BREAST MILK AND INFANT NUTRITION

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Topics

- Breast milk
- Infant formulas
- Failure To Thrive FTT

Teaching modules in pediatric GI

- Web link:
- http://radtf.indyrad.iupui.edu/radtf

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Welcome to Dr. Mark Feist's Educational Website

This website contains case-based modules which are part of a curriculum used teach residents about pediatric gastroenterology, hepatology, and nutrition. The content of this website and the curriculum is based on the needs of primary care providers faced with children who present with gastrointestinal complaints.

The multiple choice and true/false questions in the modules are the means of teaching you much of the information. Do not get discouraged if you don't know the answers; you are not expected to know all the answers as this is the first time many of you have been exposed to this information. The incorrect answers on the multiple choice questions usually have an explanation of why they are incorrect and give you a little more information about that topic; therefore, clicking on all of answers will maximize your educational experience.

Click on the link below to access the modules.

GI CASES

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CaseStudy	Diarrhea View		06/28/2005	06/14/2006
CaseStudy	Liver Disease II View		12/22/2004	02/24/2006
CaseStudy	Liver Disease I View		08/16/2004	01/24/2006
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Nutrition

Learning Objectives:

At the end of this module you should be able to:

- Describe the composition of various infant formulas and list indications for their usage
- Choose an infant formula for different clinical situations based on the protein, carbohydrate, and fat content of the formula
- Describe normal infant nutritional requirements
- List the most common causes of failure to thrive
- Describe the different types of failure to thrive based on trends in weight, height, and head circumference
- Assess nutritional status and diagnose malnutrition
- Describe the effects of pancreatic insufficiency on nutritional status
- Describe the risks that can be associated with nutritional rehabilitation
- Identify risk factors for and the presentation of deficiencies or toxicities of various vitamins and minerals

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History: A 2-month-old male infant presents to your office because of irritability. The mother reports that the patient has become more irritable over the past few weeks and has begun to spit up after most feeds. The irritability occurs around the clock, and the patient is not sleeping well. The emesis is non-bilious, non-bloody and described as undigested formula. It usually occurs within a few minutes of completing the feeding. Mom estimates the amount of emesis as half of the volume consumed. She also states that he has a red, scaly rash on his arms, legs, and face which has gotten worse over the past few weeks.

Click on the links below for more history.

Past Medical History

Family History

Social History

Diet History

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The most likely cause of this patient's symptoms is

A physiologic infantile gastroesophageal reflux
B congenital alactasia (lactose intolerance)
C cow's milk protein allergy
D malrotation with midgut volvulus

The treatment of choice for this patient would be a trial of

A Nutramigen
B Isomil
C Neocate
D Enfamil Gentlease
E goat's milk

Response to therapy in this condition is usually seen

A immediately
B within 12 hours
C after 48-72 hours
D after 2 weeks

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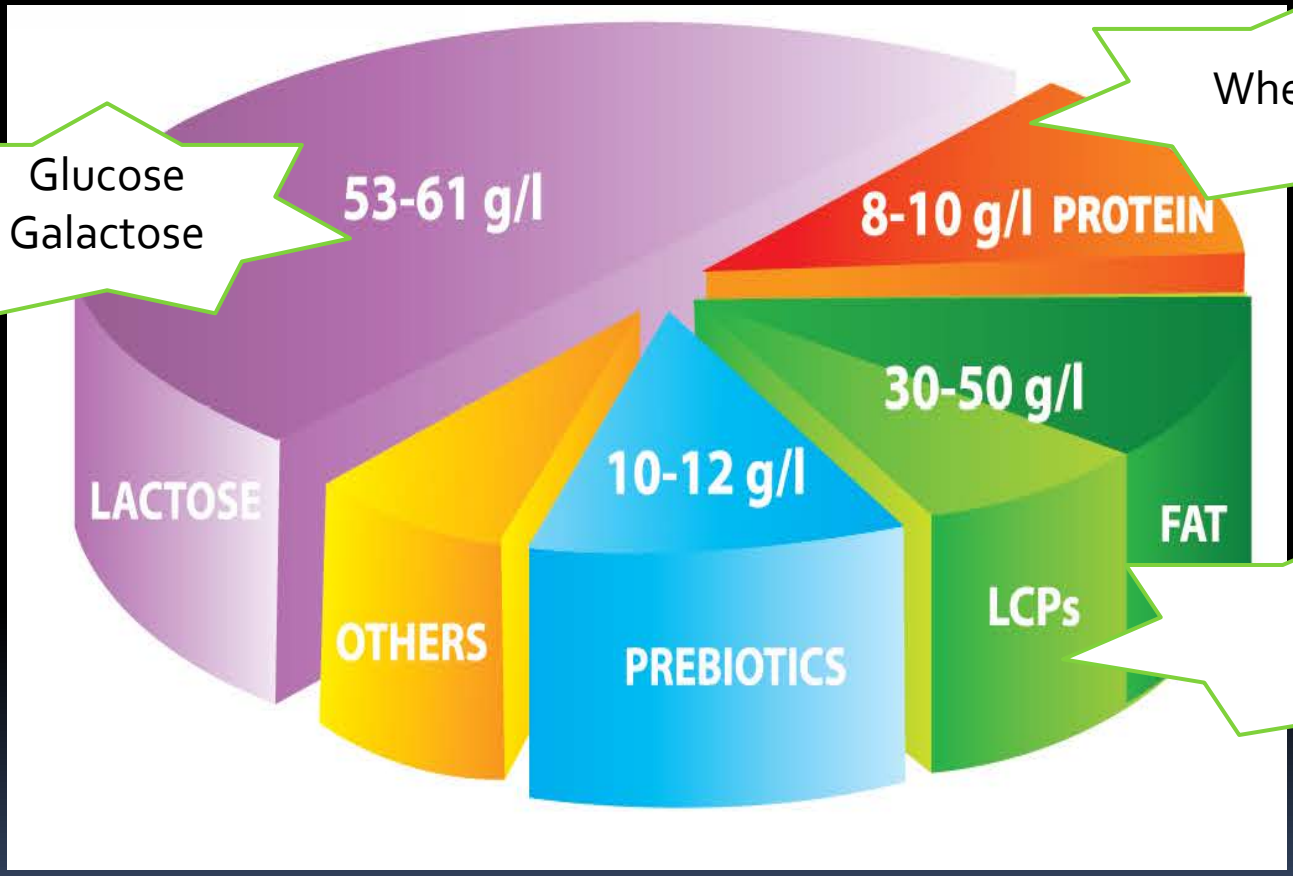
BREAST MILK

Components of breast milk



Glucose
Galactose

Whey : casein

LCT

Benefits of breast milk

- Immunity and protection against infection:
  - Antibodies in the mil
  - Cytokines
  - Normal flora growth factors

Benefits of breast milk

- Available 24/7
- Cheaper!
- No need for preparation : bottle/ water

Benefits of breast milk

- Better intelligence
- Protects against obesity

Table 42-3 CONDITIONS FOR WHICH HUMAN MILK HAS BEEN SUGGESTED TO HAVE A PROTECTIVE EFFECT

- Acute disorders
  - Diarrhea
  - Otitis media
  - Urinary tract infection
  - Necrotizing enterocolitis
  - Septicemia
  - Infant botulism
- Chronic disorders
  - Insulin-dependent diabetes mellitus
  - Celiac disease
  - Crohn's disease
  - Childhood cancer
    - Lymphoma
    - Leukemia
  - Recurrent otitis media
  - Allergy
- Obesity and overweight
- Hospitalizations
- Infant mortality

Adapted from the Schanler RJ, Dooley S: *Breastfeeding handbook for physicians*, Elk Grove Village, IL, 2006, American Academy of Pediatrics.

Mother- Baby Bonding

Benefits of breast milk to the mother

- Helps with mother weight loss
- Helps uterine contraction post delivery
- Helps with to get rid of pregnancy hormones
- Act as contraceptive : Lactation induced amenorrhea LAM

BREAST IS BEST

Patterns of milk supply

Table 42-5 PATTERNS OF MILK SUPPLY

DAY OF LIFE	MILK SUPPLY
Day 1	Some milk (~5 mL) may be expressed
Days 2-4	Lactogenesis, milk production increases
Day 5	Milk present, fullness, leaking felt
Day 6 onward	Breasts should feel "empty" after feeding

Adapted from Neifert MR: Clinical aspects of lactation: promoting breastfeeding success, *Clin Perinatol* 26:281–306, 1999.

How to Encourage breast feeding

Table 42-1 STEPS TO ENCOURAGE BREAST-FEEDING IN THE HOSPITAL: UNICEF/WHO BABY-FRIENDLY

HOSPITAL INITIATIVES
Provide all pregnant women with information and counseling
Document the desire to breast-feed in the medical record
Document the method of feeding in the infant's record
Place the newborn and mother skin-to-skin, and initiate breast-feeding within 1 hr of birth
Continue skin-to-skin contact at other times and encourage rooming in
Assess breast-feeding and continue encouragement and teaching on each shift
MOTHERS TO LEARN
Proper position and latch on
Nutritive sucking and swallowing
Milk production and release
Frequency and feeding cues
Expression of milk if needed
Assessment of the infant's nutritional status
When to contact the clinician
ADDITIONAL INSTRUCTIONS
Refer to lactation consultation if any concerns arise
Infants should go to the breast at least 8-12 times/24 hr day and night
Avoid time limits on the breasts; offer both breasts at each feeding
Do not give sterile water, glucose, or formula unless indicated
If supplements are given, use cup feeding, a Haberman feeder, fingers, or syringe feedings
Avoid pacifiers in the newborn nursery except during painful procedures
Avoid antilactation drugs

UNICEF, United Nations Children's Fund; WHO, World Health Organization.

Table 42-4 ABSOLUTE AND RELATIVE CONTRAINDICATIONS TO BREAST-FEEDING DUE TO MATERNAL HEALTH CONDITIONS

MATERNAL HEALTH CONDITIONS	DEGREE OF RISK
HIV and HTLV infection	In the USA, breast-feeding is contraindicated In other settings, health risks of not breast-feeding must be weighed against the risk of transmitting virus to the infant
Tuberculosis infection	Breast-feeding is contraindicated until completion of approximately 2 wk of appropriate maternal therapy
Varicella-zoster infection	Infant should not have direct contact to active lesions Infant should receive immune globulin
Herpes simplex infection	Breast-feeding is contraindicated with active herpetic lesions of the breast
CMV infection	May be found in milk of mothers who are CMV seropositive Transmission through human milk Causing symptomatic illness in term infants is uncommon.
Hepatitis B infection	Infants routinely receive hepatitis B immune globulin and hepatitis B vaccine if mother is HbsAg positive No delay in initiation of breast-feeding is required
Hepatitis C infection	Breast-feeding is not contraindicated
Alcohol intake	Limit maternal alcohol intake to <0.5 g/kg/day (for a woman of average weight, this is the equivalent of 2 cans of beer, 2 glasses of wine, or 2 oz of liquor)
Cigarette smoking	Discourage cigarette smoking, but smoking is not a contraindication to breast-feeding
Chemotherapy, radiopharmaceuticals	Breast-feeding is generally contraindicated

CMV, cytomegalovirus; HbsAg, hepatitis B surface antigen; HIV, human immunodeficiency virus; HTLV, human T-lymphotropic virus.

INFANT FORMULAS

Infant formula

- Can be classified according to their content:

- Protein content
- Carbohydrate content
- Fat content

How to think about formulas

Formula type	Prtn content	CHO content	fat content

Infant Formulas – Protein Content

- Divided into 4 classes of formulas
  - Cow's milk based formulas

    variable prtn content

    variable whey: casein ratio
  - Soy formulas
  - Casein hydrolysate formulas

    Extensive Vs partial
  - Amino acid based formulas

When do we have to change the formula class?

- When you suspect

Cow's milk protein allergy

Cow's milk protein allergy

- It is a clinical diagnosis
- Any combination of the following
- Vomiting
- Abd distension
- Diarrhea
- Blood in stool
- Irritability and fussiness
- eczema

in a formula fed or breast fed infant

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Protein Content of Infant Formulas

Protein Source	Examples	Indications	Price*
Cow's Milk	Enfamil with Iron Enfamil Lipil Similac with Iron Similac Advance Carnation Good Start Good Start Supreme Enfamil Gentlease Enfamil AR Store Brands	Normal GI tract; Enfamil AR used for gastroesophageal reflux	$
Soy	Prosobee Isomil Alsoy Store Brands	Cow's milk protein allergy, Lactose malabsorption, or Galactosemia	$
Casein Hydrolysate	Nutramigen Alimentum Pregestimil	Cow's milk and/or soy allergy; Alimentum and Pregestimil are also used for malabsorption	$$
Amino Acids	Neocate Elecare	Severe protein allergy not responsive to casein hydrolysate formula	$$$-$$$$

* Each $ = approximate cost of standard cow's milk based formula

As you move down this table from cow's milk to soy to hydrolysate to amino acid based formulas, the formulas become less antigenic; formulas within a class are similarly antigenic to one another. When choosing a formula to treat milk protein allergy, you should progress down the table. It is not beneficial to change to a different formula

S26
Nan
Bebelac
Seha
Similac
Ronlac
AR formulas
"Sensitive" / LF/

Bebelac HA
Nan HA

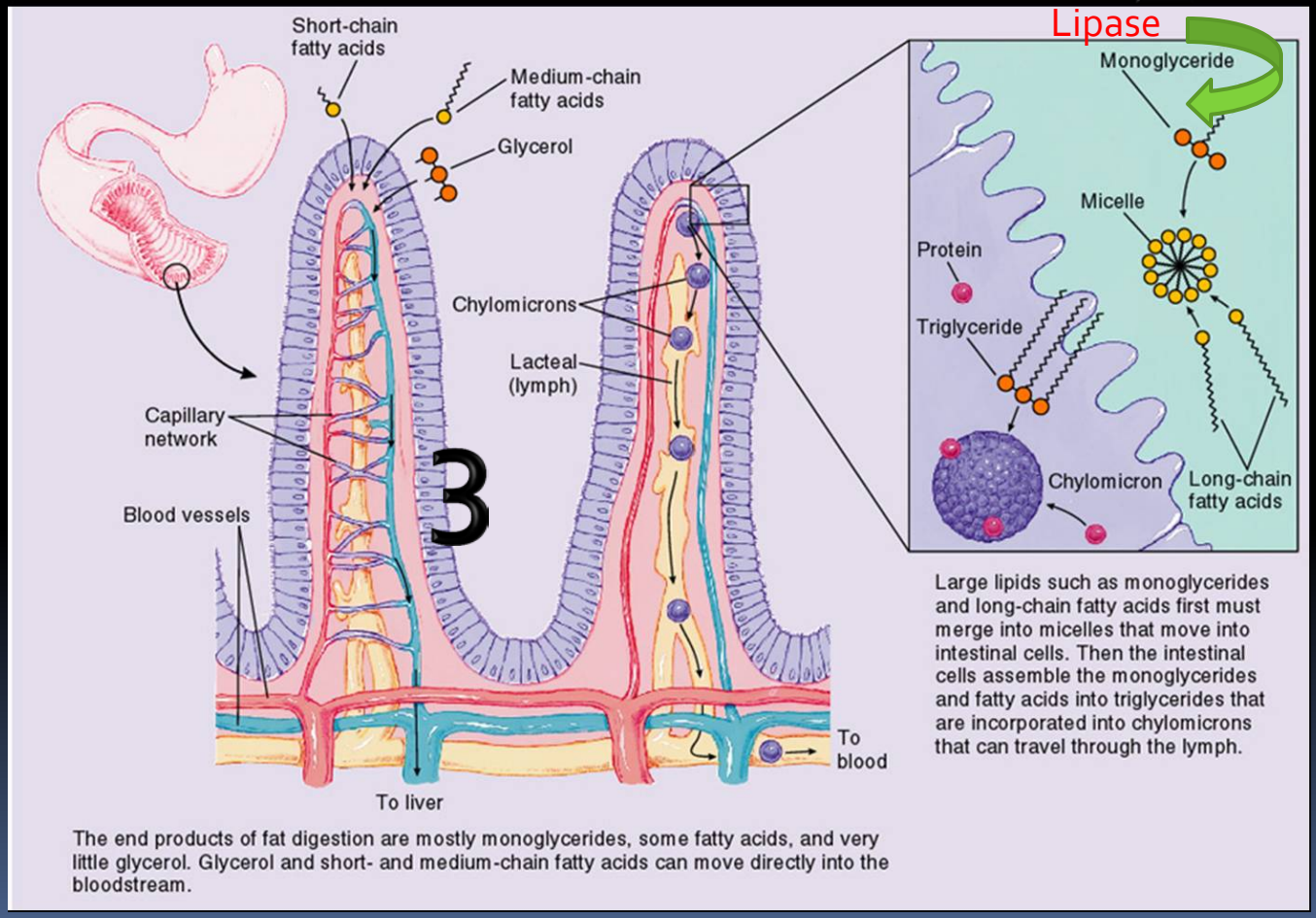
Infant Formulas – Carbohydrate Content

- Main types of carbohydrates in formulas
  - Lactose
  - Sucrose
  - Glucose polymers :
- What type of formula should be used in patients with galactosemia? Why?
  - formulas that do not contain lactose
- Which formulas contain sucrose?
  - Alimentum and soy formulas except Prosobee
- Glucose polymers :
  - Hydrolysate and AA based formulas

Infant Formulas – Fat Content

- Main types of fats in formulas
  - Long chain triglycerides (LCTs)
  - Medium chain triglycerides (MCTs)

Absorption of MCT vs LCT



- When are MCTs beneficial?
  - Impaired fat absorption or lymphatic abnormalities
- Which formulas contain MCTs?
  - Alimentum (33%), Pregestimil (55%) , Alfare 38%
  - Elecare (33%)
  - Portagen (87%), Vital HN (45%)

Proper preparation of formula

- Hand washing
- **READ THE INSTRUCTIONS**
- Most formulas in the local market:
- 1 scoop powder in 30 ml
  (nan, babelac, seha, ronlac)
- Except : S26, similac 1 scoop in 60 ml

Calorie content of formulas

- Regular formula (breast milk)
- 67 kcal : 100 ml
- 20 Kcl : 30 ml (oz) 20 Kcal/ oz

Regular calorie needs for infant

- At least 100 kcal/ kg/ day
- We need to always calculate the calorie intake from formula
- Total volume / weight X formula calorie concentration = Kcal / kg/ day

Example

- 1 month old infant
- 4 kg
- Regular Formula intake 90 ml q 3 hrs
- What is the daily total caloric intake ?

- Total volume / weight X formula Conc.
- (90*8) / 4 X 67/100

= 120 kcl / kg/ day

Failure To Thrive

FTT

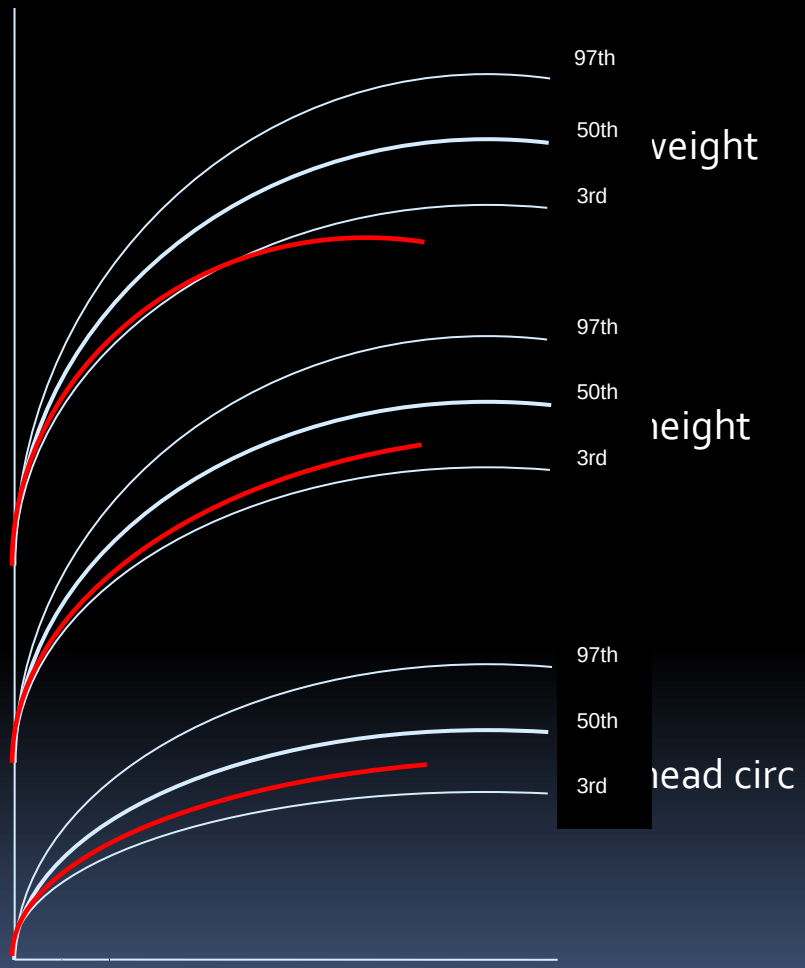
Failure To Thrive
FTT

- The inability to maintain the expected rate of growth over time.

- Growth is assessed by plotting the patient's growth parameters over subsequent visits and comparing the growth rate to normal population growth rates for age.

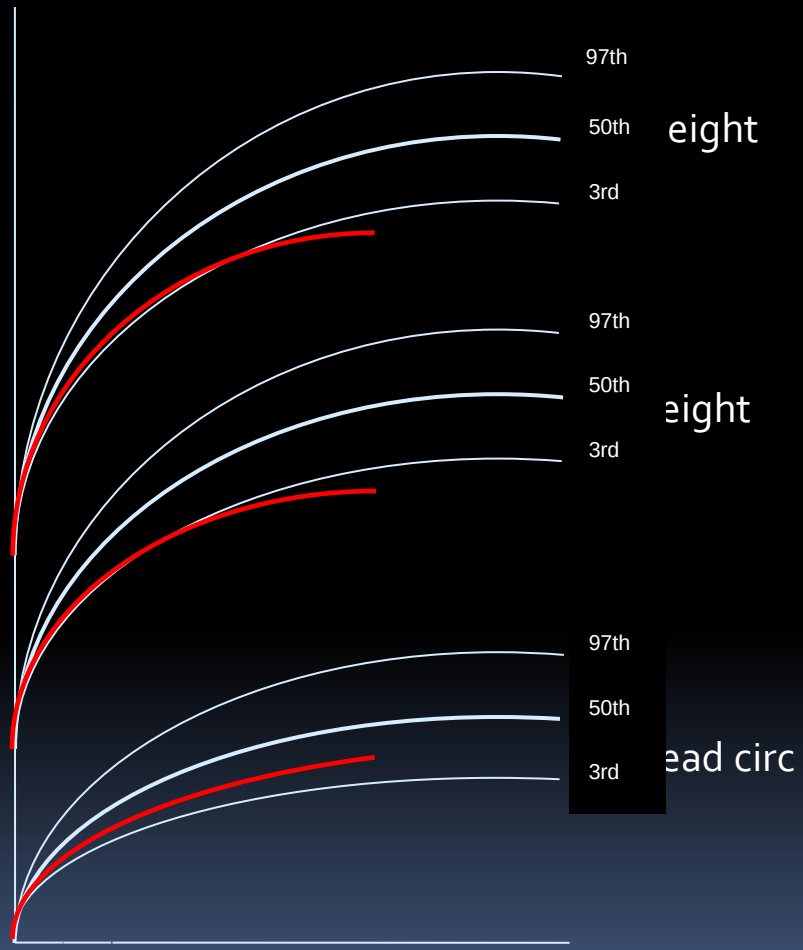
- One set of measurements can not assess rate of growth and therefore is not sufficient to diagnose failure to thrive

Failure to Thrive



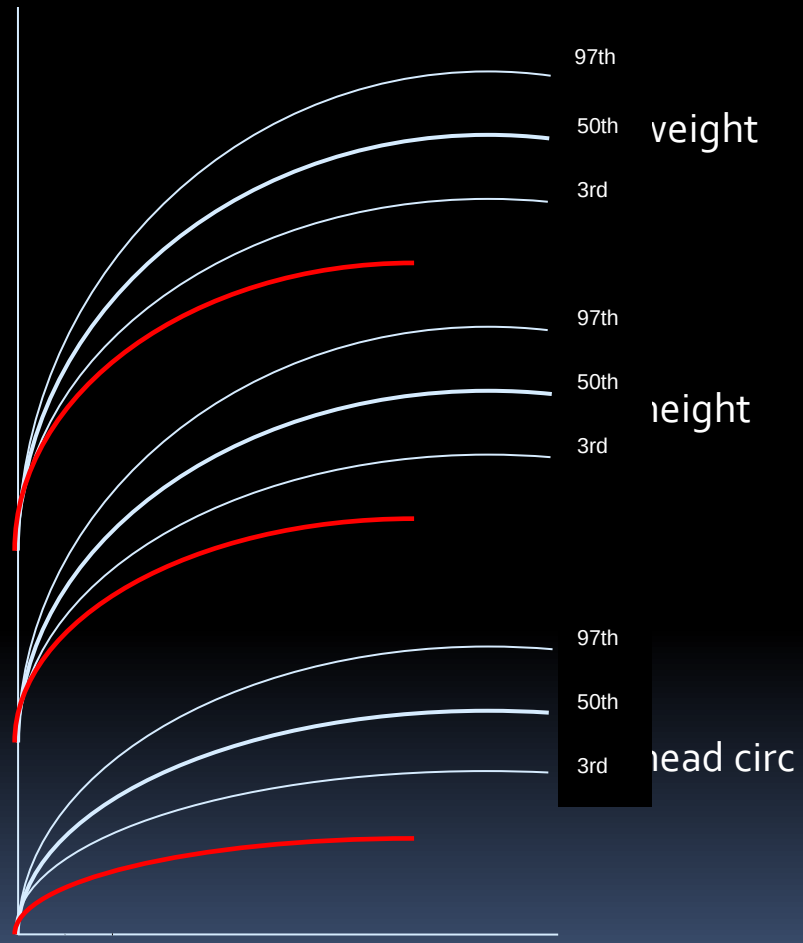
- List the three main causes of this type of growth pattern
- Type I failure to thrive
  - Inadequate caloric intake
  - Excessive loss of calories
  - Increased metabolic demands

Failure to Thrive



- List three causes of this type of growth pattern
- Type II failure to thrive
  - Constitutional growth delay
  - Genetic short stature
  - Hypothyroidism
  - Growth hormone deficiency
  - Hypopituitarism
  - Chronic malnutrition

Failure to Thrive



- List three causes of this type of growth pattern
- Type III failure to thrive
  - Congenital infections
  - Chromosomal abnormalities
  - Prenatal exposure to toxins

Type I Failure to Thrive

- Inadequate caloric intake
  - Inappropriate feeding regimen/schedule
  - Formula prepared incorrectly
  - Decreased appetite or feeding dysfunction/refusal
- Excessive loss of calories
  - GER or vomiting
  - Diarrhea/malabsorption
- Increased metabolic demands
  - Hyperthyroidism, diencephalic syndrome

THE END

QUESTIONS?