ROUTINE LAB STUDIES

Routine Clinic Lab Studies

With all lab studies, a tacrolimus or cyclosporine level will be obtained. These drug levels are routinely assessed to ensure that there is enough or not too much anti-rejection medicine within the blood stream. Here are the general guidelines for all blood draws:

- The tacrolimus or cyclosporine level is assessed at its lowest level just before the next dose of medicine. This is called a "trough level." This means that you need to have the lab studies drawn within 12 hours after the last dosage of medicines. An example of this is if you gave your child his Prograf® at 8:00 p.m. the night before clinic, you need to have your child's labs drawn at about 8:00 a.m. the next day.

- **Do not** give your child either the tacrolimus or cyclosporine **before** the blood draw. Once the blood has been drawn, then give your child his/her medicine. This means you must bring it with you.

- For all lab studies that will be drawn on a clinic appointment day, the lab slip will already be electronically sent to the blood draw station on the second floor of Mott. The labs will be sent STAT. Many times, the transplant team may have the lab results available for you before leaving clinic that day. However, the tacrolimus or cyclosporine level will not be ready for review until later that day.

- For all routine local lab studies, the transplant coordinator will provide you a lab requisition or lab slip for you to take to the local lab. The lab slip will be good for six months and will be updated with each clinic visit. The transplant coordinator will also inform you about the needed frequency of the routine lab studies. It is important to mark the date needed for the lab studies on your calendar for review.

- The local lab will draw and fax the results to the transplant center for review. Some local lab centers are not able to process either the tacrolimus or cyclosporine level. In that case, the transplant coordinator will provide you some mailing boxes to have **only** one purple tube of blood to be sent to the University of Michigan for processing. There will be no cost to you for mailing the blood specimen to the hospital. You **must** make sure that the tube of blood has your child's full name, date of blood draw, date of birth and UM Hospital ID number. Without the proper identification, the blood specimen will not be processed.

- Once your child has had the local lab studies drawn, please notify the transplant office. There are some lab centers that will need to be called for the results.

- Some specialty labs cannot be done locally and will need to be drawn at the University of Michigan.

- The transplant office **will not** contact you if your child's lab studies are within a normal range. If you would like either a copy or information regarding the lab results, you may contact the transplant office.

Calcineurin Inhibitors

1. CsA – cyclosporine (Neoral; Gengraf)
This is a medicine used to prevent rejection. This type of medicine is also called an immunosuppressant or a calcineurin inhibitor. The levels are measured in blood samples in units called nanograms (ng) per milliliter (ml) abbreviated ng/ml. We check this level to make sure your child is not on too much or too little medicine to help avoid both rejection and side effects of the medicine. Your child is usually taking either this medicine or tacrolimus.

2. Tacro – tacrolimus (Prograf)
This is a medicine used to prevent rejection. The levels are measured in blood samples in units called nanograms (ng) per milliliter (ml) abbreviated ng/ml. This type of medicine is also called an immunosuppressant or a calcineurin inhibitor. We check this level to make sure your child is not on too much or too little medicine to help avoid both rejection and side effects of the medicine. Your child is usually taking either this medicine or cyclosporine.

Other Immunosuppressants

3. Rapa – rapamycin (Sirolimus)
This is a medicine used to prevent rejection. The levels are measured in blood samples in units called nanograms (ng) per milliliter (ml) abbreviated ng/ml. This type of medicine is also called an immunosuppressant but it is not a calcineurin inhibitor. We check this level to make sure your child is not on too much or too little medicine to help avoid both rejection and side effects of the medicine. Most individuals do not use this medicine so it is likely your child will never use it.

Tests to Check for Side Effects of Medicines (Calcineurin Inhibitors) or Dehydration

4. Na+ – sodium
This is one of the important salts in your body that is necessary for proper growth and normal function of your body's cells. This test can be abnormal if your liver is not working well, you are dehydrated, or if you have problems with drugs or other glands in your body. This will be normal in most people after transplant.

5. K+ – potassium
This is a salt that is important for many parts of your body to work well. Calcineurin inhibitors (CSA and Tacro) can change how your kidney handles potassium and lead to it being too high (above the normal range). This is more common early after transplant or after an episode of rejection when you are on higher doses of these medicines. It only occasionally is high enough to need treatment.

6. Cl- – Chloride
This chemical helps keep your cells and your blood balanced and can change if you are having lots of vomiting or diarrhea. It is most directly associated with the level of your CO_2 (bicarbonate) the next test on the list. This level can also be affected by calcineurin inhibitors because of their affect on kidney function.

7. CO_2 – carbon dioxide (bicarbonate)
This is a reflection of how much acid you have in your body and blood stream. If you have diarrhea, this can be very low. If you have vomiting, it can be high. When you are on calcineurin inhibitors, they can change how your kidney works and lead to your body having too much acid in it. This is called a kidney tubular (part of the kidney that helps make urine) acidosis (too much acid), type 4 (caused by medicine).

Kidney Screening Tests (and for Dehydration)

8. BUN – Blood urea nitrogen; (kidney test)
This is related to your protein intake and metabolism. It can be very high when you are dehydrated or when you have problems with your kidney. When you are taking CsA or Tacro, you can be very sensitive to even mild dehydration (for example, not drinking enough in the summer when you are outside more, sweating more, and drinking less than you need). If this is above 20 mg/dl, you will often receive a call from the office asking you to increase your water intake.

9. Creat – creatinine; (kidney test)
This helps us monitor how your kidneys are working. It can be affected by a number of factors, but if it is higher than would be expected based on your size and age, it raises concern that your kidneys may not be working as well as they should. If it is high, you may need more testing to decide if you need a different treatment or a change in medicine.

General Health Tests

10. Glucose – (blood sugar)
Some individuals can develop diabetes after a transplant. This is especially true if other members of your family have problems with diabetes or you are very overweight. This level can also be affected by when you last ate something (not fasting), being overweight, or medicines (like prednisone).

11. Prot – protein
Total protein; this test measures the combination of albumin and immunoglobulins (antibodies) in your blood.

12. Alb – albumin
This is one of the main proteins made by the liver that circulates in the blood. Once it is made by the liver, it stays in the blood for weeks. This helps us know that you are well nourished.

Bone Tests

13. Ca++ – calcium
This mineral is important for muscles to work correctly and for your bones to grow normally. Its level is affected by having too little in your diet, by losses in your stool or from the kidney, or by Vitamin D deficiency. Mild Vitamin D deficiency is common, especially in the winter in Michigan when there is very little exposure to sunlight.

14. PO_4 – phosphorus
This is important for normal bone formation. This will be balanced with calcium under most circumstances. This level can be abnormal if your kidneys are sick, you have Vitamin D deficiency, parathyroid problems, or bone problems.

Side Effects of Medicine (Calcineurin Inhibitors)

15. Mg+ - magnesium
This metal is important for many processes in the body including muscle function. If your magnesium is low, your calcium can also be low. In individuals taking calcineurin inhibitors (CsA or tacro), magnesium can be low because of losses from the kidney. You can also lose magnesium in your stool if you have severe diarrhea. Many individuals require supplements after transplant.

Liver Enzymes

16. AST – aspartate aminotransferase
Called a liver enzyme but is in greater abundance in muscle and red blood cells. Can be elevated in circumstances where no liver disease is present or because of viral infections which do not reflect long-term problems with the liver. However, this test is used to screen for the possibility of liver disease, that is, liver cell (hepatocytes) injury or rejection. Also called SGOT at some other labs.

17. ALT – alanine aminotransferase
Called a liver enzyme but is also present in muscle and red blood cells but to a lesser degree than the AST. This enzyme is called liver specific as there is more of this enzyme present in the liver than AST. The most common reason for it to be elevated is a viral infection. It is used as a test to screen for the possibility of liver injury or disease (rejection). Also called SGPT at some other labs.

Heart Disease Risk Screening

18. Chol – cholesterol
This can be increased by medicines, being overweight, and by family history (tendency you inherit from your parents). We can suggest changes in lifestyle (like more exercise and change in diet) and/or medicines if necessary.

19. Trig – triglycerides
Elevations of this fat related molecule can be seen with diabetes, in certain families, and on certain medicines. Consistently high fasting levels can increase the risk for heart disease.

20. HDL – subtype of cholesterol
Good cholesterol

21. LDL – subtype of cholesterol
Bad cholesterol

22. Uric – uric acid
Sometimes useful for helping determine kidney function, dehydration or certain types of diseases.

Liver Synthetic Function (Does it Make the Right Proteins)

23. PT – prothrombin time
This is a measure of how well your blood clots. Many proteins necessary for this to be normal are made by the liver. If you do not have a normal amount of Vitamin K in your body, this test can be abnormal (the most common reason).

24. INR
This is a ratio that allows us to compare a PT test done anywhere in the world to those done in our laboratory. Then we know if your test is normal or abnormal.

25. PTT
Another clotting test. This is usually not important for monitoring your liver function, but is sometimes drawn in conjunction with the PT.

Complete Blood Count

26. WBC – white blood cell count
These are the cells in your body that fight off infections. Steroids (like prednisone) can make this count rise. Medicines like Cellcept and Valcyte can make this count lower than normal. These are also the cells responsible for rejection.

27. Hgb – hemoglobin
This is a measure of whether or not you have iron deficiency or anemia. This molecule carries oxygen in the red blood cells to your tissues.

28. Hct – hematocrit
This is the percent of your blood that is made up of red blood cells. If it is too low you have anemia. The most common reason is because of iron deficiency.

29. Plat – platelets
These pieces of cells (come from megakaryocytes) are important for clotting. They can be low because of some medicines.

Viral Studies

Transplant recipients can have more trouble with certain viruses. After transplant we check for CMV (cytomegalovirus), EBV (Epstein-Barr virus), and BK virus by blood test. These are specialty labs that we draw.