Anemia Support and Management

Reticulocyte
Immature Reticulocyte Fraction
Reticulocyte Hemoglobin (RET-He)
Immature Reticulocyte Measurement

The Sysmex “Gold Standard” methodology for automated reticulocyte analysis has been further refined to include a comprehensive picture of reticulocyte development and maturation, offering efficient, rapid and reproducible analysis.

Precise Reticulocyte Measurement Using Diode Laser Technology

The Sysmex proprietary polymethine fluorescent dye allows application of the diode laser technology for reticulocyte analysis. RNA and DNA content of the cells are specifically stained. In the flow cell each single cell passes through the beam of a semi-conductor laser. While being counted in the flow cell, the fluorescence and forward-scatter light intensity of each individual cell is measured. Information about RNA content and cell size is interpreted. More than 30,000 cells are counted from each sample. The advanced technology allows an accurate count of reticulocytes, erythrocytes and fluorescent platelets, even in extremely low concentrations and in samples with giant platelets or red cell fragments.

Due to higher fluorescent intensity of nucleated cells, such as leukocytes and nucleated red blood cells or red blood cells containing Howell-Jolly Bodies, these cell types are distinctly separated from reticulocytes.

Reticulocyte maturation is a direct reflection of hematopoietic activity in the bone marrow.

In addition to an accurate total reticulocyte count, an analysis of the maturation stages of reticulocytes is performed. Fluorescent flow technology takes advantage of the physiological fact that the nucleic acid content of reticulocytes decreases over time until they mature into erythrocytes, which have no nucleic acid residues. There are 3 stages of reticulocyte maturation measured, Low Fluorescence Reticulocytes (LFR), Medium Fluorescent Reticulocyte (MFR) and High Fluorescent Reticulocyte (HFR). The combination of the 2 most immature stages of reticulocyte maturation, (HFR) and (MFR), make up the Immature reticulocyte fraction, (IRF) (Fig 1)

The IRF is a direct cellular measurement of erythropoiesis that can be used by the clinician to monitor erythropoietic activity. The IRF is most useful as an aid to physicians in the diagnosis and therapeutic management of anemia and in monitoring erythropoietic stimulating agents.
Reticulocyte Hemoglobin (RET-He)

Conventional Iron Deficiency Monitoring

Traditional iron studies may provide insufficient information in assessing iron deficiency. They can display considerable biological variation and are interfered with by inflammation and uremia. They are expensive and are not accessible to physicians on demand. They are also slow to react to iron therapy.

An Invaluable Parameter for Monitoring Iron Deficiency

Reticulocytes have a life span of only 1 – 2 days. The measurement of reticulocytes with the IRF provides insight into erythropoiesis stimulation from the bone marrow. Measurement of the hemoglobin content of the reticulocyte gives a direct cellular measurement of the iron that is available for RBC hemoglobinization. Less than normal hemoglobin content in these reticulocytes is an indication of inadequate iron supply relative to demand.

The addition of the reticulocyte hemoglobin (RET-He) expands the RBC precursor information available and gives the physician an early indicator of the developing red cell population in terms of its hemoglobin carrying capacity.

The RET-He Parameter: A Clinical View

In healthy patients, iron concentrations in various tissues remain in a state of balance. Daily intake and loss of iron are small and body iron is reutilized. In patients with end-stage renal disease (ESRD), however, the supply of iron to the bone marrow may not be adequate to sustain normal erythropoiesis or red cell production.

Frequent phlebotomy, dialysis and other conditions can further compound the loss of iron stores in the body. With the RET-He parameter, critical information for monitoring the patient with kidney disease is available.

Reticulocyte Hemoglobin measurement has been established as a parameter to be monitored in the KDOQI (Kidney Disease Outcomes Quality Initiative) guidelines for assessing the initial iron status of patients with chronic kidney disease on hemodialysis, as well as for monitoring I.V. iron replacement therapy in these patients.

The Complete Reticulocyte Picture

The reticulocyte, immature reticulocyte fraction and reticulocyte hemoglobin parameters are essential tools to aid the physician in the diagnosis and management of anemia. They are direct cellular measurements for a faster indication of patient response. The complete reticulocyte picture, total reticulocyte, IRF, RET-He, will provide the clinicians with:

- A more comprehensive anemia workup of patients without access to primary care
- Less variation than acute phase reactants in patients with inflammation or infection
- Clinically useful information for patients on ESA/IV Iron Therapy in conjunction with other clinical data