

Formulas and Vitamins

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February 25th, 2020



Objectives

- Understand infant and pediatric formulas and their appropriate uses
- Understand main vitamins and minerals of concern
- Review case study

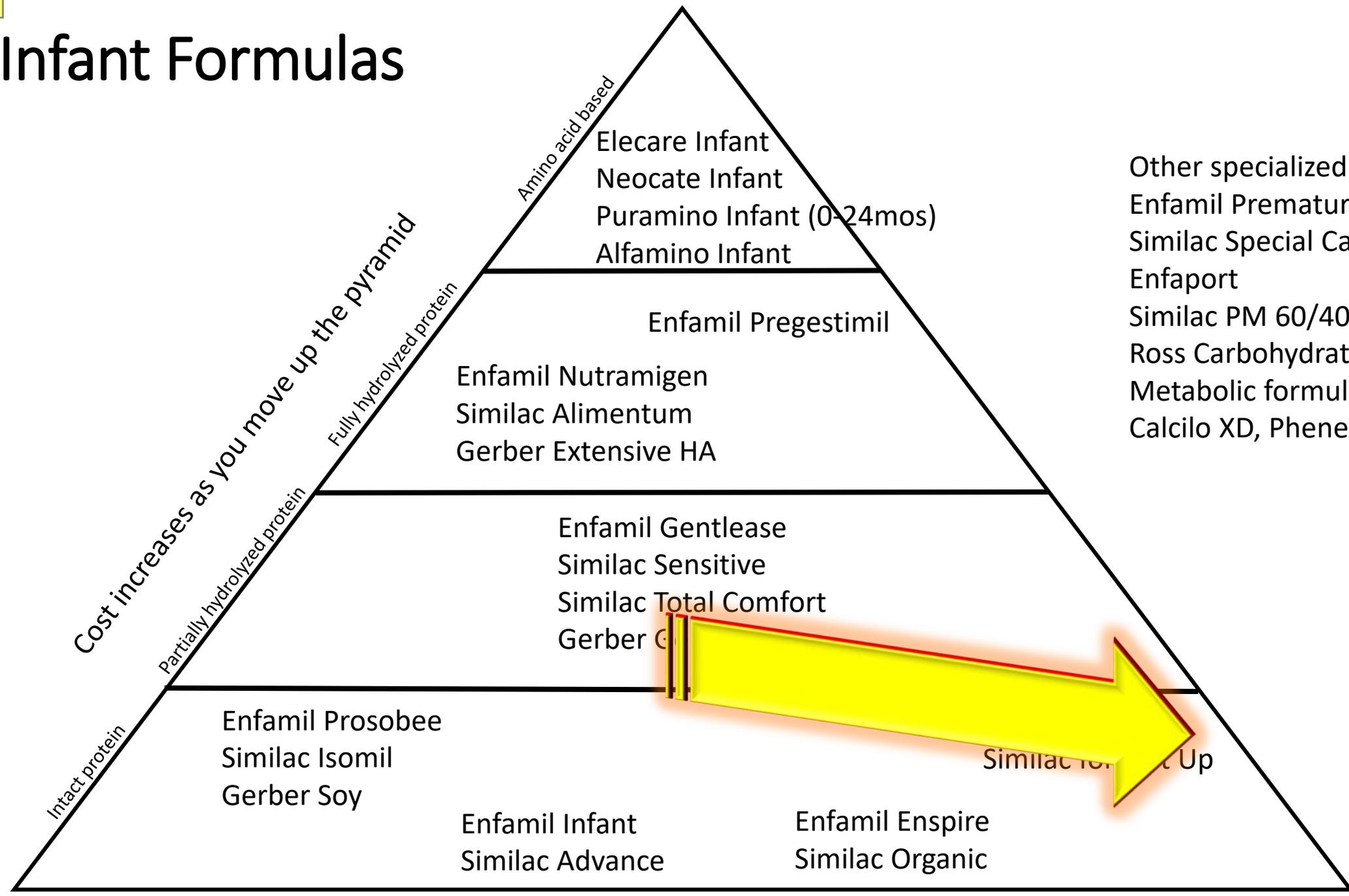


Infant Formulas

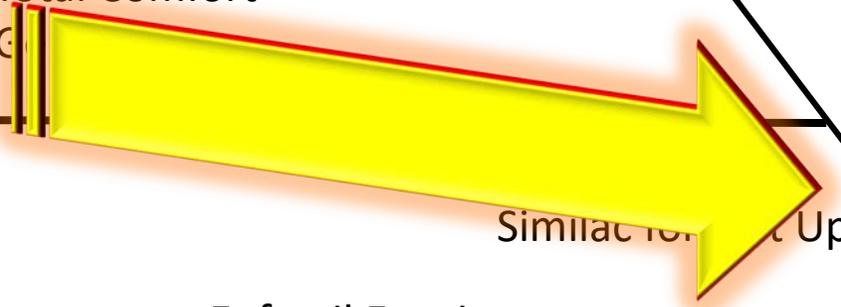
- Breastmilk is best! But sometimes not available
- FDA regulated
- Standard concentration is 20 calories per ounce for majority of formulas
 - Special recipes to make formulas higher in calories if needed
 - Premature discharge formulas are 22calories per ounce standard mixing
- Main formula companies: Enfamil and Similac



Infant Formulas



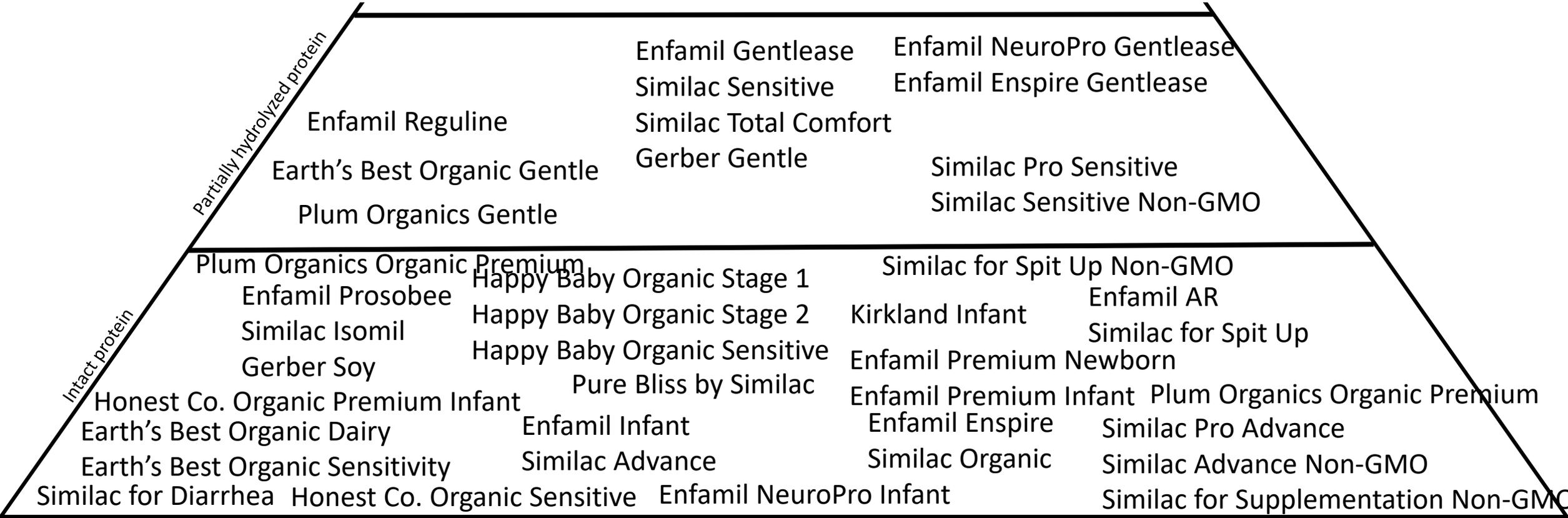
Other specialized formulas:
 Enfamil Premature and EnfaCare
 Similac Special Care and Neosure
 Enfaport
 Similac PM 60/40
 Ross Carbohydrate Free Soy
 Metabolic formulas (examples:
 Calcilo XD, Phenex-1, LMD)



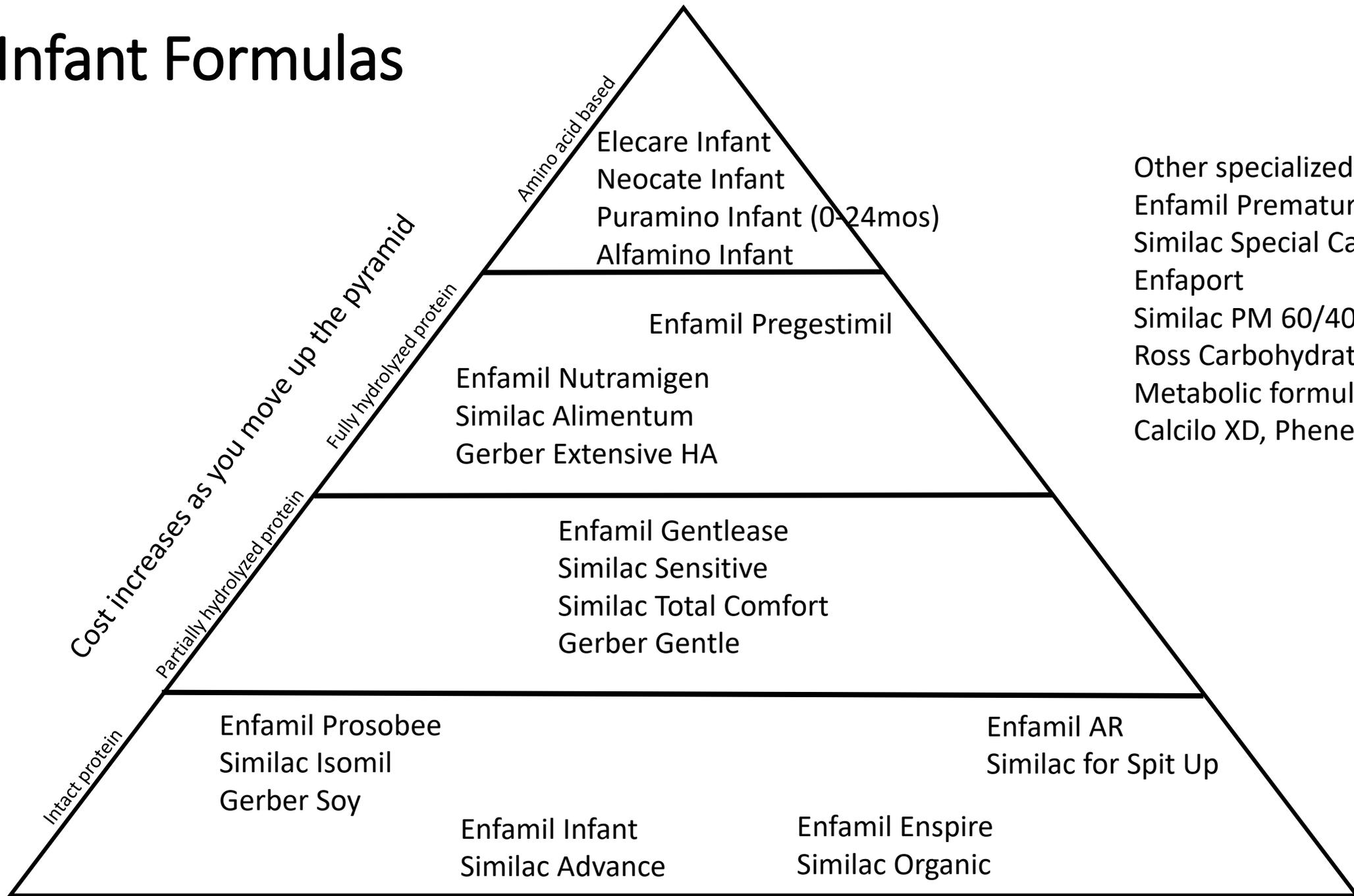
Similac Total Comfort Up

The bottom half of the pyramid really looks like this...

*Not included: Non-US formulas (such as HiPP, Holle, etc)

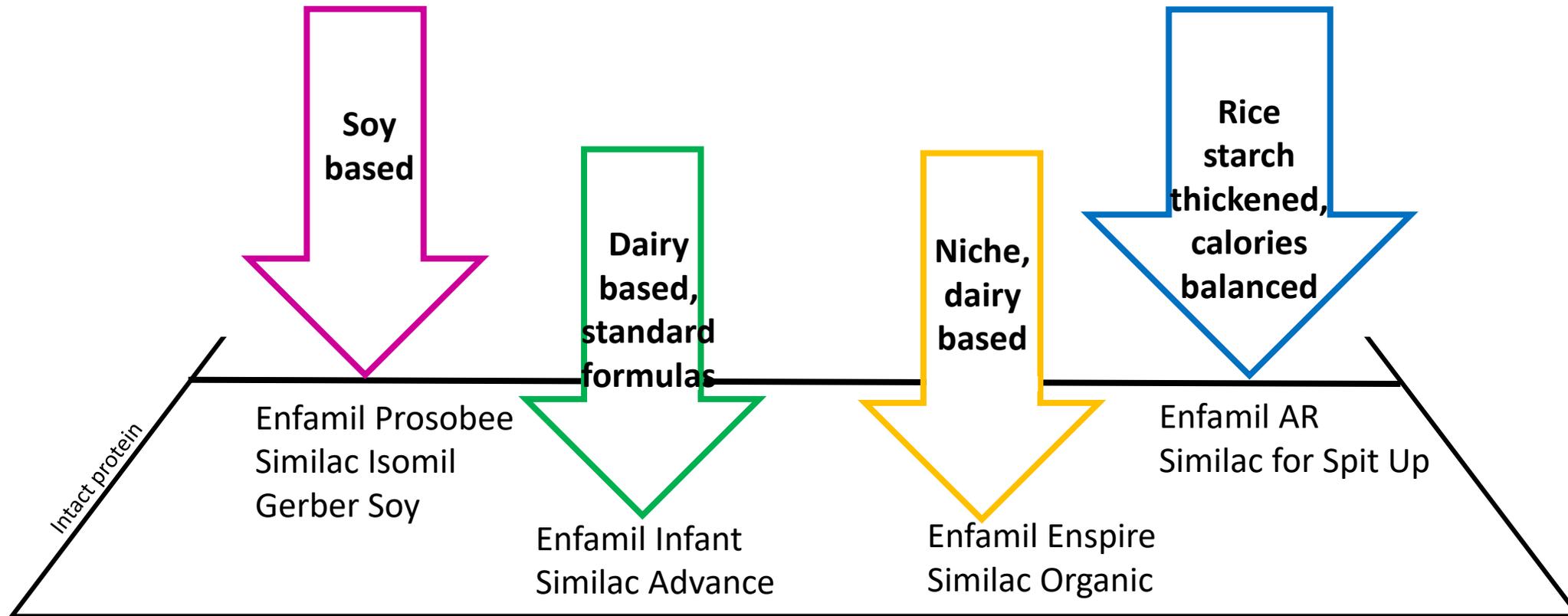


Infant Formulas



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Similac Special Care and Neosure
Enfaport
Similac PM 60/40
Ross Carbohydrate Free Soy
Metabolic formulas (examples:
Calcilo XD, Phenex-1, LMD)

Infant Formulas





Infant Formulas

**For fussiness
or gas, dairy
protein
somewhat
broken
down, low
lactose**

Partially hydrolyzed protein

Enfamil Gentlease
Similac Sensitive
Similac Total Comfort
Gerber Gentle

Intact protein

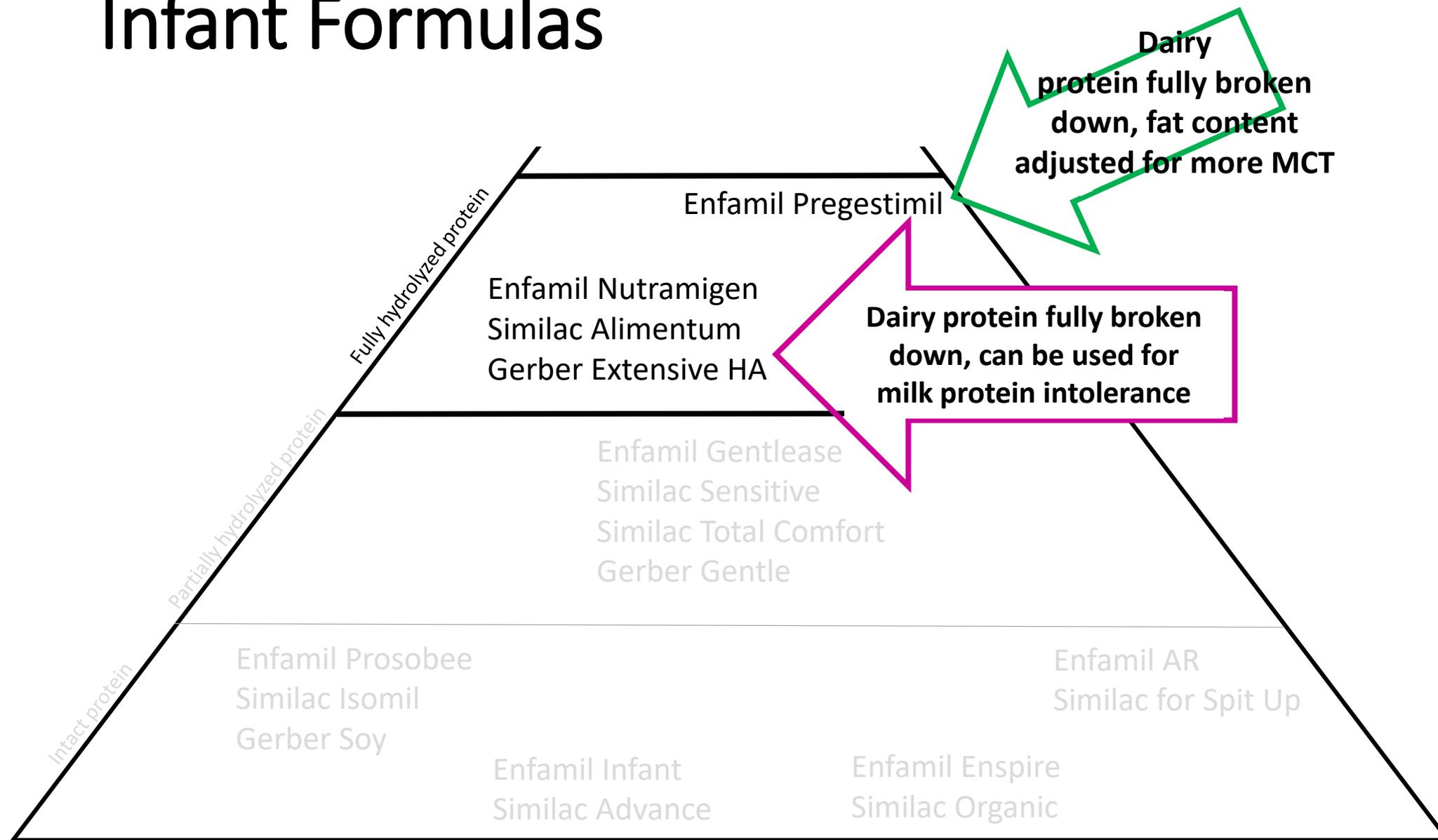
Enfamil Prosobee
Similac Isomil
Gerber Soy

Enfamil AR
Similac for Spit Up

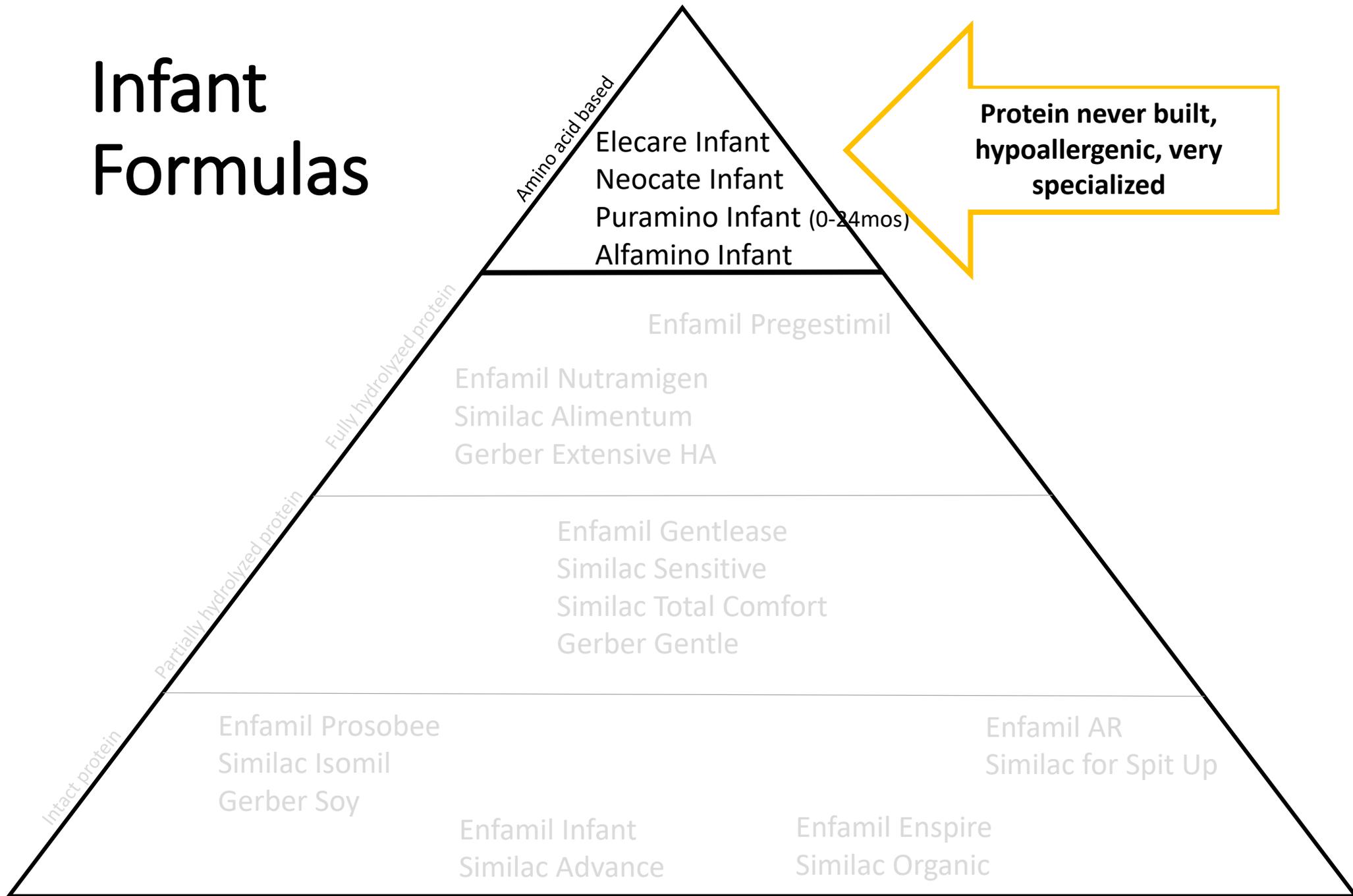
Enfamil Infant
Similac Advance

Enfamil Enspire
Similac Organic

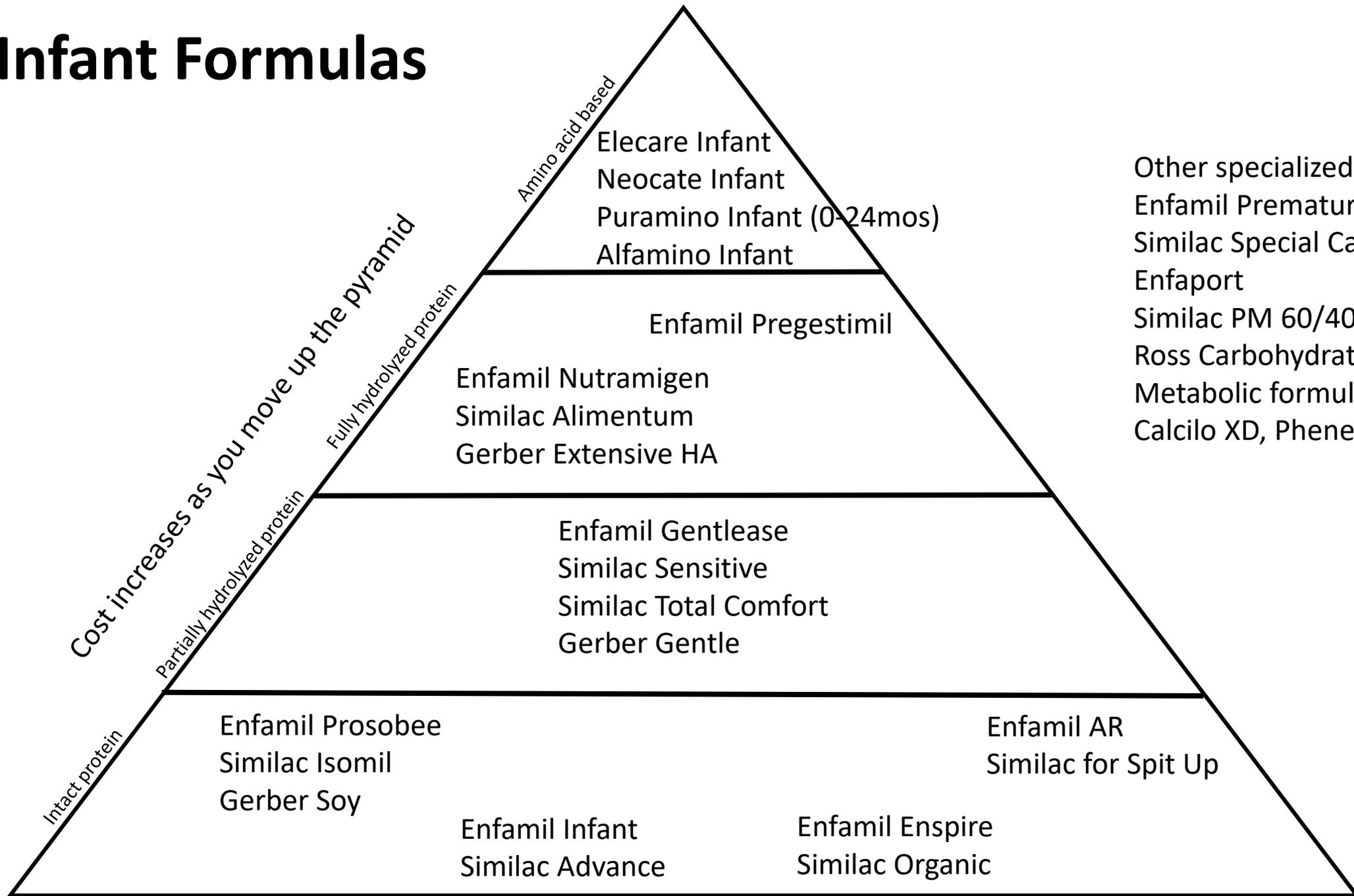
Infant Formulas



Infant Formulas



Infant Formulas



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Inappropriate Infant Milks

- Friend's breastmilk or Craigslist breastmilk
- Goat milk
- Homemade "infant formulas"
- Milk alternatives



Oh Dr. Google...



The screenshot shows a Google search interface with the following elements:

- Search Bar:** Contains the text "Google" and a search icon.
- Navigation:** Includes links for "Videos", "More", "Settings", and "Tools".
- Search Results:**
 - Title:** "Best Milk Alternatives for Babies -"
 - URL:** www.faithful-to-nature.co.za > blog > the-b
 - Image:** A product image of a can of formula with the text "THE BEST BREAST MILK ALTERNATIVE" and "www.maternitylea...".
 - Text:** "best when it" and "the best choice".
- Related Questions:**
 - What is a good substitute for breastmilk?
 - Which milk is most like breast milk?
 - Which milk is closest to breastmilk?
 - Which is the most natural baby formula?

Four red prohibition signs are overlaid on the image:

- One on the left side of the page.
- One in the top right, covering the search results area.
- One in the bottom left, covering the related questions area.
- One on the right side, covering the product image and text.



About goat milk...

- Goat milk is most similar in composition to cow's milk
- Goat milk is **NOT** like breastmilk
- Goat milk is not safe for any baby, but especially not for cow's milk protein intolerant/sensitive babies
- Homemade formulas using goat milk are NOT safe or nutritionally complete
- Raw goat milk can contain dangerous bacteria, including E. Coli, Salmonella, Listeria, Campylobacter
- If an infant is on goat milk, counsel about the dangers and send referral to Registered Dietitian

Nutrition Content Comparison

| Per 100 calories | Breastmilk | Standard Infant Formula | Goat Milk |
|--------------------|------------|-------------------------|-----------|
| Calories per ounce | 20 | 20 | 21 |
| Protein | 1.47g | 2g | 5.16g ↑ |
| Calcium | 46mg | 78mg | 194mg ↑ |
| Folate | 7μg | 16μg | 1μg ↓ |
| Magnesium | 4mg | 8mg | 20mg ↑ |
| Potassium | 73mg | 108mg | 296mg ↑ |
| Sodium | 24mg | 27mg | 72mg ↑ |

Nutrition Content Comparison

- Recommend Intake for Age: 1.6-2.2g/kg/day protein, 200-260mg/day of calcium, 65-80µg/day of folate, 30-75mg/day of magnesium, 400-700mg/day of potassium, and 120-370mg of sodium
- If baby drinks 800calories per day:

| | Breastmilk | Standard Infant Formula | Goat Milk |
|------------------|------------|-------------------------|----------------------|
| Protein | 12g | 16g | 41g ~3x more |
| Calcium | 368mg | 624mg | 1,552mg ~4x more |
| Folate | 56µg | 128µg | 8µg Only 12% of need |
| Magnesium | 32mg | 64mg | 160mg ~5x more |
| Potassium | 584mg | 864mg | 2,368mg ~4x more |
| Sodium | 192mg | 216mg | 576mg ~3x more |

International Formulas

- HiPP, Holle, etc are popular
- Unable to recommended at this time
- Per article: “The potential dangers are numerous. Children can fall ill or become malnourished if parents inadvertently use an incorrect formula-to-water ratio; unofficial formula vendors may not store the powdered formula properly, raising the possibility of bacterial contamination, product deterioration or loss in nutrient density; there is no system in place to notify consumers in the United States if any of these formulas are recalled; and while many European formulas contain the nutrients required in the United States, some do not. In addition, parents in the United States may not realize that European formulas labeled hypoallergenic aren’t meant for children with cow’s milk allergies.”



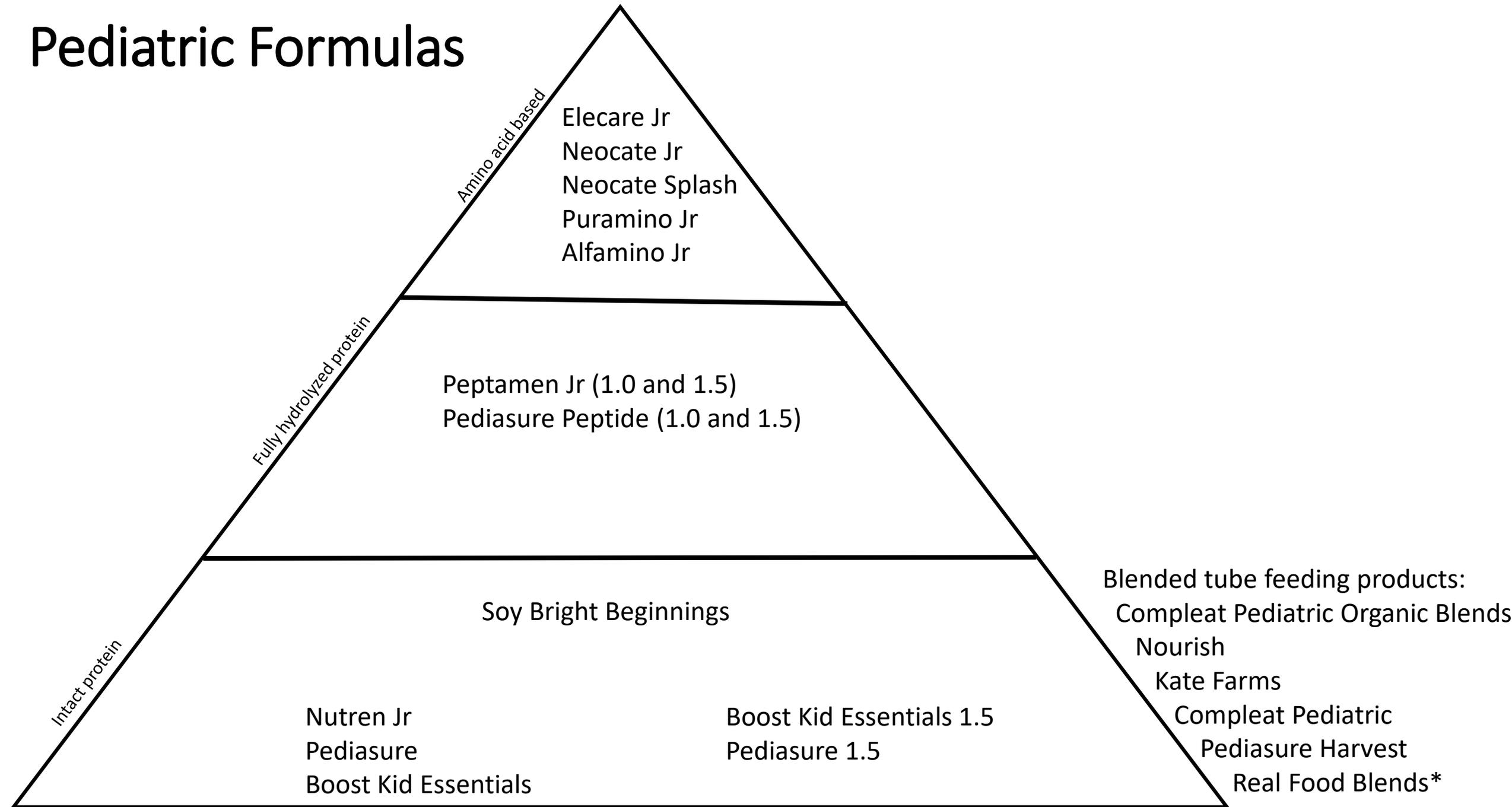
The image is a screenshot of a web page from Parenting magazine. At the top, the logo "Parenting" is displayed in a serif font. Below the logo, there are navigation links: "Stages", "Life as a Parent", "All Topics", "Guides", and "Milestones". The main content area features a teal-colored header "FEEDING & NUTRITION". The article title is "European Baby Formula That Is Illegally Sold in the United States Carries Risks, Pediatricians Warn" in a large, bold, black font. Below the title, the text reads: "HiPP, Holle and other brands are not registered with the F.D.A., but that hasn't stopped parents from buying them from third-party vendors." The author information is "By Christina Caron and Jessica Grose" and the date is "June 11, 2019".

Source: <https://parenting.nytimes.com/feeding/european-baby-formula>

Pediatric Formulas

- Oral supplements or tube feeds
- Complete nutrition source
- Most formulas are 30 calorie per ounce or 45 calorie per ounce
- Main formula companies: Abbott and Nestle
- Blended tube feeding products are gaining in popularity

Pediatric Formulas



Thankfully
only expands
a little more...

Not included are “toddler beverages”
or metabolic formulas

Other specialized formulas:

Portagen

KetoCal

KetoVie

RCF

Blended tube feeding products:

Compleat Pediatric Organic Blends

Nourish

Kate Farms

Compleat Pediatric

Pediasure Harvest

Real Food Blends*

Amino acid based

Elecare Jr
Neocate Jr
Neocate Splash
Puramino Jr
Alfamino Jr

Fully hydrolyzed protein

Peptamen Jr (1.0 and 1.5)
Pediasure Peptide (1.0 and 1.5)
1.0 comes in unflavored,
vanilla, strawberry
1.5 comes in vanilla

Intact protein

Pediasure powder
Pediasure with Fiber
Pediasure Sidekicks
Pediasure Enteral
Pediasure Enteral with Fiber
Nutren Jr
Pediasure
Boost Kid Essentials

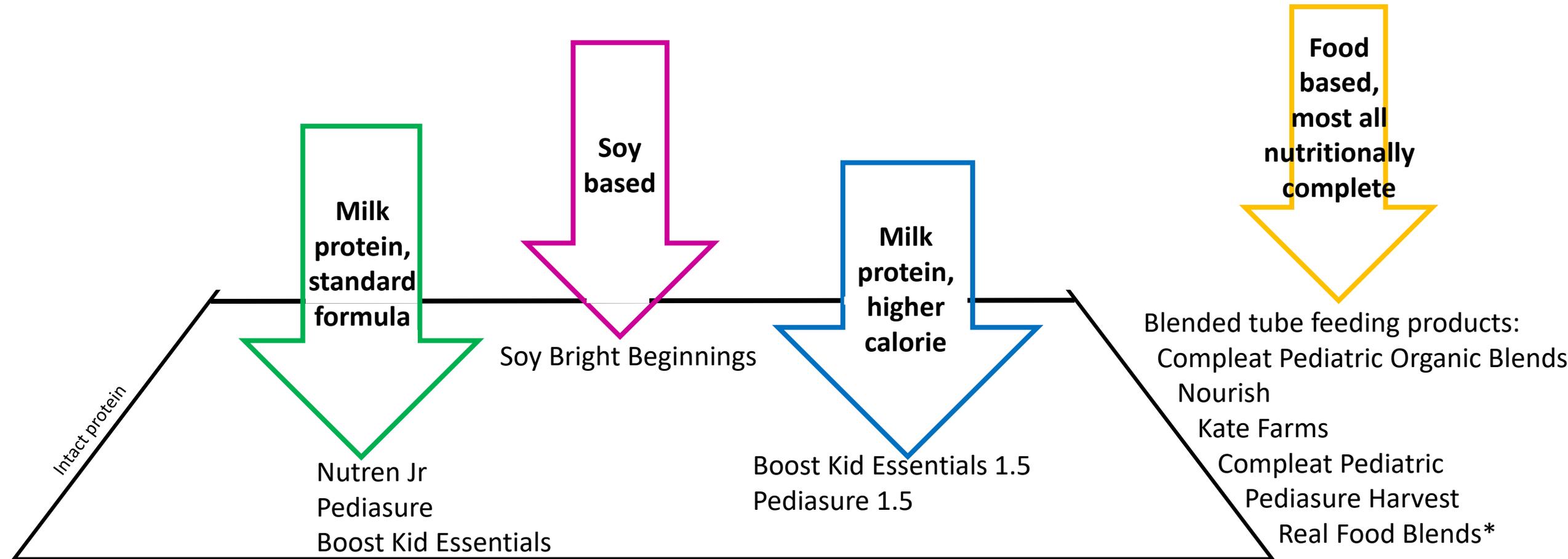
Soy Bright Beginnings

Pediasure 1.5 with Fiber

Boost Kid Essentials 1.5

Pediasure 1.5

Pediatric Formulas



Pediatric Formulas

Dairy protein broken down

Fully hydrolyzed protein

Peptamen Jr (1.0 and 1.5)
Pediasure Peptide (1.0 and 1.5)

Soy Bright Beginnings

Blended tube feeding products:
Compleat Pediatric Organic Blends
Nourish
Kate Farms
Compleat Pediatric
Pediasure Harvest
Real Food Blends*

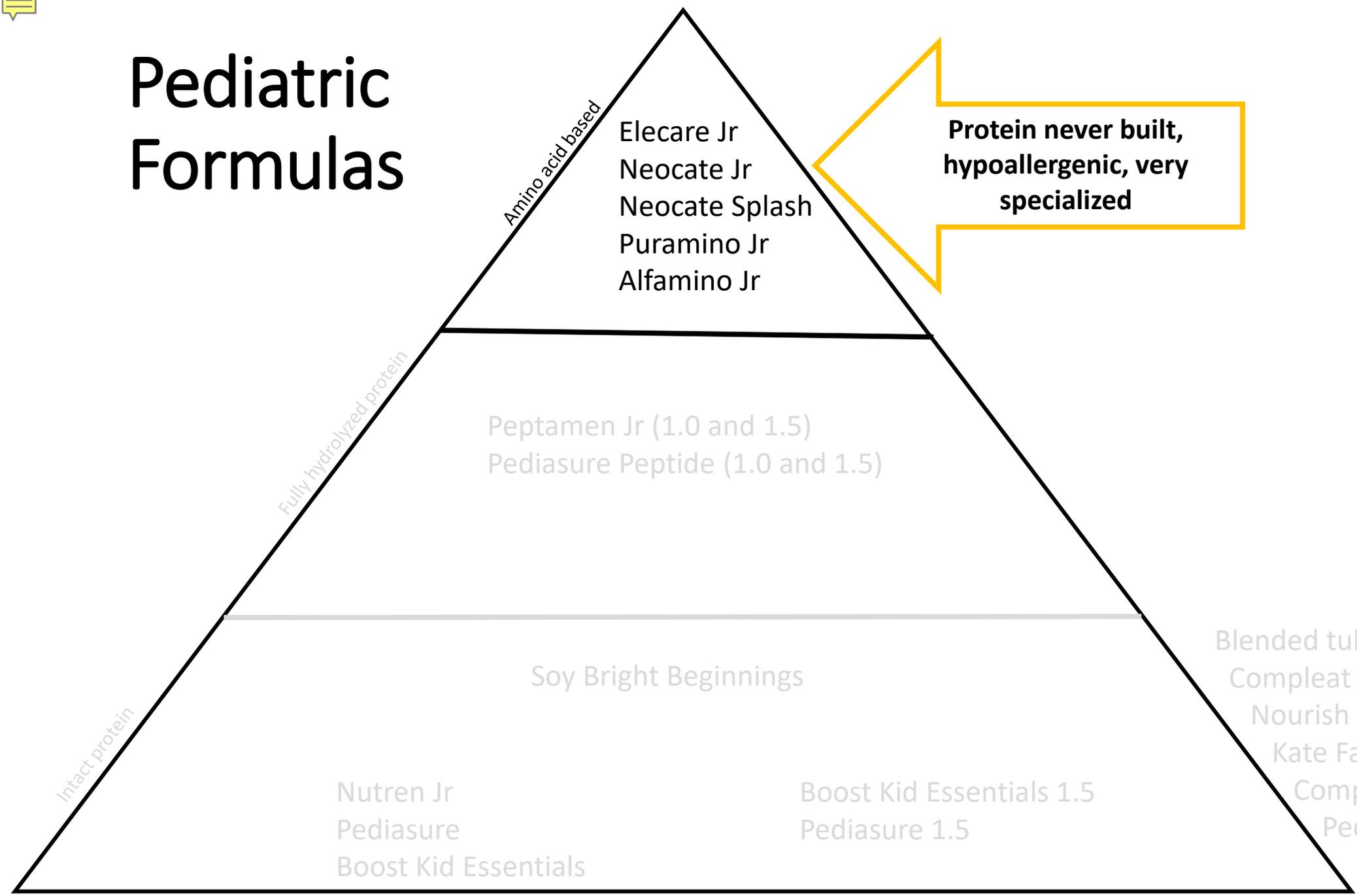
Intact protein

Nutren Jr
Pediasure
Boost Kid Essentials

Boost Kid Essentials 1.5
Pediasure 1.5



Pediatric Formulas



Amino acid based

Elecare Jr
Neocate Jr
Neocate Splash
Puramino Jr
Alfamino Jr

**Protein never built,
hypoallergenic, very
specialized**

Fully hydrolyzed protein

Peptamen Jr (1.0 and 1.5)
Pediasure Peptide (1.0 and 1.5)

Intact protein

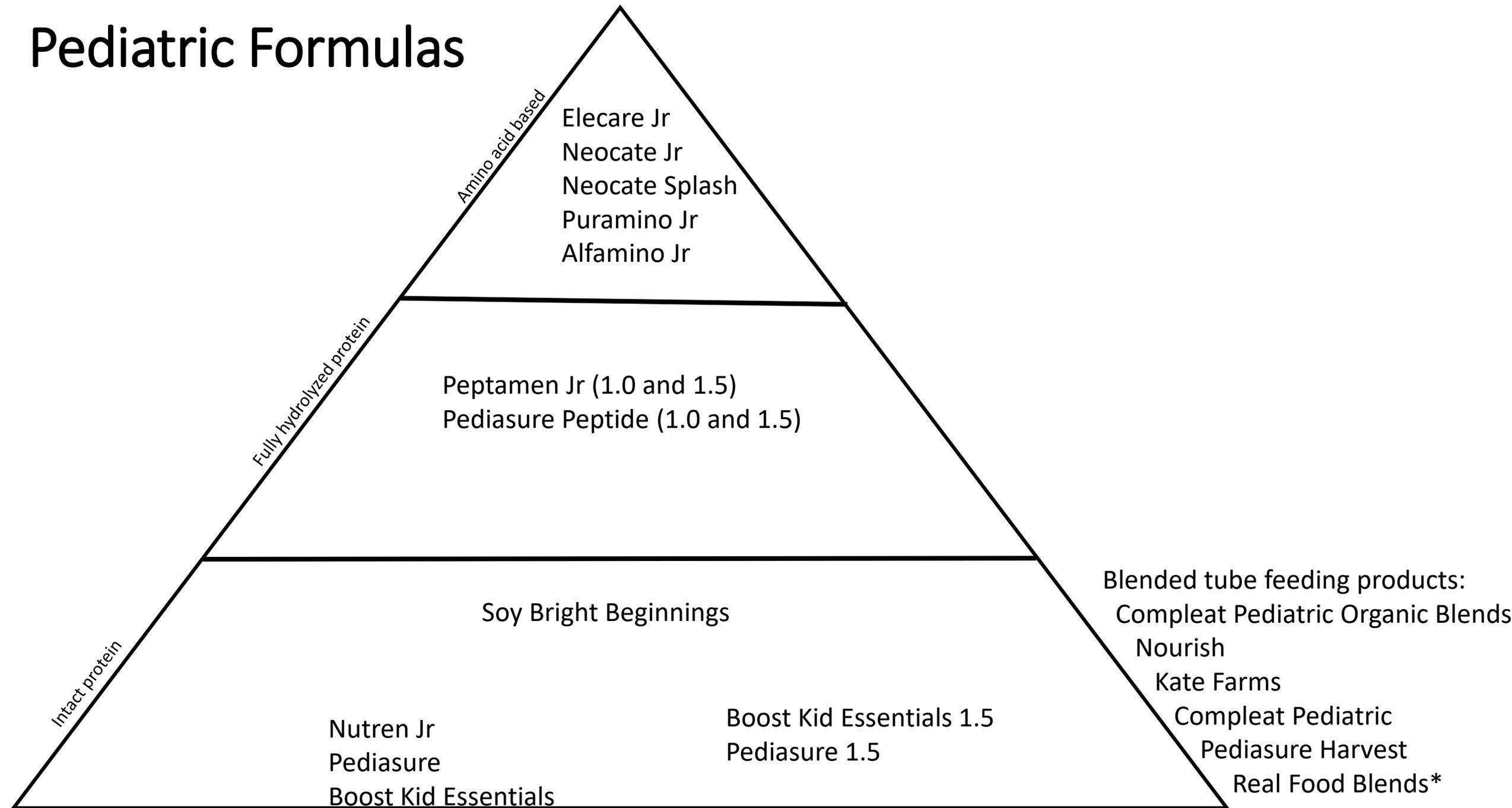
Soy Bright Beginnings

Nutren Jr
Pediasure
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Boost Kid Essentials 1.5
Pediasure 1.5

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Pediatric Formulas





Vitamins

- Not all diets are nutritionally complete
- Malnutrition can come in many forms
- Vitamin supplements are sometimes needed
 - Limited diets due to picky eating, medical conditions, choice
 - Conditions that cause malabsorption
 - Geography
 - Increased nutrient needs, metabolic conditions

Dietary Supplement Regulation

- Dietary Supplement Health and Education Act of 1994 (DSHEA)
- Manufacturers and distributors prohibited from marketing adulterated or misbranded products
 - **Manufacturers and distributors are responsible for evaluating the safety and labeling of their products**
- FDA will take action against adulterated or misbranded dietary supplements **after it reaches the market**

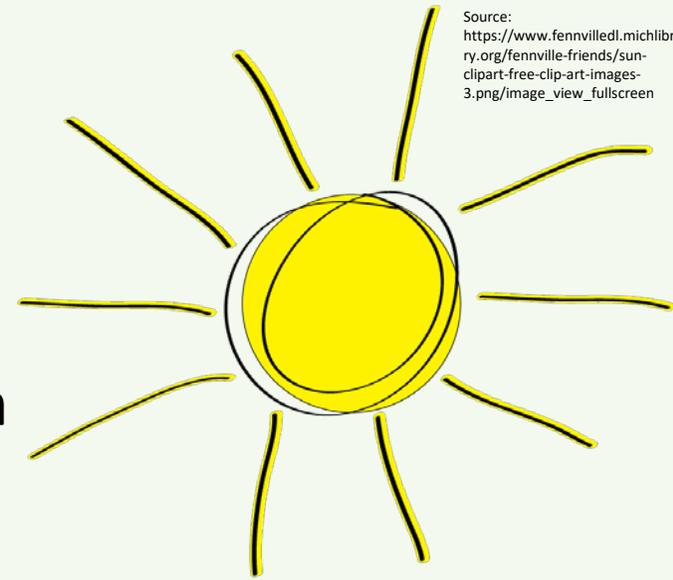


Vitamin Supplements

- Ensure that it's age appropriate
- Not excessive
- Iron or no iron?
- Supplement specific vitamins based on lab values
 - Vitamin D (25HD Vitamin D)
 - Iron (CBC, Iron panel, ferritin)

Vitamin D

- Important for calcium absorption and bone mineralization
- Naturally in very few foods
- Breastfed infants require 400 international units daily of vitamin D
- Formula fed infants may need additional vitamin D depending on volume of formula consumed
- Older children, vitamin D should be supplemented based on lab values
 - Deficient vs. insufficient
 - Age of patient
 - Ergocalciferol (D2) or Cholecalciferol (D3)
- Recheck lab after 2-3mos of supplementing



Source:
https://www.fennvillel.michlibra ry.org/fennville-friends/sun-clipart-free-clip-art-images-3.png/image_view_fullscreen

Iron

- Important for formation of hemoglobin and other blood and muscle proteins as well as enzymes
- Food sources:
 - Heme: beef, poultry, shrimp, eggs
 - Non-heme: instant oatmeal, kidney beans, tofu, spinach
- Iron absorption is increased with vitamin C
- Calcium can decrease iron absorption
- Iron be constipating, change stool color
- Supplementation based on lab values





Calcium

- Important for healthy bones and teeth, as well as cell signaling
- Too much calcium can cause issues with iron absorption, so important to check how much calcium containing foods a child is eating/drinking
- If on a dairy free diet, ensure milk alternative is calcium and vitamin D fortified
 - Ripple milk, oat milk, hemp milk tend to be good high calories, protein, fat
- Dairy foods are important calorie and fat source in toddlers
- Tums can be a good calcium supplement



Elimination Diets

- Many people are on elimination diets
- Personal choice vs. experience with food vs. medical diagnosis
- These are not without risks
- Diet is easy to change on own, but should be guided to ensure adequacy
- Counsel on substitutions

| Foods | Main nutrients |
|-----------------|--|
| Cow's milk | Protein, calcium, magnesium, phosphorus, vitamins A, B6, B12, D, riboflavin, pantothenic acid (iodine in some countries) |
| Soy | Protein, calcium, phosphorus, magnesium, iron, zinc, thiamin, riboflavin, vitamin B6, folate |
| Eggs | Protein, iron, selenium, biotin, vitamin A, B12, pantothenic acid, folate, riboflavin |
| Wheat | Carbohydrate, zinc, selenium, thiamin, niacin, riboflavin, folic acid, iron, magnesium, dietary fiber |
| Peanut/tree nut | Protein, selenium, zinc, manganese, magnesium, niacin, phosphorus, vitamins E, B12, alpha linolenic acid, linoleic acid |
| Fish/shellfish | Protein, iodine, zinc, phosphorus, selenium, niacin Fatty fish: vitamins A, D, omega-3 fatty acids |

Case Study

- 14yo boy presents with fatigue
- Overall healthy and well nourished per growth charts
- Picky eater
- Blood tests found macrocytic anemia and low vitamin B12. No antibodies to intrinsic factor or tissue transglutaminase
- Given vitamin B12 injections and “dietary advice”

Case Study

- Now 15yo developed hearing loss followed by vision symptoms
- MRI and ophthalmology exam were normal
- 2yrs later: progressive vision loss found to have optic neuropathy with 20/200 vision
- Neurologic exam and another MRI were normal
- Genetic tests, GI scope/biospies, Fibroscan were all normal

| | Result | Reference Range |
|-------------------------------------|--------------|-----------------|
| Hemoglobin, g/L | 148 | 130-160 |
| Mean corpuscular volume, fL | 100.4 | 83-100 |
| Platelets, x10 ⁹ cells/L | 250 | 150-450 |
| Creatinine, mg/dL | 0.5 | 0.7-1.2 |
| Total bilirubin, mg/dL | 1.3 | <1.2 |
| Alk Phos μ kat/L | 4.2 | 1-2.7 |
| Total protein, g/L | 74 | 60-80 |
| Adjusted calcium, mmol/L | 2.23 | 2.2-2.6 |
| CRP, nmol/L | <9.5 | <57.1 |

| | Result | Reference Range |
|---|-------------|-----------------|
| Vitamin A, $\mu\text{mol/L}$ | 0.8 | 0.8-2.2 |
| Vitamin E, $\mu\text{mol/L}$ | 14.3 | 10.2-39 |
| 25HD Vitamin D, nmol/L | 10 | >50 |
| Vitamin B12, pmol/L | 135 | 132.8-664 |
| Ferritin, pmol/L | 90.8 | 74.2-898.9 |
| Serum folate, nmol/L | 9.2 | 5.7-44.3 |
| Zinc, $\mu\text{mol/L}$ | 26.8 | 11-23 |
| Copper, $\mu\text{mol/L}$ | 9.8 | 12-23 |
| Selenium, $\mu\text{mol/L}$ | 0.55 | 0.59-1.65 |
| Manganese, nmol/L | 91.8 | 72.8-218.5 |
| Homocysteine, $\mu\text{mol/L}$ | 47.1 | 2-14.3 |
| Methylmalonic acid (urine), $\mu\text{mol/mmol}$ | 7.2 | 0.7-3.2 |

Case Study

- Persistent macrocytosis with normal ferritin, folate, and B12
- Homocysteine and MMA levels elevated indicating functional B12 deficiency, which led to nutritional evaluation
- No alcohol or smoking
- Growth was good
- Since elementary school has avoided foods with certain textures
- Will eat French fries, chips, white bread, ham lunchmeat, and sausage
- Didn't finish previous vitamin B12 injections



Case Study

- Provided supplements and referred to mental health for an eating disorder
- Vision stabilized, but did not improve
- Delayed diagnosis possibly d/t treated vitamin B12 deficiency. Homocysteine and methylmalonic acid are more sensitive indicators of functional vitamin B12 deficiency
- BMI is not the only indicator of malnutrition

References

- Groetch M, Verter C, Skypala I, Vlieg-Boerstra B, Grimshaw K, Durban R, et al. Dietary Therapy and Nutrition Management of Eosinophilic Esophagitis: A Work Group Report of the American Academy of Allergy, Asthma, and Immunology. *J Allergy Clin Immunol* Mar/Apr 2017; 5(2), 312-324.e29
- Harrison R, Warburton V, Lux A, Atan D. Observation: Case Report: Blindness Caused by Junk Food Diet. *A of Internal Medicine* Sept 2019

Questions?



Thank you!