

Appendix 10: Treatment for Hyperlipidemia High serum triglycerides, cholesterol

When Do You Treat High Triglycerides?

When fasting triglycerides are consistently twice normal. It is important to control hypertriglyceridemia, especially when it is over 1000. Severe hypertriglyceridemia can cause pancreatitis, uveitis, blindness, dermatologic disease and neurologic signs due to sludging of blood.

First, Check for Underlying Causes Which Might Be Treatable, and then Treat Them.

1. I start with CBC, general health profile including blood lipids and electrolytes, urinalysis and thyroid panel.
 - a. hypothyroidism – TSH, free T4, T4.
 - b. diabetes mellitus – check blood glucose
 - c. hyperadrenocorticism – check for clinical signs, elevated liver enzymes.
 - d. glomerular disease - check urine for proteinuria.
 - e. pancreatitis – consider clinical signs
 - f. liver disease – look for hypoglycemia, elevated liver enzymes, abnormal cholesterol, low albumin, high bilirubin, etc.
2. If blood glucose is high, but you are not sure whether your patient is a diabetic, do a serum fructosamine.
3. If signs of hyperadrenocorticism, consider ACTH stim or Low Dose Dexamethasone.
4. If any proteinuria and/or hypoalbuminemia, do a urine culture and urine protein:creatinine ratio (UPC can be interpreted only if UTI is ruled out).
5. Consider fasting and 2-hour post-prandial bile acids if indicated by above bloodwork, or if other more common causes of hyperlipidemia have been eliminated, and you need to completely rule out clinically significant liver dysfunction.

First Line Therapy for Hyperlipidemia.

1. low fat/high fiber diet.
 - a. Acceptable diets for dogs with hyperlipidemia:
 - i. Eukanuba Restricted Calorie dry.
 - ii. Waltham Low Fat canned or dry.
 - iii. CNM OM canned or dry.
 - iv. Hill's W/D canned or dry.
 - v. Hill's R/D canned or dry.
 - vi. Eukanuba Glucose Control dry.
 - vii. Eukanuba Adult Reduced Fat dry.
 - b. Acceptable cat diets with hyperlipidemia
 - i. Eukanuba Restricted Calorie dry.
 - ii. Waltham Lite dry.
 - iii. Hill's R/D canned or dry.
 - iv. Hill's W/D canned or dry.
 - c. Acceptable diets for cats with hyperlipidemia and diabetes mellitus (low carb and low fat).

2. Omega-3 fatty acids (fish oil).
 - a. Dose:
 - i. 1 regular strength (300-350 mg EPA/DHA) capsule per 10-12.5 pounds
 - ii. 1 extra strength (500-700 mg EPA/DHA) capsule per 20-25 pounds.
 - b. Omega-3 fatty acids reduce plasma triglycerides by decreasing production of VLDL (very low density lipoproteins).
 - c. As with all nutritional supplements, selecting a high quality product is important. See Appendix 11 for more information on fish oil.

Re-assess fasting triglycerides after 2-4 weeks of therapy.

1. The goal is to get triglycerides below 400-600 after a 12-hour fast.
2. If hypothyroid, make sure appropriate dose is confirmed by adequate T4 level.
3. If Cushingoid make sure well regulated before adding additional therapies for high triglycerides.
4. If diabetic, make sure well regulated prior to adding additional therapies for high triglycerides.
5. If significant glomerular proteinuria, treat with enalapril 0.5-1 mg/kg PO BID.
6. treat liver disease and pancreatitis if present.

Additional Therapy for Initially Unresponsive Hyperlipidemia. The Glasgow study suggested that approximately 10% of dogs with idiopathic hyperlipidemia are unresponsive to dietary change and may require more aggressive therapy.

1. **Increase fish oil** to 2-3x initial dose.
2. **niacinamide**
 - a. reduces hepatic triglyceride synthesis and VLDL production.
 - b. Dose: 250mg PO SID for dogs less than 10kg and 500mg PO SID for dogs greater than 10kg.
3. **gemfibrozil (Lopid, Parke Davis)**
 - a. try if 1 and 2 immediately above don't work after 30 days.
 - b. Use for at least 3 months before deciding it's not going to work.
 - c. Fibric acid derivatives reduce hepatic triglyceride synthesis and VLDL production, and some also reduce adipose lipolysis, thereby limiting the supply of lipogenic substrate to the liver, enhancing LPL activity, thus promoting clearance of VLDL and triglycerides from circulation.
 - d. **Dosages used vary from 200 mg/day to 150-300 mg BID in dogs. Has been used in cats at 7.5-10 mg/kg BID.**
 - e. Other drugs in this category are clofibrate, bezafibrate, ciprofibrate, and fenofibrate.
 - f. These drugs reduce triglycerides by 20-40% in people.
 - g. Reported adverse effects include abdominal pain, vomiting, diarrhea liver enzyme elevations and liver failure.
4. **If all else fails, try statin drugs**
 - a. **lovostatin, simvastatin, pravastatin, fluvastatin, cerivastatin, atorvastatin.**
 - b. The HMG Co-A-reductase inhibitors, commonly referred to as "statins," reduce hepatic cholesterol synthesis and enhance the removal and subsequent excretion of cholesterol from the circulation.
 - c. Clinical experiences with 'statins' in dogs is very limited, but they generally have good safety profiles in dogs.

- d. Adverse effects include lethargy, diarrhea, muscle pain and hepatotoxicity.
 - e. In humans, the statins can lower triglyceride concentrations by 10-15%.
 - f. There is a natural compound which contains lovastatin (**red yeast rice**), and is available at health food stores in standardized extracts, to ensure lovastatin content. Red yeast rice is significantly less expensive than the statin drugs, and could be tried. For a long time, the drug company that holds the patent on lovastatin was trying to get Red yeast Rice taken off the market, because they thought it violated their patent. But since it is a natural compound, they could only get the word "lovastatin" taken off the labels.
5. **Bile acid absorbers** such as cholestyramine and colestipol.
- a. are used in people, and occasionally in pets.
 - b. these drugs bind bile acids in the intestine and enhance LDL removal from the bloodstream.
 - c. **Chitosan** (from chitin in shellfish) is a natural compound which professes to do bind fats in th GI tract. It is very safe, but efficacy is unproven. It probably shouldn't be administered at the same time as fat soluble vitamins or therapeutic lipids (fish oil, etc.).