



The Bacterial Capsule

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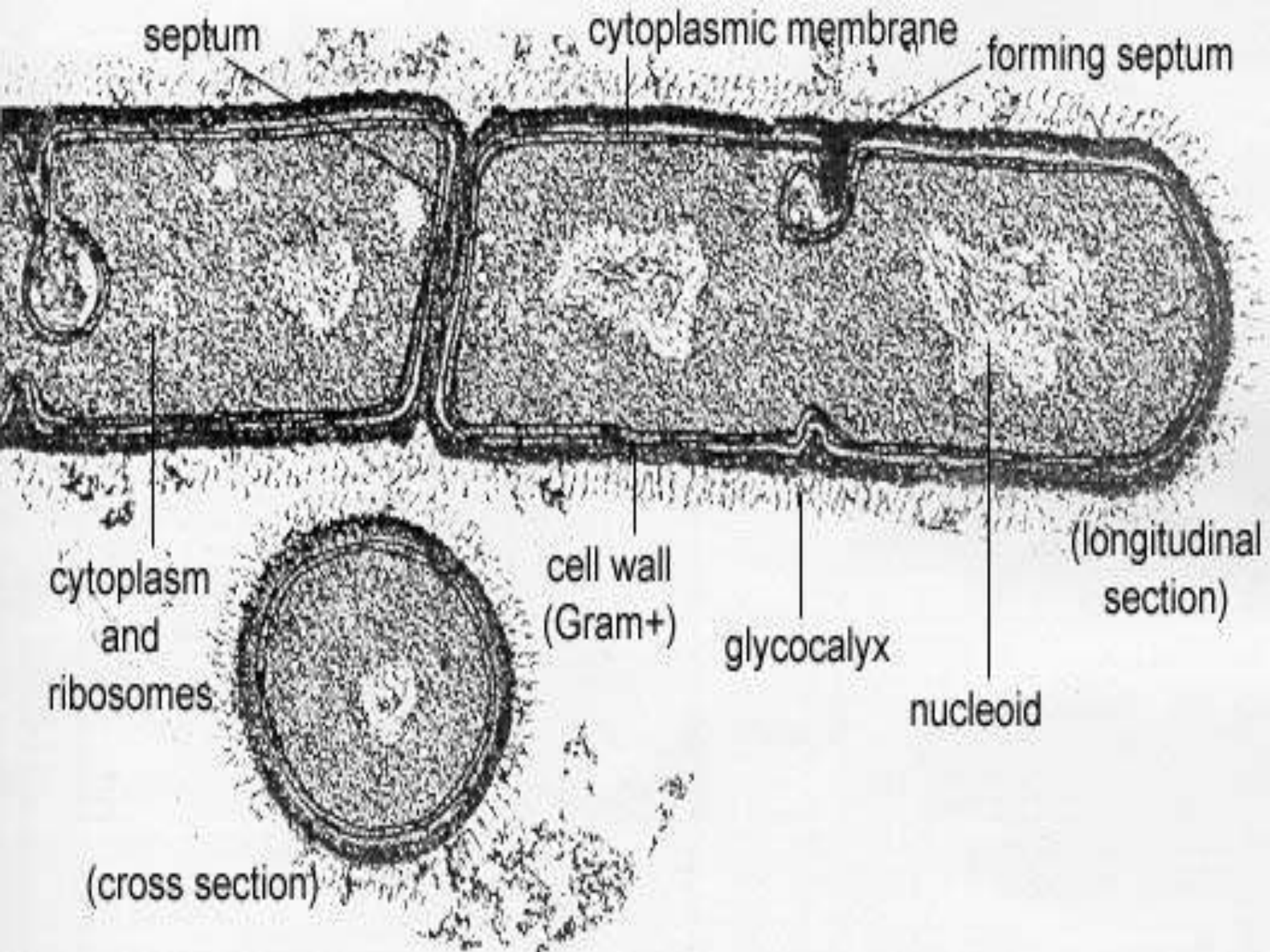
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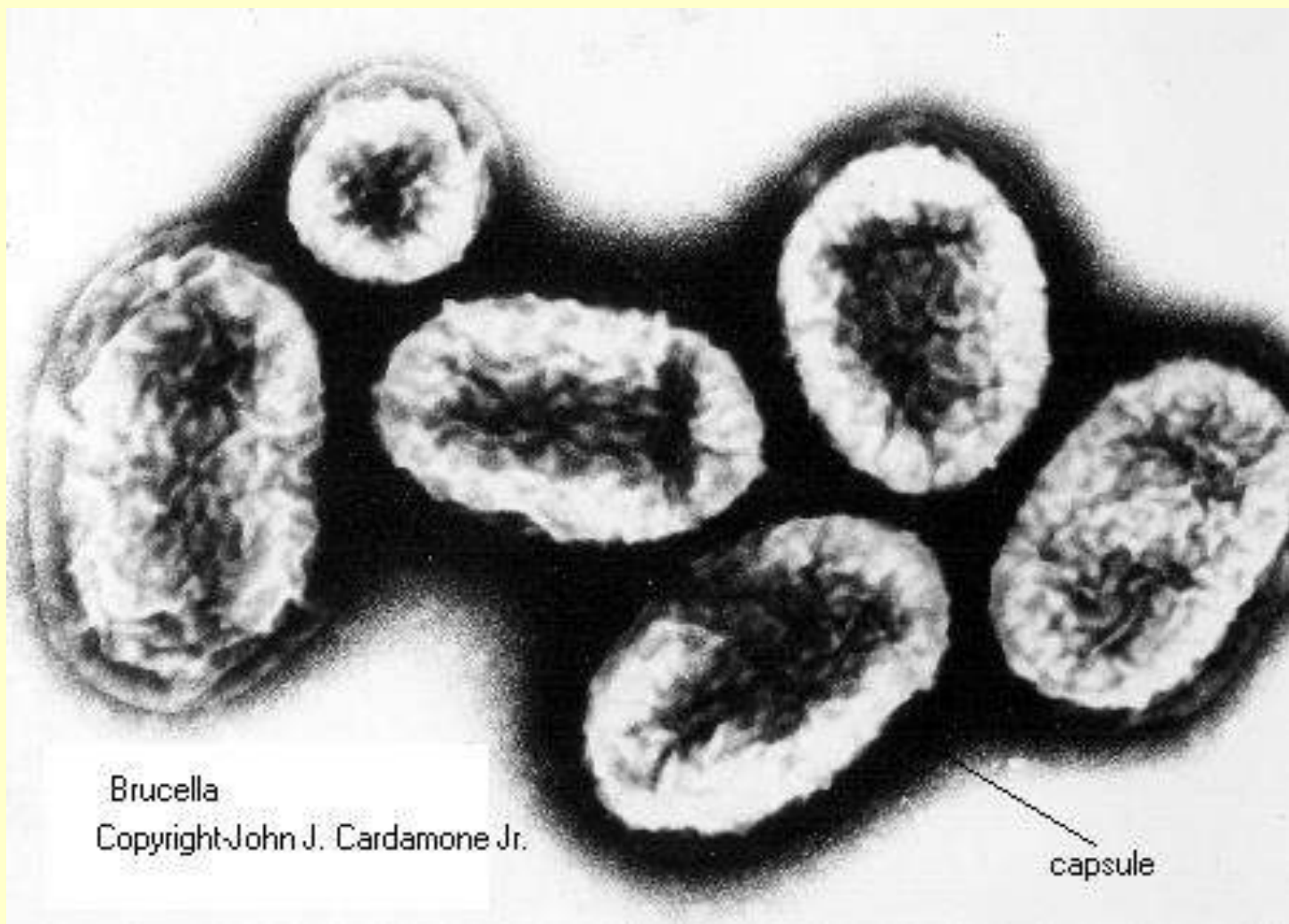
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Cell Envelope: Capsule

- Many bacterial cells surround themselves with one or another kind of hydrophilic gel.
- If the material forms a reasonably discrete layer, it is called a capsule; if it is amorphous in appearance, it is referred to as a slime layer
- Most capsules or slime layers are polysaccharides; some are simple polypeptides; a few are proteins



Encapsulated *Brucella*

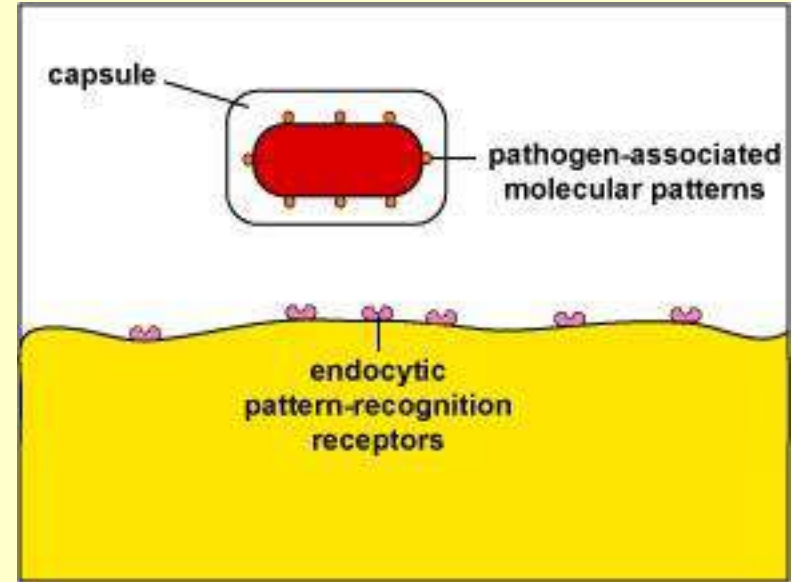
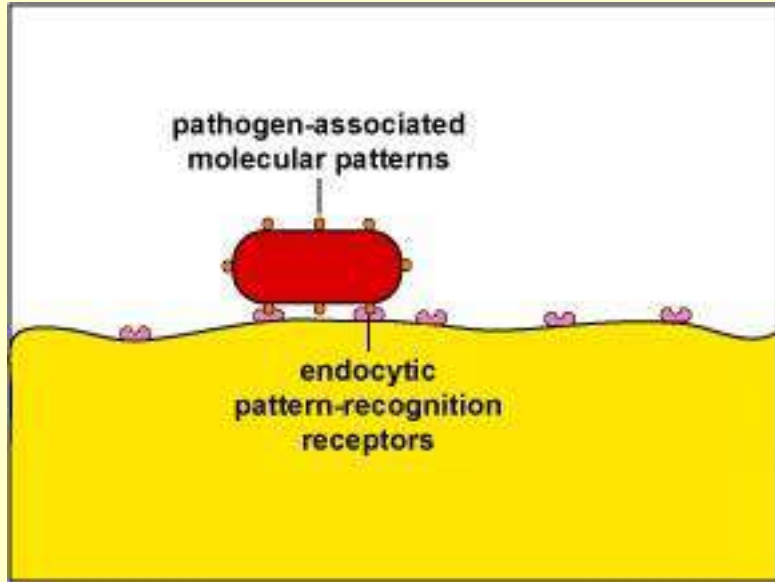


Cell Envelope: Capsule

- Capsules can protect bacteria- they impede ingestion by leukocytes
- Capsules aid colonisation, primarily by assisting the cell to attach to surfaces
- Capsules do not contribute to growth and multiplication and are not essential for cell survival in artificial culture

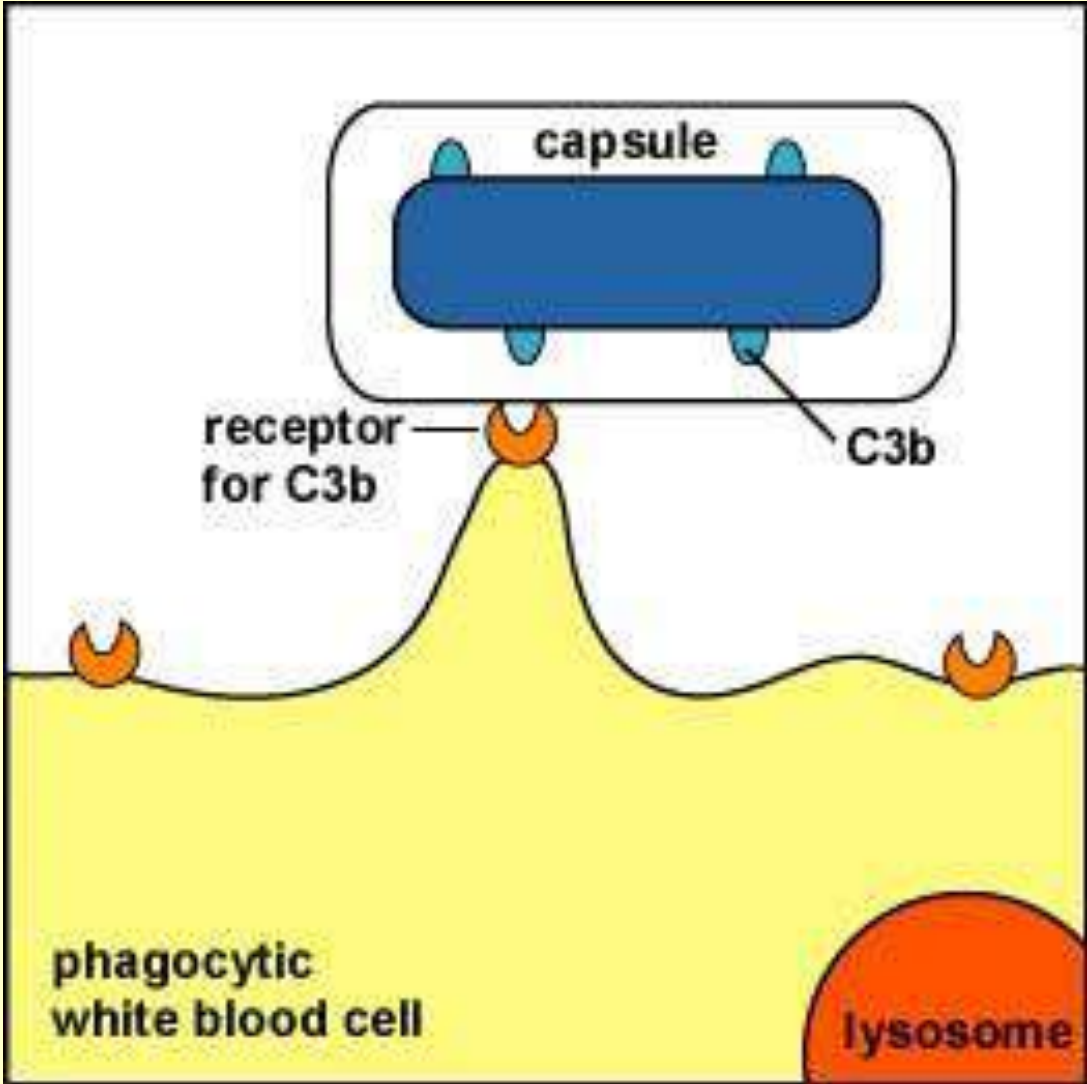
- **provide protection against temporary drying by binding water molecules.**
- **block attachment of bacteriophages.**
- **promote stability of bacterial suspension by preventing the cells from auto-aggregation.**
- **decrease friction, and thus increase motility of cell.**
- **can aid in metabolism by either having an affinity for waste products (drawing them out of the cell) or substrates (accumulating from the media).**

Capsules Blocking the Attachment of Bacteria to Phagocytes



Glycoprotein molecules known as endocytic pattern-recognition receptors are found on the surface of phagocytes. They are so named because they recognize and bind to pathogen-associated molecular patterns - components of common molecules such as peptidoglycan, teichoic acids, lipopolysaccharide, mannans, and glucans - found in many microorganisms. Capsules can cover up these surface molecules preventing their attachment to the endocytic pattern-recognition sites on the phagocyte.

Bacterial Capsule Preventing C3b Receptors on Phagocytes from Binding to C3bR Attached to a Bacterial Cell Wall



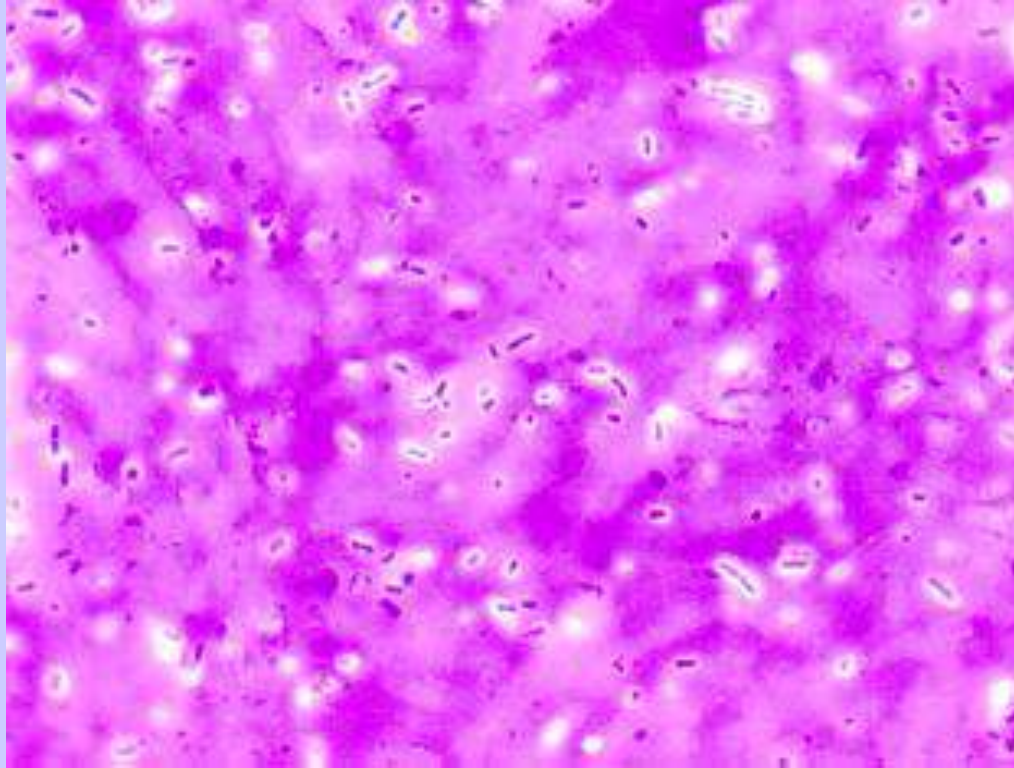
Cell Envelope: Capsule

- When cultured on solid media, encapsulated bacteria give rise to smooth, often mucus-like colonies
- Unencapsulated variants arise on long-term laboratory cultivation- their colonies are non-mucoid or 'rough.'
- The capsule contains the 'capsular' or 'K-antigens'



The colonies of *Streptococcus mutans*, a primary cause of tooth decay embedded in extra cellular polysaccharide which helps this bacterium to adhere to the teeth and probably helps to protect the cells from the action of lysozyme

Capsule stain of *Enterobacter aerogenes*



Note colorless capsules surrounding purple bacilli.

Quellung reaction

When capsulated bacterial cells are resuspended in antiserum that carries antibodies raised against the capsule, the capsule swell and can be easily visualized by suspension in India ink. This is known as Quellung reaction