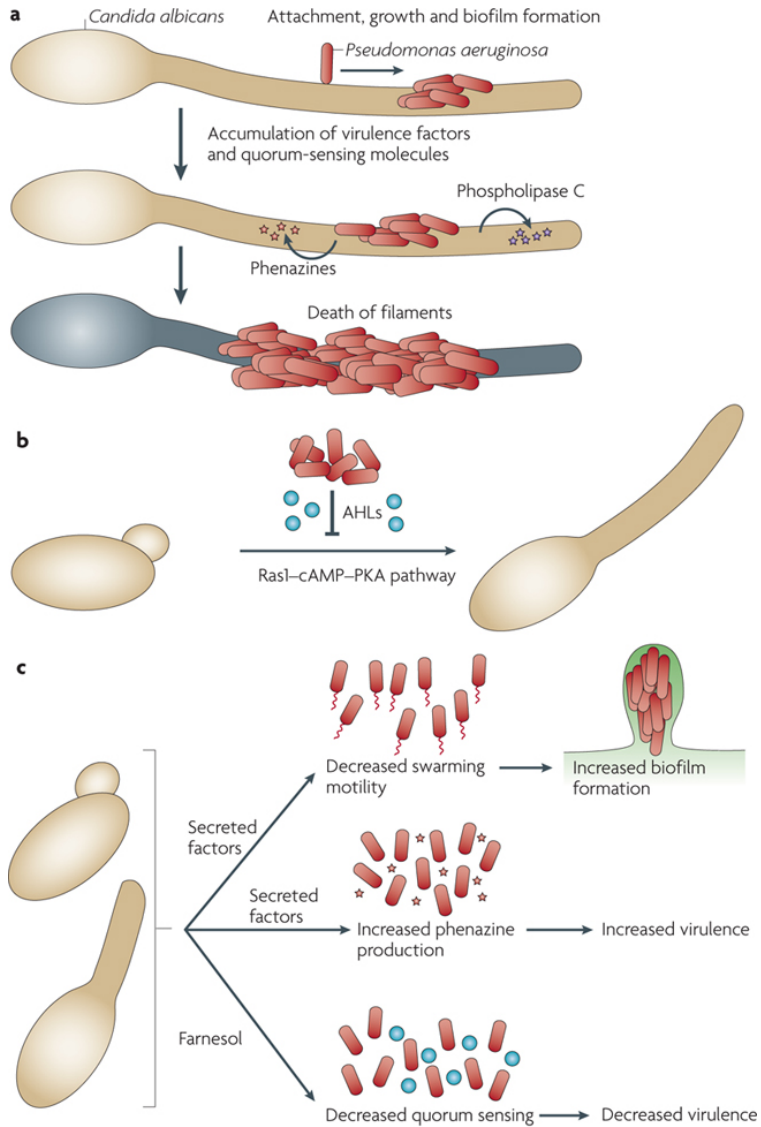
Modelo de interação *V. cholerae* e *P. aeruginosa*:

- Ataque de *V. cholerae* via T6SS é percebido pela transdução de sinais de *P. aeruginosa*.
- Contração da bainha (violeta) dispara o injektor (verde escuro) e libera o efetor Tse1 (peptidoglycan amidase)
- Tse1 leva a célula de *V. cholerae* a lise
- A ATPase e desfosforilação induz a desorganização do T6SS.

Interação microbiana



Antibiose - Interação microbiana

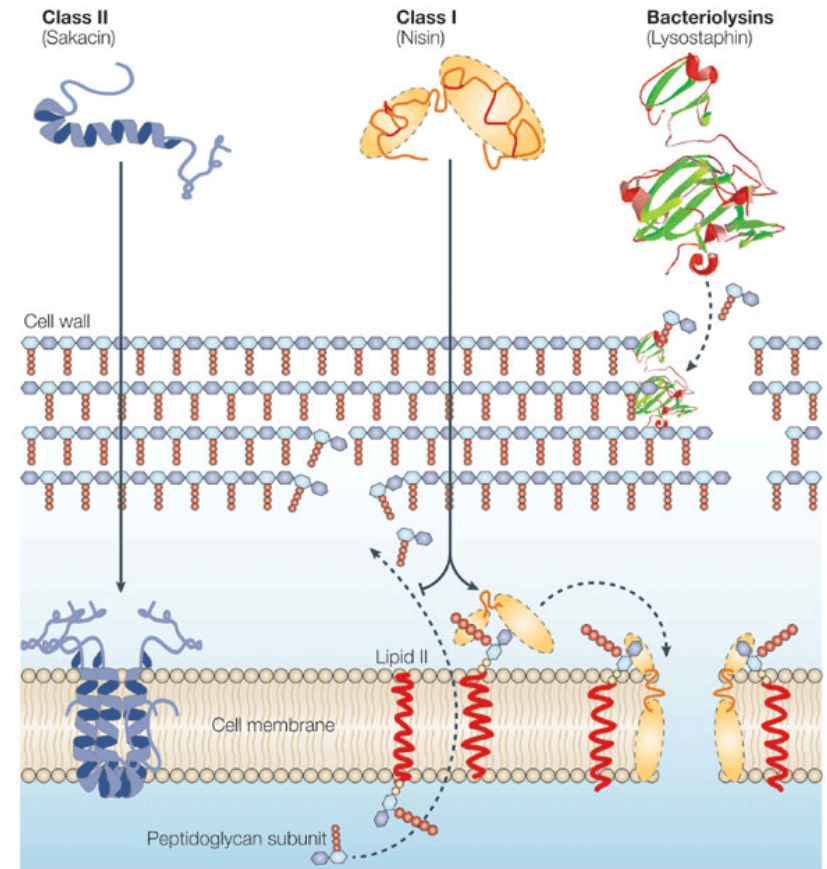
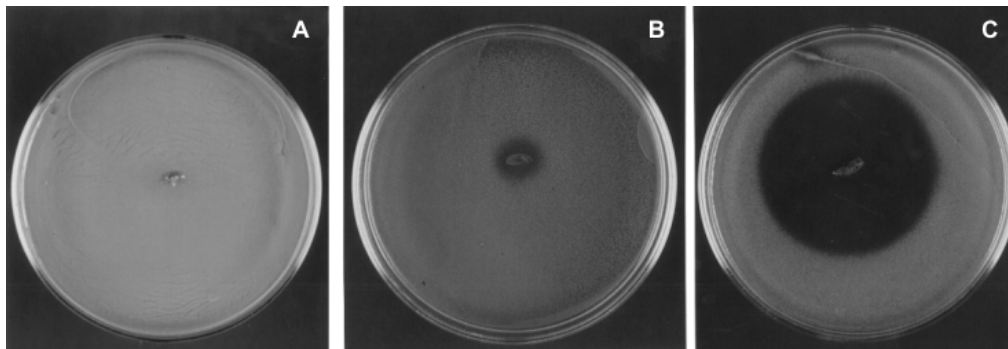


Pseudomonas aeruginosa se liga na superfície de *Candida albicans* e forma biofilmes.
Produz fosfolipaseC e fenazinas para matar o fungo filamentosos

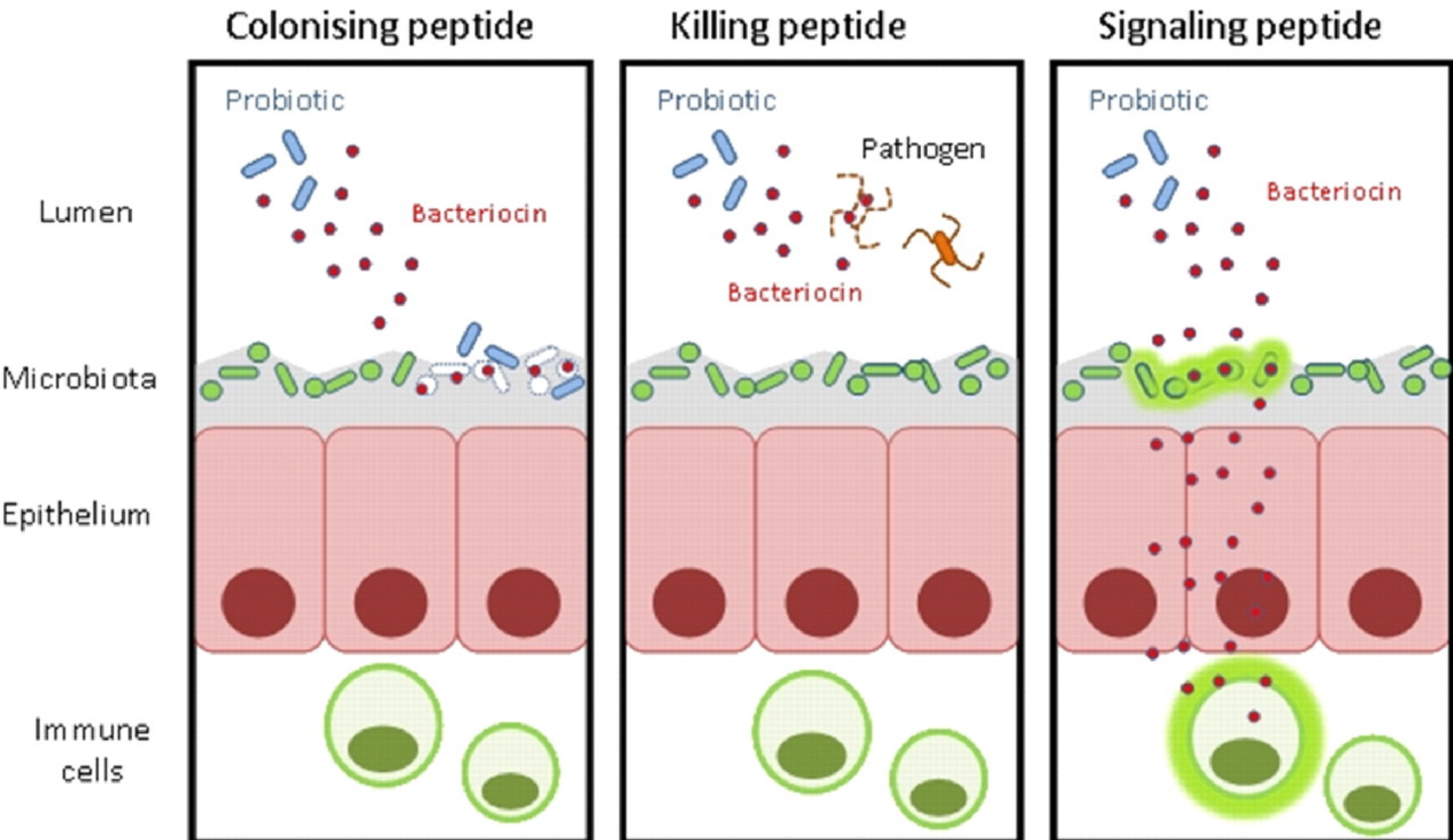
Homoserina lactona produzida por *P. aeruginosa* inibe o crescimento hifal de *C. albicans* impedindo a filamentação do fungo. Fase leveduriforme de *C. albicans* é resistente a *P. aeruginosa*, favorecendo a coexistência de ambas em culturas mistas.

C. albicans modula o comportamento de *P. aeruginosa* pela produção de farnesol.

Modo de ação de bacteriocinas de bactérias lácticas



Modo de ação de bacteriocinas

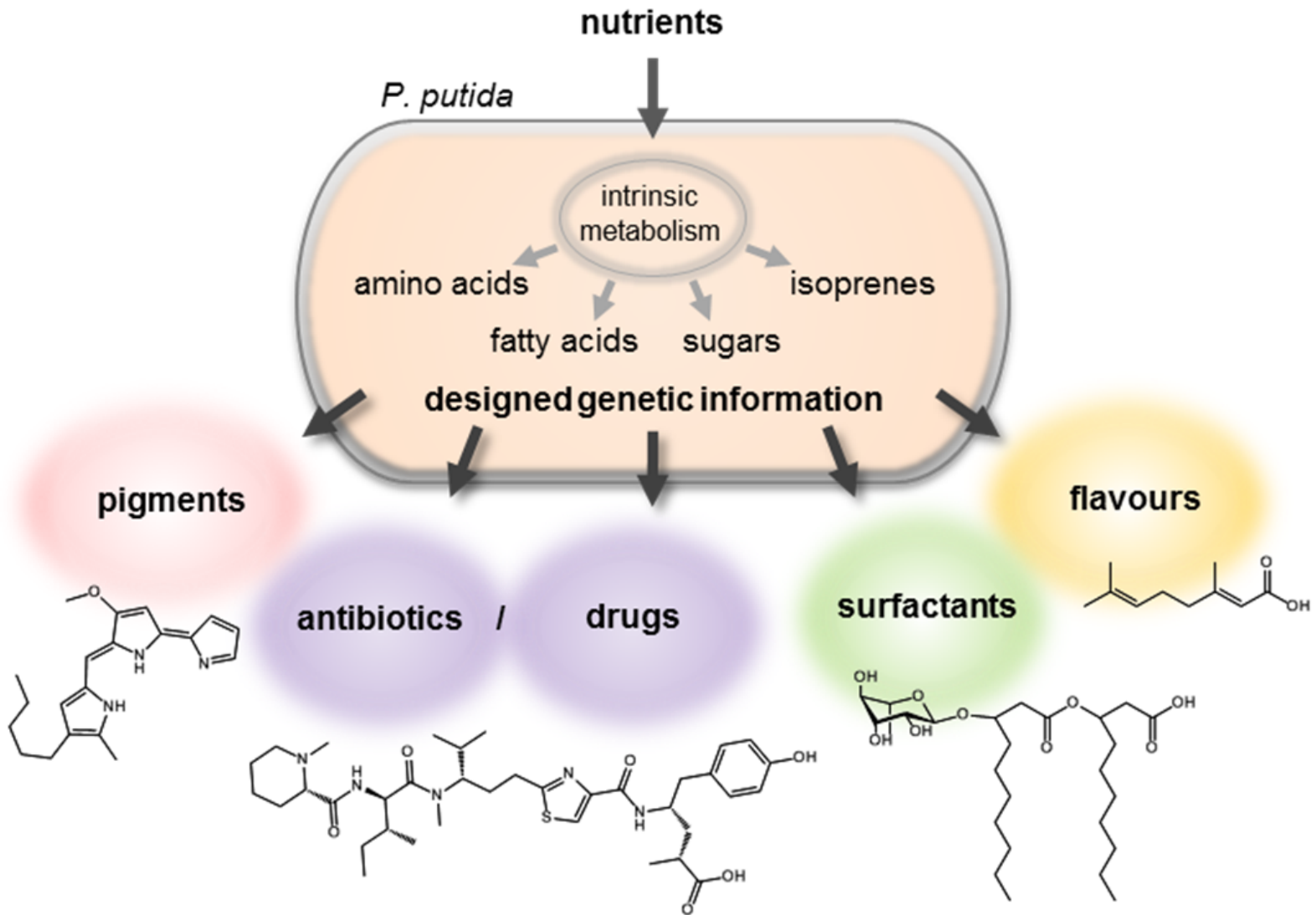


Bacteriocin

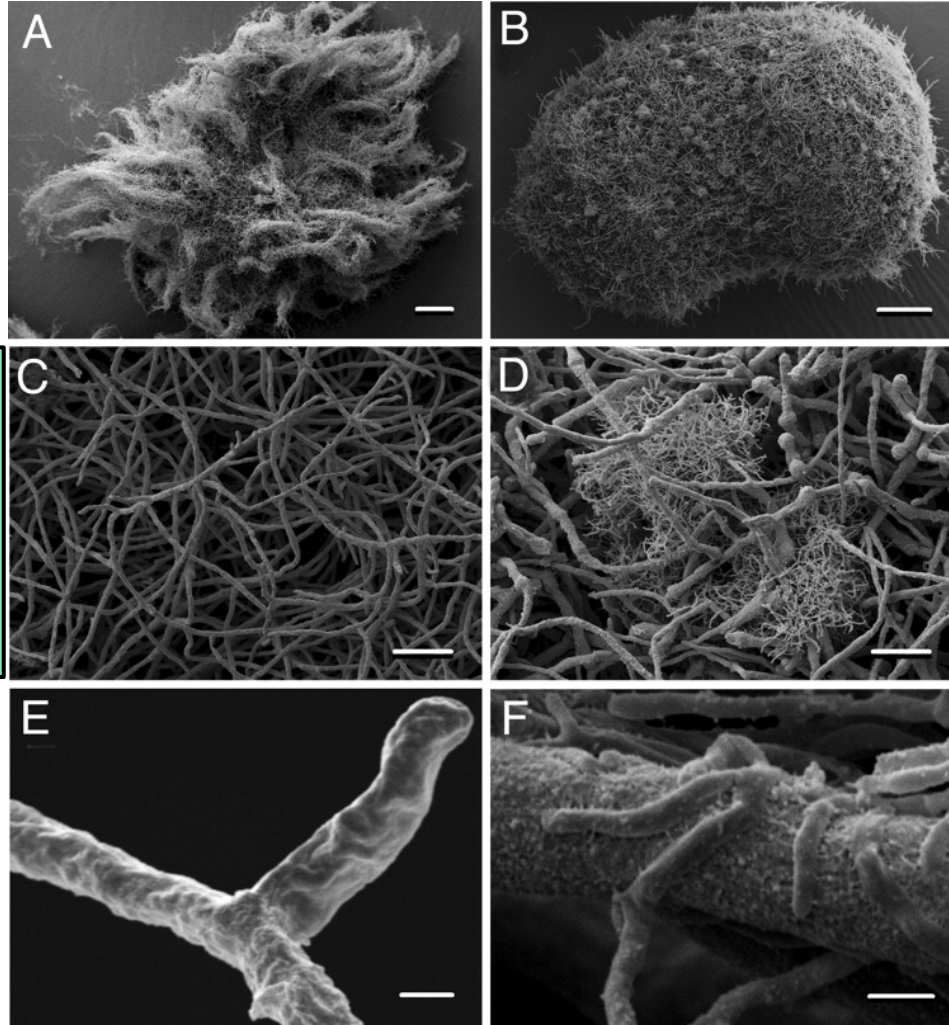
- Antimicrobial peptides produced by bacteria which kill or inhibit the growth of other bacteria
- Natural preservatives
- Bacteriocin vs. antibiotics

Characteristics	Bacteriocin	Antibiotics
Producer	Bacteria (LAB, <i>E. coli</i>)	Usually actinobacteria and fungi (not always)
Chemical composition	Proteinaceous	Complex ring structure
Antimicrobial activity	Narrow spectrum (specific)	Varying spectrum (less specific)
Host cell immunity	Yes	No
Application	Food and plant protection	Clinical

Metabólitos secundários



Interação entre *Aspergillus nidulans* e *Streptomyces hygroscopicus*



(A) Scanning electron micrograph of *A. nidulans*.

(C) Magnification of *A. nidulans* (Scale bar: 20 μm .)

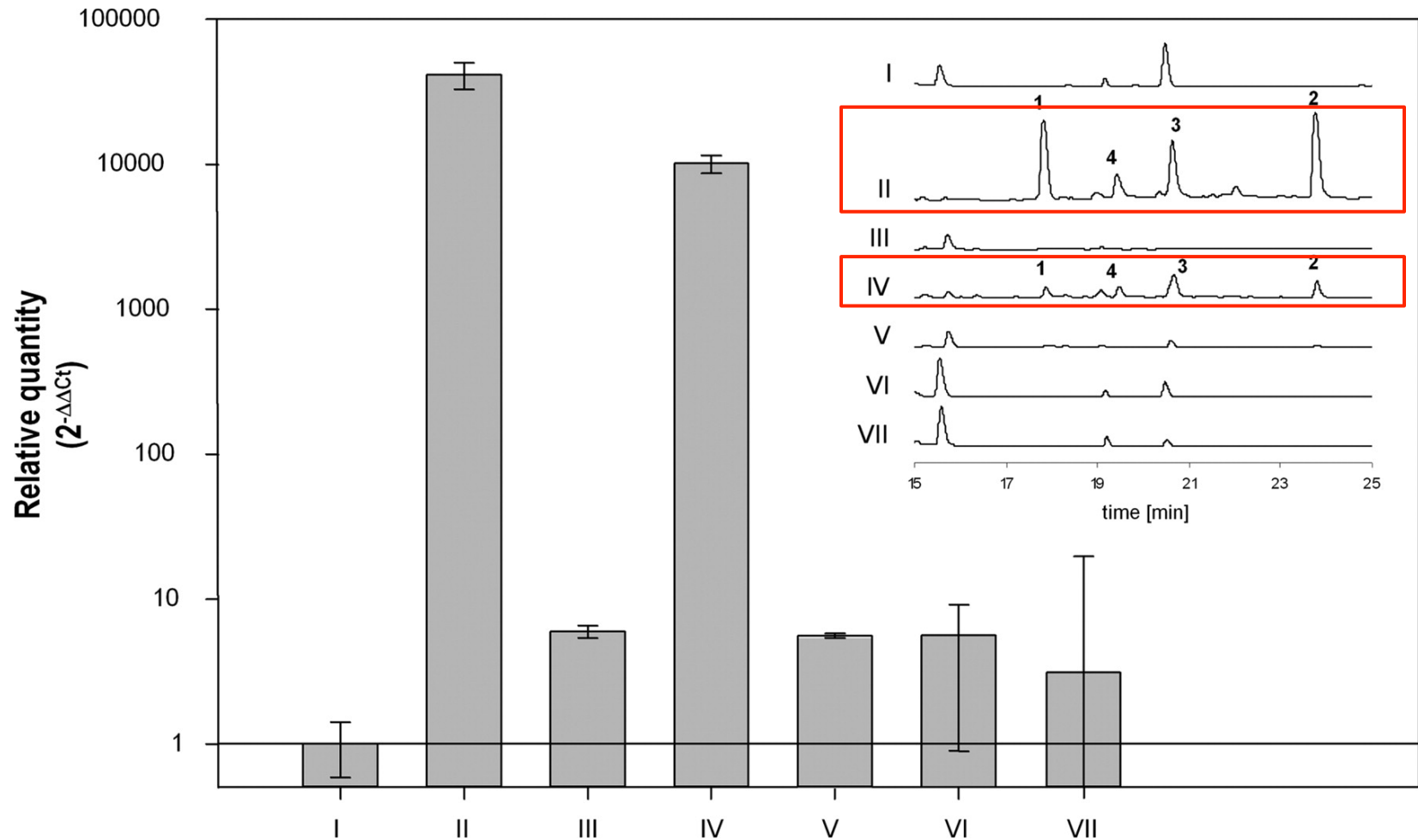
(E) Further magnification of *A. nidulans*

(B) Scanning electron micrograph of *A. nidulans* coincubated with *S. hygroscopicus*. (Scale bar: 200 μm .)

(D) Magnification of B. (Scale bar: 20 μm .)

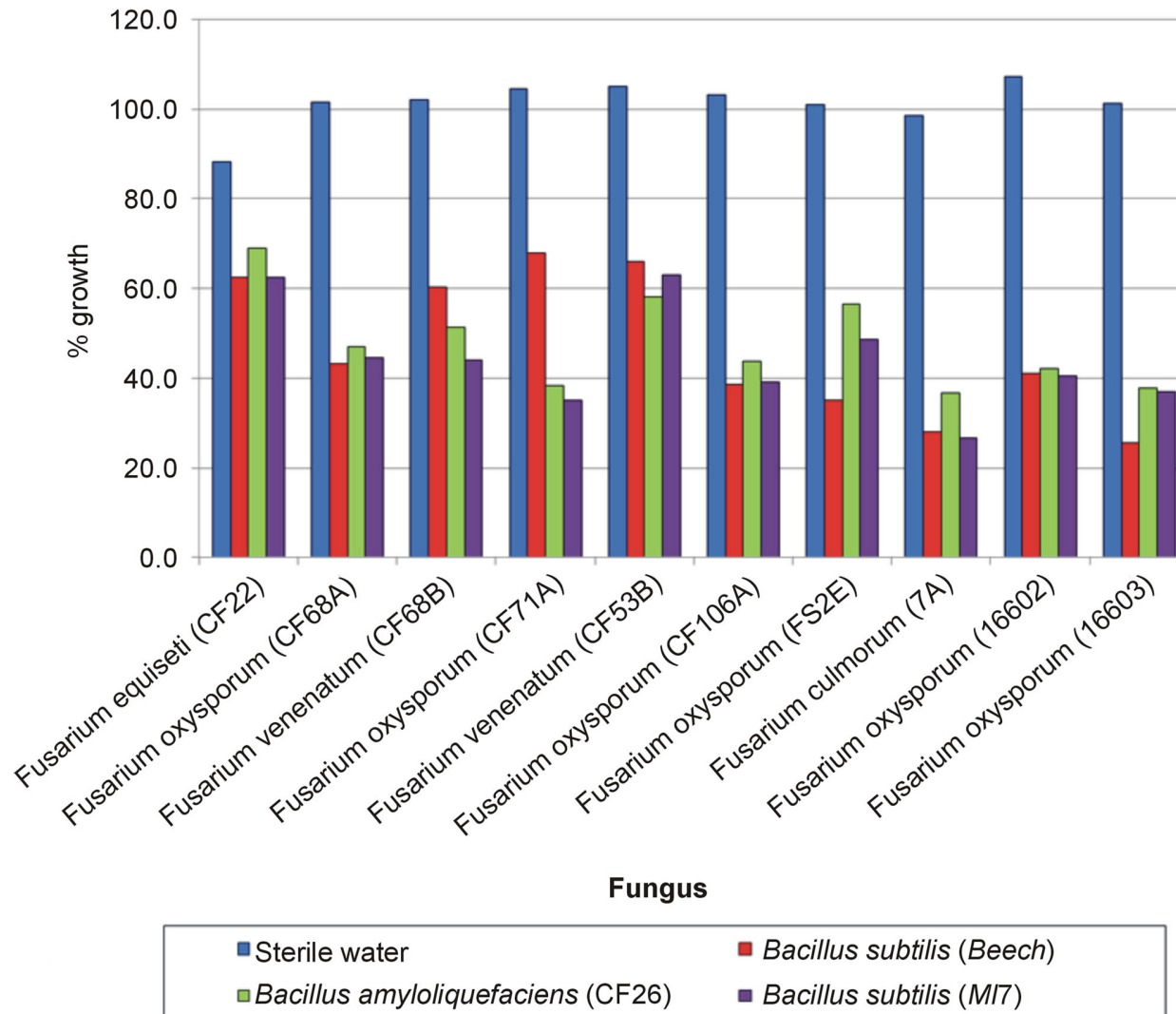
(F) Further magnification of D showing the close contact between the filamentous bacteria and fungal mycelia.

Quantidade relativa de mRNA do gene orsA (AN7909) do policetídeo e análise de HPLC do sobenadante da cultura.



PKS *orsA* (AN7909) gene expression and HPLC profiles of supernatants. I: Control, *A. nidulans*. **II: Cocultivation of *A. nidulans* and *S. hygroscopicus* (1/20).** III: *A. nidulans* culture, inoculation with filtered *S. hygroscopicus* culture supernatant. **IV: Cocultivation of *A. nidulans* and *S. hygroscopicus*, inoculation with 1/100 volume of *S. hygroscopicus* culture.** V: Cocultivation of *A. nidulans* and *S. hygroscopicus* (1/100) separated by a dialysis bag. VI: Cultivation of *A. nidulans*, inoculation with 1/20 volume culture supernatant of a coculture of *A. nidulans* WT and *S. hygroscopicus*. VII: Cultivation of *A. nidulans* with 1/20 volume culture supernatant of a coculture of *A. nidulans* Δ *orsA* (Δ AN7909) strain and *S. hygroscopicus*.

Controle de *Fusarium* por bactérias antagonistas



Controle de *Fusarium* por bactérias antagonistas

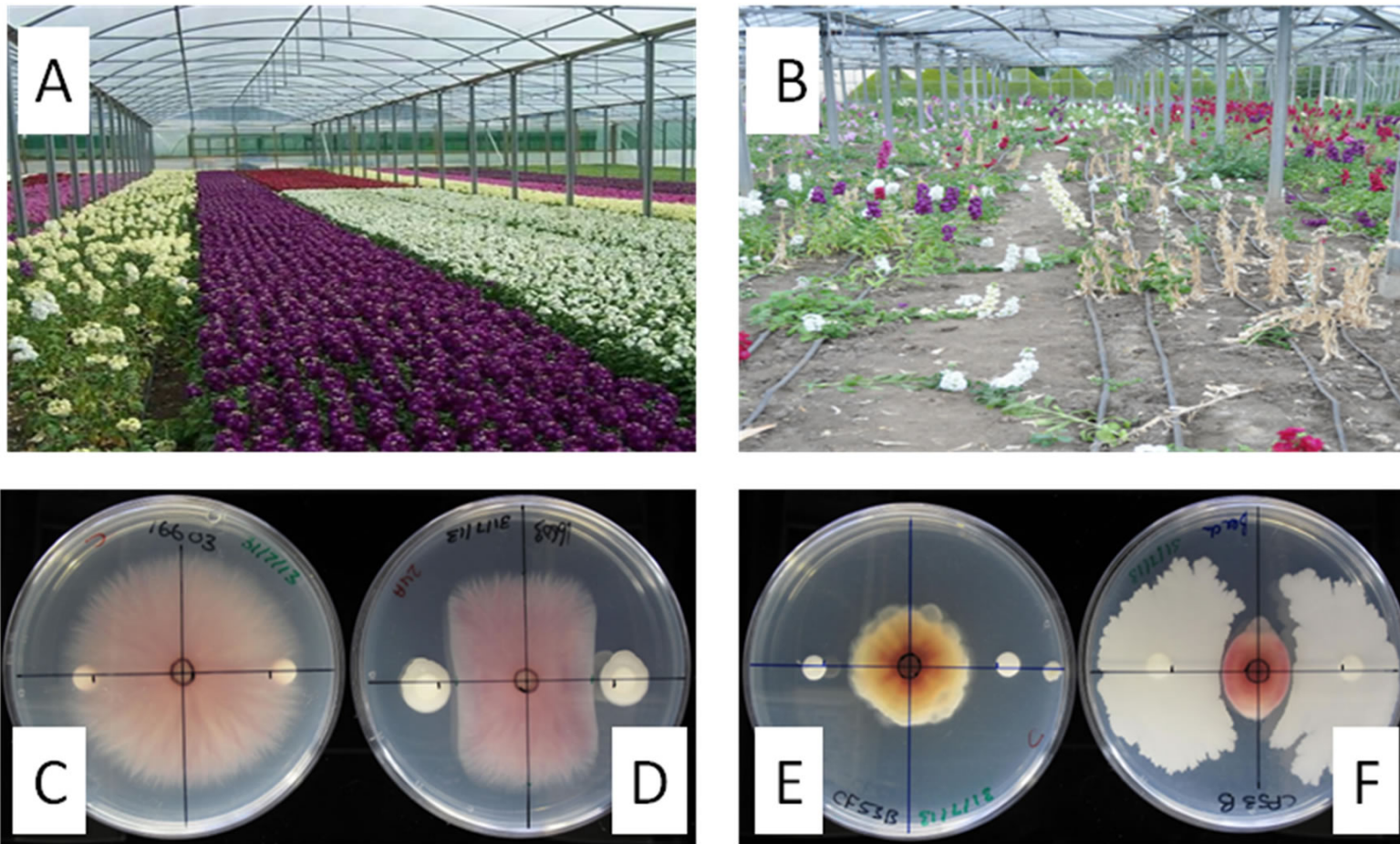
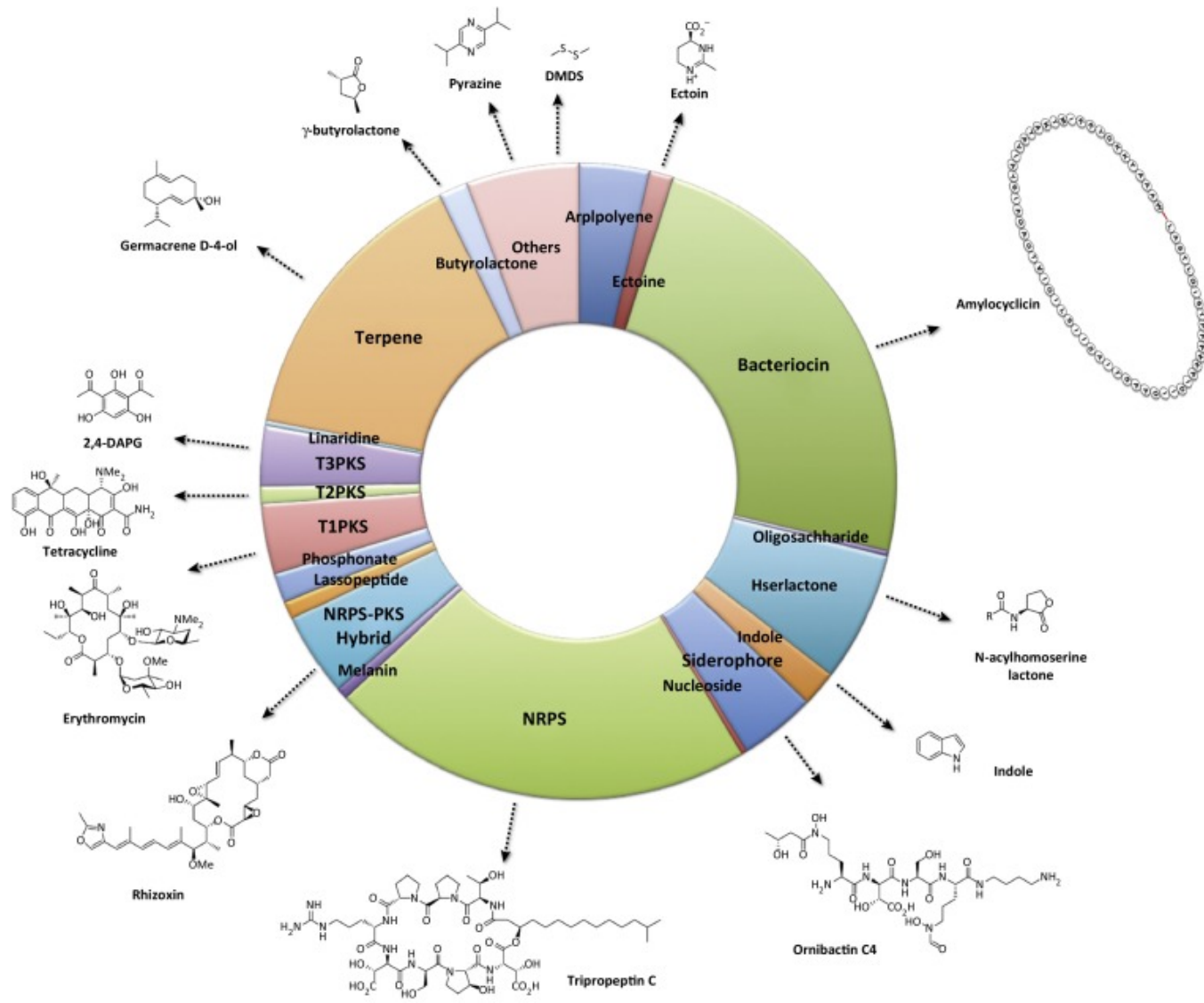


Figure 1. Biological control of *Fusarium* spp by commercial and natural microbiocides. Polytunnel greenhouse grown healthy scented cut flower stock in *Fusarium* suppressed soil (A) and symptomatic *Fusarium* wilt disease infested soil (B). KirbyBauer Petri plate assays (C)-(F) demonstrating antifungal activity against *Fusarium oxysporum*: untreated control (C), Prestop and Serenade Max (D), AlgiVyt Mn/Zn (E), *Bacillus subtilis* (F).

Metabólitos secundários



Estratégia para desenvolvimento de uma nova droga

