Erythrocyte Sedimentation Rate

Principle

In the modified Westergren method for determining erythrocyte sedimentation rate (ESR), anticoagulated blood is diluted with 0.85% saline and aspirated into a calibrated tube.\textsuperscript{1,2,3,4} The cells are allowed to settle for a period of exactly one hour.

Reagents and Equipment

1. Westergren pipet - must meet NCCLS' specifications

   - Overall length: 300.5 ± 0.5 mm
   - Internal diameter: 2.65 ± 0.15 mm
   - External diameter: 5.5 ± 0.5 mm
   - Uniformity of tube bore: ± 0.05 mm

2. Westergren pipet rack
3. Timer
4. 0.85% NaCl
5. Test tubes, 13x100 mm
6. Pipets, 2.0 mL & 0.5 mL

Quality Control

Commercial quality control materials with established control limits should be run periodically. The frequency is determined by each laboratory's workload. For instance, quality control material may be run at the beginning of each eight-hour shift.

Specimen
Whole blood, anticoagulated with EDTA, is the specimen of choice. The ESR should be set up within six hours after collection.

**Procedure**

1. Specimen preparation
   a. Pipet 0.5 mL of 0.85% NaCl in a labeled 13 x 100 mm test tube.
   b. Add 2.0 mL of well-mixed whole blood to the test tube.
   c. Mix the test tube to obtain an even suspension.

2. Using a pipeting device, fill the Westergren pipet to the "0" mark (± 1 mm) with the diluted blood sample. Wipe off the outside of the pipet with gauze. If necessary, adjust the volume of blood to the "0" mark. There should be no bubbles in the blood.

3. Place the Westergren pipet in the pipet rack. Make sure the pipet fits snugly to eliminate possible leakage and that the pipet is in a vertical position.

4. Set timer for one hour.

5. In exactly one hour, record the distance in millimeters between the meniscus of the plasma and the top of the sedimented erythrocyte column. Do not include the buffy coat in the reading. The resulting distance is the erythrocyte sedimentation rate in mm/hr.

**Reference Interval**

- Adult Males: 0-10 mm/hr
- Adult Females: 0-20 mm/hr
- Children: 0-10 mm/hr

**Comments**

1. Disposable Westergren pipets and dilution reservoirs are available from several laboratory manufacturers.

2. Technical sources of error for the modified Westergren method for ESR are given in Web Table 7-6.

3. The Wintrobe method utilizes undiluted whole blood and the Wintrobe tube. The Wintrobe tube is filled to the "0" mark and allowed to sit in a vertical position for 60 minutes. The ESR is read as the distance (mm) between the meniscus of the plasma and the top of the erythrocytes. The disadvantages of this method include: too short free fall time as a result of the short tube; problems arising due to the narrow bore of the tube and the use of undiluted blood.
4. Conditions associated with an elevated ESR are listed in Table 7-5.

References


