13.2F: Preventing Bacterial Adherence

Learning Objectives

1. Discuss how antibodies defend the body by way of preventing bacterial adherence to host cells. (Include what classes or isotypes of immunoglobulins are involved, the role of the Fab portion of the antibody, the role, if any, of the Fc portion of the antibody, and the role of any complement proteins, if any, involved.)

2. Briefly describe 2 different ways bacteria may resist antibodies that block bacterial adherence to host cells.

One of the body's innate defenses is the ability to physically remove bacteria from the body through such means as the constant shedding of surface epithelial cells from the skin and mucous membranes, the removal of bacteria by such means as coughing, sneezing, vomiting, and diarrhea, and bacterial removal by bodily fluids such as saliva, blood, mucous, and urine. Bacteria may resist this physical removal producing pili, cell wall adhesin proteins, and/or biofilm-producing capsules.

For More Information: Bacterial Adherence from Unit 3

Antibodies are made against pili, capsules, and cell wall adhesins. The binding of the Fab portion of the antibody to the adhesive tip of the pili, the cell wall adhesins, or the capsular molecules prevents the bacteria from adhering to and colonizing host cells (see Figure "Page1" and Figure "Page2".) IgG blocks adherence of bacteria in tissues while IgA blocks adherence of bacteria at mucosal surfaces within the body.

Flash animation showing antibodies blocking bacterial adherence to host cell.

html5 version of animation for iPad showing antibodies blocking bacterial adherence to host cell.
The body is able to make antibody molecules against the adhesive tips of Escherichia coli pili and yet E. coli is still the most common cause of urinary tract infections. State what might account for this.

However, as learned in Unit 3, some bacteria by means of the activities described below are able to overcome this antibody defense.

- Some bacteria can produce immunoglobulin proteases which can degrade the protective IgA found in mucus. Examples include bacteria that colonize the mucous membranes such as *Streptococcus pneumoniae*, *Haemophilus influenzae*, *Neisseria gonorrhoeae*, *Neisseria meningitidis*, *Helicobacter pylori*, *Shigella flexneri*, and enteropathogenic *Escherichia coli*.
- Another way certain bacteria can evade antibodies is by changing the adhesive tips of their pili as seen with *Neisseria gonorrhoeae* (see Figure \(\PageIndex{3}\)). Bacteria can also vary other surface proteins so that antibodies already made will no longer "fit."

For More Information: Bacteria Resisting Adaptive Immunity from Unit 3

**Summary**

Bacteria resist physical removal by means of pili, cell wall adhesin proteins, and/or biofilm-producing capsules. The binding of the Fab portion of the antibody to the adhesive tip of the pili, the cell wall adhesins, or the capsular molecules prevents the bacteria from adhering to and colonizing host cells.

**Questions**

Study the material in this section and then write out the answers to these questions. Do not just click on the answers and write them out. This will not test your understanding of this tutorial.

1. Discuss how antibodies defend the body by way of preventing bacterial adherence to host cells. (Include what classes or isotypes of immunoglobulins are involved, the role of the Fab portion of the antibody, the role, if any, of the Fc portion of the antibody, and the role of any complement proteins, if any, involved.) *(ans)*
2. Describe how immunoglobulin proteases may protect bacteria from antibodies that block bacterial adhence to host cells. *(ans)*
3. Multiple Choice *(ans)*
Contributors and Attributions

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