Erythrocyte sedimentation rate (ESR)

If blood is allowed to stand in narrow tube the corpuscles settle progressively to the bottom leaving clear plasma above. This known as sedimentation rate .

- The RBCs sediment because their density is greater than that of plasma
- this is particularly so, when there is an alteration in the distribution of charges on the surface of the RBC (which normally keeps them separate form each other) resulting in their coming together to form large aggregates known as rouleaux.
- Rouleaux formation is determined largely by increased levels of plasma fibrinogen and globulins, and so the ESR reflects mainly changes in the plasma proteins that accompany acute and chronic infections, some tumors and degenerative diseases. In such situations, the ESR values are much greater than 20mm/hr.

ESR varies greatly among different species of animals :

species	**Cat**	**Cattle**	**Chicken**	**Dog**	**Horse**
mm	15.4	2.4	1.5	6-10	15-38
time	1 hr	7 hr	1 hr	1 hr	20 min.

Sedimentation occurs in 3 phases :

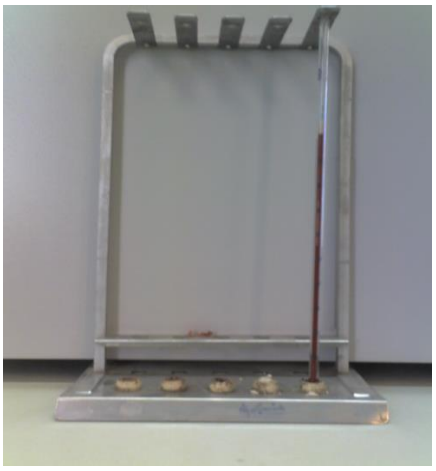
1. formation of rouleaux (clumping of red cells together like a stack of coins) .

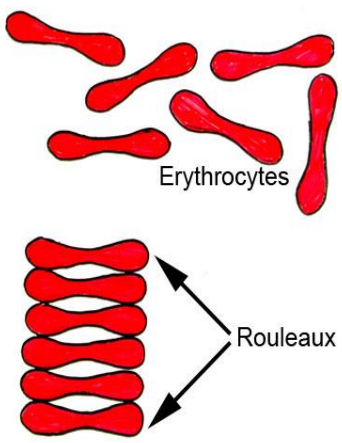
2. rapid settling .

3. packing of the red cell mass .

Sedimentation rate varies with the speed of rouleaux formation , this procedure outside the body is unknown . Plasma protein (fibrinogen , globulins) and tissue destruction increase rouleaux formation hence the sedimentation rate except albumen reduce it ESR increases in :- 1. acute general infection . 2. Tumors . 3. Hypothyroidism . 4. Pregnancy . **Procedure ESR** is determined by westergren method by use of westergren pipette . Westergren pipette is a narrow pipette graduated to

200 mm (20 cm) , 3 mm in diameter , fixed upright in a special rak . Fill the pipette to zero point with blood and leave it stand vertically for 1 hour. At the end hour read the lower end of the clear plasma.





Some interferences which increase ESR:

-increased level of fibrinogen, gamma globulins.

-technical factors: tilted ESR tube, high room temperature.

Some interferences which decrease ESR:

-abnormally shaped RBC (sickle cells, spherocytosis).

-technical factors: short ESR tubes, low room temperature, delay in test performance (>2 hours), clotted blood sample, excess anticoagulant, bubbles in tube.

- Chronic inflammatory disease (collagen and vascular diseases) increases ESR.

- Polycythemia decreases ESR.