

Bugging the Bugs

Microbial Geneticist Bonnie Bassler:
Investigating Bacterial Communications

Bonnie Bassler Is a Spy

Bassler, a bacterial geneticist at Princeton University, eavesdrops on bacteria.



The bacteria Bassler investigates

- Float freely in oceans
- Coat fish, coral, and debris
- Glow in the dark

Question:

What word describes bacteria that glow in the dark?

Answer: Bioluminescent



Luminescent
bacteria can
make seafood
glimmer
blue-green.

Next time
you see raw
fish, turn out
the lights
and check
out the glow!

Vibrio harveyi bacteria (*V. harveyi*)

Only glow when they are in a sufficiently large group
(known as a quorum)

Can You Guess?

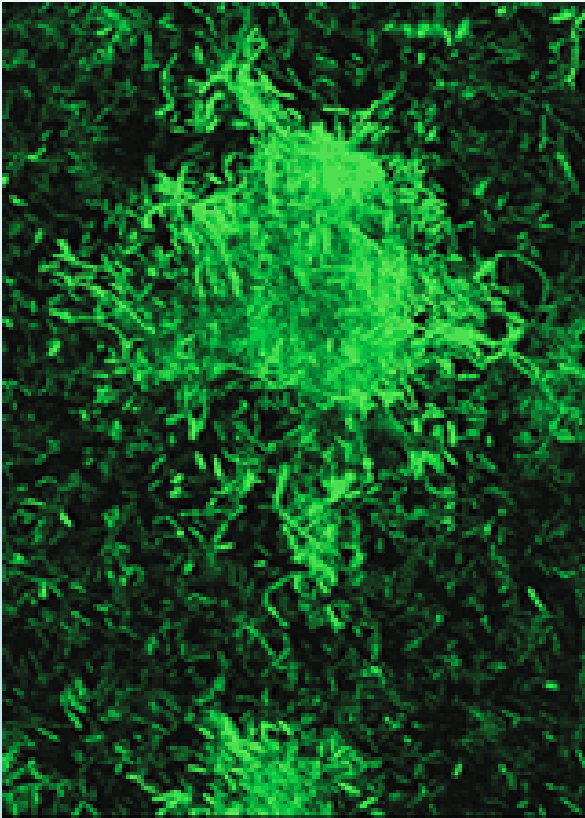
What happens
when *V. harveyi*
achieve a
quorum?

Answer

Using a chemical strategy dubbed quorum sensing, bacteria

- Assess their own population size
- Distinguish themselves from all other kinds of bacteria.

Quorum Sensing

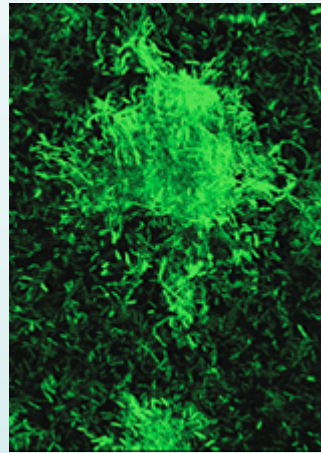


Bacteria use quorum sensing to mastermind behaviors, including

- Mating
- Releasing toxins
- Causing disease (virulence)

How Harmful Bacteria Use Quorum Sensing

The bacteria appear relatively innocuous as they quietly grow in number.



These changes culminate in an infection that can ambush and overwhelm our immune system defenses.


When their population reaches a certain level, instant changes occur in their

- Behavior
- Appearance
- Metabolism

More About Quorum Sensing


1. Bacteria leak a chemical into their surroundings.

What do we call such chemicals?



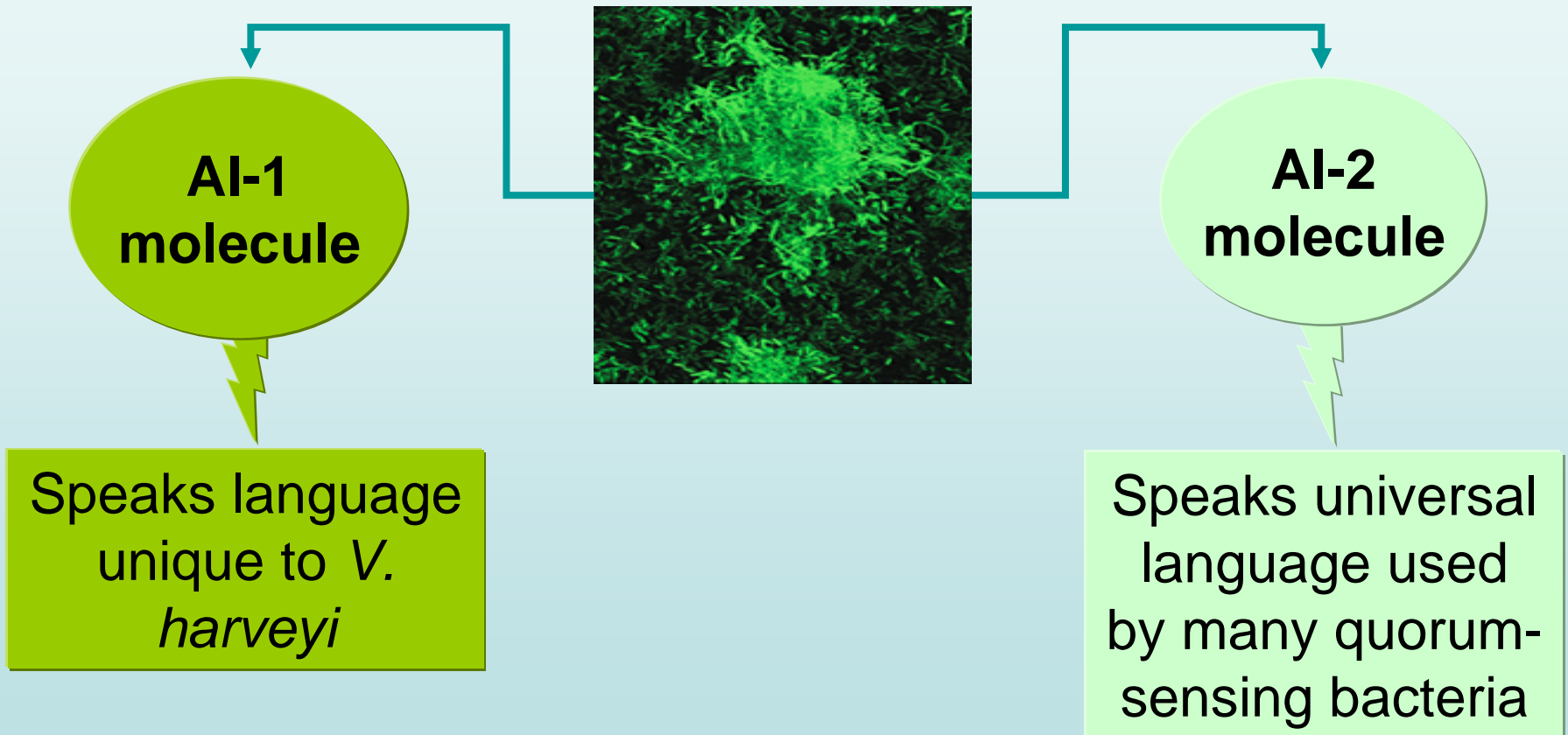
2. Independent, solitary bacterial cells become part of a large, multicellular organism, known as biofilm, when the amount of a certain chemical reaches a particular level.

Give an example of a common biofilm.

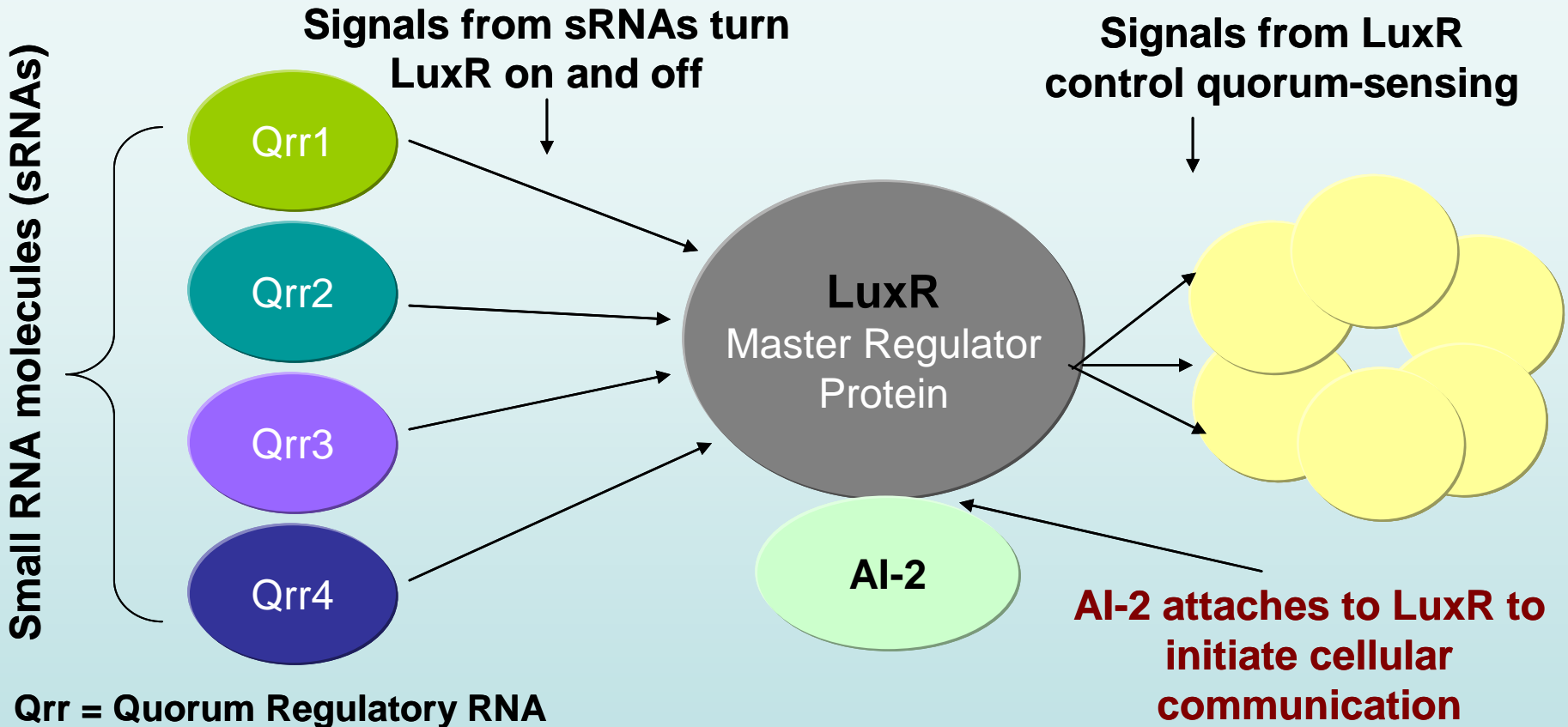


V. harveyi Are Bilingual

V. harveyi communication systems



The Chain of Command in Bacterial Communication



Decoy Molecules?

Autoinducer 2 may hold the key to disrupting quorum-sensing.

AI-2 contains the element boron



AI-2 and similar boron-containing molecules made in the laboratory could serve as decoys to subvert virulence and other quorum-sensing behaviors

Research Applications

In what ways might the knowledge that Bassler has gained about bacterial quorum-sensing be applied in human medicine?