**Lec.4**

**2. Collagenase :**

**Collagenase is the most abundant protein of vertebrates and occurs in virtually every tissue .**

**The collagen building fibrils ( proteins ) are the main components of the supporting tissue of connective tissues , bones , skin , tendon , cornea , cartilage , teeth , and extracellalar matrices of blood vessels .**

**In mammalian , approximately 25 – 33% of total protein is collagen.**

**Collagen is long ( 300 nm ) , rod – like molecule which comprises three parallel polypeptide chains . Each chain is left handed helix and the three helices twist around a common axis to from a major helix of slightly right handed sense .**

**The triple helix is stabilized by inter chain hydrogen bonding and inter and intramolecular cross links .**

**Denaturation of the collagen triple helix causes disruption of these stabilizing bonds and results in the production of gelatin .**

**Collagenases are enzymes that are able to cleave the peptide bonds in the triple helical collagen molecule(cleave the helical region).**

**Examples of bacterial pathogens that produce Collagenolytic enzymes:**

***Bacillus cereus .***

***Bacteroides spp.***

***Bifididobacterium sp .***

***Brucella melitensis .***

***Clostridium spp .***

***Enterococcus faecalis .***

***Escherichia coli .***

***Flavobacterium meningosepticum .***

***Peptococcus sp .***

***Peptosteptococcus spp .***

***Proteus mirabilis .***

***Pseudomonas aeruginosa .***

***Serratia marcescens .***

***Staphylococci spp.***

***Streptococcus agalactiae* ( group B streptococci ) .**

***Streptococcus mutants* .**

***Treponema spp .***

**Clostridial collagenases**

***Clostridium perfringens* is the etiological agent of myonecrosis ( gas gangrene ) where collagenase is an important virulence factor . It is a tissue destroying enzyme know as *( Kappa* toxin ) .**

**Applications :**

* **Tissue dissociation for cell culture .**
* **Isolation of pancreatic islets cell of Langerhau .**
* **Isolation of cardiomyocytes .**
* **Isolation of hepatocytes .**
* **Isolation of tumour cells .**

**3.Coagulase:**

**Coagulase is an enzyme that is produced by some types of bacteria . The enzyme clot the plasma component of the blood . The only significant disease causing bacteria of human that produce coagulase is *S. aureus*.**

**Staphylocoagulase ( coagulase ) clots fibrinogen only in the presence of protein co-factor , the coagulase – reacting factor ( CRF ) or ( Prothrombin ) .**

**Coagulase reacts with prothrombin in the blood . The resulting complex is called staphylothrombin , which enables the enzyme protease to convert fibrinogen to fibrin , this results in the clotting of the blood .**

**In the human host , the action of coagulase produces clotting of the plasma in the immediate vicinity of the bacterium . The resulting increased effective diameter of the bacterium makes it difficult for the defense reactions of the host to deal with infecting cell .**

**In particular , the defensive mechanism of phagocytosis , where the bacterium is ingulfed by a host cell and then dissolved is rendered in effective , this enables the bacterium to persist in the presence of host immune response , which can lead to the establishment of infection.**

**The coagulase can be described as a disease causing or virulence factor of *S. aureus* .**

**4. Fibrinolysin:**

**This catalyzes the conversion of plasminogen to the fibrinolytic enzyme plasmin . Thus it acts opposite of coagulase .**

**In *S. aureus* the gene for fibrinolysin is on a bacteriophage and is expressed during lysogeny .**

**5. Lipase:**

**Production of excessive amounts of lipase allow bacteria to penetrate fatty tissue with the consequent formation of abscesses .**

**6.IgA protease:**

**Many bacteria which colonize the mucous membranes produce an IgA protease which degrade secretory IgA .**

**7.Exfoliative Toxin ( ET ):**

**Staphylococcal scalded skin syndrome toxin**

**Ritter disease , staphylococcal epidermal necrolysis , encompassed a spectrum of superficial blistering skin disorders caused by exfoliative toxins of some strains of *Staphylococcus aureus .***

***S. aureus* produce 2 distict but serologically identical forms of ET , A and B , ( ETA and ETB ) , proteins of MW = 25000 – 30000 daltons.**

**The initial infection occurs , commonly at a site such as oral or nasal cavities , throat or umbilicus . ( in new borne)**

**Epidermolytic toxins are produced by the infecting staphylococcal species , these toxins leading to separation of the epidermis beneath the granular cell layer .**

**Two types of this syndrome**

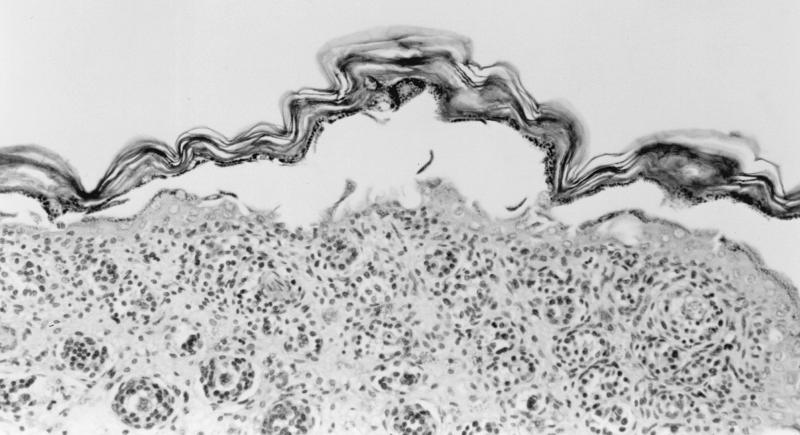
1. **localized , ( patchy ) .**
2. **generalized , ( areas ) .**

**Principal pathological features of the disease :**

* **Cell separation within the epidermis .**
* **Massive denuding of the body surface .**

**The mechanism of action :**

**It is an extracellular non – cytolytic process, one suggestion is that the intercellular bubbles might contain an enzyme or proenzyme , which is released or activated by ET and then acts on the nearest desmosome to cause cell splitting .**

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