

What Biomedical Device Shape Minimizes Blood Damage?

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Hemolysis is the breaking of red blood cells in the blood. When hemolysis occurs, red blood cells release proteins called hemoglobin. While in the cell, hemoglobin helps carry oxygen around the body. When hemoglobin is released into the blood by hemolysis, it is toxic in high concentrations. A small amount of hemolysis usually occurs in hemodialysis machines that clean blood for people with kidney problems. The hemolysis mainly occurs in the tube connectors of the machine. In the connectors are usually found a small stenosis (a narrow opening). The stenotic shape can be modified to lower the hemolysis rate. This purpose of this project is to identify what stenotic shape minimizes hemolysis. Various programs will be used when performing the tests such as computer aided design (CAD), automatic mesh generation, and computational fluid dynamics (CFD). The results of the tests will be analyzed and compared, so a functional model can be made to achieve a low hemolysis rate. The main hypotheses of this project are that stenoses with sharp edges will have the highest hemolysis rates and stenoses with rounded edges will have the lowest hemolysis rates.