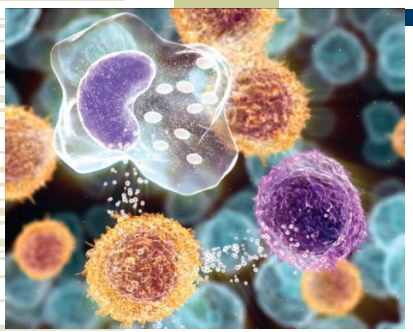

What about those other tests?

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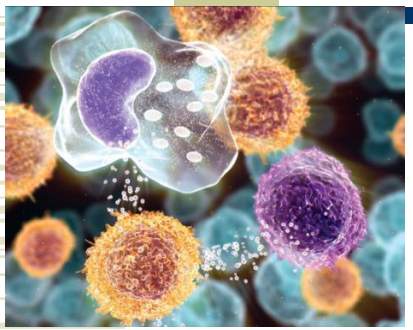
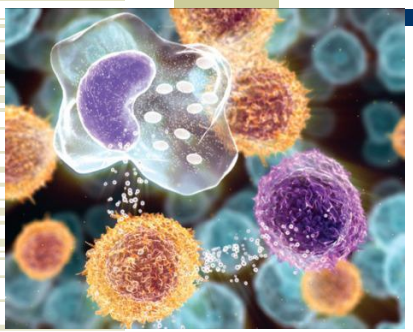


Other organs

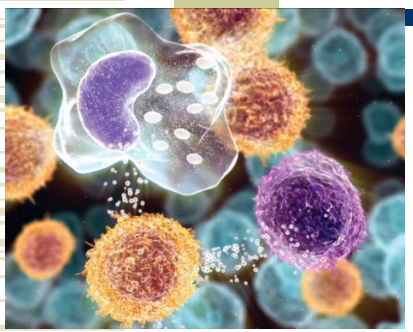
- Even though MPNs look and feel like the only organs involved, many others are
  - The liver detoxifies any medications and debris from damage/dead cells.
  - The kidneys then excretes what it can of the waste material and keeps long term acid/base balance in order.
  - The lungs keep acid/base balance in order and deals with inflammation from over production of red cells.
  - The stomach produces more acid, leading to erosion , inflammation, and ulcers.
  - The brain doesn't like any of this.



Liver

Functions:

- Digestion - production of bile to break down fats and bring waste to the small intestine
- Purification - detoxification of toxins, drugs, harmful substances (alcohol is one)
- Blood glucose regulation - stores and converts glucose
- Protein production - too many to list
- Hormone regulation - all of them
- Blood clotting - makes and stores proteins for blood to clot and break down clots
- Immune response - removes solid antigens from the blood stream and makes immune agents such as cytokines
- Red Cell waste clean up - hemoglobin released from dead/dying red cells is toxic to the kidneys so needs to be detoxified



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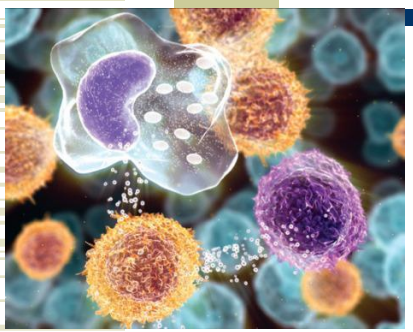
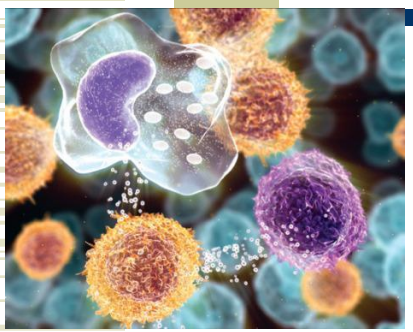


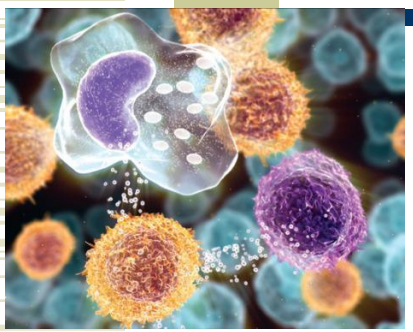
Yes, it is possible to test for a bunch of things that the liver does

Liver Function Tests (LFT) or Liver panel



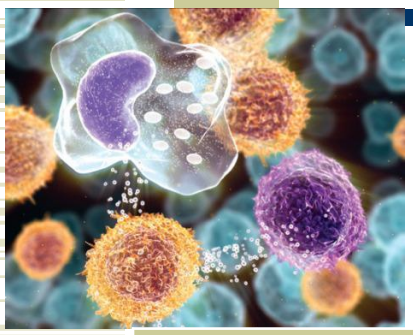
Tests

Test – Just the enzymes	Detection
Aspartate transaminase (AST)	Found in liver, heart, muscles, kidneys Increase = cellular damage somewhere Decrease = no significance
Alanine transaminase (ALT)	Cellular damage to the liver Increase = cellular damage in the liver Decrease = no significance
Alkaline Phosphatase (ALP)	Cellular damage to liver, bile ducts, bone and kidneys Increase = cellular damage somewhere Decrease = no significance
Gamma Glutamyl transferase (GGT)	Cellular damage to the liver and bile duct Increase = cellular damage to the liver; maybe from absolutely nothing Decrease = no significance
Lactate Dehydrogenase (LD)	Found in almost every cell of the body Increase = cellular damage somewhere maybe muscles, heart or blood cells



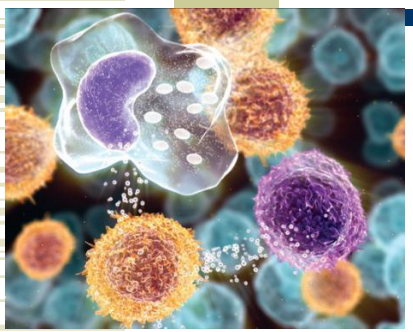
Tests

Tests for Proteins	Detection
Total Protein (TP)	The liver's ability to make proteins Increase = dehydration; inflammation, especially of the liver; Multiple Myeloma, Waldenström's macroglobulinemia Decrease = liver, kidney or diet issues such as malabsorption; bleeding
Albumin (ALB)	Made solely in the liver but relies on diet to provide essential amino acids Increase = dehydration Decrease = either liver stress or poor diet
Globulin	Not really tested (calculation) but since what you are interested in the subcategories of protein, if increase do follow up tests
Follow up tests for globulin	Protein electrophoresis; immunoelectrophoresis, immunofixation; Urine protein electrophoresis



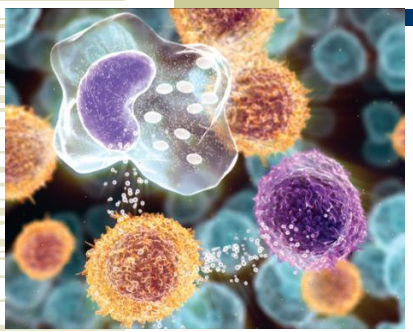
Tests

Tests	Detection
Bilirubin	When red cell die, hemoglobin is released into the spleen or blood stream. Free Hemoglobin is toxic to the kidneys so it needs to be detoxified. Increase = either increased blood cell death or inability of liver to fully detoxify it Decrease = no significance
Bilirubin : Direct L I V E R	Completely detoxified hemoglobin Increase = liver stress, bile duct blockage; drug reactions Decrease = no significance
Bilirubin Indirect **B** **L** **O** **O** **D**	Partially detoxified hemoglobin Increase = OVERSTRENUOUS EXERCISE; inherited disease called Gilbert's disease; hemolytic anemia; bleeding; blood transfusions; Decrease = no significance



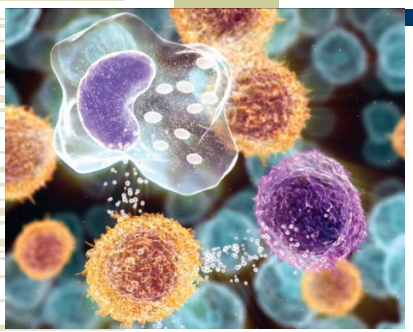
HUH

- One test can mean nothing or something
- A pattern of tests - paired with others can tell a lot.
  - Examples
    - - Inc. AST and LD with no other findings - heart damage
    - - Inc. LD and Reticulocyte count - hemolysis
    - - Inc GGT with no other findings - glass of wine 2 days ago or an aspirin



Kidney Function

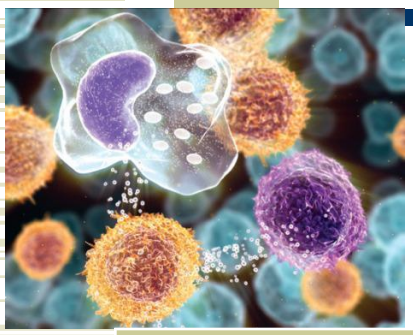
- Much fewer functions than the liver
- BUT the liver can repair itself after decades worth of damage; the kidneys do not (limited in comparison).



Kidney Function

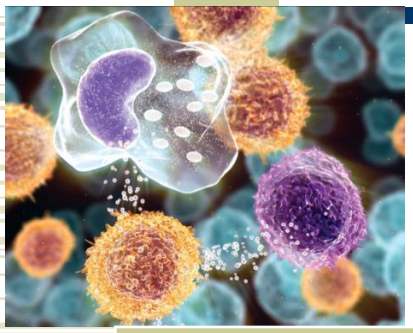
Functions

- Filters the blood of waste products
- Concentrates the filtrate for efficient excretion
- Maintains fluid volume (sodium and potassium levels) and thus blood pressure
- Maintains bone health (phosphorous and calcium balance)
- Maintains blood pH (bicarbonate levels)



Kidney Function

Test	Determination
Albumin	Protein made by the liver that is conserved by the kidneys Increased = Damage to the glomeruli Decreased = Burn, liver stress, sepsis, thyroid diseases; high protein diet
Blood Urea Nitrogen (BUN)	The amount of waste products remaining in the blood; Increase = heavy diet of protein; dehydration; trauma, especially GI Tract; certain medications Decrease = no significance
Creatinine	A waste product of muscle metabolism and protein degradation Increase = Renal damage, medications such as **NSAIDs, ANTIBIOTICS, betablockers;** strenuous exercise; dehydration; pregnancy-associated issues, infections, autoimmune diseases Decrease = Cirrhosis, liver disease, reduced muscle mass, vegan diet



Kidney Function

Test	Determination
eGFR	Estimated Glomerular Filtration - done on a random specimen - needs data such as age, sex, and body size which may or may not be available Increased = not significant Decreased = OVER THE AGE OF 70; Medications such as NSAIDS and ACE inhibitors; inflammation; acute and chronic renal disease; liver disease
BUN:Creatinine ratio	Not a wonderful assay since so many things can interfere with it Increased = dehydration, congestive heart failure, GI tract bleeding Decreased = malnutrition; liver disease