Universidad de los Andes

iGEM

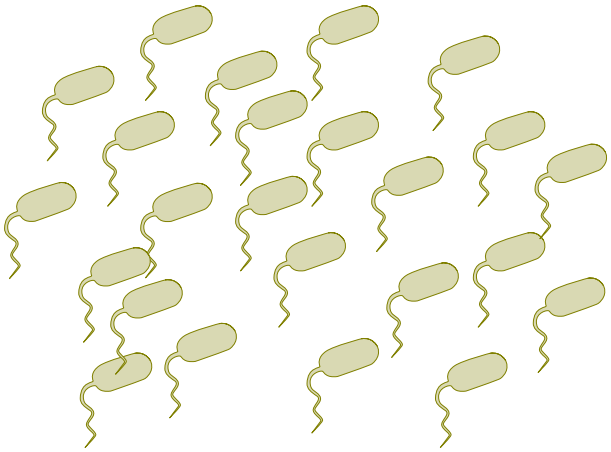
Bacterial Quorum Sensing

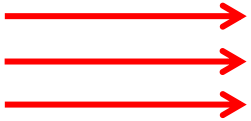
Camilo Gómez

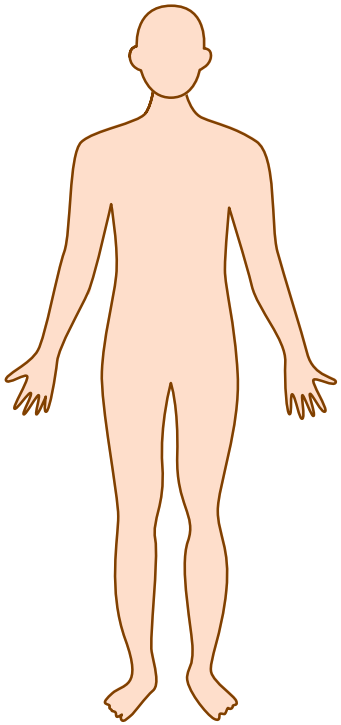
Contents

Number and coordination

0,5 – 5,0 µm





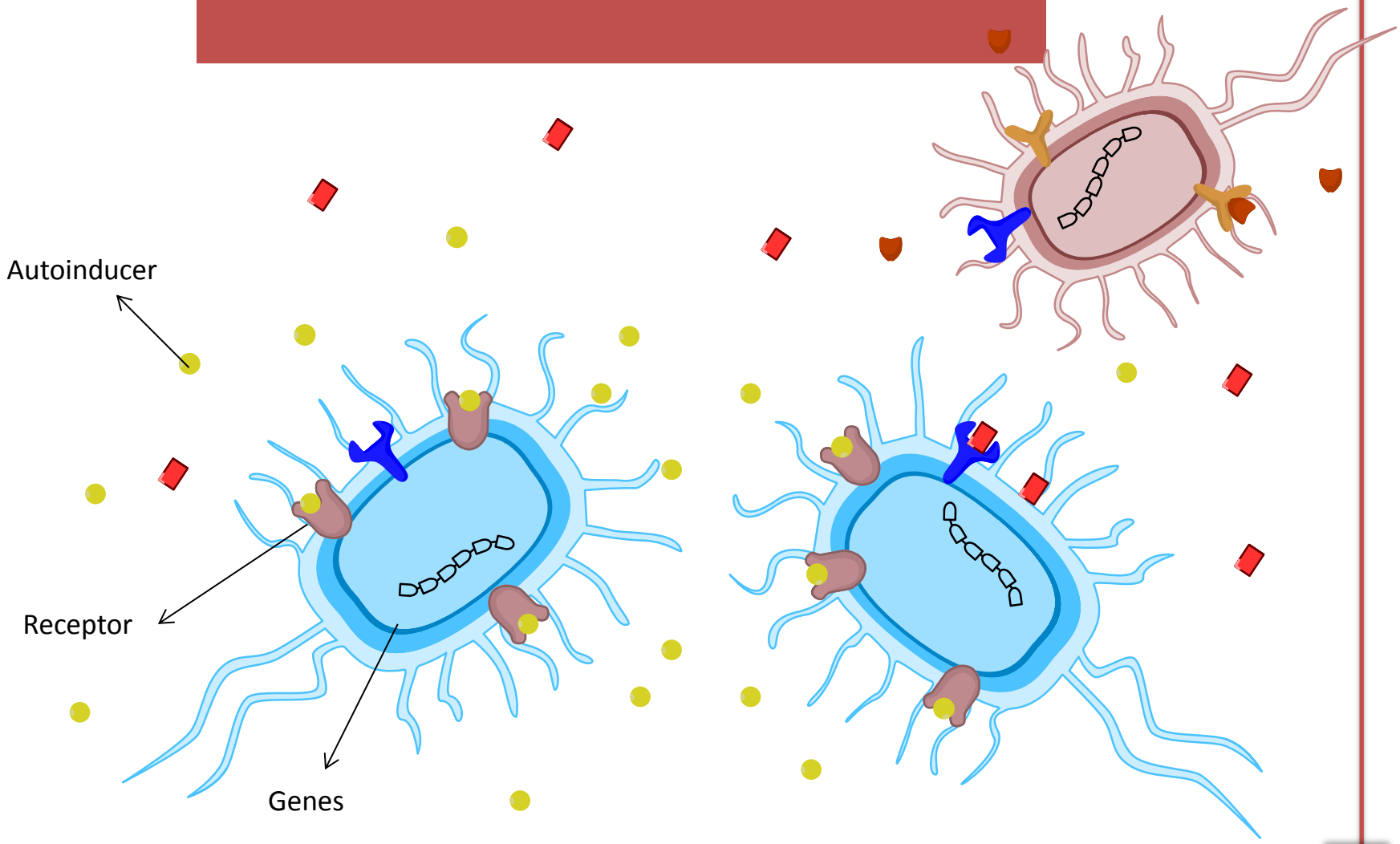


Cholera: *V. cholerae*
Tuberculosis*: M. tuberculosis*
Carbuncle: *B. anthracis*
Bubonic plague: *Y. pestis*
Ulcer: *H. pylori*
…

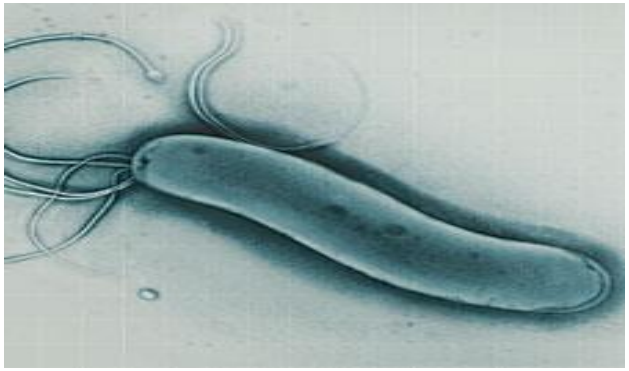
Euprymna scoloeps

Aliivibrio fischeri

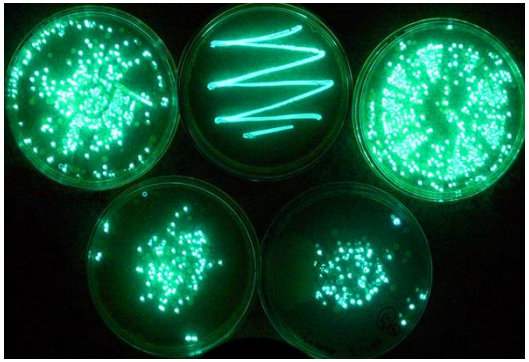
Quorum sensing



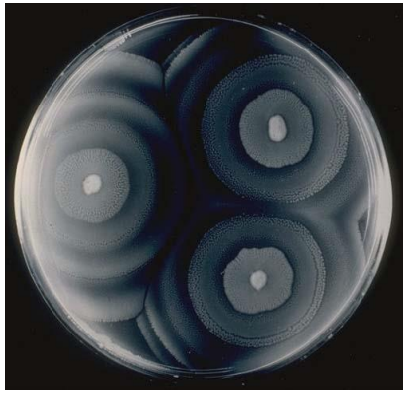
Quorum sensing



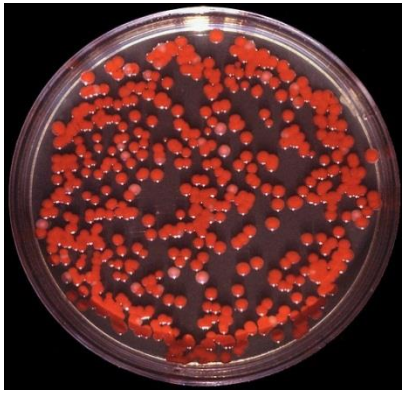
Virulence



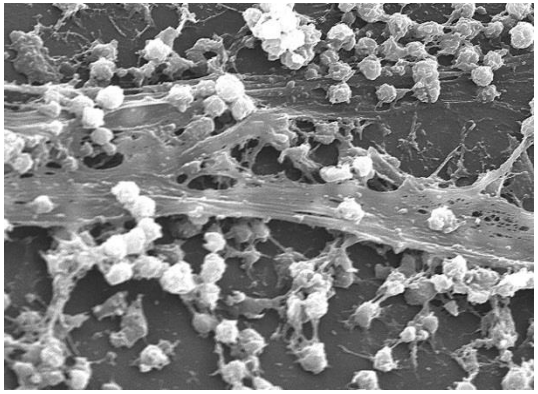
Bioluminiscence



Swarming

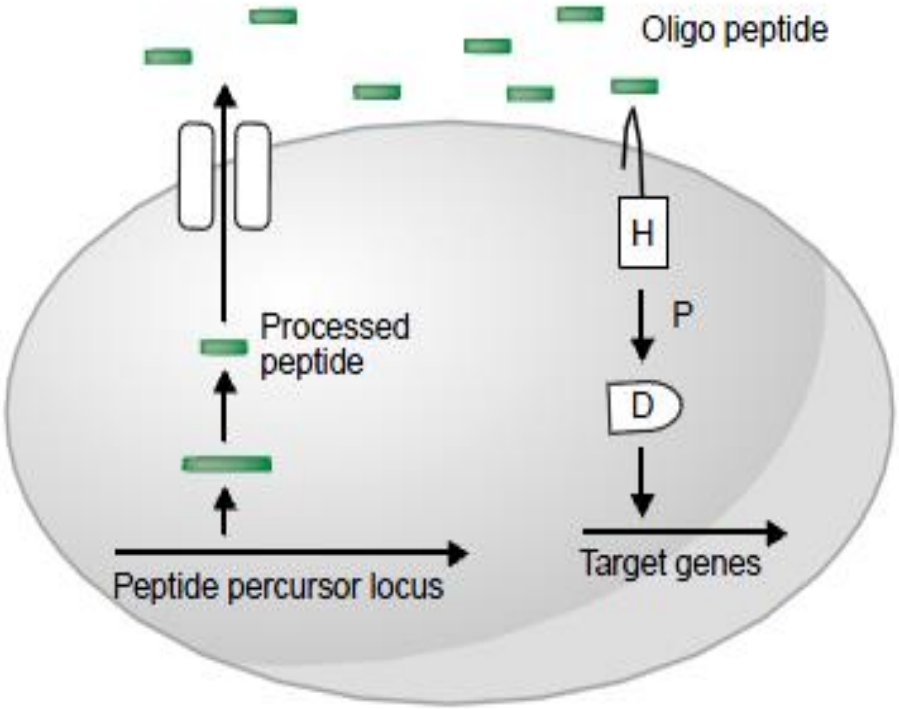


Pigments



Biofilms

Gram-positive bacteria

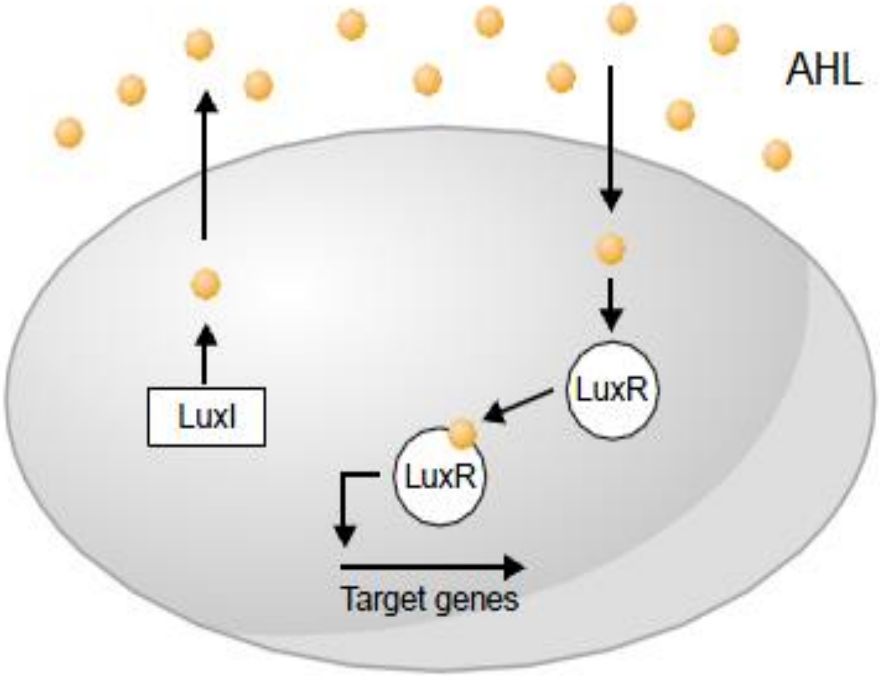


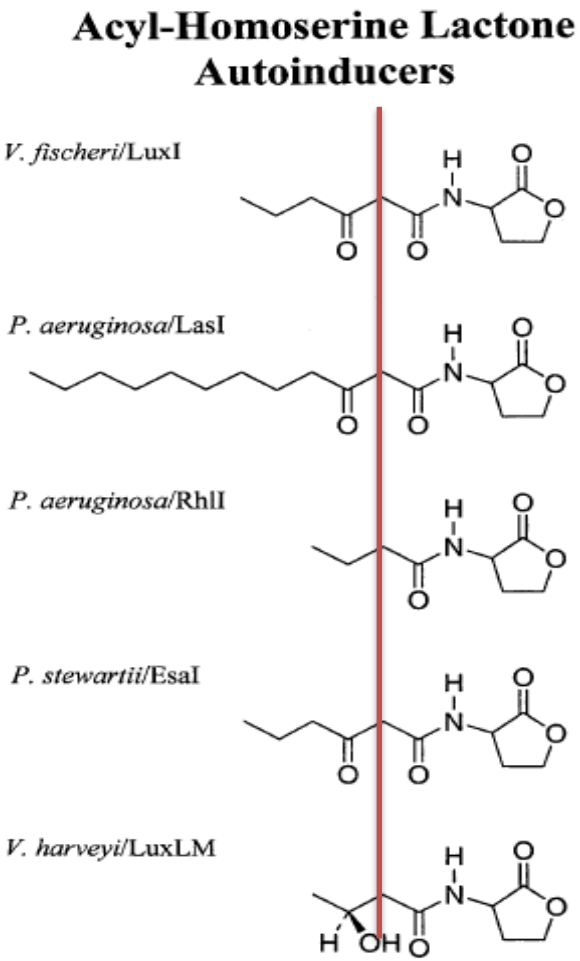
Oligopeptide Autoinducers

B. subtilis/ComX	ADPITRQWGD
B. subtilis/CSF	ERGMT
S. aureus/subgroup 1	YSTCDFIM
S. aureus/subgroup 2	GVNACSSLF
S. aureus/subgroup 3	YINCDFLL
S. aureus/subgroup 4	YSTCYFIM

Current Opinion in Microbiology 2003, 6:191–197

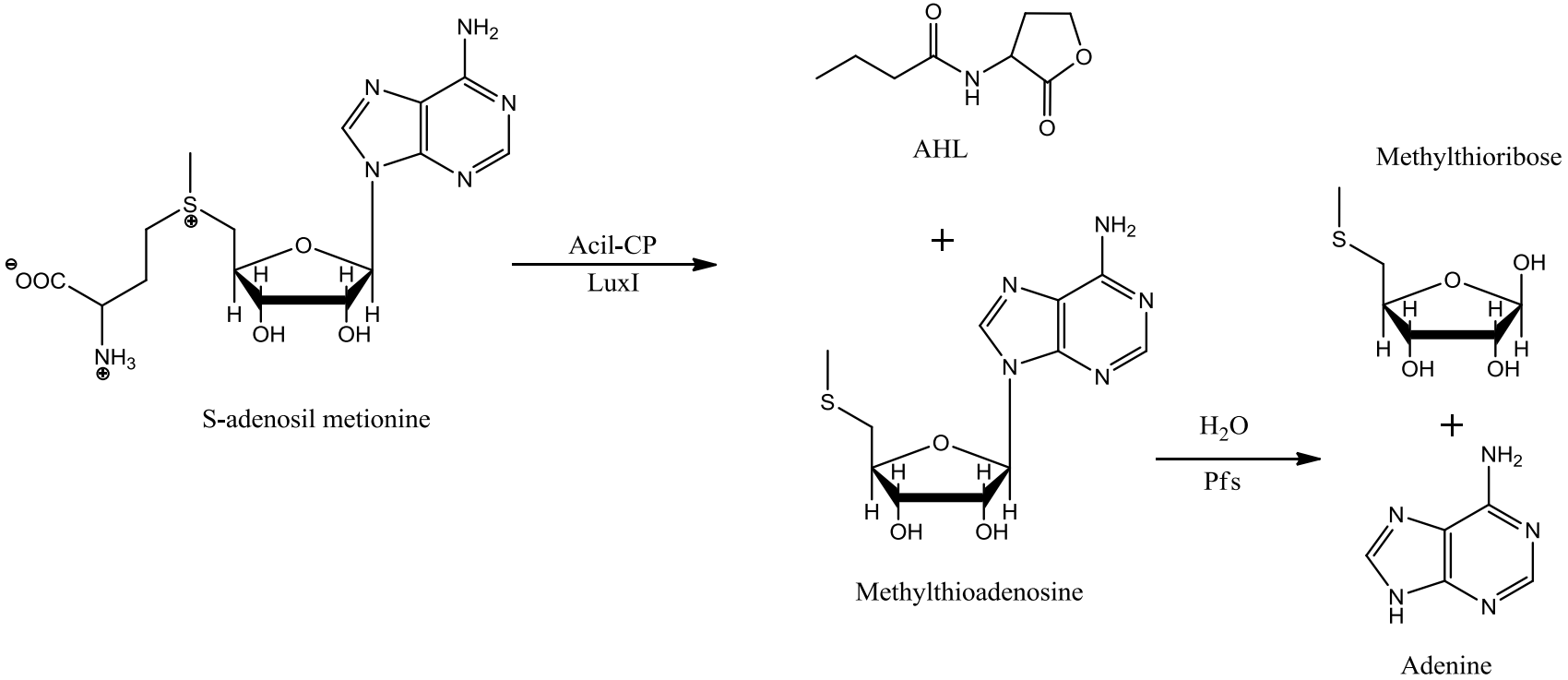
Gram-negative bacteria



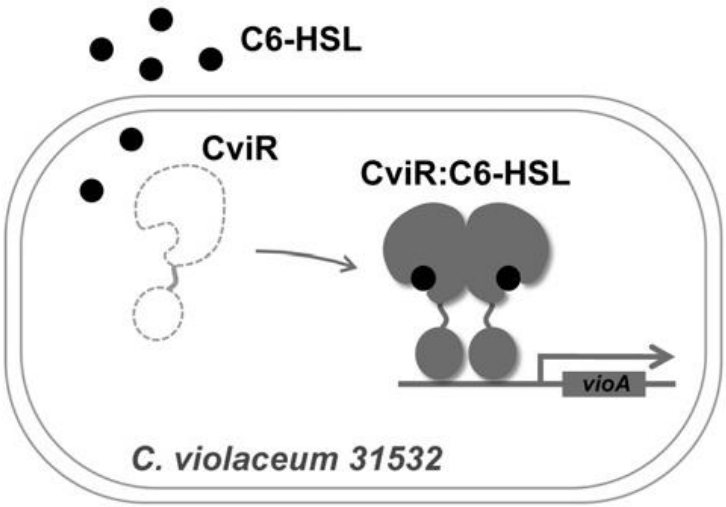


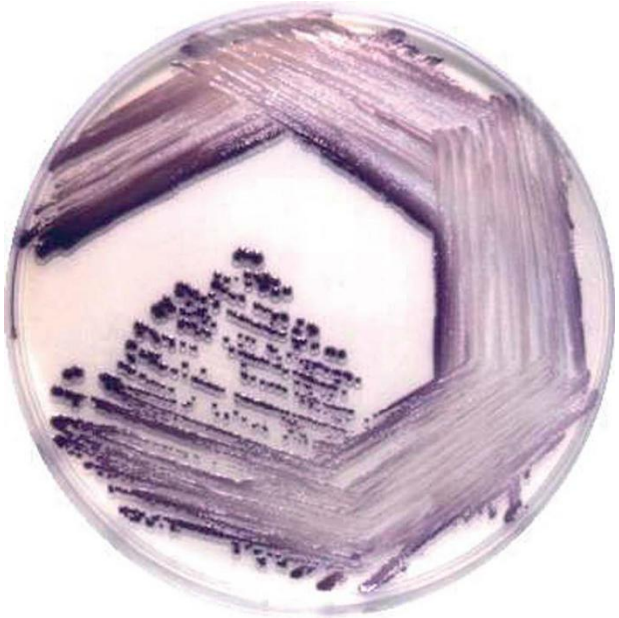
Current Opinion in Microbiology 2003, 6:191–197

Synthesis of AHL



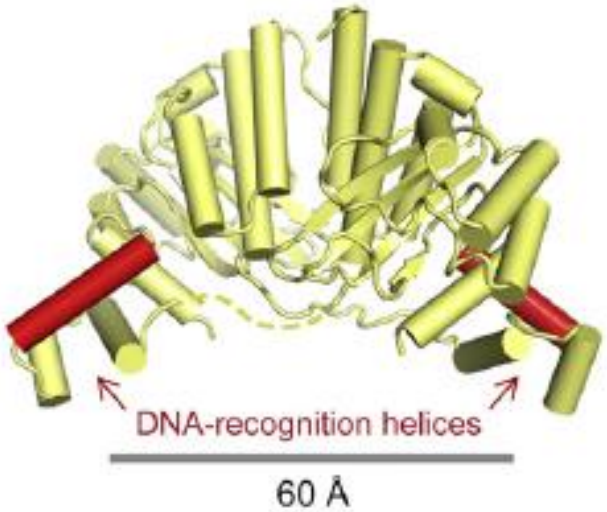
LuxR-type receptor

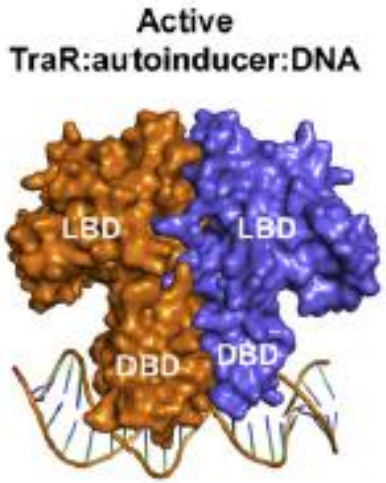


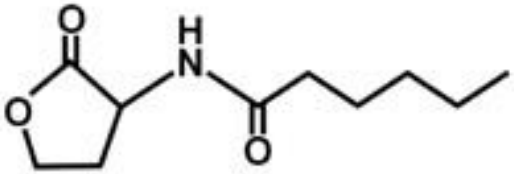


Molecular Cell 42, 199–209, April 22, 2011 ª2011 Elsevier Inc.

LuxR-type receptor





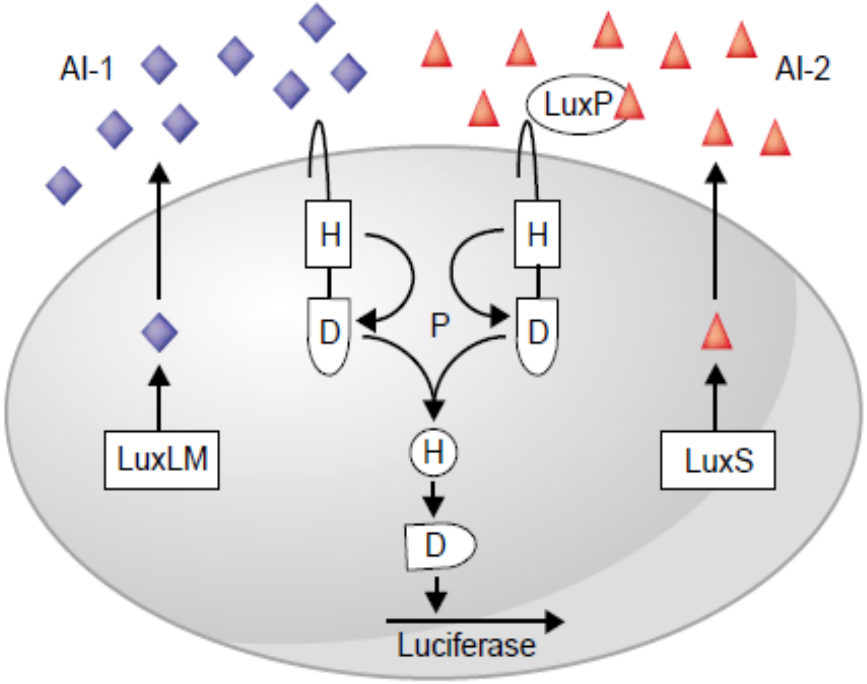


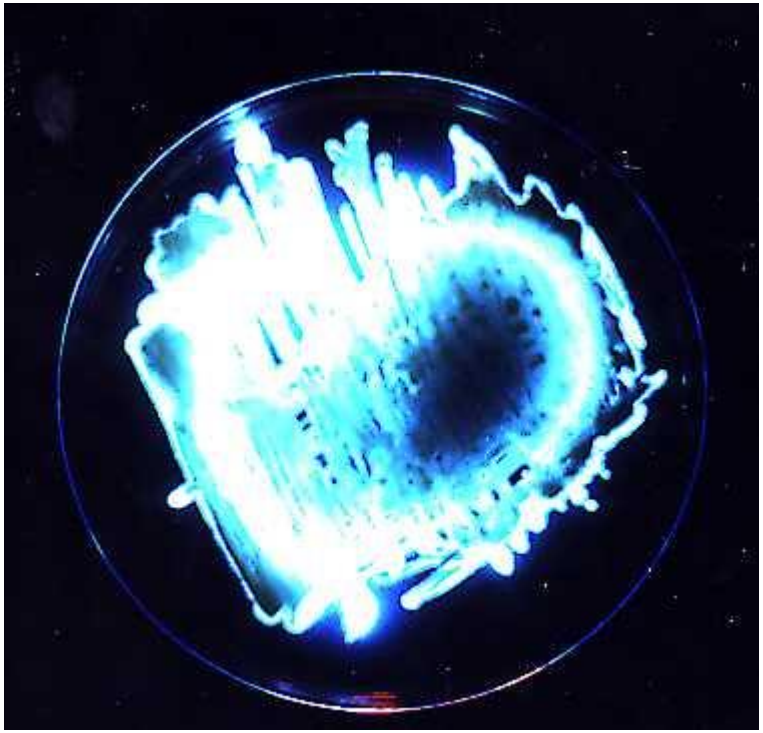
Autoinducer: C6-HSL

Molecular Cell 42, 199–209, April 22, 2011 ª2011 Elsevier Inc.

Universal signal
AI-2

Vibrio harveyi uses two systems of quorum sensing for the same function





Current Opinion in Microbiology 2003, 6:191–197

Universal signal AI-2

Functions regulated by *luxS*/AI-2 in pahtogenic bacteria

Bacterium	Functions regulated by *luxS*
Actiniobacillus actiniomycetemcomitans	Leucotoxin, iron acquisition
Campylobacter jejuni	Motility
Clostridium perfringens	Toxins
Escherichia coli W3110	Morfology, celular division
Neisseria meningitides	Bacteremia
Porphyromonas gingivalis	Proteases
Salmonella typhi	Biofilms
Streptococcus pyogenes	Hemolysin
Vibrio cholerae	Toxins
Vibrio harveyi	Bioluminiscence, siderophores, morfology

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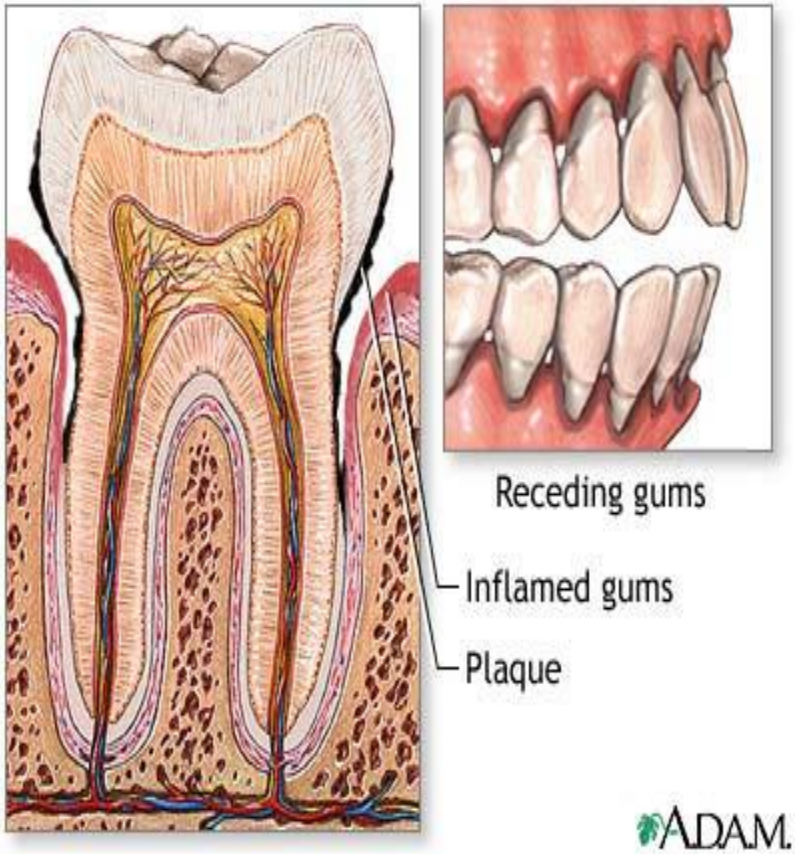
P. gingivalis

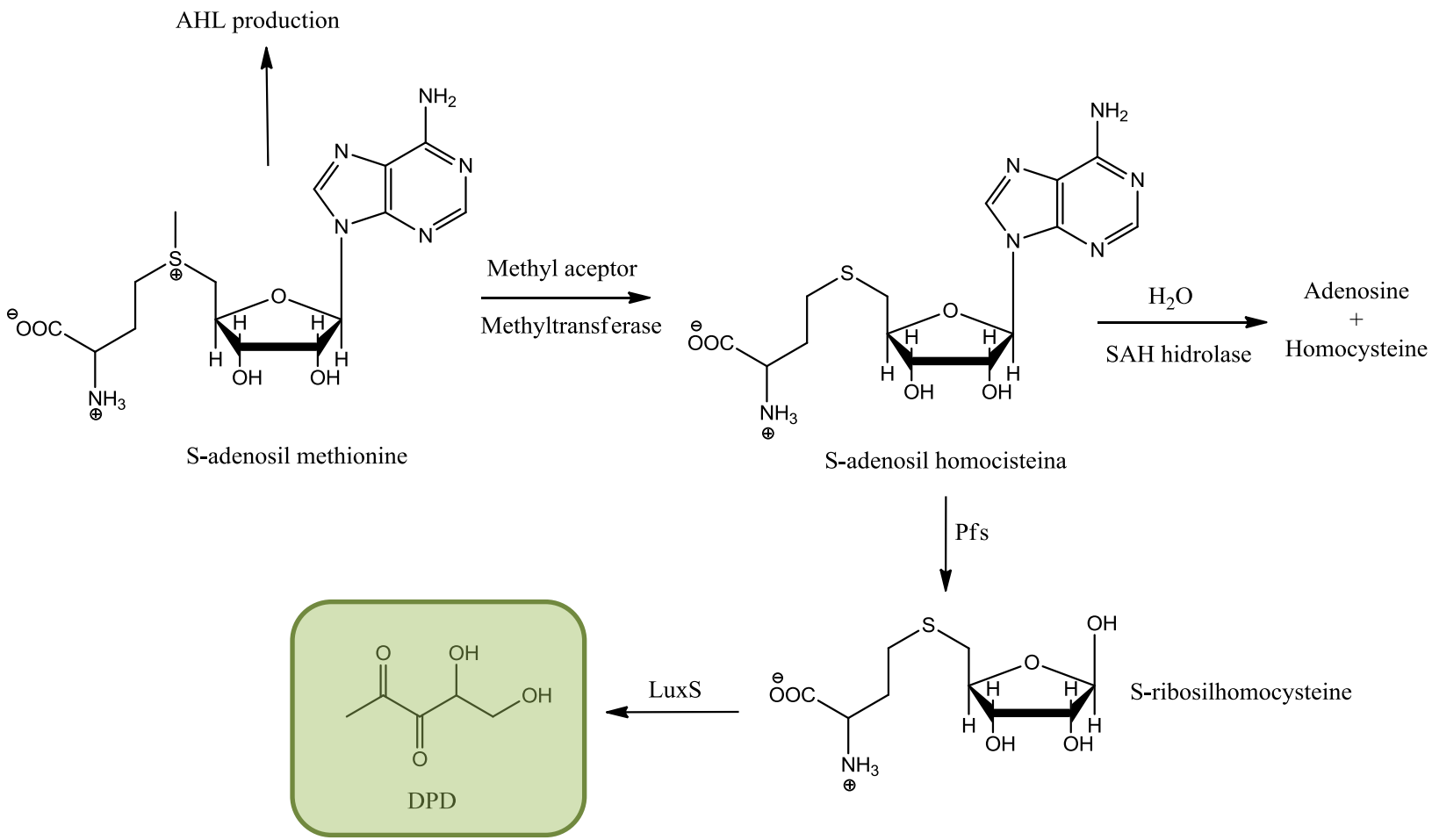
It responses to AI-2 in mouth

- It «looks for» *S. gordoni*

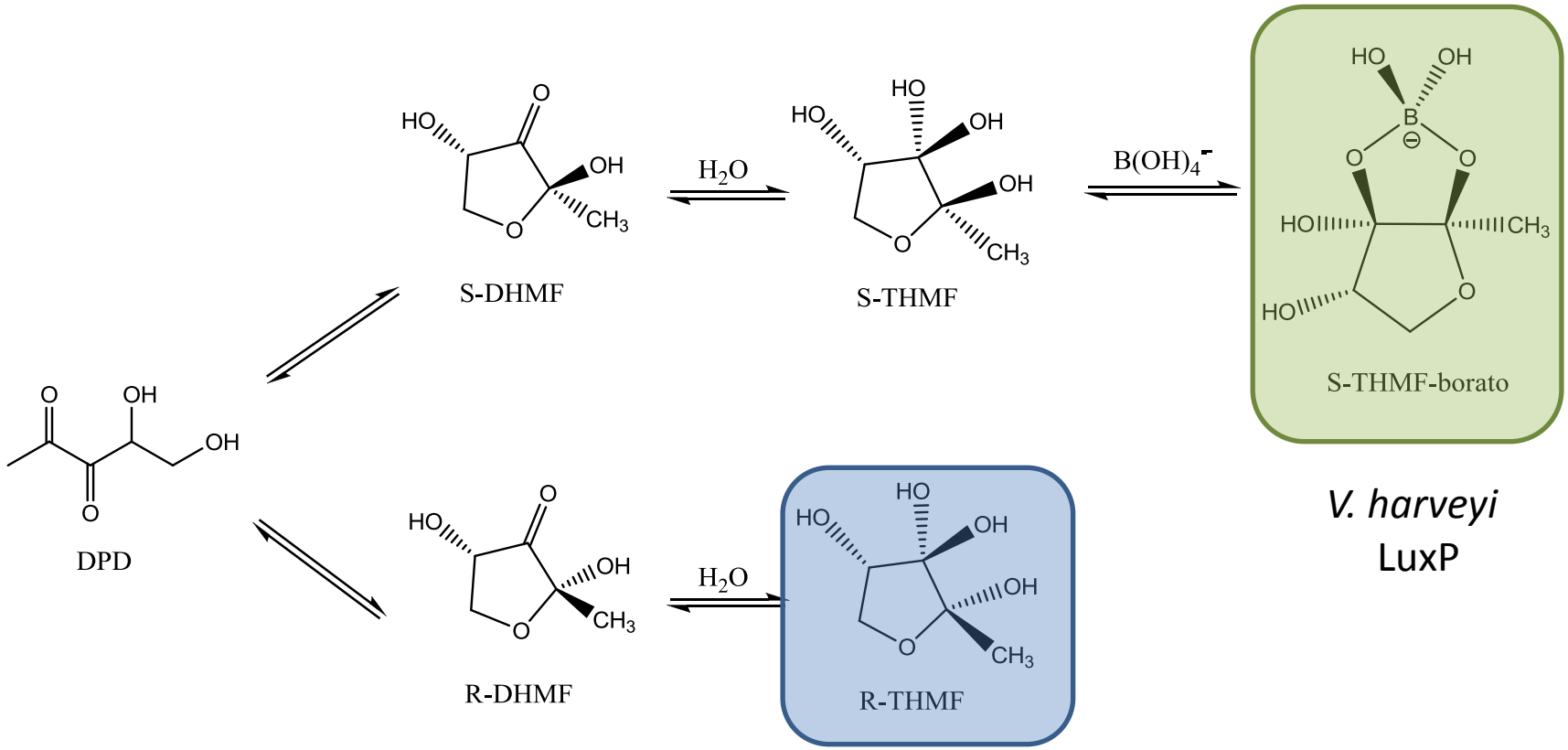


Current Opinion in Microbiology 2003, 6:191–197

Universal signal
AI-2



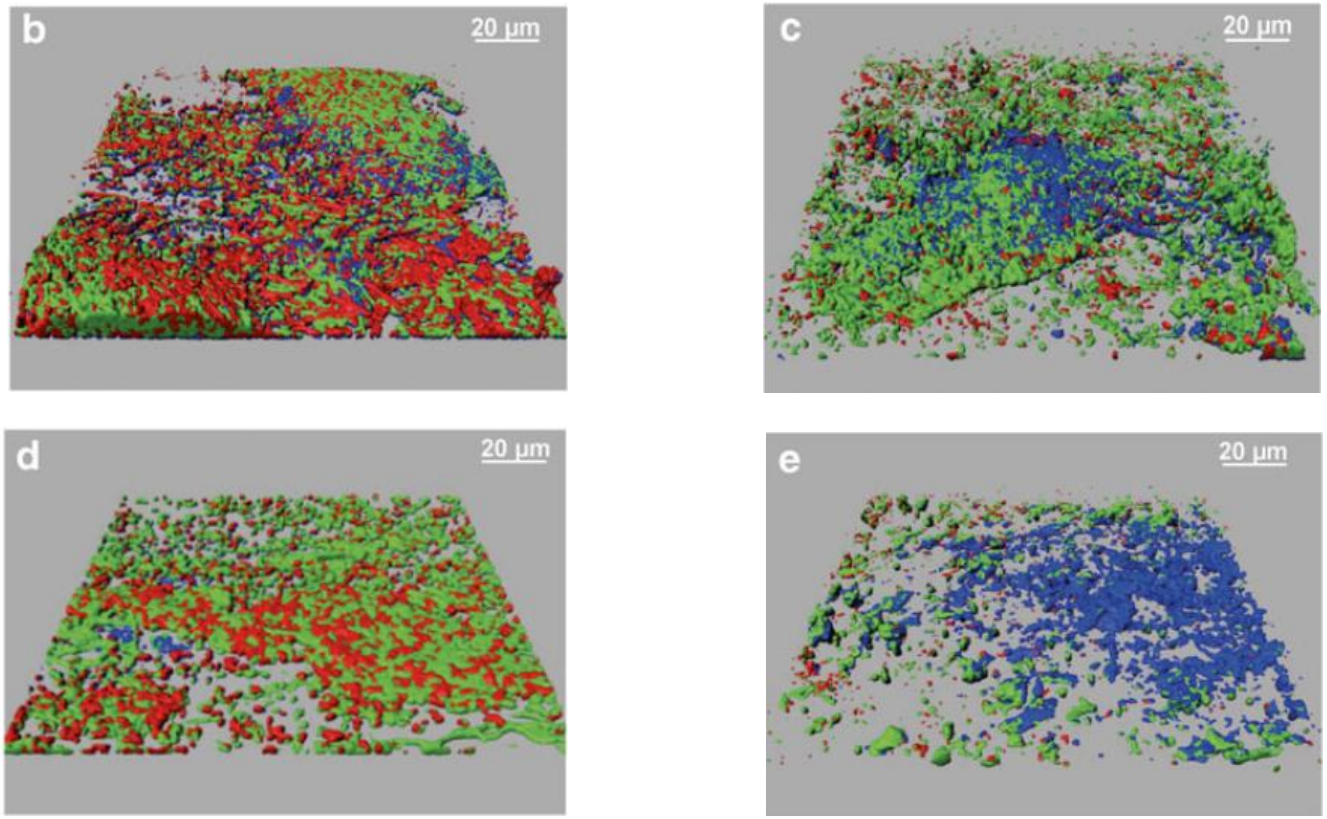
Señal universal
AI-2



V. harveyi
LuxP

S. Typhimurium
LsrB

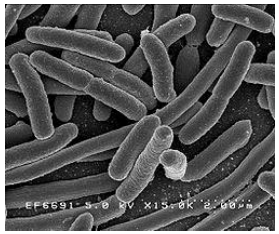
Inhibition using AI-2

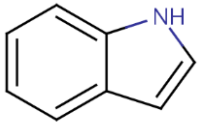


Appl Microbiol Biotechnol 2012 (online first)

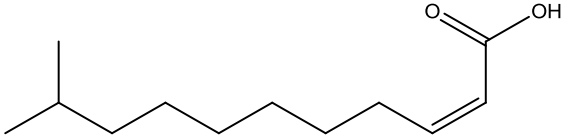
Other signals

Escherichia coli: Indol

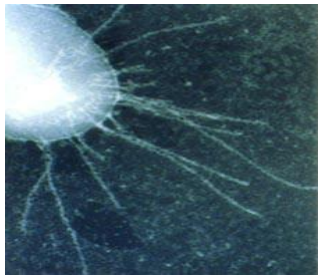


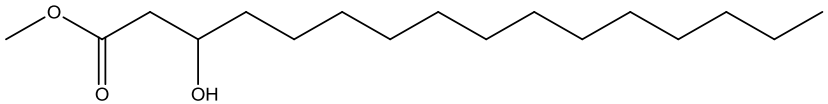


Xanthomonas campestris: DSF

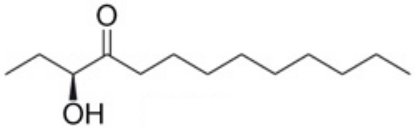


Ralstonia solanacearum: 3OH-PAME





Vibrio cholerae: CAI-1



Microbiol Rev 2008, 32(5):842-57.

Conclusions

- Bacteria are constantly «talking» to each other
- Quorum sensing is a census system and it carries out essential functions in bacteria, including interactions between them.
- The inhibition and the induction of bacterial quorum sensing have too many useful applications.

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Gamby S. et al. (2012): **Altering the Communication Networks of Multispecies Microbial Systems Using a Diverse Toolbox of AI-2 Analogues.** ACS Chemical Biology, vol 7: 1023-1030.

Roy V. et al. (2012): **AI-2 analogs and antibiotics: a synergistic approach to reduce bacterial biofilms,** Applied Microbial And Cell Physiology **(***Online first*).

QUIZ

1. Escriba la secuencia del transcrito obtenido del siguiente templado:

ATTGCTTACGT

2. ¿Qué es el Quorum sensing. Qué importancia tiene en los procesos realizados por las bacterias?

3. ¿Qué es un plásmido y para qué puede ser utilizado en biología sintética?

4. Esquematice los postulado en el dogma central.

Bono: Mencione un autoinductor; diferente de AHL, péptidos o AI-2; y la bacteria que lo utiliza.