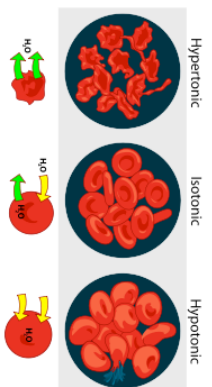


# Red Blood Cell resistance to osmotic stress

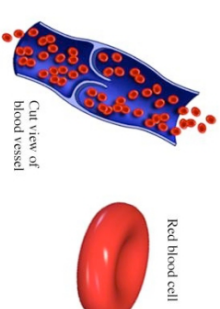


The concentration of solutes in the cytoplasm of the RBC is the same as in blood plasma and it exerts an osmotic pressure of about 7.6 atm at 37 °C. This is the osmotic pressure exerted by 0.15 M NaCl and corresponds to 300 mmol of solute osmotically active per liter (0.3 osM). Since cell membranes are semipermeable and can be crossed by water, if RBCs are suspended in solutions at lower osmolarity, they absorb water and swell until they burst.

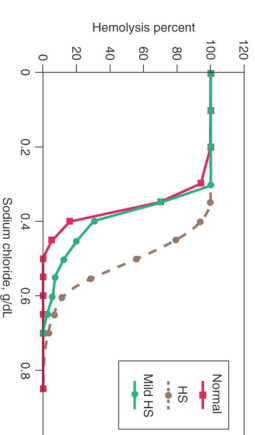
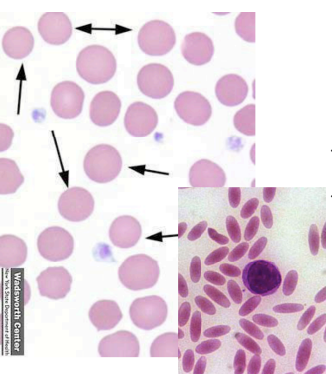


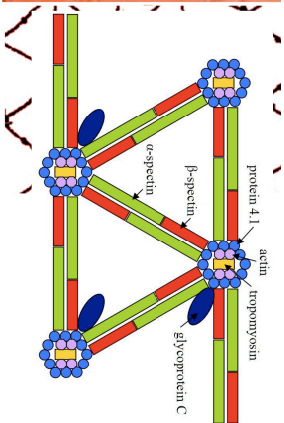
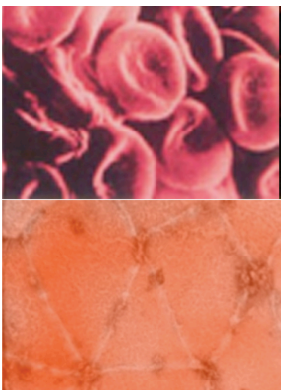
## Red Blood Cells (RBCs) Resistance to osmotic shock

RBC is a small blood cell responsible for the transport of oxygen. It is devoid of nucleus and organelles therefore it cannot reproduce itself. To perform its function, RBCs contain a high concentration of hemoglobin, a protein whose function is to reversibly combine with oxygen. RBC average life is 120 days, new RBCs are constantly produced in the bone marrow from specialized stem cells (erythroblasts).

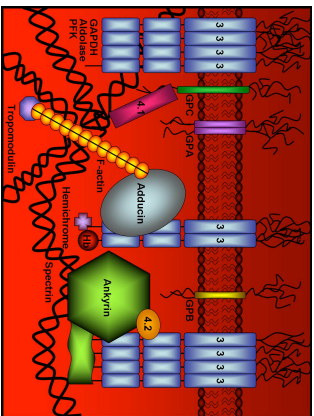


There are diseases in which, for defects in either the membrane proteins or in the enzyme content in the cytoplasm, the resistance of RBCs to osmotic stress is decreased. The resulting clinical case-study is that of a hemolytic anemia (spurious clinical picture, which may be due to many different causes, not all related to the osmotic resistance of the membrane). Examples of inherited defects in the membrane of RBCs are spherocytosis (HS) and elliptocytosis (HE).

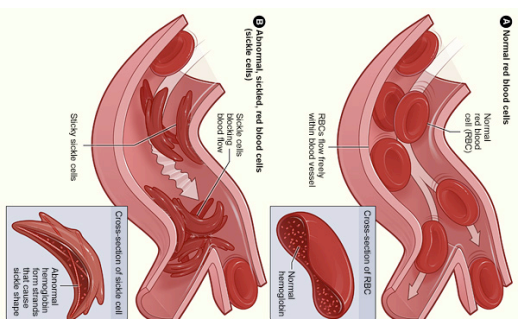




Spherocytosis is caused by mutations of proteins of the cytoskeleton: spectrin, ankyrin band 3 or proteins 4.1 and 4.2



It is possible to measure the resistance of the membrane of red blood cells by suspending them in solutions gradually of decreasing concentration and measuring the fraction of cells that undergo osmotic lysis.  
 The easiest way to quantify the results of an experiment of this kind is to centrifuge the cells and determine the concentration of hemoglobin in the supernatant.  
 In fact, the osmotic lysis releases the hemoglobin in red blood cells and the concentration of this protein in the supernatant is directly proportional to the number of cells that have undergone lysis.



Also in sickle cell anemia the reduced elasticity of RBCs leads to hemolysis

The procedure will be presented in this experiment is used in clinical practice, after a first quick screening, such as the reticulocyte count (immature red blood cells), that can give indications on the presence of hemolytic anemia

