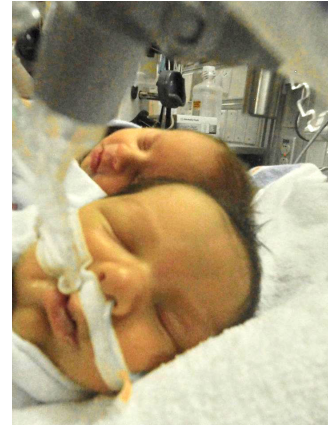


## ROUTINE LAB STUDIES

### Routine Clinic Lab Studies

With all lab studies, a Tacrolimus 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 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/her Tacrolimus at 8 p.m. the night before clinic, you need to have your child’s labs drawn between 7 and 8 a.m. the next day.
- DO NOT give your child Tacrolimus before the blood draw. Once the blood has been drawn, then give your child his/her medicine.
- For all lab studies that will be drawn on a clinic appointment day, the lab orders will already be at the drawing station. Many times, the transplant team may have the lab results available for you before leaving clinic that day. However, the Tacrolimus level will not be ready for review until later.
- 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 to 12 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 the Tacrolimus 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.



	<b>Measures:</b>	<b>Increase Could Mean:</b>	<b>Decrease Could Mean:</b>
Hematocrit (HCT)	The percentage of oxygen-carrying red blood cells (RBCs) in the blood	<ul style="list-style-type: none"> <li>Thickened blood and unwanted clotting</li> <li>Dehydration</li> </ul>	<ul style="list-style-type: none"> <li>Anemia – weakness, dizziness, even breathing and heart difficulties</li> </ul>
Hemoglobin (Hgb)	The pigment found in red blood cells that carries oxygen from the lungs	<ul style="list-style-type: none"> <li>Dehydration</li> <li>Heart or blood disorders</li> </ul>	<ul style="list-style-type: none"> <li>Muscle weakness</li> <li>Sleepiness</li> <li>Problems with the heartbeat</li> <li>Could be caused by some anti-rejection drugs and antibiotics</li> </ul>
Platelets (Plts) (also called thrombocytes)	Platelets in the blood that help stop bleeding by clumping and forming a clot around an injury	<ul style="list-style-type: none"> <li>The blood is too thick and prone to clotting</li> </ul>	<ul style="list-style-type: none"> <li>Easy bruising and bleeding</li> <li>A sign of kidney or liver disease</li> <li>Internal bleeding</li> <li>Anemia</li> <li>Could be caused by some anti-rejection drugs and antibiotics</li> </ul>
Glucose	How well the body is regulating the use of glucose (a sugar) following a meal	<ul style="list-style-type: none"> <li>Development of diabetes (signs of diabetes – excessive thirst, excessive urination, fatigue and weight loss)</li> </ul>	<ul style="list-style-type: none"> <li>A problem with the pancreas: fainting, sweating, nervousness, fast pulse and headache</li> <li>Liver disease</li> <li>A thyroid problem</li> </ul>
Potassium (K)	Potassium levels in the blood; reflects potassium in the tissues that is required to change carbohydrates into energy, build protein and help the heart, muscles and nerves function	<ul style="list-style-type: none"> <li>Kidney is not working well</li> <li>Some anti-rejection drugs may be the cause</li> </ul>	<ul style="list-style-type: none"> <li>Use of diuretics can cause potassium to be excreted (released) by the kidneys</li> <li>Heart problems</li> <li>Muscle cramps</li> </ul>
Sodium (Na)	The balance between electrolytes and water in the body Also indicates nerve and muscle disorders, as well as kidney and adrenal gland problems	<ul style="list-style-type: none"> <li>Excessive sodium in the diet</li> <li>Not enough water in the body</li> <li>Kidney function problems</li> </ul>	<ul style="list-style-type: none"> <li>Chronic kidney disease</li> <li>Inadequate sodium intake</li> </ul>
Creatinine (Cr)	Creatinine, a protein waste substance produced by muscles and released into the blood stream for removal by the kidney. Measuring creatinine in the blood helps show how the kidney is working	<ul style="list-style-type: none"> <li>Dehydration</li> <li>Kidney disease</li> <li>A possible side effect of some anti-rejection medicines</li> <li>Obstruction within the urinary system</li> </ul>	N/A

	<b>Measures:</b>	<b>Increase Could Mean:</b>	<b>Decrease Could Mean:</b>
Cholesterol (Chol)	Cholesterol, a fat-like material carried in the blood that makes hormones and builds cell walls	<ul style="list-style-type: none"> <li>• Narrowing or blockage of blood vessels</li> <li>• You've eaten fatty food within 12 hours of the test</li> <li>• A side effect of some anti-rejection medicines</li> </ul>	N/A
Triglycerides	Triglycerides, a fat that, along with cholesterol, helps determine the risk of coronary artery disease	<ul style="list-style-type: none"> <li>• Poorly controlled diabetes</li> <li>• High blood pressure</li> <li>• Increased risk of coronary artery disease (if cholesterol levels are also high)</li> </ul>	<ul style="list-style-type: none"> <li>• Malnutrition</li> <li>• Overactive thyroid</li> </ul>
Uric Acid	Elimination of uric acid, a waste product of energy production found in the urine and blood	<ul style="list-style-type: none"> <li>• Gout, liver disease, or ulcerative colitis</li> </ul>	N/A
White Blood Count (WBC)	The number of leukocytes (white blood cells) in your blood. White blood cells fight off infection. They also are involved in kidney rejection.	<ul style="list-style-type: none"> <li>• Infection</li> <li>• Inflammation</li> <li>• Tissue destruction</li> <li>• Stress can elevate the levels, as can some anti-rejection drugs</li> </ul>	<ul style="list-style-type: none"> <li>• Too few infection-fighting cells to protect the body</li> <li>• Taking medicines like antibiotics, diuretics, or some anti-rejection drugs</li> </ul>
BUN	Blood urea nitrogen (BUN), a waste product of protein breakdown that is removed from the blood by the kidneys. A very important test of kidney function	<ul style="list-style-type: none"> <li>• Kidney is not functioning properly</li> <li>• Diet is too high in protein</li> <li>• Dehydration</li> <li>• May be caused by anti-rejection medicines</li> </ul>	<ul style="list-style-type: none"> <li>• Liver disease</li> <li>• Too much water in your body</li> </ul>
Bicarbonate ( $\text{HCO}_3$ )	Acid/base balance of blood as controlled by the kidney	<ul style="list-style-type: none"> <li>• A lung disorder</li> <li>• Result of prolonged vomiting</li> <li>• Taking too many antacids</li> </ul>	<ul style="list-style-type: none"> <li>• A sign of diabetes</li> <li>• Kidney failure</li> </ul>
Calcium	Calcium—needed for blood clotting, building bones, and also muscle, heart, and nerve function	<ul style="list-style-type: none"> <li>• Too much calcium intake from overuse of antacids</li> <li>• Bone disorders</li> <li>• Too much vitamin D</li> <li>• Problems with thyroid or parathyroid glands</li> </ul>	<ul style="list-style-type: none"> <li>• Inflammation of pancreas</li> <li>• Kidney failure</li> <li>• Too little vitamin D</li> <li>• Too much water in the body</li> </ul>

	<b>Measures:</b>	<b>Increase Could Mean:</b>	<b>Decrease Could Mean:</b>
Phosphorus (PO <sub>4</sub> )	Phosphorous levels in the blood—valuable in creating energy	<ul style="list-style-type: none"> <li>• Kidney failure</li> <li>• Too much phosphorous in the diet</li> </ul>	<ul style="list-style-type: none"> <li>• Bone disorders</li> <li>• Too little vitamin D</li> <li>• A complication of diabetes</li> <li>• Excessive use of some antacids</li> </ul>
Protein in Urine (Proteinuria)	Normally, protein is not present in urine. If it is, the quantity of protein may be measured over a 24-hour period	<ul style="list-style-type: none"> <li>• A kidney disorder</li> <li>• A complication of diabetes</li> </ul>	N/A
Urinalysis	White blood cells, red blood cells, bacteria and protein levels in the urine	<ul style="list-style-type: none"> <li>• Kidney disease</li> <li>• Urinary tract infection</li> <li>• Poorly controlled diabetes</li> </ul>	N/A
Albumin	A protein produced by the liver and released into the blood stream	<ul style="list-style-type: none"> <li>• Recovering from a serious illness</li> </ul>	<ul style="list-style-type: none"> <li>• Ascites (excess fluid in the abdomen)</li> <li>• Kidney disease</li> <li>• Hepatitis</li> <li>• Cirrhosis</li> <li>• Body is not absorbing nutrients from food</li> <li>• Malnutrition</li> </ul>
Alkaline Phosphatase	An enzyme produced in the liver, bone and placenta that is released into the blood stream	<ul style="list-style-type: none"> <li>• Inflammation in the bile ducts inside the liver</li> </ul>	N/A
ALT (Alanine Transaminase)	An enzyme produced in the liver that is released into the blood when liver cells are injured	<ul style="list-style-type: none"> <li>• Liver cell injury</li> <li>• Hepatitis</li> <li>• Noncancerous tumor</li> <li>• Use of medicines or drugs that are toxic to the liver</li> <li>• Rejection episode</li> <li>• Excessive use of alcohol</li> <li>• Severe infection</li> </ul>	N/A
AST (Aspartate Transaminase)	An enzyme released into the blood when the liver is injured	<ul style="list-style-type: none"> <li>• Liver cell injury</li> <li>• Hepatitis</li> <li>• Use of medications that are toxic to the liver</li> <li>• A rejection episode</li> <li>• Excessive use of alcohol</li> <li>• Severe infection</li> </ul>	N/A

	Measures:	Increase Could Mean:	Decrease Could Mean:
Bilirubin	A component of bile, a digestive enzyme produced by the liver	<ul style="list-style-type: none"> <li>• Liver cell injury</li> <li>• Hepatitis</li> <li>• A change in the bile duct structure</li> <li>• A rejection episode</li> <li>• Use of medications toxic to the liver</li> <li>• A narrowing of the common bile duct</li> <li>• Gallstones</li> </ul>	N/A
INR	The ability of the liver to make prothrombin, a protein that is important for blood clotting	<ul style="list-style-type: none"> <li>• Liver damage</li> <li>• A person is taking anti-clotting medicine</li> </ul>	N/A
LDH (Lactic Acid Dehydrogenase)	LDH, an enzyme found in many body tissues including the heart, liver and kidney; most often measured to evaluate tissue damage	<ul style="list-style-type: none"> <li>• Stroke or heart attack</li> <li>• Low blood pressure</li> <li>• Liver diseases such as hepatitis</li> <li>• Disease of the pancreas</li> </ul>	N/A

## Cardiac Biopsy

As previously discussed, one new concern will be rejection.

Cardiac biopsies are the only reliable way to detect rejection of the heart. There will be several biopsies the first year, and then they begin to become less frequent. By the time the recipient is two years out from the surgery, cardiac biopsies will be much less frequently. After five years, they may be done annually. Of course, they can be scheduled at any time if there is ever any question of rejection.



The recipient will not be able to eat or drink anything for six hours before the biopsy. **DO NOT** give your child the anti-rejection medicines that morning because a drug level will be checked at the time of the procedure. Bring these medications along so they may be administered afterward. All other medications may be given before the biopsy.

The procedure is performed in the catheterization room. The skin of the neck or the groin will be cleaned and anesthetized. A needle is introduced into a vein and a tiny tube is passed through and guided into the heart. The biopsy procedure is used to take several small samples of the heart wall for examination. The procedure lasts approximately 30 minutes.

The child life specialist will be available to accompany the recipient to the CATH Lab, as well as provide distraction and emotional support during the procedure.

After the biopsy, pressure is applied to the puncture site to stop bleeding and then a bandage is applied. The bandage can be taken off after six hours. Soon after the biopsy, the recipient should take all medications and eat. If the biopsy was done through the groin, the recipient will be required to rest the remainder of the day. If the biopsy was done through the neck, the recipient will be able to resume normal activity following his/her clinic appointment.

Biopsies are routinely performed on Tuesdays. The results of the biopsy are available at the end of the week and are usually discussed by the transplant team on Fridays. The transplant coordinator will call to discuss the results.