

METABOLISM

Contact: Lori Myers (559-6800)

When to contact: One month prior

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Where to meet: MMI 3062B

Purpose:

This experience should prepare the resident to consider inherited metabolic conditions in the differential diagnosis of a variety of clinical problems and make appropriate use of available diagnostic tests.

Objectives:

Cognitive Objectives

- A. Identify major clinical features of the following inborn errors of metabolism, as outlined in Nelson Textbook of Pediatrics, 16th Edition, 2000, pp 328-430:
 - Phenylketonuria
 - Tyrosinemia type 1
 - Homocystinuria
 - Methylenetetrahydrofolate reductase deficiency
 - Maple syrup urine disease
 - Isovaleric acidemia
 - Biotinidase deficiency
 - Beta-ketothiolase deficiency
 - Propionic acidemia
 - Methylmalonic acidemia
 - Nonketotic hyperglycinemia
 - Pyridoxine dependency
 - CPS deficiency
 - OTC deficiency
 - Citrullinemia
 - Transient hyperammonemia of the newborn
 - Glutaric aciduria type 1
 - Canavan disease
 - Medium-chain acyl CoA (MCAD) deficiency
 - Long-chain 3-hydroxyacyl CoA (LCHAD) deficiency
 - Zellweger syndrome
 - X-linked adrenoleukodystrophy
 - Tay-Sachs disease
 - Gaucher disease
 - Niemann-Pick disease
 - Metachromatic leukodystrophy
 - Krabbe disease
 - Wolman disease
 - Glycogen storage disease

- Galactosemia
 - Hereditary fructose intolerance
 - Pyruvate dehydrogenase (E₁, E₂, E₃) deficiency
 - Carbohydrate-deficient glycoprotein syndrome
 - Mucopolysaccharide storage disease
 - Lesch-Nyhan syndrome
 - Mitochondrial myopathy
 - Acute intermittent porphyria
 - Mitochondrial encephalomyopathy
- B. Become familiar with the currently recommended management for phenylketonuria, galactosemia, urea cycle defects, fatty acid oxidation defects, and glycogen storage disease.

Experiential Objectives

- A. Gain skill in diagnosing metabolic disease by utilizing the Metabolism Review 2001 handout (attached) and/or Nelson Textbook of Pediatrics for working through the following scenarios:
1. Given a newborn infant with a positive screening test for phenylketonuria, galactosemia, or biotinidase deficiency, recommend the appropriate confirmatory diagnostic steps.
 2. Recommend metabolic screening procedures for a severely jaundiced infant, several days old, with what appears to be Gram-negative septicemia but still awaiting culture proof.
 3. Recommend metabolic screening procedures for a neonate with fulminating liver failure.
 4. Recommend metabolic screening procedures for a neonate with lethargy and hyperventilation.
 5. Recommend metabolic screening procedures for a neonate with lethargy, vomiting, an increased anion gap, and neutropenia.
 6. Recommend metabolic screening procedures for a neonate with myoclonic jerking, hypotonia, and secondary apnea.
 7. A previously healthy 6 month-old infant presents with a hypoglycemic seizure and hepatomegaly in the course of a febrile illness with vomiting. The initial urine specimen is free of acetone. Recommend appropriate diagnostic steps.
 8. A 3 month-old infant was delivered at 34 weeks because of the HELLP syndrome in the mother. The infant is now gaining poorly and is often lethargic between feedings. You find mild hepatic enlargement, fasting hypoglycemia without ketonuria, and elevation in AST and ALT. Recommend additional diagnostic steps.
 9. A female patient with a long-standing history of protein aversion develops a febrile illness with vomiting and then becomes confused, combative, and progressively obtunded. Recommend appropriate diagnostic steps.
 10. An infant has marked hepatomegaly and fasting hypoglycemia which is relatively asymptomatic. Recommend appropriate diagnostic steps.
 11. Given a young child who presents with a hypoglycemic seizure and marked ketonuria, recommend an appropriate protocol to confirm a diagnosis of ketotic hypoglycemia.
 12. Identify one or more disease states and one or more therapeutic regimens which can lead to carnitine depletion, and predict the clinical manifestations of carnitine depletion.
 13. Predict the artefact that might appear in an organic acid screen of the urine of an infant whose diet contains medium-chain triglyceride.
 14. A 6 month-old male infant has x-ray evidence of active rickets. Recommend test procedures which will differentiate type 1 vitamin D dependency, type 2 vitamin D dependency, x-linked hypophosphatemia, and cystinosis from each other.

15. Recognize the clinical presentation of Gaucher disease, Pompe disease, Tay-Sachs disease and Hurler's disease. Given an infant or child with a positive urine screening test for mucopolysaccharide, recommend additional tests which would differentiate the major types of generalized mucopolysaccharidosis.
16. Given a child with any newly diagnosed lysosomal storage disease, counsel the parents regarding mode of inheritance, recurrence risk, and prognosis.
17. A newborn infant has an unusual facial appearance with prominent forehead, a large fontanelle, and cataracts. Recurring seizures are difficult to control and marked hypotonia is present. Recommend appropriate diagnostic steps.
18. An 8 year-old boy has a worsening school performance and behaviors suggestive of ADHD. His handwriting has been deteriorating. His gait is clumsy and you find his tendon reflexes increased. There is a suggestion of Addisonian pigmentation. Recommend appropriate diagnostic steps.

B. Utilize diagnostic strategies from Metabolism Review 2001 in evaluating children seen as outpatients in metabolic management clinic and in in-patient consultations.

Methods:

The resident will participate in inpatient consultations and clinic follow-up visits for children with metabolic problems. Guidance will be offered in selection of tests and use of progress notes for documentation of rationale. Regular tutorial sessions will be scheduled for purposes of didactic instruction, sharing of current articles, reviewing patient experience, and evaluating resident progress as needed.

Implementation:

Expectations will be routinely discussed in an orientation session. Standard departmental evaluative questionnaires and reports will be utilized at end of rotation. Results of the written exam will be scrutinized for indications of gaps in the educational experiences.

Evaluation:

Evaluation will be accomplished by direct observation of resident interactions with patients, resident contributions to the clinical record, and resident information-retrieval techniques. At end of rotation, the resident will be asked to complete a multiple choice exam based on the cognitive and experiential objectives outlined in sections II and III, and results will be discussed with the resident.