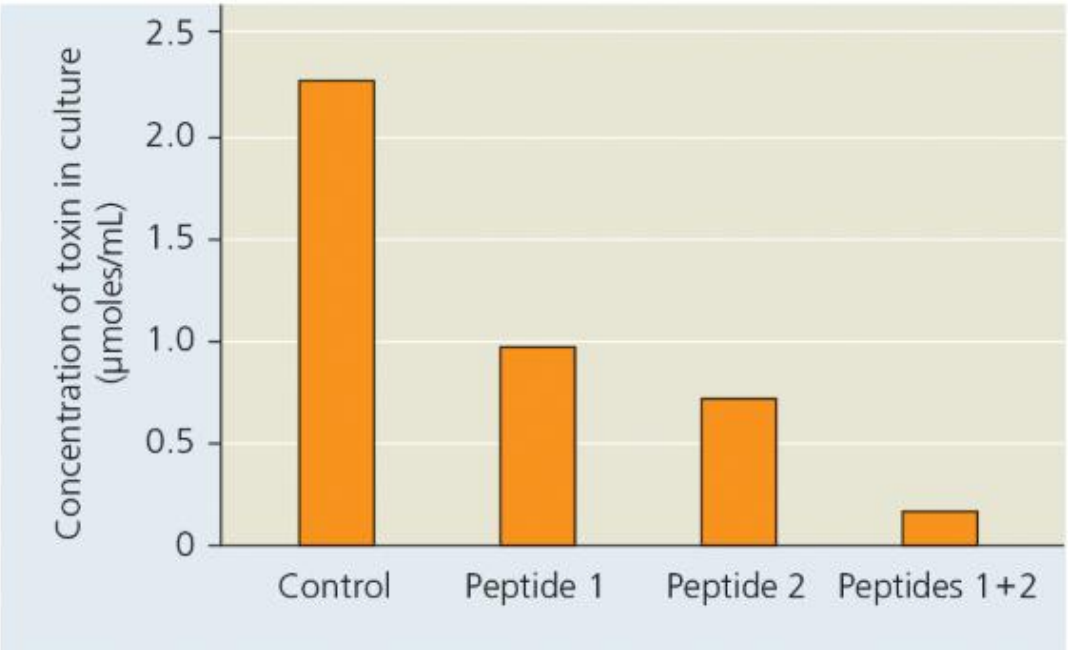
Quorum Sensing in *S. Aureus*

Staphylococcus aureus (S. aureus) is a common bacterial species found on the surface of healthy skin that can turn into a serious pathogen if introduced into tissue through a cut or abrasion. Once inside the body, a population of *S. aureus* that reaches a certain density will start to secrete a toxin, killing body cells and contributing significantly to inflammation and damage. Because about 1 in 100 people carry a strain of *S. aureus* that is resistant to common antibiotics, a minor infection can turn permanently harmful or even deadly.

Cells can somehow determine their own density, so researchers wondered if blocking this quorum sensing could stop *S. aureus* from producing toxin. They believed that quorum sensing in *S. aureus* involves two separate signal transduction pathways that can lead to toxin production. Two candidate synthetic peptides (short proteins), called peptides 1 and 2, have been proposed to interfere with the *S. aureus* quorum-sensing pathways. An experiment was designed to test these two potential inhibitors of quorum sensing to see if they block either or both of the pathways that lead to toxin production.

In the experiment, four cultures of *S. aureus* were grown to a standardized high density and the toxin concentration in each culture was measured.



1. Identify the independent and dependent variables.

2. Describe the control group.

3. Identify the culture with a toxin concentration similar to the control culture. Justify your response.

4. Describe the effects of peptide 1 and peptide 2 on the toxin concentration.

5. Propose a mechanism for the observed activity of the peptides on quorum sensing in *S. aureus*.

6. a) Do these data suggest a possible treatment for antibiotic-resistant *S. aureus* infections?

b) State two questions researchers might have in trying to develop a drug to treat MRSA.