**2**- **Collagen:**

Collagen, the most abundant protein in mammalian tissues, accounts for up to one-third of all protein mass in a mammal. Collagen fibers form the matrix or cement material in human bones where bone mineral precipitate. Collagen fibers constitute a major part of tendons and act as a major part of skin. The main function of collagen is the mechanical reinforcement of the connective tissues of vertebrates .

The individual polypeptide chains of collagen contain 20 different amino acids and the precise composition varies between different tissues. The variation in specific amino acid sequence gives rise to the different types of collagen labeled as Type I , Type II up to Type XIX. The most commonly occurring collagens are Types I , and M, which form the long-recognized characteristic fiber bundles seen in many tissues. Type I collagen is mostly found in skin, tendon, and bone, and Type HI in blood vessels. The various collagen types show differences in degrees of glycosylation, which means that glucose and galactose are covalently coupled to the collagen molecules .

The basic building block of collagen is a triple helix of three polypeptide chains called the tropocollagen unit. Each chain is about 1,000 amino acid residues long. These three individual a-chains are cross-linked biosynthetically and fold to form a triple helix (tertiary structure) with a molecular weight of approximately 300.000 g/mol, a length of approximately 300 nm and a diameter of 1. 5 nm .



Figure 1 Triple helix structure of collagen molecule.

The collagen molecules possess an axial periodicity that is visible in the electron microscope and pack into lattices with lateral symmetry (quaternary structure). This supramolecular structure is widely accepted as the microfibril containing five collagen triple-helices, with a diameter between 3. 5 nm and 4.0 nm. Approximately 1,000 microfibrils can aggregate laterally and end-toend into a fibril having a diameter of 80 -100 nm, that displays a regular banding structure with a period of 65 nm (Fig. 2 ) .

Collagen fibers are strong. In tendons, the collagen fibers have strength similar to that of hard-drawn copper wire .

There has been an increased interest in the use of collagen and collagencontaining

tissues in medical devices during the recent two decades. One way to use collagen-rich tissues is to chemically treat the tissue in order to make them into implantable prostheses. Examples are heart valves, vascular grafts, tendons, ligaments, and pericardium. Another way involves the use of purified collagen obtained from animal tissue, processed in a variety of ways to generate a large number of products that not only have applications in the medical field, but also in the manufacturing of cosmetics. Collagen can be used in the form of native soluble collagen, enzymatically processed native collagen, soluble collagen of reconstituted fibers, etc. Products are used as dermal implants, implantable drug delivery vehicles, sponges, tubes and suture.



Figure 2 Collagen fibril structure