PRESIDENTIAL ADDRESS

MATHEMATICAL MODELLING OF BIOFLUID FLOWS

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Building models on scientific lines for complex systems has become a necessity for a better understanding of the functioning of the systems. The real value of modelling lies not so much in understanding the behaviour of the system, but in designing system having the desired characteristics. In several situations, experimentation is not possible or expensive (for eg. blood flow in arteries). In view of this, mathematical modelling of biofluid flows becomes relevant and important for providing solutions to the problems concerning physiological fluid flows.Biofluid mechanics is the study of certain class of biological problems from fluid mechanics point of view.

Complex moments of fluids in the biological system demand for their Analysis, Professional fluid mechanics skills. The most Common Problem in the biological system is the flow of blood. In 1839 the engineer Hagen Studied water flow though brass tubes. He was the first to suggest the importance of fourth power of radius occurring flux determination. In 1840, the French physician Poiseuille was interested in the flow of blood though vessels of circulatory system, but he worked with water because of clotting of blood in air. After several experiments he proposed the well Known Poiseuille's Law. Now a days this has a lot of importance in analysing bio fluid flows through elastic conduits which serve one of the best models of biological systems. Other prominent models for complaint calls (including elasticity) are proposed by Sochi, Mazumdar and A. Rama Chandra Rao.

Blood Consists of a suspension of cells in an aqueous solution called plasma which is composed of about 90% water and 7% protein. Blood is a liquid tissue consisting of several types of cells suspended in an aqueous fluid matrix (the plasma). The Plasma itself Contains a complex spectrum of organic molecules. It is made up of red cells (RBC), white cells(WBC) and Platelets. WBC Play a major role in fighting diseases, but fewer in number compared to the RBC(Except for the Capillaries, all blood vessels have walls Composed of thee layers separated by elastic lamina).This complex structure of blood demands several mathematical models to have a better understanding of its transport through blood vessels.

The experiments of Gold Smith and Skalak (1975) have shown that blood behaves like a non-Newtonian fluid when it flows through Capillaries. Blair (1959) reported that blood obeys the Casson model for moderate shear rate flows.

Peristaltic mechanism of biofluid transport has been receiving considerable attentions in recent times in engineering as well as in physiological science. This mechanism is observed in several contexts such as mobility of the spermatozoa and Ova, propulsion of bacteria and protozoa, blood flow through circulatory systems of mammals. According to behaves Brasseur, human stomach work likes a grinder, mixture under peristalsis. Several biological problems are still unsolved in these areas.

In view of the above observations, mathematical modelling of biofluid flows through biological systems is attracting the present researchers in biofluid mechanics. The available literature is limited in this area and hence considerable attention has to be made in explaining the fluid properties, wall properties and origin for peristaltic moments involving neuro science using latest advanced computational techniques.