**Virulence**

I – Invasiveness

   A – Increase spread (penetration)

          1 – Enzymatic factors

             a- Hyaluronidase

             b- Collagenase

             c- Streptokinase

             d- Lecithinase

             e- Hemolysins

   B – Resist phagocytosis

          1 – Enzymatic factors

             a- Leukocidin

             b- Coagulase

          2 – Capsule production

          3 – Cell wall components

             a- M protein

             b- A protein

          4 – Flagellation

   C – Other factors

          1 – Necrotizing factor

          2 – Hypothermic factor

          3 – Edema producing factors
II - Toxigenicity

A - Exotoxins

1 - Produced by mostly Gram positives and some Gram negatives

2 - Secreted into fluids by living cells

3 - Chemically they are polypeptides

4 - Specific tissue affinities and functions
   a - cytotoxins - kill host cells directly or affect functions of cells which are ultimately fatal
   b - neurotoxins - interfere with nerve impulse transmission
   c - enterotoxins affect cells lining the G. I. tract

5 - Can be denatured by heat or U.V. and inactivated by chemicals. They are not stable. Therefore, they can be made into a type of vaccine known as toxoids. Toxoids can be injected and will trigger the body into antibody production against the original active exotoxin.

6 - Febrile reactions are minimal

B - Endotoxins

1 - Produced by Gram negatives only

2 - Released upon lysis of dead cells (walls)

3 - Chemically they are lipopolysaccharides (LPS component of Gram negative cell walls)

4 - Produce non-specific or generalized reactions
   a - fever (can be quite pronounced)
   b - weakness and aches
   c - shock (endotoxic shock from vasodilation and capillary permeability)

5 - Endotoxins are heat stable and cannot be made into toxoids