



DECIPHERING MY MYELOMA LAB RESULTS

Do you understand your myeloma diagnosis and your myeloma lab results? This guide attempts to simplify the complex process of understanding your myeloma markers and helps you track your treatment history. Based on the actual lab printouts you receive in the clinic, we've added color-coding to help you identify the most important markers.

Key:

Items in orange are top priority myeloma markers



Items in blue are secondary myeloma markers



Items in white are not important myeloma markers



Special Thanks to myeloma specialist Dr. Guido Tricot of the University of Iowa, pathologist Dr. Michael Misialek of Newton-Wellesley Hospital, Jen Higbee of Huntsman Cancer Institute and Barbara Waagen for their contributions to this document. (Please note that the Normal Ranges given are not necessarily consistent between laboratories. Each laboratory is required to establish their own normal ranges. Abnormal results must be flagged as High, Low or Critical if they fall out of the established normal range.)

Do you have suggestions to make this document better? Send your comments to jenny@crowcare.org and we will keep revising this document as we learn more.

MY MYELOMA DIAGNOSIS SUMMARY

YOUR MYELOMA DIAGNOSIS	YOUR RANGE	WHAT IT MEANS
STAGE – International Staging System	<input type="checkbox"/> STAGE 1 <input type="checkbox"/> STAGE 2 <input type="checkbox"/> STAGE 3	<p>Stage I: Your serum beta2-microglobulin is < 3.5mg/L Your serum albumin > 3.5 g/Dl</p> <p>Stage II: Neither Stage I or Stage III</p> <p>Stage III: Your serum beta2-microglobulin is > 5.5 mg/L</p>
STAGE - SALMON/DURIE	<input type="checkbox"/> STAGE 1 <input type="checkbox"/> STAGE 2 <input type="checkbox"/> STAGE 3	<p>Stage I: All of the following are present:</p> <ul style="list-style-type: none"> • Hemoglobin value is > 10 g/dL • Serum calcium value is normal or < 12 mg/dL • Bone radiograph, normal bone structure or solitary bone plasmacytoma only • Low M-spike (IgG value < 5 g/dL, IgA value <3 g/dL, Bence-Jones protein <4 g/24 hours) <p>Stage II: Neither Stage I or Stage III</p> <p>Stage III: One or more of the following:</p> <ul style="list-style-type: none"> • Hemoglobin value <8.5 g/dL • Serum calcium value >12 mg/dL • Advanced lytic bone lesions • High M-spike (IgG > 7 g/dL, IgA > 5 g/dL, Bence-Jones protein >12 g/24 hours)

YOUR MYELOMA DIAGNOSIS	YOUR RESULTS	WHAT IT MEANS
CYTOGENETICS/FISH	<p>Cytogenetics</p> <p><input type="checkbox"/> Normal <input type="checkbox"/> Abnormal</p> <p>Gene</p> <p>Translocations/Mutations</p> <p><input type="checkbox"/> C-MYC abnormalities <input type="checkbox"/> Monosomy 13 <input type="checkbox"/> FGFR3/MMSET t(4;14) <input type="checkbox"/> CCND1 t(11;14) <input type="checkbox"/> CCDN2 C-MAF t(14;16) <input type="checkbox"/> CCND2 MAFB t(14;20) <input type="checkbox"/> MUM1 t(6;14) <input type="checkbox"/> P53 inactivation (17p13) <input type="checkbox"/> RAS mutations (K-RAS and N-RAS)</p> <p>Hyperdiploid/Hypodiploid</p> <p><input type="checkbox"/> Hyper-diploid OR</p> <p>Hypodiploid including:</p> <p><input type="checkbox"/> Near-tetraploid <input type="checkbox"/> Pseudodiploid <input type="checkbox"/> Hypodiploid</p> <p>Pathway</p> <p>Activation/Inactivation</p> <p><input type="checkbox"/> Rb pathway inactivation (P16/INK4a, P18/INK4c, RB1) <input type="checkbox"/> PTEN inactivation</p>	<p>Metaphase cytogenetics is a test that puts dividing myeloma cells in culture and identifies abnormalities while the cells are dividing. Because myeloma cells can't grow outside the bone marrow environment, only 30% of patients show abnormalities, which means they have more aggressive disease. For the 70% of patients whose myeloma cells don't show abnormalities during cell division, this means that they have less aggressive disease. The advantage of this test is that it identifies the 30% of patients with more aggressive disease, but is not very informative in 70% of patients with less aggressive disease.</p> <p>The FISH test allows you to look at certain "hot spots" or probes on the chromosomes and it allows you to find translocations of genes. The FISH test does not need actively dividing cells. This test is informative for all patients. The limitation is that you can only see what your are looking for, or there are only a certain number of probes. The FISH test evaluates the chromosomes in the normal and myeloma cells in the bone marrow. Some may have too many chromosomes, too few chromosomes or other chromosome abnormalities. This test takes approximately 2-3 weeks. It can be used on regular blood or bone marrow samples. The quality of the specimen and of the test matters greatly.</p>
FLOW CYTOMETRY	<p><input type="checkbox"/> CD38 <input type="checkbox"/> CD138 <input type="checkbox"/> CYTOPLASMIC KAPPA <input type="checkbox"/> CYTOPLASMIC LAMBDA</p>	<p>Flow cytometry is a test used on both blood samples and bone marrow samples to evaluate for the presence of myeloma cells and can detect low levels of myeloma plasma cells after high-dose therapy and transplantation. It is used as the method of choice to assess minimal residual disease (MRD). It looks in more detail than the immunohistochemistry tests and also studies the light chains. This test is used to classify cells according to substances that are present on their surfaces. Cells are passed in front of a laser beam which cause them to give off light. Groups of cells can be separated and counted. Flow cytometry sensitivity tests can range from 2 color tests (less sensitive) up to 12 color tests (more sensitive). This test helps to identify "markers" on the cell's surface and may give us targets for the use of monoclonal antibodies.</p>

YOUR MYELOMA DIAGNOSIS	YOUR RESULTS	WHAT IT MEANS
<p>GENE EXPRESSION PROFILE (TO HAVE AT DIAGNOSIS AND AGAIN AT RELAPSE)</p>	<p>You receive a Prognostic Risk Score (GEP-70), Molecular Subtype, and Virtual Karyotype unique to your disease. The Prognostic Risk score and the Molecular Subtype designations have been clinically shown to predict overall survival, event-free survival, complete response duration, and post-relapse survival. MyPRS distinguishes between patients with high and low-risk disease.</p>	<p>Risk Score High-Risk: Poor Prognosis, Probability of 5-year OS 38% Low Risk: Good Prognosis, Probability of 5 year OS 83%</p> <p>Molecular Subtype You receive 1 of 7 molecular subtypes associated with your unique genetic lesions, altered genes and outcome variation.</p> <p>Virtual Karyotype Your Cytogenetic (FISH) results checking for high-risk chromosome abnormalities.</p>
<p>ELECTROPHORESIS TESTS TO FIND THE MONOCLONAL PROTEIN</p>	<p><input type="checkbox"/> IgA <input type="checkbox"/> IgD <input type="checkbox"/> IgE <input type="checkbox"/> IgG <input type="checkbox"/> IgM <input type="checkbox"/> Kappa <input type="checkbox"/> Lambda</p>	<p>A monoclonal protein is one antibody (also called immunoglobulin) that has grown out of control. This is also identified as an “M-spike”. Each of the different immunoglobulins in your body fights a different type of infection. The electrophoresis tests will help you identify this M-spike type.</p>

TRACKING YOUR PROGRESS

IMMUNOGLOBULIN TESTS (BLOOD TESTS)

This test measures the blood levels of the different antibodies (also called immunoglobulins). There are several different types of antibodies in the blood: IgA, IgD, IgE, IgG, and IgM. Each type of antibody fights a different type of infection. The levels of these immunoglobulins are measured to see if any are abnormally high or low. In multiple myeloma, one type of immunoglobulin has overgrowth that crowds out the other types of immunoglobulins, which is why you may be susceptible to certain kinds of infections, like pneumonia. The electrophoresis tests will identify the type of immunoglobulin you have (such as IgG Kappa, IgA Lambda, etc.)

	NORMAL RANGE	YOUR RANGE	WHAT IT MEANS
FREE KAPPA/LAMBDA RATIO *	.26-1.65		The ratio of kappa to lambda is an important indicator. When one level (kappa or lambda) is high and the other is low, this is an indication that myeloma is active. If both kappa and lambda are increased, it can show a disease other than myeloma (like kidney disease). If kappa and lambda levels are both normal but the ratio is abnormal, there may be a low level of active myeloma. A normal kappa/lambda ratio after treatment is a particularly good remission.
BETA 2 MICROGLOBULIN, SERUM	.7-1.8		Tests for severity of MM. Decrease shows good treatment response. Can also identify kidney damage.
FREE LAMBDA LIGHT CHAIN *	.57-2.63 OR 5.71-26.30		Plasma cells have heavy and light chains attached together (a "bound" chain). When they detach, you can have too many "free" light chains (or unattached chains) in your blood. This blood test is more accurate than the SERUM FREE LIGHT CHAINS test as the kidneys' job is to keep protein.
FREE KAPPA LIGHT CHAIN *	.33-1.94 OR 3.3-19.40		
IMMUNOGLOBULIN IgG	768-1632		Measures blood levels of different antibodies (IgA, IgD, IgE, IgG and IgM). These are antibodies that normally fight infection and you typically have a balanced number of various types. This test indicates if any are abnormally high or low which is an indicator of a single antibody growing out of control (an indicator of myeloma). Elevated immunoglobulins that are not related to a person's myeloma can be indicative of current infection.
IMMUNOGLOBULIN IgA	68-378		
IMMUNOGLOBULIN IgM	60-263		

PROTEIN ELECTROPHORESIS, SERUM (BLOOD TEST)

The electrophoresis tests (both in the blood and in the urine) are critical in multiple myeloma, particularly to identify the M-protein, or M-spike.

	NORMAL RANGE	YOUR RANGE	WHAT IT MEANS
SERUM PROTEIN ELECTROPHORESIS TOTAL PROTEIN (SPEP)	6.0-8.3		Measures the total amount of protein in the blood and finds abnormal proteins. The SPEP is broken down into the 5 following categories: Albumin, Alpha-1, Alpha-2, Beta and Gamma (see below) In particular, this test can detect the presence of "M protein" another name for the large number of abnormal monoclonal antibodies being produced.
SERUM PROTEIN ELECTROPHORESIS ALBUMIN	3.75-5.01		Albumin proteins keep the blood from leaking out of blood vessels and are important for tissue growth/healing. Low values can indicate malnutrition, kidney or liver disease, inflammation and protein-losing problems. High values can indicate dehydration.
SERUM PROTEIN ELECTROPHORESIS ALPHA 1	.19-.46		Low values can indicate severe liver disease, High values can indicate acute/chronic inflammation.
SERUM PROTEIN ELECTROPHORESIS ALPHA 2	.48-1.05		Low values can indicate malnutrition, severe liver disease, or red blood cell disintegration, High values can indicate kidney disease or acute/chronic inflammation.
SERUM PROTEIN ELECTROPHORESIS BETA	.48-1.10		Beta globulin proteins help carry substances, such as iron, through the bloodstream and help fight infection. Low values can indicate malnutrition or fibrous tissue in the liver, High values can indicate hypercholesterolemia, iron-deficient anemia, MGUS or MM.
SERUM PROTEIN ELECTROPHORESIS GAMMA	.62-1.51		These proteins are also called antibodies. They help prevent and fight infection. Low=immune disorder, High/Polyclonal=inflammatory diseases like arthritis, lupus, liver problems, High/Monoclonal=MM, lymphoma, Waldenstroms macroglobulinemia.
SERUM PROTEIN ELECTROPHORESIS PARAPROTEIN 1	0.0-0.0		Paraproteins form a narrow band or "spike" when they are all the same protein. They are also referred to as " M proteins. " (M=monoclonal). This is the M-spike number.
SERUM IMMUNOFIXATION ELECTROPHORESIS, (IFE)			Identifies the type of immunoglobulin protein(s) present in monoclonal bands on a protein electrophoresis pattern; typically immunofixation determines the presence of a heavy chain (IgG, IgM, IgA) and a light chain (kappa or lambda).

ELECTROPHORESIS, URINE TEST

Abnormal proteins are produced by abnormal plasma cells and are called "monoclonal" antibodies, or antibodies all of one kind making them ineffective and even harmful. They do not fight infections. They are made up of two light chains and two heavy chains. Bence-Jones proteins are the light chain part of these monoclonal antibodies. Bence-Jones proteins are considered the first tumor marker used to diagnosis and monitor Multiple Myeloma.

	NORMAL RANGE	YOUR RANGE	WHAT IT MEANS
URINE PROTEIN ELECTROPHORESIS (UPEP)	1-14		This test is generally performed on a single urine sample. Bence-Jones proteins will be detected if present. A routine urinalysis will not detect Bence-Jones proteins.
URINE PROTEIN IMMUNOFIXATION ELECTROPHORESIS			This test is generally performed on a 24 hour collection of urine and will measure exact amounts of Bence-Jones proteins present and is used to monitor the progress of treatment. The higher the level, the more tumor growth.
URINE M-PROTEIN			This is protein is the monoclonal antibody detected in the urine. It is usually called the M-Spike. It is usually measured in percentage.
URINE TOTAL VOLUME			
URINE PROTEIN IN TOTAL VOLUME	40-150 mg/day		
ALBUMIN, URINE	3.75-5.01 OR 33.0-50		Albumin proteins keep the blood from leaking out of blood vessels and are important for tissue growth/healing. Low values can indicate malnutrition, kidney or liver disease, inflammation and protein-losing problems. High values can indicate dehydration.
GLOBULIN URINE	50.0-66.0		The other major protein in urine along with albumin.
ALBUMIN %, URINE	%		See above for albumin.
ALPHA-1% URINE	%		Low values can indicate severe liver disease, high values can indicate acute/chronic inflammation.
ALPHA-2%, URINE	%		Low values can indicate malnutrition; severe liver disease, or red blood cell disintegration. High values can indicate kidney disease or acute/chronic inflammation.
BETA GLOBULIN%, URINE	%		Beta globulin proteins help carry substances, such as iron, through the bloodstream and help fight infection. Low values can indicate malnutrition or fibrous tissue in the liver. High values can indicate hyper-cholesterolemia, iron-deficient anemia, MGUS or MM.

CREATININE CLEARNANCE	mL/minute		Creatinine clearance is the gold standard measurement for kidney function. This measures urine excretion of creatinine against serum creatinine. If serum creatinine is elevated, creatinine clearance is low.
CREATININE, URINE	mg/dL		
PARPROTEIN %, URINE	%		The percentage of a monoclonal protein, if present, in the urine.
URINE FREE KAPPA LIGHT CHAINS	3.3-19.4 mg/L		The serum free test is tested in the urine. This test can test for free light chains but not whole immunoglobulins. Myeloma can be detected earlier than with UPEP, SPEP or IFE, but these tests are needed for the complete picture.
URINE FREE LAMBDA LIGHT CHAINS	5.71-26.3 mg/L		
URINE FREE KAPPA/LAMBDA RATIO			

IMAGING TESTS

Imaging tests are critical for a myeloma diagnosis as well as detection of recurring myeloma. It is important to know that not every imaging test will be performed on every patient and many times the imaging tests are alternated.

	YOUR RESULTS	WHAT IT MEANS
SKELETAL SURVEY / BONE SCAN		This is a traditional X-ray that looks for the number of visible lytic lesions. The number of lytic lesions found can help describe the stage of myeloma.
POSITIVE EMISSION TOMOGRAPHY (PET) SCAN		A PET scan can detect enlarged lymph nodes, liver or spleen and bone lesions. The test is repeated to measure the size of these and other structures during and after treatment. A report is generated by a radiologist with an interpretation for your physician.
BONE MARROW CHARACTERISTICS		Sometimes CT or MRI can detect marrow abnormalities, which would be reported as “enhancement”.
FOCAL LESIONS ON PET		Particular note of focal lesion progression on PET scans are noted.
COMPUTED TOMOGRAPHY (CT) SCAN		A CT Scan can detect enlarged lymph nodes, liver or spleen and bone lesions. A CT scan can be used to measure the size of these and other structures during and after treatment. A report is generated by a Radiologist with an interpretation for your physician.
FOCAL LESIONS ON CT		Particular note of focal lesions progression on PET scans are noted.
MAGNETIC RESONANCE IMAGING (MRI)		Magnetic Resonance Imaging results are reported by a Radiologist with an interpretation for your physician. This test is used to monitor changes in lesions.

BONE MARROW ASPIRATION AND CORE BIOPSY

The bone marrow biopsy tests will show how many cells in the bone marrow are myeloma cells and will also indicate the quality of the specimen that was taken.

	YOUR RESULTS	WHAT IT MEANS
IMMUNOHISTOCHEMISTRY		Part of the biopsy is treated with antibodies that attach to specific molecules on the cell surface
PLASMA CELLS ON ASPIRATION		The percentage of plasma cells and their appearance will be reported. This number is important in classifying the type of plasma cell disorder and should be followed over time.
PLASMA CELLS ON BIOPSY		The percentage of plasma cells and their appearance will be reported. This number is important in classifying the type of plasma cell disorder and should be followed over time.
CD56 POSITIVE ON IMMUNOFIXATION		
ROLEUX		
LEUKOCYTE NUMBER		
LEUKOCYTE MORPHOLOGY		
CIRCULATING PLASMA CELLS		Circulating plasma cells are generally a poor prognostic factor.
PLATELET NUMBER		
PLATELET MORPHOLOGY		
ASPIRATION DIFFERENTIAL COUNT (300 CELLS)		
ERYTHROIDS		
PLASMA CELLS		Circulating plasma cells are generally a poor prognostic factor.
LYMPHOCYTES		
MYELOBLASTS		
MYELOIDS		
M:E RATIO		
BONE MARROW ASPIRATE		
SPECIMEN QUALITY		An indication of how representative the specimen is of the marrow. Look for terms such as "hemodilute" which implies blood contamination.

CELLULARITY		A measure of how cellular the marrow is. Will be reported as a percentage. Look for terms normal, hypo or hypercellular.
SPICULES		A measure of quality. The presence of spicules means the sample is from the marrow with little or no blood contamination.
MYELOID TO ERYTHROID RATIO		A measure of developing white to red cells.
TRILINEAGE HEMATOPOIESIS		Refers to whether there is normal development of the white cells, red cells and platelets.
HEMATOPOIETIC MATURATION		Same as above.
MEGAKARYOCYTE MORPHOLOGY		Appearance of the platelet precursor cells.
PLASMA CELL NUMBER		The percentage will be a major determinant of the classification of type of disorder.
PLASMA CELL MORPHOLOGY		Look for terms such as "mature", "immature" or "atypical". "mature" is generally a better prognostic feature than the others.
CORE BIOPSY SPECIMEN QUALITY		Size of biopsy is important for assessing adequacy. Should be over 1cm.
BONE TRABECULAE		Should be present, which implies the sample is truly representative of marrow.
CELLULARITY		Reported as a percentage of cells to fat in the marrow. Look for terms like normal, hypo or hyper cellular.
BONE MARROW CLOT IMMUNOHISTOCHEMISTRY		Stains may be performed to highlight the different cell types present.
CD138		An antibody stain that marks plasma cells and aids in enumeration.

BLOOD COUNTS (CBC)

Multiple myeloma is a cancer of the plasma cells. These are immune system cells that produce specialized molecules called antibodies to help fight infectious agents. Because most plasma cells live in bone marrow, multiple myeloma tumors are usually, but not always, found in bone. The bone marrow is where blood cells are produced. Because multiple myeloma crowds out bone marrow, it can cause several kinds of blood deficiencies such as : Anemia, a shortage of red blood cells, Thrombocytopenia, a shortage of blood platelets, and Leukopenia, a shortage of white blood cells.

	NORMAL RANGE	YOUR RANGE	WHAT IT MEANS
WHITE BLOOD CELL COUNT (WBC)	3.2-10.6		White blood cells are produced in the bone marrow. White blood cell counts include: Neutrophils (also known as granulocytes) , Lymphocytes, Monocytes, Eosinophils and Basophils. The counts are reported in two ways. First as a percentage of the total WBC count and also as an " absolute " count or actual number of cells present. Low counts of WBC show an inability to fight infection. High WBC may indicate illness or cancer growth.
RED BLOOD CELL COUNT (RBC)	3.88-5.46		Low counts of RBCs are an indicator of anemia resulting in fatigue and lowered oxygen transport. and can be the result of hemorrhage or low RBC production in the bone marrow.
HEMOGLOBIN (HGB)	12.1-15.9 g/dL		Hemoglobin is carried in the red blood cells. If the hemoglobin is less than 7.5 G/DL, many facilities will transfuse unless the patient is symptomatic. If is less than 9%, Aranesp injections are sometimes used to stimulate red blood cell production.
HEMATOCRIT (HCT)	34.3-46.6 %		Hematocrit measures the percentage of the volume of whole blood that is made up of red blood cells. This measurement depends on the number of red blood cells and the size of red blood cells.
MEAN CORPUSCULAR VOLUME (MCV)	77.8-94 cu microns		MCV is a measure of the average red blood cell volume.
MEAN CORPUSCULAR HGB (MCH)	26.5-32.6 pg		MCH is a measure of the hemoglobin content in the average red cell.
MEAN CORPUSCULAR HGB CONCENTRATION (MCHC)	32.7-36.9		MCHC the average concentration of hemoglobin in a given volume of packed red cells.
RED CELL DISTRIBUTION WIDTH (RDW)	10.8-14.1		
RDW STANDARD DEVIATION			

	NORMAL RANGE	YOUR RANGE	WHAT IT MEANS
NEUTROPHIL OR GRANULOCYTE PERCENT	44-76 %		Neutrophils (granulocytes) are the most numerous of the white blood cells. They are the "soldiers" that fight infections. They engulf infectious particles (bacteria) in your body. Low levels indicate inability to fight infection.
LYMPHOCYTE PERCENT	14.7-42.6 %		Lymphocytes are the essential cell type in the body's immune system. There are 3 major types of lymphocytes: B lymphocytes that produce antibodies; T lymphocytes that have several functions and assist in antibody production; and natural killer (NK) cells that can attack virus-infected cells or tumor cells. Low levels indicate inability to fight infection.
MONOCYTE PERCENT	4-8.9 %		Monocytes also help to fight infection. When they enter the tissues they fight infection, ingest dead cells and assist in immune responses.
EOSINOPHIL PERCENT	0-6 %		Eosinophils are elevated in allergic reactions and help to fight certain parasitic infections.
BASOPHIL PERCENT	0.0-1.7 %		Basophils also participate in allergic reactions.
NEUTROPHIL ABSOLUTE COUNT (ANC) or GRANULOCYTE ABSOLUTE COUNT (AGC)	1.3-7		See above
LYMPHOCYTE ABSOLUTE COUNT	.8-3.1		See above
MONOCYTE ABSOLUTE COUNT	.2-.7		See above
EOSINOPHIL ABSOLUTE COUNT	.0-.4		See above
BASOPHIL ABSOLUTE COUNT	.0-.1		See above
IMMATURE GRANULOCYTE ABSOLUTE COUNT (MD)			Immature neutrophils or granulocytes cells may be released prematurely from the bone marrow.
PLATELET COUNT	150,000-440,000		Platelets are produced in the bone marrow and their primary function is to induce coagulation at points of injury. Abnormally low counts can result in bleeding.
MEAN PLATELET VOLUME	5.9-9.8 fl		Platelets are very small cells. This test measures their size and volume.

	NORMAL RANGE	YOUR RANGE	WHAT IT MEANS
IRON	60-150 µg/dl		These tests are all related to the status of your body's red cell production and help the physician to monitor your disease because red cells transport iron.
IRON BINDING CAPACITY			
IRON SATURATION			
FERRITIN			
FOLATE			
TOTAL IRON BINDING CAPACITY (TIBC)			
TRANSFERRIN SATURATION			
VITAMIN B12			
THYROID STIMULATING HORMONE (TSH)			Can be a contributing factor to anemia.

CHEMISTRY PANELS

Chemistry panels are run regularly during and after treatment to check your body's normal functions such as heart, kidney, insulin production, electrolyte levels, etc. Some indicators can also determine the aggressiveness of the myeloma.

	NORMAL RANGE	YOUR RESULTS	WHAT IT MEANS
TOTAL PROTEIN	6.5-8.6 mg/dL		Total protein in the blood which includes both albumin and globulin. See special note for albumin.
ALBUMIN SERUM	3.5-4.7 mg/dl		A protein found in the blood. Low levels can be a sign of more advanced myeloma.
CALCIUM SERUM	8.4-10.2 mg/dl		May be higher in people with advanced myeloma because of bone destruction. Higher calcium levels should trigger your doctor to do more testing. High calcium levels may affect heart functions and damage kidneys.
PHOSPHORUS SERUM	2.4-4.3 mg/dl		Phosphorus and calcium levels have an inverse relationship.
ANION GAP	17mE/L		The anion gap is a measurement of the relationship between the "electrolytes" (Sodium, Potassium, Chloride and Carbon Dioxide) and the combination of Magnesium and Phosphorus. Decreased levels (below 10 mEq/L) is used as a monitor of multiple myeloma.
GLUCOSE	64-128 mg/dl		Monitors glucose levels and insulin production.
BLOOD UREA NITROGEN (BUN)	6-22 mg/dL		Urea is a waste product excreted by the kidneys. High levels are the first sign of dehydration or possible kidney damage.
CREATININE SERUM	.52-1.08 mg/dl		Creatinine is a waste product excreted by the kidneys. Elevated levels indicate poor hydration or possible kidney damage.
CREATINE CLEARANCE	mL/minute		A measure of renal function.
CREATINE, URINE	mg/dL		
URIC ACID SERUM	2.5-7.0 mg/dl		Uric acid levels are watched during treatment. Elevated level can indicate tumor lysis syndrome.
ALKALINE PHOSPHATASE	38-126 IU/l		Alkaline Phosphatase levels are elevated in bone and liver disease.

LACTATE DEHYDROGENASE (LDH)	300-600		LDH levels are elevated in aggressive myeloma and is associated with poor prognosis if no explanation for its increase is available other than myeloma.
SODIUM SERUM	136-144 mEq/l		Sodium, Potassium, Chloride and Carbon Dioxide are also known as "electrolytes" and are all linked to acid/base balance which is a delicate system maintained by lungs and kidneys which eliminate excessive amounts of each one to maintain this critical pH balance. The most important effects are the neurological and cardiac effects of elevated or decreased levels.
POTASSIUM SERUM	3.3-5.0 mEq/l		
CHLORIDE SERUM	98-107 mEq/l		
CARBON DIOXIDE	20-29 mM		A measure of acid base status.
MAGNESIUM SERUM	1.6-2.3 mEq/l		Magnesium and calcium levels are linked and need to be kept in balance.
BILIRUBIN TOTAL	0.2-1.3 mg/dl		Total Bilirubin includes both direct and indirect bilirubin. Total bilirubin is a byproduct of hemoglobin and/or red cell destruction.
BILIRUBIN, INDIRECT	0.1-1.0 mg/dl		
BILIRUBIN, DIRECT	0.0-0.4 mg/dl		
SGOT (ALSO KNOWN AS) SERUM GLUTAMIC-OXALOCETIC TRANSAMINASE ASTPARTATE AMINOTRANSFERASE AST AMININOTRANSFERASE	15-40 U/ml		The SGOT test measures an enzyme found in the liver, muscles (including the heart), and red blood cells. It is released into the blood when cells that contain it are damaged. The SGOT level is measured to check the function of your liver, kidneys, heart, pancreas, muscles, and red blood cells. It is also measured to check on medical treatments that may affect the liver.
SGPT (ALSO KNOWN AS) SERUM GLUTAMIC-PYRUVIC TRANSAMINASE ALANINE AMINO TRANSAMINASE	8-50 U/ml		The SGPT enzyme present in liver cells. When a cell is damaged, it leaks this enzyme into the blood, where it is measured. It rises dramatically in acute liver damage, such as viral hepatitis or paracetamol (acetaminophen) overdose.

BLOOD COAGULATION			
	NORMAL RANGE	YOUR RESULTS	WHAT IT MEANS
INTERNATIONAL NORMALIZED RATIO (INR)			INR is the actual number used for measuring therapeutic Coumadin dosing.
PROTHROMBIN TIME (PT)	12-15.5 seconds		Prothrombin times are used to investigate prolonged bleeding disorders and to monitor warfarin (Coumadin) anticoagulant therapy.
PARTIAL THROMBOSPLASTIN TIME (APTT)	24-35 seconds		Partial thromboplastin times are used to investigate prolonged bleeding disorders and to monitor heparin anticoagulant therapy.

IMMUNOLOGY/ALLERGENS			
	NORMAL RANGE	YOUR RESULTS	WHAT IT MEANS
C-REACTIVE PROTEIN	0.0-0.8		An elevated C-Reactive Protein is an indicator of inflammation in your body. It is an indirect measurement of the size and growth of the myeloma tumors.

TOXICOLOGY/DRUG LEVELS			
	NORMAL RANGE	YOUR RESULTS	WHAT IT MEANS
CYSTATIN C			Cystatin C is a protein encoded by the CST3 gene and is mainly used as a biomarker of kidney function.

PULMONARY FUCTION TESTS

These tests check for pulmonary function prior to and between treatments.

	NORMAL RANGE	YOUR RESULTS	WHAT IT MEANS
FVC			FVC - Forced Vital Capacity - after the patient has taken in the deepest possible breath, this is the volume of air which can be forcibly and maximally exhaled out of the lungs until no more can be expired. FVC is usually expressed in units called liters. This PFT value is critically important in the diagnosis of obstructive and restrictive diseases.
FEV1			Forced Expiratory Volume in One Second - this is the volume of air which can be forcibly exhaled from the lungs in the first second of a forced expiratory maneuver. It is expressed as liters. This PFT value is critically important in the diagnosis of obstructive and restrictive diseases.
DLCO / DSBHB			Diffusing capacity of the lungs for carbon monoxide (DLCO).