Laboratory Tests

***Introduction*:** Laboratory tests serve a valuable function in the care of patients with rheumatic disease, assisting in the diagnosis and monitoring of a number of illnesses, and also screening for a number of medication side effects. The following are a list of various laboratory studies that are useful in treating patients in our office. This summary is not all-inclusive, but constitutes the most frequently utilized tests in our office.

Complete Blood Count (CBC): This test consists of many components.

***Hemoglobin*:** The main protein of the red blood cell, carrying oxygen to other parts of the body.

***Red Blood Cells (RBCs)*:** This and other values are helpful in the assessment of anemia. Also included are the MCV, MCH, and MCHC, which determine the size, weight, and hemoglobin content of each red blood cell.

***White Blood Cells (WBCs)*:** These cells are responsible for protecting the body against infection. Because all of these cells are produced in the bone marrow, some medications that suppress the bone marrow may suppress the production of these cells. Conversely, these cells may be elevated in the presence of infection, certain inflammatory diseases, or in patients taking corticosteroids.

Hematocrit: This test combines the number of RBCs and WBCs in the bloodstream in comparison with the *plasma*, the amount of liquid in the bloodstream. This test is helpful in evaluating anemia and fluid imbalances such as dehydration.

***Platelets*:** These cells are responsible for clotting the blood. They may be low because of medication side effects or in certain diseases such as systemic lupus erythematosus (SLE), or elevated in the presence of inflammation.

Chemistry Studies:

Comprehensive Metabolic Profile (CMP): This test includes electrolytes and blood sugar, as well as liver and kidney function tests. A subset of this test is the ***Basic***

Metabolic Profile**,** which does not include liver function studies. Depending on what medications a patient is taking or what diseases are being treated, your provider may feel the need to monitor a number of these blood levels. Specific values listed under these tests include:

- Electrolytes
  - Sodium
  - Potassium
  - Chloride
- Kidney Function
  - BUN
  - Creatinine
- Liver Function
  - SGOT (AST)
  - SGPT (ALT)
  - Alkaline Phosphatase
- Other
  - Glucose
  - Albumin

Muscle Enzymes**:** The *Creatine Phosphokinase (CPK)* and *Aldolase* are enzymes found in muscle. These markers are useful both in the diagnosis of muscular diseases (see Myositis section) and in monitoring the effectiveness of certain treatments. These tests can help determine if the cause of a patient's weakness is muscular or neurological (due to nerve or brain damage).

Uric Acid**:** Both gout (see related section) and certain kidney stones are caused by crystals formed as a result of increased uric acid levels. An elevation of the uric acid level is not diagnostic of gout, as dehydration and certain medications (diuretics, for example) can contribute to elevated uric acid levels.

Serology Tests: These studies are a focus of the rheumatology field and help serve as markers for many rheumatic diseases. They consist of either antibodies or other components of the immune system.

Erythrocyte Sedimentation Rate (ESR or "Sed Rate") and C-reactive Protein (CRP)**:** These are non-specific markers for inflammation; i.e. – they can be elevated in a number of conditions, including not only inflammatory arthritis but also infections or cancer. We often use these values, along with physical examination and the patient's report, to determine the need for or effectiveness of certain types of medical treatments.

Complement**:** A system of molecules in the immune system, complement proteins are inactive by themselves, but in certain disease processes this system can be activated in what is considered a "cascade." In the field of rheumatology, the presence of low complement levels can give us an indication of disease activity and can gauge the effectiveness of treatment when they improve or return to normal. On the other hand, the

situation becomes confusing when certain individuals have genetic conditions where their complement levels are *always* low regardless of disease activity.

***Serum Protein Electrophoresis* (*SPEP*):** This test involves a process that separates various proteins fractions into *albumin* and *globulins*. An important set of proteins known as *gamma* globulins make up the body's antibody system which form an important part of the immune system**.** This test may demonstrate abnormal proteins among the gamma globulins that help identify certain blood diseases such as multiple myeloma and Waldenström's disease.

***Rheumatoid Factor*:** This test is a lab marker for an antibody present in 70-80% of patients with rheumatoid arthritis and can be a useful piece of information in making the diagnosis. This marker, however, is not entirely specific for rheumatoid arthritis; up to 5-10% of the normal population may also demonstrate this antibody. Moreover, 20-30% of rheumatoid arthritis patients will not exhibit this antibody.

***Anti-Cyclic Citrullinated Peptide* (*Anti-CCP*):** This test is also a marker for rheumatoid arthritis. While it is present in a smaller percentage of patients, when present, it is about 98% specific for the diagnosis of rheumatoid arthritis and may be helpful in confirming the diagnosis in borderline cases.

***Anti-Nuclear Antibody* (*ANA*):** This antibody is present in about 99% of patients with systemic lupus erythematosus but is also present in up to 5-10% of the normal population. This antibody can also be present in patients with drug-induced lupus, Sjögren's syndrome, scleroderma, myositis, juvenile rheumatoid arthritis, polyarteritis nodosum, and chronic active hepatitis, among other conditions.

The ANA can be broken down into separate components, which is called an *ANA panel*, a series of more specific antibody tests that may be helpful in narrowing down the diagnosis. Antibody tests included in the ANA panel are listed with most common disease associations:

- Anti-Ro/SSA
  Sjögren's Syndrome
  Lupus
- Anti-La/SSB
  Sjögren's Syndrome
  Lupus
- Anti-Smith
  Specific for Lupus (+ in 30% of patients)
- Anti-RNP
  Lupus
  Mixed connective tissue disease
- Anti-Centromere
  Limited Scleroderma

***Anti-Double Stranded DNA*:** Another specific antibody seen in systemic lupus erythematosus which can function as a marker of disease activity, found in some ANA panels.

***Anticardiolipin and Lupus Anticoagulant*:** Subsets of antibodies that interfere with certain aspects of blood clotting. These tests may be positive in lupus patients or may be present by themselves and are associated with blood clots (including strokes) and/or miscarriages.

***Anti-Neutrophil Cytoplasmic Antibody* (*ANCA*):** These are antibodies directed against proteins in the white blood cells. Depending on the pattern of the antibody seen, different diseases are suggested by a positive ANCA. The c-ANCA is associated with Wegener's granulomatosis (see Vasculitis section). The presence and level of this antibody depends on disease severity and activity. The p-ANCA and "atypical ANCA" may be seen with a variety of other conditions. These diseases include but are not limited to Churg-Strauss syndrome, microscopic polyangiitis, polyarteritis nodosum, systemic lupus erythematosus, ulcerative colitis, and less commonly Wegener's. Some medications, such as hydralazine, propylthiouracil (PTU), D-penicillamine, and minocycline may produce a positive p-ANCA or atypical ANCA.

***Angiotensin Converting Enzyme* (*ACE*):** The enzyme is found primarily in cells located in the lungs or the kidneys. It can be elevated in various pulmonary conditions but for our purposes we look for it in sarcoidosis. While not entirely reliable, the ACE may be helpful in diagnosing and gauging the condition of the lungs in sarcoidosis.

***HLA-B27*:** This is a genetic marker for ankylosing spondylitis and other diseases known as *spondyloarthropathies* (see related sections). It is present in over 90% of whites and 50-80% of non-whites with ankylosing spondylitis. This marker can also be present in a number of people without ankylosing spondylitis, including 8% of the general population. Most of the diagnosis of this condition is determined through a history of symptoms, physical examination, and x-ray findings.