Principles of Nutrition

Introduction,
Nutrition in Pregnancy, Lactation, Infancy and Childhood: A Broad Overview

This is our first look at how nutrition effects our body and how our development plays a significant role in what, when and how we eat. Nutritionists have long felt that there are signs of healthy nutritional status and unhealthy nutritional status. As you read through the following table, pay attention to any comments that are noted along the way.

Table 1: Clinical Signs of Nutritional Status

Features	*Healthy Status*	*Unhealthy Status*
General appearances	Alert, responsive	Listless, apathetic
Hair	Shiny, lustrous, healthy scalp	Stringy, dull, brittle, dry, depigmented[1]
Neck glands	No enlargement	Thyroid enlarged
Skin, face and neck	Smooth, slightly moist, good color, reddish pink mucous membranes	Greasy, discolored, scaly
Eyes	Bright, clear, no fatigue circles	Dryness, signs of infection, glassiness
Lips	Good color, moist	Dry[2], scaly, swollen
Tongue	Good pink color, no lesions	Smooth appearance, swollen, red, beefy
Gums	Good pink color, no swelling or bleeding	Receding, spongy
Teeth	Straight, no crowding, no discoloration	Unfilled cavities, missing teeth, worn surfaces[3]
Abdomen	Flat[4]	Swollen
Legs, feet	No weakness or swelling	Edema[5], tingling, weakness
Weight	Normal for height, weight and body build	Over[6] or Under weight
Posture	Erect, arms and legs straight, abdomen in, chest out	Sagging shoulders, sunken chest, humped back[7]
General vitality	Endurance, energetic, sleeps well at night, vigorous	Easily fatigued, no energy, falls asleep in school[8], looks tired[8], apathetic[8]
Nervous control	Good attention span for age, does not cry easily, not irritable or restless	Inattentive[9], irritable

[1]As we age our hair generally depigments. That is not a function of nutrition, rather, that of the process of growing old.

[2]Dry lips may have nothing to do with one's nutritional status: those of us who talk a lot or are mouth breathers may have dry, cracked lips; those who spend a great deal of time out of doors may have chapped lips. Chapstick or something like that will take care of the dried lip problem.

[3]Worn tooth surfaces may be because the patient/client has bruxism (grinds his or her teeth together). Discolored, or mottled, teeth may be because the person's mother took tetracycline antibiotics during that person's gestation.

[4]This means that the abdominal wall has no guarding, rigidity or other activities that are of a protective nature to the abdominal contents or are indicative of fluid retention in the abdominal cavity.

[5]Edema, while overloading on sodium can cause it, may represent congestive heart failure (now referred to as heart failure as not everyone gets congestion with it). This can be helped by watching sodium ion intake and by taking appropriate medications.

[6]There is that segment of the population that appears to be morbidly obese, but has no overt or covert health problems because of the obesity. Guamanians tend to be very large, but do not seem to have the associated health risks that those of us in the western world develop. Keep in mind that there is also a correlation of about 80% - 85% between being over-weight and depressed.

[7]A dowager's hump (or kyphosis as you learned in BIOL 223) may be due to nutritional inadequacy, or may be due to that person's genetic make-up. If the genes are present that do not permit enough calcium to be taken up, the bones will not be strong; if a woman has too many pregnancies too close together, the bones will not be strong. Both situations may set up an environment whereby the bones in the spinal column may begin to compress and fracture (compression fractures), causing the spine to "hook" forward in the classic anterior curvature of the thoracic spine that characterizes kyphosis.
[8]This is how most of my students look. This has nothing to do with nutrition, rather with the amount of time you are putting into your studies, your work and your life. I highly recommend that while you are taking classes that you make certain to exercise regularly (lets you study more efficiently) and get an adequate amount of sleep (for the general population this is somewhere around 7-9 hours a night).

[9]This may be due to being sensory over-loaded and have nothing to do with nutritional status. It may be because the person has attention deficit-hyperactivity disorder (ADHD). ADHD is NOT caused by anything that a person eats. It is a biological immaturity of the central nervous system, putatively through the reticular formation (reticular activating system) and involves reduced monoaminergic neurotransmitter activity.

Piaget's Theory of Cognitive Development and How It Applies to Feeding

Stage 1 (aka sensorimotor) tends to run from birth to 2 YOA, more or less. The baby progressing from automatic reflexes to purposeful interaction with the environment characterizes it. It is during this stage that the baby is initially using symbols. The relationship to feeding is that the infant moves from suckling and rooting to learning how to feed itself. Food is to stop hunger and to learn about his/her environment. It is also used to hone fine motor skills.

Stage 2 (aka preoperations) runs from about 2 YOA to 7 YOA, more or less. It is characterized by increased use of symbols. The child lives in an egocentric world. His/her thought processes are intuitive but unsystematic. Reasoning in this stage is based in "magic". The relationship to feeding is that eating is not as important as wandering around socializing while everyone else is eating. The child is learning to increase his/her language skills and can describe food by color, shape and how much he or she wants. At this stage, the child is learning -- vigorously -- his/her likes and dislikes.

Stage 3 (aka concrete operation) runs from about 7 YOA to 11 YOA, more or less. It is characterized by decreased egocentrism, which allows the child to listen to other's views. Cause and effect are more systematic and less "magic". They can focus on more than 1 aspect of an issue at once. Mental sorting emerges with generalizing ability. The relationship to feeding is that meal times are socially significant. Peer pressure increases with increased food selection in, amongst and with the child's social group. They begin to understand that "good foods" help them grow and be healthy, but are uncertain as to how or why it is.

Stage 4 (formal operations) runs from around 11 YOA on. It is characterized the expansion of hypothetical and abstract thought processes. They develop a deeper understanding of scientific/theoretical processes. The relationship to feeding is that they understand how nutrients "work" at the physiological/biochemical level -- within their level of comprehension/education. They have conflicts with food choices: 1) with "good" food vs foods that "taste good" and 2) with "good" food vs non-nutritious foods.

Nutrition in Pregnancy

Women who are at nutritional risk when they are pregnant include those who fall into one or more of the following categories/characteristics:

Nutritional Risk Categories				
Inadequate diet	Alcohol drinkers	Lack nutrition knowledge	<15 YOA	Bizarre food habits
Lactose intolerant	Illicit drug users	Lack sufficient money for food	>35 YOA	Therapeutic diet for a chronic disorder
Carrying more than 1 fetus	Under/over-weight at conception	Adolescents	Smokers	Medical problems during previous pregnancy
Gain insufficient weight (< 2#/month after first trimester)		Gain excessive weight (> 1 kg/week after the first trimester)		Frequent pregnancies: 3 or more in a 2-year period

Determinants of Nutritional Needs in Pregnancy

1) Age and Parity: (BTW: para = # of live births; grav = # of total pregnancies; aborta = # of abortions). If the mother to be is too young, she has nutritional needs for her OWN growth PLUS her pregnancy needs. If the mother to be is older, she has an increased risk of gestational diabetes. The amount of time between pregnancies effects the outcome, as well: it may cause intra-uterine growth retardation (IUGR). Each mother needs to give herself at least 2 years between pregnancies.

Age also seems to effect reproduction in terms of chromosomal abnormalities, as well. The incidence of mothers having children with Down Syndrome (trisomy 21) seems to follow a "U"-shaped curve, i.e., mothers who are very young and mothers who are aging (> 35) seem to have the highest frequencies of babies born with trisomy 21. Keep in mind that studies of the same sort have not been completed on fathers. At present, research is showing that at least a third of all cases of trisomy 21 are paternal. I suspect that in another 50 years or so, that we'll find that the "source" of the extra chromosome in trisomy 21 will reflect an equal distribution

across the sexes, i.e., we'll find that the extra chromosome doesn't "just" come from the mother, but from either parent equally.

2) Preconception Nutrition: Every life experience of the mother's to be is brought to the pregnancy, e.g., diet or the lack thereof, drug use (a woman is born with a fixed number of ova -- anything that happens to her happens to the ova, as well), her state of health and fitness (this is from lifelong (±) dietary behaviors and the mother's genetic lineage).

3) Complex Metabolic Interactions of Gestation: There are THREE entities of pregnancy: the mother, the placenta and the zygote/embryo/fetus. Weeks 0-2 post-conception are the zygotic period; Weeks 3-9 are the embryonic period; Weeks 10-38 are the fetal period. The following table summarizes the periods of vulnerability and some examples (non-inclusive) to the developing embryo/fetus:

Week of Gestation	System Effected	Week of Gestation	System Effected
3-6	CNS	6.5-9	Teeth
3.5-5.5	Heart	6.5-9	Palate
3.5-5.5	Arms	7.5-9	External genitalia
3.5-7.5	Eyes	2.5-9	Ear
3.5-8	Legs		

This table is only a review of that which you learned during fetal development in BIOL 224. Additionally, as you learned in BIOL 224, the greatest welfare factor on fetal development is that the chorionic villi are bathed by maternal blood. Recall that spiral arteries feed maternal blood through the decidua basalis (maternal part of the placenta) and that nutrients are taken up by the chorionic villi (fetal part of the placenta).

The functioning of the mother, placenta and embryo/fetus, while different, depends on appropriate functioning of each set of tissues, i.e., there is an incredibly important inter-dependence of all three entities on themselves.

Week 1-30, the fetus increases in weight (review fetal development in BIOL 224) and the maternal reproductive organs increase in weight (per table, below).

Weight Gain by Organ in Pregnancy	
Organ	Weight Gain in Pounds
Infant (birth)	8.5
Placenta	1.25
Increased blood for placental supply	4
Increased maternal fluid volume	4
Increased breast mass	3.2
Increased uterine/muscle mass	2.75
Amniotic fluid	2.3
Maternally derived fat stores	10
Total weight gained during pregnancy	36

The following table is a summary of recommended weight gain during pregnancy by BMI for a woman carrying a singleton embryo/fetus:

Weight-for-height category	Recommended total gain, kg (lb)
Low (BMI < 19.8)	12.5–18 (28–40)
Normal (BMI 19.8–26.0)	11.5–16 (25–35)
High (BMI > 26–29)	7–11.5 (15–25)

Data from Institute of Medicine and http://www.nutrition.org/cgi/content/full/133/6/1997S/T1

BMI	Comment	Rate of gain in trimesters 2 and 3	Total weight gained
< 20	Underweight	1 lb. per week	28-40 lbs.
20-26	Normal	1 lb. per week	25-35 lbs.
26-29	Overweight	0.5-0.75 lb. per week	15-25 lbs.
> 29	Obese	0.5 lb. per week	At least 15 lbs.

The physiological role of fat that has been deposited between week 1 and 30 is to protect the mother (fetus?) against the particularly high energy demands during the 3d trimester and first 6 months of lactation.

Energy is required for maintenance metabolism. This must increase because of increased cardiac output and respiratory rate, increased cellular mass in the uterus, placenta, fetus, breasts and increased kidney function.

The developmental pattern in pregnancy is that 1) fat synthesis dominates the early part of pregnancy and 2) raised maintenance metabolism dominates the 2d part of pregnancy. In terms of the energy cost of pregnancy in MEGA calories (Mcal; this is 1000 kcal or food calories), fat stores make up 36 Mcal, maintenance metabolism/tissue synthesis makes up another 36 Mcal, allowance for efficiency of enzymatic/protein conversion (about 90%) is 8 Mcal.

The total thus far is 80 Mcal. When figuring in the nutritional allowance of 258 kcal/day in excess of normal intake, this amounts to 65 Mcal. The difference between the 80 and the 65 Mcal, is 15 Mcal. Amongst other things, here's the energy for lactation (the 15 Mcal) post-partum.

Pregnancy protein requirements seem to be mostly in controversy. WHO says to increase intake by 6 grams/day and is based on egg protein. NRC says increase intake by 30 grams/day and is based on nitrogen balance studies. The latter prefers to err on the side of caution. The table, below, summarizes the minimum food selections for pregnant/lactating women.

Minimum Food Selections for Pregnant/Lactating Women		
Group	Non-pregnant/non-lactating woman	Pregnant/lactating woman
Meat/alternates	2	3
Dairy/alternates	2	4
Fruits	2-4	2-4
Veggies	3-5	3-5
Grains/breads	6-11	6-11

Summary of the Extra Daily Nutrient Allowances for Pregnancy and Lactation

Nutrient	Dietary Reference Intakes (DRI)[1]		
	Adult women	Pregnancy	Lactation
Energy,[2] *kcal*	19–50 y	↑ 340 kcal/d 2nd trimester ↑ 452 kcal/d 3rd trimester	↑ 500 kcal/d 0-6 mo ↑ 400 kcal/d 7–9 mo
Protein,[3] *g*	46	71	71
Vitamin C,[3] *mg*	75	85	120
Thiamin,[3] *mg*	1.1	1.4	1.4
Riboflavin,[3] *mg*	1.1	1.4	1.6
Niacin,[3] *ng NE*	14	18	17
Vitamin B-6,[3] *mg*	1.3	1.9	2
Folate,[3] *µg DFE*	400	600	500
Vitamin B-12,[3] *µg*	2.4	2.6	2.8
Vitamin A,[3] µg RE	700	770	1300
Vitamin D,[4] µg	5	5	5
Vitamin E, [3] mg α-TE	15	15	19
Vitamin K,[4] µg	90	90	90
Calcium,[4] mg	1000	1000	1000
Phosphorus,[4] mg	700	700	700
Magnesium,[3] mg	310	350	310
Iron,[3] mg	18	27	9
Iodine,[3] µg	150	220	290

[1] Values are from the Institute of Medicine and http://www.nutrition.org/cgi/content/full/133/6/1997S.

[2] Calculations are based on recommended intakes per day, assuming 9 months is equivalent to 270. Abbreviations NE, niacin equivalents; DFE, dietary folate equivalents; RE, retinol equivalents; TE, tocopherol equivalents.

[3] and [4] are, respectively, Recommended Dietary Allowance (RDA), the average daily dietary intake level that is sufficient to meet the nutrient requirements of nearly all (97 to 98 percent) individuals in a life stage and gender group and based on the Estimated Average Requirement (EAR); and Adequate Intake (AI), the value used instead of an RDA if sufficient scientific evidence is not available to calculate an EAR.

During pregnancy, exercise is of utmost importance. It not only makes the pregnancy go easier, it makes the delivery go MUCH easier. The following are guidelines to use for exercising while pregnant:

1) Stop when you feel over-heated;

2) Drink plenty of fluids before you exercise;

3) Avoid exercising in hot, humid weather;

4) Protect your abdomen from injury;

5) Discontinue your activity if you feel any discomfort;

6) NO exercise on your back after the 4th month;

7) Keep your heart rate less than 140 beats per minute.

In addition, you want to keep in mind that there are those in the medical profession that feel that specific weights are to be made on their schedules, not the mother's schedule. I'd prefer to see a mother put on an extra 10 pounds and be relatively content. I'd prefer to see her have a content baby and treat the baby well. I'd rather not have a mother go on a diet while she's pregnant and lose sight of her goal and lose any healthy perspective she may have had towards that baby while she's got an irate physician shouting at her that she's fat. If you run into physicians who have this attitude, find another one. This violates the first maxim of medicine: DO NO HARM! Typically, it's male physicians who have this problem with their female patient's weight.

As always, there are going to be some mothers who go through pregnancy with little or no increase in food intake -- also in lactation. In spite of this, birth weights are little effected UNLESS intakes fall disastrously. The effect that is directly attributable to diets less than or equal to 300 grams on birth weight is a 10% reduction in birth weight. The message here is that the fetus is protected at the expense of the mother.

Nutrition in Lactation

Breast milk doesn't "just happen". It takes energy to make breast milk.

Typical Incremental Calculation for Energy Needs During Lactation		
1	Volume of milk per day	850 mL
2	6 month's lactation (for calculation purposes)	155 L
3	Energy content and synthetic cost	135 Mcal
	Energy content	108 Mcal
	Synthetic cost	27 Mcal
4	Energy derived from maternal fat stores	36 Mcal
5	Net dietary requirements (3 minus 4)	100 Mcal
	Works out to	550 kcal/day

Minerals of serious consequence in breast milk include Ca and Fe. A typical days' supply of calcium in breast milk is about 300 mg -- remember, too, that Ca is really important in the last trimester of pregnancy for the fetus' rapid bone growth. The requirements of maternal Ca are in controversy: in developing countries, non-pregnant, non-lactating women are recommended

to take 300 mg/d as an adequate amount. In the U.K., 800 mg/d is necessary for zero balance. Perhaps industrialization is something we need to study and the effects of industrialization on Ca uptake in the female. Recommendations from the NRC and the U.K. are that lactating women require an extra 400 mg/d of Ca.

If a woman does not wait at least two years between pregnancies, she is running the risk of developing osteoporosis, prematurely. This comes about since Ca loss during the reproductive years come at the expense of bone demineralization. In short, lose Ca, get early fractures and osteoporosis -- or v.v. There is a paradox to this previous warning: women in developing countries who have 10-12 pregnancies and nurse up to 2 years on a Ca intake 1/4th that of the recommendation appear to NOT have a higher incidence of osteoporosis or fractures.

Iron is necessary to synthesize the mother's [and fetus'] RBC. To a SMALL extent, this need is met by the cessation of menstruation during pregnancy. Menses in the non-pregnant female, remember, leads to iron loss, hence supplementation is necessary, pregnant or not.

Composition of Breast Milk

Milk Comparison		
Human Milk	Parameter	Cow's
20 kcal/oz	Energy	20 kcal/oz
6-7% of energy (60% = whey: easy to digest curd)	Protein	20% of energy (80% = casein: tough, hard to digest curd)
High concentration	Taurine/Cystine (essential)	Low concentration
42% of energy	Lactose	30% of energy
50% of energy	Lipids	50% of energy
4%	Linoleic Acid (EFA)	1%
7-47 mg/dl	Cholesterol	10-35 mg/dl
Reflects maternal intake	B complex	Adequate
Reflects maternal intake	Vitamin C	Little
Sufficient	Vitamin A	Sufficient
Richer	Vitamin E	Poorer
49% absorbed	Fe	< 1% absorbed
Present	Lactoferrin	Absent
Lactoferrin is an iron-binding protein (FeBP) that deprives bacteria of the Fe and, hence, decreases bacterial growth.		
	Ca	3X human's
	P	6X human's
Supplement	Fluoride	2X human's
Increase the growth of	Lactobacillus bifidus	Doesn't
Breast feed for at least 3 months	IgA	----------
IgA protects the infant's gut from infection -- depending on the study and the pediatrician, there are recommendations for 6 months to 1 year of breast feeding a baby. Breast-fed babies are at a lower risk of infection than are formula-fed babies; they have lesser chances of becoming obese than formula-fed babies; they seem to bond better to their mothers than formula-fed babies.		

Formula vs Breast Milk

There are those times when a formula is necessary. In choosing not to breast feed -- regardless of the reasons -- it becomes necessary to find an appropriate formula for your baby.

When choosing a formula, there are a series of questions for which one must first obtain answers: Is the baby healthy? Is the baby a full term baby? If the answer to these two questions is "YES", then a "regular/standard" formula may be used.

If, however, a mother is not breast-feeding due to the infant's intolerance to one of several categories, then another series of questions must be answered: Is the baby lactose intolerant? If so, go to a lactose-free formula (generally soy-based; contains corn syrup or sucrose instead of the lactose). If not, use a regular formula.

Does the baby have milk hypersensitivity and is soy allergic? If the answer to this is "YES", use a hydrolysate formula (this contains various proteins that have been subjected to enzymatic hydrolysis to reduce the likelihood of causing an allergic reaction). If the answer is "NO", a formula containing soy-protein is appropriate.

Is the baby a pre-term baby and is the baby being breast-fed? If the answer is "YES" and "YES", continue with breast milk and add in special supplements to fortify the breast milk. If the answer is "YES" and "NO", you will need a special formula designed for prematurely born babies.

Does the baby have an inborn error in metabolism? If the answer to this is "YES", then you will need to use a therapeutic formula.

Formulas are typically based on cow's milk or soy-base.

NON-fat milk products include Enfamil, SMA (the whey to casein ratio is about equal to that in human milk in these two), Similac, Gerber Formula (was pre-heated to reduce the toughness of the curd of these two) and Good Start (hydrolyzed reduced mineral whey). ALL have vegetable oils added for "human-like" absorption.

Soy-based products are available for the children of vegetarians, for the management of galactosemia, primary lactose deficiency or recovery from secondary lactose intolerance, and for infants with POTENTIAL milk allergies who have NOT shown signs of allergy. These products are not for those with food allergies due to cross-allergenicity with soy products. Examples of these sorts of products include Advance, ProSobee and Isomil.

For those with OBVIOUS allergies, there are casein hydrolysate products, e.g., Nutramigen, Pregestenul and Alimentum.

Formula preparation is basically simple. Formulas are available as ready-to-feed, concentrates (use an equal volume of water to mix) or powder (2 oz of water with every tablespoon of powder). Make certain to read the instructions on your formula. When preparing formula, keep the area clean. Thoroughly wash bottles, nipples, mixers and the top of the milk can. Feed immediately after preparation. Toss the milk not drank. Refrigerate open cans. The latter is under controversy: some sources tell us to not save the milk in the can as the milk will react with the metals in the can. Other sources tell us that the cans are lined with a thin lining of plastic, rendering the metals unreactive with the milk. Discuss with your pediatrician to determine that which you'd prefer to do.

Undernutrition and Lactation

The effect on breast milk output and composition is uncertain. Maternal dietary supplementation does not cause an increase in milk yield. Total energy content and protein

concentrations in breast milk are maintained at remarkably normal levels in the developing world.

Question: Do reduced demands from a smaller baby control the amount of milk or does the low output of milk result in a reduced rate of growth? This is sort of the chicken vs the egg argument and has not been resolved satisfactorily.

Vitamin and Mineral Deficiencies

Water-soluble vitamins' content of breast milk is sensitive to dietary intake. Maternal diets low in thiamin will have a baby with infantile beriberi. Riboflavin content is effected DESPITE mechanisms, which favor the fetus during gestation at the expense of the maternal stores. If an infant is born riboflavin deficient and is breast-fed, the infant WILL REMAIN deficient unless the mother's diet is FORTIFIED with RIBOFLAVIN!

Vitamin C levels follow maternal patterns of intake and variation.

Fat-soluble vitamins are less clear, however. Well-nourished mothers have high Vitamin A levels in their milk vs high levels of β-carotene in UNDERNOURISHED mother's milk.

Mineral content needs more study. Malnourished mothers may produce milk with reduced average calcium content -- or not! Fe in breast milk is of crucial importance due to the high degree of efficiency with which it is absorbed. This efficiency is partly due the milk iron forming a lactoferrin-protein complex. Mothers with high iron intakes have elevated lactoferrin concentrations and vice versa.

Deficiencies in both vitamins and minerals in breast milk can be readily reversed with dietary supplementation: <u>THE issue of critical importance is the BALANCE of the diet as a whole!</u>

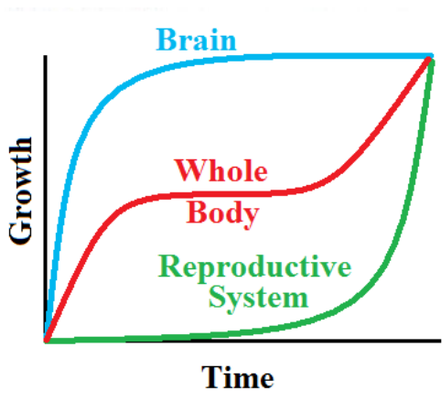
Nutrition in Infancy

A neonate is defined as the baby in his/her first month of life. An infant is the baby from one month of age to 2 years of age.

For the first few days following birth, infants lose weight. They generally regain it by 7-10 days of age. They will double their birth weight by 4-6 months of age (MOA) and triple it by 1 YOA. The weight gained in year 2 is approximately equal to the birth weight. Infants will increase their height by 50% by 1 YOA and will double their height by 4 YOA. Their stomach volume is about 10-20 mL on the day of their birth and about 200-mL by 1 YOA.

Growth from Birth to Roughly 20 YOA

The **BRAIN** reaches maximal growth by approximately 12 YOA and follows a rectangular hyperbola. The **REPRODUCTIVE SYSTEM** slowly grows until about 13 (±) YOA, then reaches a maximum by 20 YOA and follows a backward rectangular hyperbolic curve. The **BODY AS A WHOLE** follows a backward sigmoid curve. There is a rapid increase in growth until somewhere around 6 YOA, then it levels out until about 11 YOA (review your BIOL 224 on the growth spurt) when it grows rapidly to a maximum by about 20 YOA (what's the last bone in the body to stop growing?).



In terms of fat absorption, 85-90% of the fat in human milk is absorbed while less than 70% of the fat from cow's milk is absorbed. The absorption of fat from formula is approximately equal

to that observed from human milk. Remember, though, no cow's milk until the child is at least 1 YOA.

When do you add in "real" food into a baby's diet? When the birth weight is doubled, or when the infant is 6 months old, or when the infant can sit up, or after the baby eats 8 oz of formula and is hungry in less than 4 hours or after eating 32 oz of formula a day and demands more. The table, below, summarizes the satiety behaviors in infants and toddlers:

1-3 MOA	Pulls away from nipple; falls asleep; after nipple re-inserted, closes mouth tightly; bites nipple; purses lips; smiles and lets go
4-6 MOA	Releases nipple and pulls away; fusses/cries; obstructs mouth with hands; pays more attention to surroundings; bites nipple
7-9 MOA	Changes posture; keeps mouth tightly closed; shakes head ("NO!"); plays with utensils; hands become more active; throws utensils and food
10-13 MOA	As above; sputters with tongue and lips; hands bottle or cup to "feeder"

In addition to earlier discussion, when preparing food for infants and toddlers at home, follow the following guidelines:

1) use fresh, quality fruits, vegetables and meats;

2) Clean everything beforehand;

3) Wash your hands before preparing the food;

4) Use as little water as possible before cooking;

5) Cook until tender in minimal water -- avoid over-cooking;

6) Use no extra salt and only minimal sugar -- for infants < 1 YOA, use NO honey or corn syrup;

7) Add just enough water for food to be easily pureed;

8) Strain/puree food with an electric blender, food mill, baby food grinder or kitchen strainer;

9) Pour the puree into an ice cube tray and freeze;

10) When frozen hard, remove and store in freezer bags;

11) Defrost and heat the amount used in/for a single feeding.

What and when do you add “people food” into the diet? In addition to the earlier discussion, at 4-6 MOA, add iron-fortified rice cereal (Fe is a BIGGEE!) and other cereals as you wish. 3 tablespoons of iron-fortified cereal is all they need due to increased bioavailability of the Fe. Continue giving until at least 1 YOA to recover from iron losses.

Refrain from wheat cereals until the baby is 7-9 MOA if there is a familial history of [food] allergies.

At 5-7 MOA, add strained veggies and fruits -- add the veggies FIRST as humans inherently like sweets better than veggies. If you do it the other way around, you may never get your child to eat veggies. OJ is allergenic in some infants. Because of this, start with apple juice. Remember

to NOT put your baby in its crib with a bottle of fruit juice. This is a wonderful way in which to cause baby bottle caries. It's best to not put the baby in bed with a bottle, anyway, as it will effect the way in which teeth come in.

At 6-8 MOA, add higher protein foods like cheese, yogurt, cooked beans, de-boned fish and egg yolk (yolk is NOT as allergenic as whole egg, so start easy).
At 9 MOA, add finely chopped meat and teething biscuits.

At 10-12 MOA, add whole eggs, whole milk (the latter preferably after 12 MOA).

A sample diet for a 12 month old child is summarized below (it varies by child; also, your child's liver only has 2-3 hours worth of glycogen stores, so plan ahead for meals and snacks):

Breakfast	Lunch	Snack	Dinner
1 cup milk 3 T cereal 2-3 T fruit Teething biscuits	1 cup milk 2-3 T veggies 2 T chopped meat OR 2 T well-cooked mashed legumes (protein)	0.5 cup milk teething biscuits 1 T peanut butter	1 cup milk 1 egg 2 T cereal or spuds 2-3 T veggies 2-3 T fruit

Minimal Food Group Servings per Day for People of Varying Ages are summarized in the table, below:

Food Group	6 MOA - 9 YOA	9-12 YOA	12 and gained height in last year	13-24 YOA and no height gained in last year	Mature adult
Fruits and Veggies					
Carotenoid rich (Vitamin A)	1	1	1	1	1
Ascorbate rich (Vitamin C)	1	1	1	1	1
Others to equal a total of:	4	4	5	5	5
Grains					
	4	4	6	6	6
Dairy					
	2-3	3	3	3	2
Meats/alternates					
	2	2	2	2	2

The New Food Guide Pyramid for Kids

A rainbow of colored, vertical stripes represents the five food groups plus fats and oils (next page, top). Here's what the colors stand for: orange – grains; green – vegetables; red – fruits; yellow - fats and oils; blue - milk and dairy products; purple - meat, beans, fish, and nuts. (Source: http://kidshealth.org/kid/stay_healthy/food/pyramid.html)

NEW Food Groups: Skinnier bands are foods to eat less of and Thicker bands are foods to eat more of. Examples follow in table, below.:

Food Group	Grains	Veggies	Fruits	Milk and Dairy Products	Meats, fish, beans and nuts
Size of Serving	ounce equivalents	measured in cups			An ounce equivalent
Examples of servings	1 piece of bread 1/2 cup of cooked cereal, like oatmeal 1/2 cup of rice or pasta 1 cup of cold cereal				1 ounce of meat, poultry, or fish 1/4 cup cooked dry beans 1 egg 1 tablespoon of peanut butter, a small handful of nuts or seeds

Clarification: Keep in mind that this not inclusive, merely examples. You also can see the bands of the pyramid start out wider and get thinner as they approach the top. That's designed to show you that not all foods are created equal, even within a healthy food group like fruit. For instance, apple pie might be in that thin part of the fruit band because it has a lot of added sugar and fat. A whole apple - crunch! - would be down in the wide part because you can eat more of those within a healthy diet.
Source: http://kidshealth.org/kid/stay_healthy/food/pyramid.html

A Compressed Analysis of A Typical 1-2 YOA Child's Lunch

Food Group	kcal	g carbohydrates (CHO)	g protein (CHON)	g lipid (fat)
Dairy	60	9	6	0
Breads/grains	72	15	3	0
Fruits/veggies	88	20	2	0
Meat/alternates	491	22	40	27
Total	711	66	51	27
Conversion factor (kcal/g)		4	4	9
Total energy (kcal) per nutrient		264	204	243

The table below summarizes the first two-year feeding behavior progressions as kids become more independent in their search for food:

Infant/child behavior	Caregiver's reaction	Food examples
Tongue wiggles food laterally Tongue and lips work under infant's control, i.e., no drooling Can sit on his/her own Chews (±) with jaw in up-n-down motion	Give soft, mashed table food	Tuna, mashed potatoes/veggies, bananas, yogurt
Pincer grasp of objects Moves hand to mouth	Give large finger foods	Dry toast, teething biscuits, cheese sticks, peeled Vienna sausages
Refined pincer grasp (lets go)	Give small finger foods	Bits of cottage cheese, dry cereal, small pieces of meat
Rotary chewing pattern	Give more textured food from family menu	Well cooked chopped meat, cooked vegetables, macaroni, spaghetti
Infant/child behavior	Caregiver's reaction	Food examples
Can approximate lips to the rim of cup	Begin cup use with help	
Figures out that something he/she wants is in a container	Begin self-feeding: MESSY! (A trick with this is to use a seat that clamps to the breakfast bar or a high chair and put an old shower curtain under it to catch the "over flow")	Foods that when scooped will stick to the spoon, applesauce, cooked cereal, mashed potatoes, cottage cheese
Increased rotary jaw movement Ulnar deviation of wrist develops	Greater skill with cup and spoon	Chopped roast, chopped steak, raw veggies (SLOWLY 3-4 days between new foods) and raw fruit (SLOWLY)
Walks alone Names food Has preferences Prefers unmixed food Food jags Appetite seems to decrease	Child seeks food on own -- a trick with this is to put his/her food in a low cabinet so that he/she can pick out his/her foods	Food of increased nutrient value Let child have a balanced diet AND develop own preferences PARENTS: do NOT be concerned with these preferences: they'll CHANGE

NOTE: Avoid honey and corn syrups during the first year because of Clostridium botulinum spores. This causes true botulism. The spores are present because neither syrup can be heat sterilized to destroy the spores.

Infants and Children Have Water Requirements, Table, below:

AGE	Water requirements (mL/kg BW/day)
10 days	125-150
3 months	140-160
6 months	130-155
1 year	120-135
2 years	115-125
6 years	90-100
10 years	70-85
14 years	50-60

Note that although the water requirement in milliliters/kilogram body weight/day seems to decrease, because of the increasing weight of the child, the amount of water totally ingested actually increases. As we age, these requirements continue to change.

Nutrient Deficit Effects on Behavior

Iron is a BIGGEE! Fe is required with hemoglobin for oxygen transport to cells with other proteins for oxygen transport in cells. A lack of iron leads to 1) energy crises, 2) directly affects behavior, mood, attention span and learning ability and 3) abnormal synthesis/degradation of neurotransmitters which are used to regulate attention span.

Diagnostically, blood tests may be done when the patient has anemia (CBC). The brain, however, is affected long before anemia is diagnosed. This affect may be observed as follows: decreased motivation to persist in intellectually challenging tasks, decreased attention span and/or decreased overall intellectual performance. Anemic children perform less well on tests and have more conduct disturbances than their non-anemic classmates.

Behavioral signs of nutrient deficiencies include irritability, aggressive, disagreeable, and/or sad and withdrawn. The labels placed upon kids, in particular, by the very ones we entrust their care and education to include hyperactive, depressed and unlikable.

Malnutrition is complex with multiple ramifications -- not only from a biological perspective, but a sociological and psychological one, as well. More training in the area of working with kids to determine the root of their behavior and altering the behavior in productive, non-judgmental ways is greatly needed.

Lead poisoning leads to iron-deficiency anemia. This anemia impairs bodily defenses against lead absorption, which keeps the lead uptake cycling and making the anemia worse. 1 out of 7 children (2010) between the ages of 6 months and 5 YOA are effected/affected with lead poisoning -- even in this day and age! This is an improvement, for as recently as 2005, the ratio was 1 in 6 – progress!

Food Allergies

The primary foods involved in food allergies include nuts, eggs, peanuts, chicken, milk, fish, soybeans, shellfish, wheat and mollusks. This list is not inclusive.

There are two kinds of food allergies:

1) Symptomatic (indicated by the presence of antibodies and symptoms, e.g., nausea, vomiting, skin rash, asthma)

2) Asymptomatic (indicated by the presence of antibodies, but NO symptoms characterize the latter).

Food INTOLERANCES are not the same as allergies, but have similar symptoms. This can make it very confusing when trying to figure out if the reaction is an allergic reaction or an intolerant reaction, e.g., allergic reaction to molds, antibiotics and other food poisoning; Chinese restaurant syndrome caused my the ingestion of MSG (1 in several hundred are sensitive to MSG); reactions to bacterial toxins, e.g., C. botulinum; reactions to chemicals in foods, e.g., the natural laxative in prunes; symptoms of digestive disease such as hernias and ulcers, aggravated by eating any food; enzyme deficiencies, e.g., lactose intolerance, which cause symptoms SUPERFICIALLY indistinguishable from those of food allergy; psychological reactions based upon the belief that certain foods cause certain symptoms.

Hyperactivity and Diet

Hyperactivity occurs in 5-10% of young school-age children (1 or 2 out of 20; clinically, 6-9 times more prevalent in males than females and increasing as of 2010). This can lead to academic failure, major behavior problems and incredible societal labeling. It is of GREAT importance that parents of kids with hyperactivity (specifically ADHD) watch their primary and secondary public school teachers for this kind of labeling and nip it in the bud decisively!

A quick diagnostic test for this is to have the MD give a stimulant to the child. With hyperactivity, it (they) paradoxically "calm" the child down -- putatively by stimulating the reticular formation (reticular activating system) to "wake up" and focus the child [and adult, as we are now finding out]. If a child responds, medications are prescribed as necessary.

NO behavior problems originate with diet other than the general misery caused by malnutrition. This includes the commonly held belief that if you give children sugar, they will bounce off the walls! Research has shown very conclusively that kids who receive wholesome, healthy food and appropriate attention from their parents do not bounce off the walls when given sugar. Conversely, kids who do not receive appropriate attention and who receive junk food from their parents all the time continually bounce off the walls. The latter conclusion is that these kids have learned that negative attention is better than no attention and bounce all over the place seeking it. Additionally, our bodies run on a simple sugar (glucose). 'Nuf said.

Lastly, food allergies do NOT cause hyperactivity!

Some of the normal, every day causes of the wild and hyper child include a desire for attention, a lack of sleep, over stimulation, too much TV and a lack of exercise. All these add up to Tension Fatigue Syndrome, which is an apparent hyperactivity, produced in a child by the above combinations.

Caffeine

Caffeine does irritate children! A 12-oz. soda has, on the average, 50-mg caffeine. 2 or more sodas per 60 lb. child is equal to the amount of caffeine in 8 cups of coffee per 175-lb. adult. All of this caffeine may cause sleeplessness, restlessness and irregular heartbeats. 77% of 1000 kids (770 kids!) between 1 and 17 YOA were "caffeine consumers" in one study!

Caffeine Content in Some Beverages, Foods and OTC Medications, Summarized, below:

Beverage, Food and OTC Medication	Average Caffeine Content (mg/serving)
Coffee, 5 oz., brewed, drip	130
Tea, 5 oz., brewed, US	40
Tea, 5 oz., brewed, imported	60
Diet soda	28
Chocolate milk	5
Jolt	72
Triaminicin	30
Dristan	0
Excedrin	130
Vivarin	200
Anacin	32
Dexatrim	200

How may schools respond to children's' nutritional needs and tastes?

1) Increase the variety of offerings and allow children to choose what they are served.

2) Vary portion sizes (little children with little portions) as are age- and child-appropriate.

3) Involve students in menu planning (secondary students).

4) Improve scheduling of lunches and snacks so children eat when hungry and have time to eat well -- feeding children when it's convenient for adults puts our kids at risk of not performing up to their abilities.

Research has shown, conclusively, that the younger we are, the better we do in the later part of the day -- conversely, the older we are, the better we do in the early part of the day. Funny how we have the old group of people preparing the young group of people, isn't it?! And they wonder why the younger generation has no respect for the older generation!

Nutritionally, the best K-3 or 4 teacher is one who makes certain his/her students get a snack mid-morning. The significance, of course, is that these kids have depleted their liver glycogen stores by mid-morning. It's easier for children (and adults) to study on full stomachs/livers than the other way around as anyone with a modicum of observational skills will attest to.

Adolescent Growth and Nutrition

Table, below, summarizes, non-inclusively, developmental tasks facing the adolescent

Task	Approximate age (YOA)
More mature relationships with peers from both sexes	11-16
Establishing gender role	11-17
Accepting one's physique and using one's body effectively	11-18
Becoming emancipated from parents/other adults	13-22
Preparing for marriage/family	16 on
Choosing/preparing for vocation	15 on
Developing standards and value systems as guide to behavior	13 on
Developing social intelligence and a commitment to responsible citizenship	17 on
Developing conceptual and problem solving, decision making skills	11-17 (±)

Growth and Nutritional Needs during the Teen Years

Table, below, summarizes foods for nutritional requirements for teens:

Food Group	Exchanges	Minimum kcal	Amount for 13-17 year old teen
Bread	4-6	480	4-6 slices or more
Cereal	2	160	1 cup or more
Veggies, Raw	1/2	13	1/2 cup
Veggies, Cooked	1	25	>1/2 cup
Potato, rice or pasta	1	80	1 large or 3/4 cup
Fruits, Citrus (Vitamin C source)	1	60	1/2 cup or 1 tablet
Fruits, Other	1	60	1 each (1 apple, 1 banana)
Dairy	4	360	>4 cups
Lean meat, poultry, fish	2	110	4 oz
Lentils, PB	1	80	1-2 servings/week, 1/2 cup cooked beans; 2T PB (about 1 oz meat equivalent)
Eggs	1	75	3-4 weekly
Total		1500 kcal	

Tanner Comparisons – Across Genders

The female adolescent growth spurt occurs about 10-11 YOA and peaks about 12). Fat becomes a greater percentage of total body weight (22%) in females. An inactive female at 15 YOA with growth at a standstill may need less than 2000 kcal/day to avoid obesity. The total nutrient needs are the greatest during adolescence than at any other period of growth EXCEPT pregnancy and lactation.

The table, below, compositely summarizes the minimal food group SERVINGS (NOT exchanges -- more in another chapter on this) per day for an adolescent, comparing un-pregnant and pregnant teen requirements.

Food Group	UN-pregnant teen	Pregnant teen
Fruits/Veggies		
Vitamin A rich	1	1
Vitamin C rich	1	2
Other (for a total of)	5	5
Breads/Grains	6	At least 6, preferably more
Dairy/products	3	5
Meat/alternates	2	3

Foods that Increase Energy and Protein for Pregnant Teens are summarized in the table below:

PB (2T) Sandwich	320 kcal	PB (2T) Sandwich, 12 oz milk	29 g protein
1 cup cereal, 8 oz low fat milk, banana	325 kcal	3 oz meat/poultry, 8 oz milk	31 g protein
2 slices of 12" cheese pizza	290 kcal	Cheeseburger	33 g protein
8 oz flavored yogurt with 4 crackers	320 kcal	1 cup spaghetti with meat sauce, 2T parmesan cheese, 8 oz milk	32 g protein
Plain hamburger	305 kcal		

If you are presented with an adolescent who is pregnant, be aware of the following:

1) she will need to gain about 35 lbs. during her pregnancy; with lesser weight gains, she will have a smaller baby;
2) the greatest risk of teenage pregnancy is death of the infant;
3) the highest infant mortality rate occurs with mothers who are 15 YOA or younger;
4) the second highest infant mortality rate is with mothers between 15 and 20 YOA;
5) 1 out of every 5 babies (i.e., 20%), nationwide, is born to a teenager;
6) slightly more than 10% of these teen mothers are less than 15 YOA.

Tanner Comparisons – Across Genders

The male adolescent growth spurt occurs about 12-13 YOA and peaks about 14 (±). Lean body mass makes up the greater percentage of total body weight (twice as great as in females) and fat drops (15% of total body weight). An active male at 15 YOA may need more than 4000 kcal/day just for MAINTENANCE.

A nutrient of special interest is iron. Iron needs increase in adolescent females because of menarche and in males because of the increase in lean body mass (LBM). Iron-rich sources/snacks include hard-boiled eggs, bran muffins and PB with crackers.

An additional mineral of significance is calcium. It is sometimes a problem with teens, as they feel it is (and whine when you say this) "BA-by food!" The problem is that the calcium requirements are greatest in adolescence. If your teenager drinks sodas, s/he may have a reduction in Ca intake. As regards adolescents, all adults can do is make the food available, THEN leave the decision up to the teenager -- remember how much you listened to your parents when you were a teenager.

Likewise, remember that teenagers are NOT fed, they EAT! They have irregular feeding patterns due to increasing social and economic commitments. Adults need to avoid nagging, scolding and pressuring your adolescent into eating -- you will be successfully ignored (remember when you were a teen and how much you listened to your own parents).

About 25% of the energy that teens take in are from snacks. Typically, they will get enough protein, thiamin, riboflavin, B_6, Mg and Zn from snacks. If the snack is with a dairy product, they'll probably get enough Ca. They will NOT obtain enough Fe, vitamin A and/or folate. While protein doesn't need to be stressed, CAREFUL encouragement will get the teen to look at more dairy (Ca) and vegetables (vitamin A and folate). If vitamin A intake is reduced, folate intake will be reduced as well, as both come from the same sources.

A Typical Junk-Food Lunch for Teens

Eaten by male and female teens (particularly those who attend open campus high schools near fast food joints). The lunch consists of a hamburger, chocolate shake and fries. Note that one "only" needs to add fruits/veggies (vitamins A and C sources), good fiber source and folate, Fe and Zn sources at other meals to "balance this out" for a healthy diet:

	% RDA	
Nutrient	MALE	FEMALE
Energy	27	37
Protein	41	55
Ca	32	32
Fe	30	24
Vitamin A	8	10
Thiamin	34	47
Riboflavin	53	73
Niacin	32	43
Folate	23	26
Vitamin C	16	16
TOTAL kcal:	820 kcal	

In terms of adolescent nourishment, one study found that males met the RDA (Recommended Daily Allowance) for all nutrients. Females did NOT meet the RDA for Fe, Ca or vitamin A. Another study showed inadequacies in female diets in B_6, Zn, folate, iodide, Vitamin D and Mg. The gender differences in the diets in both studies reflect the males' eating habits: they shoveled a lot of food in!

The table, below, summarizes the recommended energy/protein allowances for adolescents. With changes in height due to growth spurts, the following units are normalized to a "per cm" unit. Also, remember that in females, the growth spurt ranges from 9.5-14.5 YOA and peaks about 12 YOA ±; in males it's about 10.5-17.5 YOA and peaks about 14.5 YOA.

FEMALES				
Age (YOA)	Ht (cm)	Wt (kg)	kcal/cm	g protein/cm
11-14	157	46	14	0.29
15-18	163	55	13.5	0.26
19-24	164	58	13.4	0.28
MALES				
11-14	157	45	16	0.28
15-18	176	66	17	0.33
19-24	177	72	16.4	0.33

Body Image in Adolescence

Teens have mixed emotions about themselves -- duh! They feel uncomfortable with the rapid changes they are going through. They want to be like their peers. They want to be like their "most perfect" peers. Think about your own adolescence and remember how much fun it was or wasn't. All of these mixed emotions lead to turmoil because the teen's sense of worth MAY be derived by or how s/he feels about their physical attributes (if you don't believe this, just look at any teen magazine or commercials on TV). These feelings of self-worth, or the lack thereof, may lead to nonsensical weight loss, the use of supplements and/or bingeing and/or dietary restrictions. Any of these leads to an incredible vulnerability to having SEVERE distortions if (when?) an eating disorder develops.

Two landmark studies (**Am J Dis Child 144: 475, 1990 and Am J Dis Child 144: 144, 1988**) looked at a number of teen image issues by studying 1700 adolescents and young adults, ranging in age from 12-23 YOA. The study group was about equal in distribution in male and female subjects. This study revealed that more than 50% of the NORMAL weight-females considered themselves OVERWEIGHT; 60% of UNDERWEIGHT girls were satisfied with their weight. 31% of males of NORMAL weight were dissatisfied with their weight; 2/3 of the 31% felt they were UNDERWEIGHT. The number of overweight subjects in both groups was equal by objective (NOT subjective) review: 40%.

There was one huge disparity, though, between the genders. 63% of the females who were dissatisfied felt they were overweight while 22% of males who felt dissatisfied felt they were overweight. In terms of body shape, 54% of the females were dissatisfied. They were primarily concerned with thighs and hips. 33% of males were dissatisfied. They were primarily concerned with chest/arms/abdomen.

The per cent of adolescents by sex who DELIBERATELY altered their eating habits and the behaviors they utilized:

MALES	BEHAVIOR	FEMALES
11%	Attempted weight loss	38%
12%	24 hour fasting	31%
24%	Bingeing	30%
2%	"auto-purgatation" (self-induced vomiting)	8.5%
11%	Problems with weight control	31%

Obesity

Obesity is a combination of factors: psychological, physiological and cultural. Obesity is defined as a condition of excessive fatness -- either general or localized. Overweight is a state in which weight exceeds a standard based on height. We'll discuss this more later.

The longer a teen is obese -- REGARDLESS of the reason -- the body will adapt to maintain a state of obesity. These teens do not want to be seen where vigorous exercise is required (have them take walks, ride bikes, swim). These teens will be/are subjected to real OR imaginary social rejection. 14% of obese infants, 40% of obese 7-year olds and 70% of obese 10-14-year olds will become obese ADULTS! With these kids, encourage NON-competitive exercises like walking, cycling, and swimming with POSITIVE reinforcement.

Teens are vulnerable to the unrealistic times/efforts about effective weight management: MAGICAL thinking, again! They want a QUICK FIX!

Fad diets + [diet] drugs + equipment = QUICK REMEDY + LOSS OF MONEY

There is a scarcity of realistic, comprehensive, educational and therapeutic programs for these kids. For these programs, if present, at all, to be successful, they MUST INCLUDE individualized diet programs, individualized fitness programs and individualized support programs. AND ... they MUST ALL involve the family with the individual in a POSITIVE manner -- like this is really gonna happen in inter-adolescent/sibling relationships. If the latter doesn't exist in a healthy manner, and doesn't appear promising, the adolescent will have to develop a hide thick as a rhino's and learn to cognitively provide a great deal of his/her own reinforcement.

The table, below summarizes possible signs/symptoms of eating disorders with weight loss:

Medically Evident	Visually Evident
Pituitary abnormalities	Thinning, dry hair
Altered thyroid function	Cold sensitivity, lowered body temperature
Reduced heart size (reduced fat)	Light-headedness
Bradycardia	Reduced muscle mass
Lowered EKG amplitude	Lanugo (fine, raised, white hair on body surface)
Mild anemia	Amenorrhea and/or constipation
	Loss of subcutaneous fat, Dry skin
	Slower reflexes
	Edema

ACNE

More than 50% of adolescents contact a health care professional regarding acne. Acne is a normal part of development (review effects of testosterone in BIOL 223/224 notes). Testosterone's effects on sebaceous glands initiate it. Acne is mediated by stress, stage of menstrual cycle and tissue composition. THERE IS NO CORRELATION BETWEEN FOOD AND ACNE. Effective medications for acne include oral antibiotics (against Propionibacterium acnes), topical benzoyl peroxide, topical Tretinoin (retinoic acid) and Accutane (isotretinoin; elevates blood triglycerides and cholesterol -- are reversible by discontinuing; this drug is also teratogenic/mutagenic).

From 1 study, it has been suggested that zinc deficiency exacerbates acne. However, zinc replacement therapy does NOT reverse acne. Hence, zinc is probably not an effector/modulator/mediator of acne.

Behavioral Problems, Delinquency and Nutrition

Nutritional status suggests that an environmental factor may be suspected of causing serious adolescent problems. The popular press gives attention to untested -- or disproven -- theories on nutritional affects on behavior, e.g., shortened attention spans, learning disorders, criminal behavior. Theories abound and include, but are not limited to, too much sugar in the diet (FALSE!), heavy metal intoxication (not as prevalent as the press would have us believe), food additives (stomach cancer actually decreased when BHT was put on the market), allergic reactions. Dietary factors will alter brain function or behavior therapeutically ONLY in an EXTREMELY LIMITED number of rare neurological disorders. Clinically applicable intervention strategies have NOT come from theories that less-than-obvious deficiencies of Fe and B vitamins influence neurological function.

A danger of people taking the popular press seriously is that those responsible for juvenile detention facilities may spend tax dollars in ineffective programs based upon untested theories. The solution to this dilemma is that all institutions need to support the teens in their care by having nutritious foods available. This means screening out tempting, less nutritiously valuable, but commercially rewarding, foods that tend to be "sold in the hall". This will improve the teen's health and physical well being, but will NOT prevent criminal behavior, attention disorders or other behavioral disorders.

The development of problem behaviors (drugs, alcohol, and cigarettes) is critical in teen years. 3 of 5 high school seniors have at least tried an illicit drug. The most commonly tried drug is marijuana. The active ingredient in marijuana (Δ^9 -THC -- Δ^9-tetrahydrocannabinol) is rapidly and almost completely absorbed from the lungs (90%). After processing and storing in adipose tissue, the Δ^9-THC from one joint is excreted from the body over a week OR LONGER. With repeated exposure, accumulation and concentration occurs in fat, lungs, liver, reproductive organs and the brain. Even with "munchies", there is no weight gain due to the Δ^9 -THC. Depending on the marijuana, 1 joint is approximately equal to 3-5 cigarettes in terms of the lung damage caused by inhaling the joint.

Cocaine elicits intense euphoria, restlessness, heightened self-confidence, irritability, insomnia, and loss of appetite. Weight loss is a very common side effect. Cocaine users often meet criteria for eating disorders. Repeated use causes rapid heart rate, irregular heartbeats, heart attacks and death (review your BIOL 223 notes on cocaine).

Drug abusers face multiple nutrition problems: 1) spend their money on drugs instead of food; 2) lose interest in food when they are "high"; 3) some drugs temporarily suppress appetite; 4) the lifestyle of the drug abuser lacks routine that promotes healthy eating habits (it's the old turmoil vs excitement controversy); 5) Drug abusers may contract hepatitis with concomitant taste changes and decreased appetite; 6) Their nutrient status may be adversely effected by

therapy and medications; and 7) They often get infectious diseases with increased nutrient needs.

Alcohol is a drug -- pure and simple. For the teen, because it may be purchased by the population over 21 in most states, this creates all sorts of choices: to obtain some, whether it be from the bar at home or an obliging stranger, or to walk away from it, period. Keep in mind that laws don't stop a teen (or anyone for that matter) from obtaining alcohol once s/he has made his/her decision. Some teens use alcohol as an escape or for support. This is an ineffective way to cope with problems that leads to many additional problems.

Where do they learn this behavior? Watch their parents, siblings or the adults who socialize with their families and you'll learn where they learned it (review your BIOL 223 notes on the positive feedback loop set up by alcohol). Alcohol is NOT a stimulant, but a DEPRESSANT! This is sort of an oxymoron, isn't it?! You feel down, so you go find a bottle of booze and depress yourself even more! Hello! First, alcohol sedates inhibitory nerves, which are in the greater number. From this temporary action, you feel "lively". As you continue drinking, the alcohol sedates excitatory nerves, which are in the lesser number. From this action, you feel "down". Lastly, if you continue to drink, you get to fall over, pass out, black out, puke or even kill someone -- rarely does a drunk have the good taste to kill him/herself only. Alcohol is “empty” kcal and displaces needed nutrients from the diet with concomitant metabolic changes, which are not easily corrected with healthy nutrition.

The energy content of alcoholic beverages is summarized for a few beverages, below:

Alcoholic drink	Serving size, oz.	Grams alcohol/serving	kcal/serving
Beer	12	13	150
Light beer	12	11	100
Wine	5	14	110
Gin, vodka, whiskey (80 proof)	1.5	14	100
Daiquiri	2	14	111
Tom Collins	7.5	16	121

Keep in mind that alcohol (in the form of red wine, 1 oz before evening meals) may stimulate appetites in people who are elderly, on chemotherapy, have a chronic illness and promote healthier eating.

Nicotine is a drug -- pure and simple. Nicotine is more than 200 times as addictive as heroin. Smoking cigarettes, cigars and/or pipe tobacco leads to lung cancer, oropharyngeal cancer, coronary artery disease (CAD/CHD), myocardial infarction, digestive diseases, strokes (CVA) and chronic obstructive pulmonary disease (COPD), among other diseases. Smoking influences hunger, body weight and nutrient status. Smoking "blocks" feelings of hunger. Smokers weigh less than non-smokers and DO put on weight after they stop smoking. This weight gain may be regulated by diet and exercise. Smokers take in lower dietary fiber, vitamins and minerals even with approximately the same energy intakes as non-smokers. The risk of lung cancer is greatest for smokers with the lowest dietary intake of β-carotene. CAUTION: even with β-carotene in their diet, smokers will still get lung cancer.

NOTE: in 1996 or 1997, a huge study examining the effects of b-carotene on smokers was abruptly stopped because it was found that those smokers who were taking high doses of β-carotene were dying faster than those smokers on lower to no doses of β-carotene.

Nutrition Programs for The Adult
(Between the Adolescent Years and Adult Age Less Than 51 YOA)
Approx. 20-50 YOA

Energy is defined as that force or power that enables our bodies to carry on their life-sustaining activities. Energy is present as

> FREE (energy involved at any given moment in the performance of a task, unbound or in motion, e.g., catabolism, results in work and energy in the form of heat) or
>
> POTENTIAL (stored or bound energy in numerous chemical compounds for conversion to free energy as needed, e.g., glucose) energy in human metabolism.

In general, energy input is in the form of food. We utilize the energy for numerous functions which lowers the free energy in our bodies. With this low energy reservoir, we feel hungry because signals are sent to our brain that sends out in search of more food (energy). The grinding your stomach makes when you get hungry is because your blood sugar is dropping and/or has dropped.

The energy demands of the body require continuously available energy to support the body's basal metabolic needs, PLUS for additional activity requirements, e.g., ATP from glucose catabolism for the energy to move.

Energy is measured in the unit, calorie, which is defined as that amount of heat which is required to raise 1 gram of water by 1° C (not entirely correct, but it gets us by within reason).
A kilocalorie, or kcal or Cal, is 1000 * calories. The kcal is equal to a food Calorie. Note that I've use "calorie" and "Calorie":

> "calorie" is the definition we discussed;
>
> "Calorie" is a kcal.

In the metric (SI) system, heat is measured in joules (J). To get from Cal to kJ, multiply Cal by 4.184 -- review your CHEM 121 notes on this.

Why do we want to measure food energy? We need to be able to determine our basal metabolic needs, the needs brought about by activity and the energy required for digesting our food, as well. The energy necessary for homeostasis (when at digestive, physical and emotional rest) is the BMR. The **BMR is the basal metabolic rate**. It is also referred to as the **RMR or resting metabolic rate**. Both are the measure of the energy required of resting tissue[s]. It is also known as the **REE: the resting energy expenditure**, i.e., the amount of energy required to maintain the body at rest after a 12 hour fast.

The brain, liver, GI tract, heart and kidney make up less than 5% of the total body weight. Yet, they provide 60% of the total metabolic processes. Resting muscle and adipose tissue contribute a far greater mass with reduced BMR contribution. The measurement of food energy is based upon fuel factors. These fuel factors equate one gram of a nutrient with so many Calories:

Nutrient	Calories of energy	kJ of energy
1 g carbohydrate (CHO)	4	17
1 g lipid	9	38
1 g protein (CHON)	4	17

To measure these fuel factors, we must use calorimetry: the measurement of heat loss or the heat output of the body of the energy values of foods. This can be done directly in a chamber large enough for a person to enter (the body's heat production is measured). This is limited to research. When the BMR is calculated this way, it is by the heat released from the body. Another form of direct calorimetry is the bomb calorimeter (so-called because the combustion chamber of this calorimeter resembles a bomb). This can be done indirectly (seldom used in the clinic, but used in research) and measures gas exchange in respiration (Respiratory Quotient or RQ) while at rest.

$$RQ = \frac{Volume\ of\ CO_2\ \mathrm{Pr}oduced}{Volume\ of\ O_2\ consumed}$$

Examples of calculating RQ's for glucose and triglycerides follow:

$C_6H_{12}O_6 + 6\ O_2 \rightarrow 6\ CO_2 + 6\ H_2O + 673$ Cal
RQ = 6 CO_2/6 O_2 = 1
2 ($C_{55}H_{106}O_6$) + 157 $O_2 \rightarrow$ 110 CO_2 + 106 H_2O + 16.353 Cal
RQ = 110 CO_2/157 O_2 = 0.7
Protein is not as clear cut, but averages between 0.8 and 0.82.

To Calculate a Person's Total Energy Output

We must first calculate the BMR for that person. To do this, we must have 2 constants:

Male constant	Female constant
1.0 Cal/kg body weight/hour	0.9 Cal/kg body weight/hour

Remember from CHEM 121 that 1 kg equals 2.2 lbs. For example, a 175 lb male weighs 79.4 kg. A 125 lb female weighs 56.7 kg. The BMR for the male and female are determined using the above constants as follows:

$$BMR\,(Male) = \frac{1\,Cal}{kg - hour} * 79.4\,kg * \frac{24\,hours}{day} = 1905\,Cal$$

$$BMR\,(Female) = \frac{0.9\,Cal}{kg - hour} * 56.7\,kg * \frac{24\,hours}{day} = 1225\,Cal$$

Secondly, we must calculate the energy required for our level of activity. To do this, we must know what our average activity level is and the effect of this energy on our BMR (i.e., how much it increases it). These are summarized in the following table:

Level of Activity	Energy needs	Examples	% BMR increase
Sedentary	120-150 Cal/hr	Shave, write, billiards	20
Very light	150-300 Cal/hr	Making beds, light gardening, auto repair, bicycle at 5.5 mph, level	30
Moderate	300-420 Cal/hr	Pull weeds, walk 3.5-4 mph level, dance (waltz)	40
Heavy	420-600 Cal/hr	Chop weeds, walk up hills, cross country ski	50

Using a moderate level of activity, the second step becomes: BMR + (0.4 * BMR).

$$Px\ A(Male) = 1903 + 762 = 2668 \frac{Cal}{day}$$

$$Px\ A(Female) = 1225 + 490 = 1715 \frac{Cal}{day}$$

The last step in this determination is to calculate the energy cost of food effect. This is called the **Specific Dynamic Action (SDA)** or **Dietary Induced Thermogenesis (DIT)** of food. The DIT = 10% * (BMR + Px A).

$$Energy\ Needs\ (Male) = 2668 + 267 = 2935 \frac{Cal}{day}$$

$$Energy\ Needs\ (Female) = 1715 + 172 = 1887 \frac{Cal}{day}$$

In summary, then the basic components during weight maintenance include 1) energy demands of the BMR; 2) change[s] in physical activity and 3) the thermogenic effect of food intake.

Some nutritionists add a fourth category: adaptive thermogenesis. This is defined as the change in RMR due to adaptation to environmental stress. These include 1) change in dietary intake and 2) change in ambient temperature and/or change in emotional stress. Remember that the formula for calculating caloric needs for simple weight maintenance is:

$$Weight\ Ma\,\text{int}\,enace = BMR + Px\ A + DIT$$

Remember, also, that obesity is classified as having an excessive amount of energy intake over energy output and that anorexia is decreased energy intake over energy output OR energy requirements.

There are indirect lab tests that can be used to determine the metabolic rate in humans. These include protein bound iodine (PBI -- ancient lab test, still used on rare occasion), iodine uptake very common), T_3 and T_4 levels (with elevated T_3 and T_4 there will be an elevated BMR; with reduced T_3 and T_4, there will be a lowered BMR) and the free thyroxine index (FTI), which is the product of the T_4 and the T_3 resin uptake (T_3RU). Note that these indirect tests focus on the thyroid. Remember from BIOL 224 that T_4 regulates more than 180 ATP requiring enzymes.

Numerous factors effect BMR. The level of lean body mass (LBM) exerts influences primarily due to increasing the metabolic activity relative to the amount of bone and fat. Note that the young have an elevated BMR (and lots of LBM) and that as we age, the BMR decreases as we lose LBM (about 5% per decade. A measure of LBM is through the body mass index (BMI).
It may be calculated as follows:

$$BMI = \frac{weight\ in\ kg}{(height\ in\ meters)^2} = \frac{88.6\,kg}{3.17\,m^2} = 27.95$$

A Desirable BMI is in the range of 20-25. A BMI in the range of 25-30 indicates Obesity Associated Health Risks. A BMI >40 goes along with Morbid Obesity. Keep in mind that this is just a measure of LBM. I've known power lifters who ran BMI's >40 who were far from being obese. Also keep in mind that within the last 2 years, BMI ranges have been changed to reflect a more leaner population.

Height effects BMR. Tall thin people have a higher BMR because they have more skin surface. The **Body Surface Area (BSA)** may be calculated as follows (BTW: the weights and heights used in the above and following examples were obtained from scales and measuring tapes -- not out of thin air):

$$BSA = 71.84 W^{0.425} * H^{0.725}$$

$$W = kilograms$$

$$H = centimeters$$

$$71.84 = constant$$

$$E.G.,$$

$$BSA = 71.84(88.6)^{0.425} * (177.8)^{0.725} = (71.84) * (6.724) * (42.776) = 20663.04\,cm^2 = 2.07\,m^2$$

Sex effects BMR as it relates to the basic composition (LBM) between the genders. The more LBM, the greater the BMR; the converse is equally as true.

Growth effects BMR. Children and pregnant women (increases about 20-25% which is roughly equivalent to 300 Cal) have elevated BMR's. Growth hormone (GH), released from acidophilic cells in the anterior pituitary, goes to bone, muscle and organs. It causes increased linear growth, bulking up, organomegaly, increased organ activity and it increases peripheral resistance of cells to insulin due to amino acid uptake (review your notes from BIOL 224). As a general rule, GH slowly rises from day 0 to about age 5 years. The levels the flatten out until puberty kicks in. From puberty until somewhere in late middle age, GH levels continue to increase. With time, GH levels decrease. GH increases BMR 15-20%

Fever increases BMR about 7% per degree F (0.6° C). Stress, more or less, increases BMR. Generally, though, mental effort requires few calories. The feelings of fatigue from studying are due to muscle tension. Heightened emotional states do not increase metabolic activity, but lead to increased energy needs because of increased muscle tension, restlessness and agitated movements.

All of the following effect BMR: increased muscle mass of the uterus, increased size of mammary glands, increased fetal mass and placenta, increased cardiac work and increased respiratory rate.

Lactation effects BMR. About 60% or 1000 Cal-equivalents due to the production of around 30 oz. per day. Generally, you figure that there are 30 Cal/oz of milk, which equates to about 1000 Cal/day.

Hyperplastic disease, e.g., cancer, some anemias, congestive heart failure, hypertension. Chronic obstructive pulmonary disease increases BMR. Starvation/malnutrition reduces the BMR as LBM is reduced. Environmental temperature effects BMR: hot and cold temperatures increase BMR. This is a compensatory, defense mechanism in the cold and is a q10 effect in warm weather (review your chemistry for this concept).

T_4 needs are environmentally temperature dependent:

1. At 35°C, need 1.7 μg per day
2. At 25°C, need 5.2 μg per day
3. At 1°C, need 9.5 μg per day

Cold is stimulating to the pituitary to release TSH to increase T_4 output. This is data from 1943 – and remains undisputed.

"Rules of Thumb" for State of Physical Well-Being

- #1: Appropriate weight for height.

Males	Females
Medium frame at 5 feet tall: 106 lbs	Medium frame at 5 feet tall: 105[1] lbs
For every 1" over 5 feet, add 6 lbs	For every 1" over 5 feet, add 5 lbs
For every 1" under 5 feet, subtract 6 lbs	For every 1" under 5 feet, subtract 5 lbs
For a large frame, add 10%	For a large frame, add 10%
For a small frame, subtract 10%	For a small frame, subtract 10%
[1]Some sources suggest 100 lbs for a 5 feet tall female.	

#2: Triceps pinch. If you can pinch more than an inch beneath your TRICEPS muscle, this is indicative of being in an obese state.

#3: Waist to Chest (NOT bust -- we all have chest measurements, only women have bust measurements) measurements. Every 1" of waist measurement greater than chest measurement will reduce your life by 2 years.

#4: ASIS (review BIOL 223)/Ruler Test. Lie down on your back, relax and place a ruler across your waist to both ASIS'. If the ASIS' do not touch easily, then you are in a state of being too fat.

#5: BMI RANGE increases by 1 for every decade beginning at 25 (35, 45, 55, >65).

#6: Body weight runs in families. As a general rule, if both of your biological parents have the same amount of adipose tissue, UNLESS you work to alter this, you will too. Children of lean parents tend to be lean. Children of obese parents tend to be obese.

Characterization of Obesity by Hirsch and Knittle as Modified by Carman:

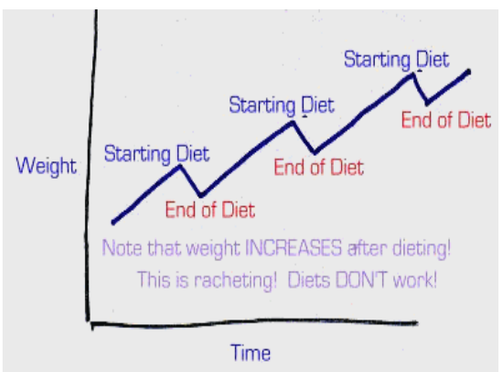
Obesity Category	Comment	Adipose Cell Numbers or Size	Result
Hyperplastic	Occurs during childhood	High number of adipose cells	Generally regain any weight lost
Hypertrophic	Occurs during adulthood	Large sized adipose cells of normal number	Less likely to regain lost weight

Plastotrophic	Generally in childhood, but may happen whenever	Large cells in large amounts	Blend of the two, above

Numerous Risks Associated with Obesity are summarized in the following table:

General		Male	Female
Abdominal hernia	Accidents	Increased risk of colon cancer, rectal cancer, prostate cancer	Gynecologic irregularities
Arthritis of the knee, hip, low back	Respiratory problems		Pregnancy-induced hypertension
Post-surgical complications	Varicose veins		Increased risk of breast cancer (data is getting murky on this -- watch your journals), uterine cancer, ovarian cancer, gall bladder cancer, bile duct cancer
Gout	Risk of death of obese is 2 times greater than non-obese		
Elevated cholesterol (CAD)	Dieting, racheting/spot reducing -- spot reducing does NOT work!; racheting leads to even greater weight gain after each successive diet -- see graphic, below		
Hypertension			

Dieting Pattern



------Academic Aside------ In starvation, glycogen is catabolized first. Lipid is catabolized after the glycogen is catabolized. Protein is catabolized BEFORE and WITH lipid AFTER glycogen stores are depleted. ------End of Aside------

Food Intake Regulation

The bottom line with this is the following question: Is there anything to eat? I'm hungry! Hunger is mediated by the central nervous system (review BIOL 223 notes), the hypothalamus, serotonin and endogenous opioids. Emotional factors like stress, mood and perceptions alter hunger. Environmental influences, such as food availability and climate play a role, as well. Disease states, such as obesity, anorexia, bulimia, mental illness and diabetes regulate hunger.
Other body systems like the liver, adipose tissue, hormones and the stomach regulate hunger.

Food Intake Control

The bottom line with this is the following question: What do I want to eat? I really have an appetite! The environment plays a role in regulating appetite -- if it's too hot, appetite is minimized. Conversely, if it's very cold, your appetite is magnificent.

Pharmacologically, your appetite can be controlled. This may happen through appetite suppressant drugs or something like naloxone (a narcotic antagonist).

If you, as my seven and a half year old (now 19) puts it, "have a hunger for it", thirst and salt hungers can drive your appetite (ribs does his, BTW :-)), i.e., specific appetites.

Social "requirements", such as culture, religion and social pressure play a role in appetite control. Pleasure one obtains from the food(s), such as palatability, taste, texture, odor, may run your appetite, too. Increased metabolic influences, such as energy requirements (climbing Denali, for example), neurotransmitter levels and hormones affect your appetite. Learned preferences or aversions control your appetite, e.g., fear of new foods, cravings for specific foods -- I remember when I first moved to Reno from rural western KS: I thought that sushi shops were the KS equivalent of bait shops. Diseases like diabetes, obesity and cancer affect your appetite, as well.

Exercise and Fitness

Regular physical activity helps to protect against backaches, diabetes, obesity, growth failure in children, headaches, ulcers, constipation, diarrhea, osteoporosis, MI and CVA, kidney disease, cancer (colon, breast, reproductive organ), hypertension, hypercholesterolemia and menstrual irregularities and infertility.

Fitness may be defined in many ways. Three definitions of fitness follow:

1) characteristics of the body that enable it to perform physical activity;

2) the ability to meet routine physical demands with enough reserve energy to rise to a sudden challenge;

3) the body's ability to withstand stress INCLUDING psychological stress.

The Benefits of Exercise and Fitness

Healthy rest and sleep	Reduced anxiety and depression	Improved nutritional health	Freedom from substance abuse
Reduced fatness and increased LBM	Improved self image and confidence	Improved resistance to disease	Better learning ability
Reduced risk of MI, CVA, CAD	Improved QUALITY of life in later years	Fewer and less severe injuries	Longer life

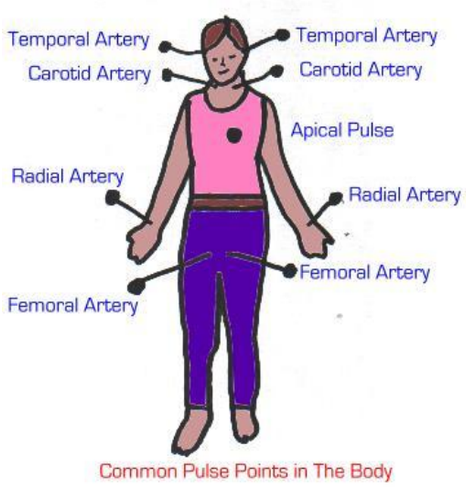
Fitness contributes to ALL aspects of health: physical, emotional, social and spiritual. It makes physical activity easy. It promotes rest, healing sleep and relaxation. It contributes to nutritional health. It increases disease resistance and increases accident resistance. Fitness provides social opportunities. It enhances intimate relationships. It promotes wholesome sexuality. It opens the way for social support and increases energy for productive work. Fitness increases resistance to emotional problems. It allows freedom from drug abuse. It increases self esteem. It increases your ability to learn. It improves your self image. It improves your outlook on life, in general. Fitness instills joy in life and inspires courage to face challenges.

How does one go about "getting fit"? One must initiate a training program. There are some cautions that go along with this in the form of the following 9 questions. If you answer "YES" to ANY of them, see your health care provider BEFORE starting a training program!

1. Are you older than 35 YOA?
2. If you're older than 35 YOA, have you been sedentary for a long time?
3. Are you more than 20 lbs. heavier than you're "supposed to be"?
4. Do you smoke more than 1.5 packs of cigarettes per day?
5. Has an M.D., D.O., PA or NP ever told you that you have a heart problem?
6. Do you have a chronic illness?
7. Have you ever had or do you now have a murmur?
8. Have you had a diagnosed or suspected MI?
9. Do you have chest pains at any time?

Assuming that the answers to these questions are "NO", one of the pieces of information that you will need to determine is what an acceptable Target Heart Rate Zone is for you. The table, below, shows you how to do this a step at a time with a side-by-side set of calculations. When you take your pulse, remember to use one (only one) of the arteries in the accompanying graphic, count it for 15 seconds and, then, multiply your beats by 4 to get your heart rate in beats per minute (bpm). Also remember to use a finger, NOT your thumb when taking a pulse. Your thumb has its own pulse that can confuse you.

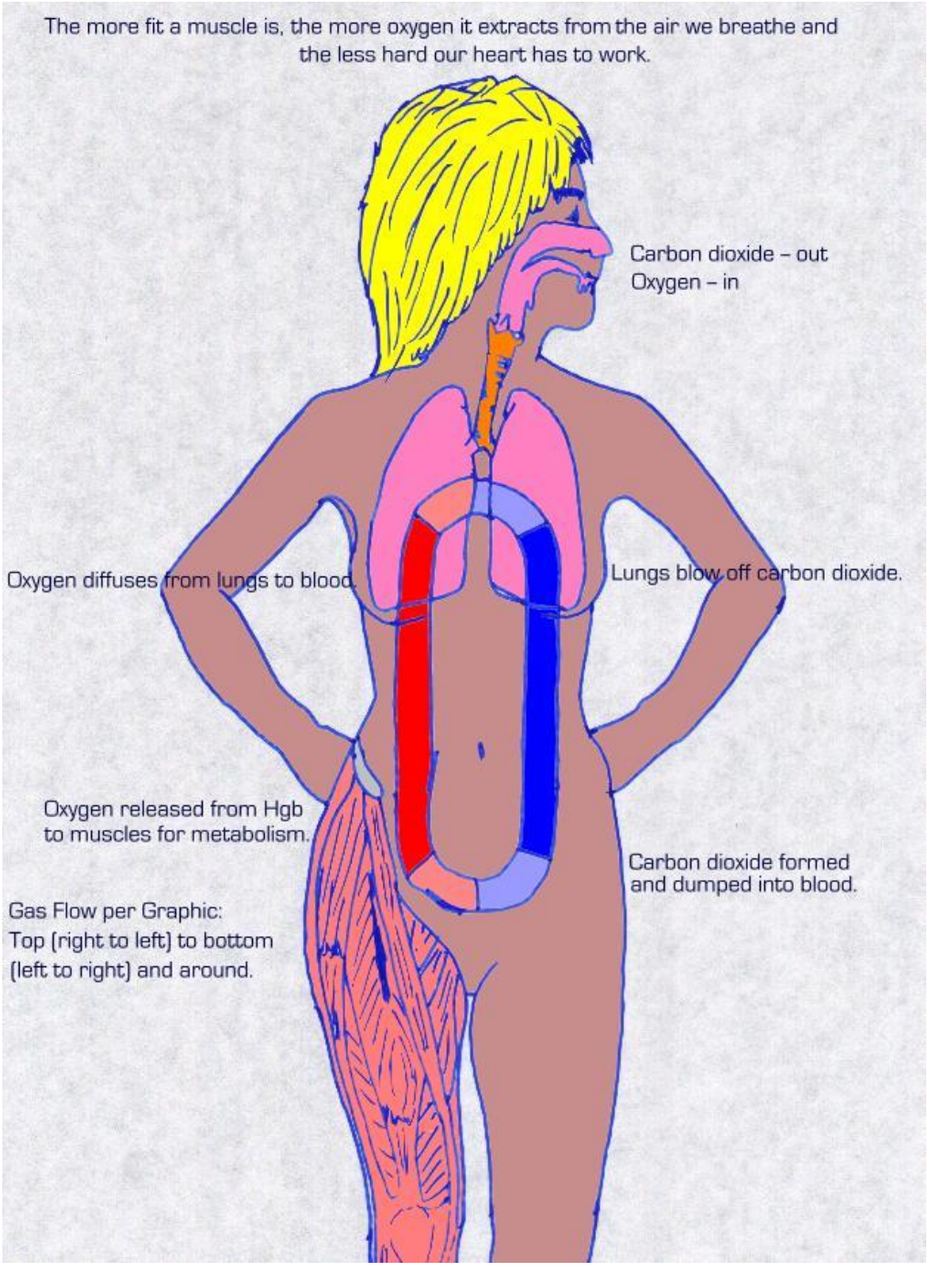
1) Find your resting pulse	64 bpm
2) Subtract your age from 220 (205 if you use swimming) bpm (this is your maximal heart rate)	220 - 48 = 172
3) Subtract step 1 from step 2	172 - 64 = 108 bpm
4) Take half of step 3	(108/2) = 54 bpm
5) Add step 1 to step 4 (this is your low end)	64 + 54 = 118 bpm
6) Add step 1 to 0.85 times step 3 (this is your high end)	60 + (0.85 * 108) = 152 bpm



Common Pulse Points in The Body

The significance of staying in this target heart range zone while you work out -- for a minimum of 30 minutes (start slowly and build up) -- is seen in the graphic:

The bottom line concept to get from this graphic is that the more fit muscles are, the less our heart and lungs have to work to extract the oxygen for our cells to utilize.



Characteristics of The Body's Energy Systems are summarized in the table, below:

Energy System	Oxygen required?	Exercise duration	Intensity	Example
ATP/phosphocreatine	No	< 30 seconds	ALL initially; extreme thereafter	100 yard dash; shot put
ATP from lactate	No; anaerobic	30 seconds - 3 minutes	Very high	Quarter mile run at maximum speed
ATP from carbohydrates	Yes, aerobic	3 minutes - 20 minutes	High	Cross country skiing; distance swimming
ATP from lipid	Yes; aerobic	> 20 minutes	Moderate	Distance running, jogging

Carbohydrate and Fat Utilization with Levels of Exercise are summarized in the table, below:

Carbohydrate and Fat Use During Activity				
Fuel	Performance time	Oxygen required?	Intensity	Example
Carbohydrates	30 seconds - 3 minutes	No	Extreme	Quarter mile, football
Primarily carbohydrates with some fat	3 minutes - 20 minutes	Yes	High	Distance running
Primarily fat with some carbohydrate	>20 minutes	Yes	Moderate	Distance jogging; cross country skiing

Endurance Times by Dietary Composition are summarized, below:

High fat diet (94% of calories from fat)	Normal diet ± (55% of calories from fat)	High carbohydrate diet (85% of calories from carbohydrates)
57 minutes to exhaustion	114 minutes to exhaustion	167 minutes to exhaustion

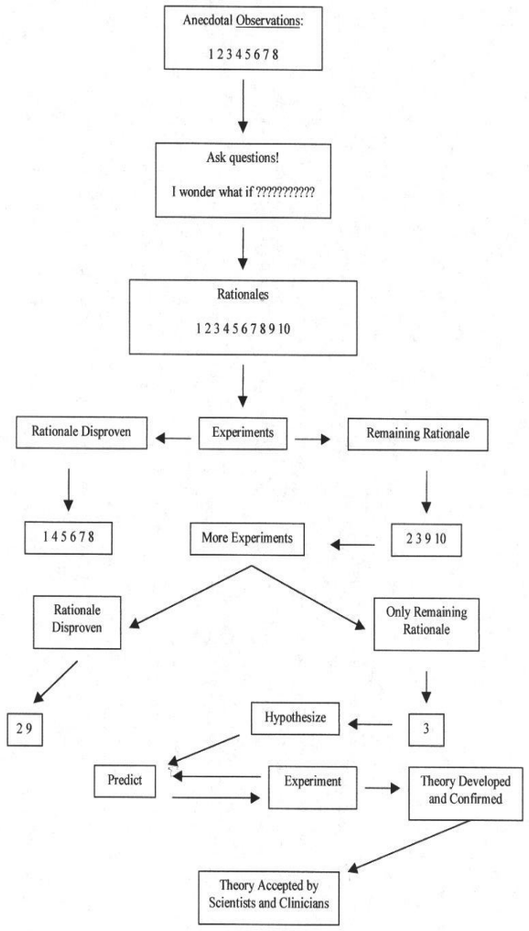
Clearly, a diet high in carbohydrates permits longer periods of exercise and activity. Note that we haven't discussed putting together diets for this age group. That is being "saved" for the next sections of this monograph.

The American College of Sports Medicine (ACSM) has developed fitness guidelines for anyone. They recommend training 3-5 days per week, at 50-85% of maximal heart rate for 20-60 minutes of continuous activity that uses the large muscle groups. The table, below, has a sample training program for all 7 days of the week:

MWF	TR	SS
15 minutes warm up 30 minutes aerobic 15 minutes cool down	15 minutes warm up 20 minutes weights 15 minutes cool down	Softball, hike, bike, swim

Adult and Senior Nutrition

Since we've been discussing diets, already, we really need to take a monent and also discuss how to VALIDATE diets by the scientific method. Take, for example, the nutritional quackery surrounding arthritis. No known diet prevents, relieves or cures arthritis. That means that none of the following are effective against arthritis: alfalfa, cod liver oil, honey, wheat germ oil, black strap molasses, fruit, lecithin, yeast, calcium, garlic, vitamin megadoses or copper. These "nutrients" were studied by the scientific method and thrown out. The method by which this was accomplished (the scientific method) is demonstrated/summarized in flow-chart form, in the graphic.



Adult Nutrition

The System of Exchanges: Another Way to Prepare Balanced Diets

This is not just for grown-ups, any more. The exchange system was first developed for diabetics. Since its inception, it has been used for everything of a dietary nature. Also keep in mind that when using this system to determine dietary applications to keep fat at no more than 30% of the diet and the protein at about 0.8 g/kg body weight. Fill in the rest of the diet with carbohydrates.

By definition, the exchange system is a system by which foods may be "exchanged" to maintain a diet with variety, without altering dietary requirements. In the system of exchanges, there are 6 groups: Milk Exchange Group, Vegetable Exchange Group, Fruit Exchange Group, Starch/Bread Exchange Group, Meat Exchange Group, Fat Exchange Group. This is somewhat similar to the "new food pyramid":

Milk Exchange Group	Vegetable Exchange Group	Fruit Exchange Group
12 g carbohydrate 8 g protein (non-fat) 0 g fat = 90 Cal/serving (low fat) 5 g fat = 120 Cal/serving (whole) 8 g fat = 50 Cal/serving	5 g carbohydrate 2 g protein 0 g fat = 25 Cal/serving	15 g carbohydrate 0 g protein 0 g fat = 60 Cal/serving
Starch/Bread Exchange Group	**Meat Exchange Group**	**Fat Exchange Group**
15 g carbohydrate 3 g protein 0 g fat = 80 Cal/serving	0 g carbohydrate 7 g protein (low) 3 g fat = 55 Cal/serving (low fat is aka lean) (med) 5 g fat = 75 Cal/serving (high) 8 g fat = 100 Cal/serving	0 g carbohydrate 0 g protein 5 g fat = 45 Cal/serving

The following table provides you with some examples of serving sizes in each group. Keep in mind that this listing is far from inclusive.

Milk Exchange Group	Vegetable Exchange Group	Fruit Exchange Group
1 cup milk 1 cup yogurt	1/2 cup cooked veggies 1 cup raw veggies	1 - 2" apple 1/2 cup unsweetened applesauce 1-4.5" banana 1/2 grapefruit 2 tablespoons raisins
Starch/Bread Exchange Group	Meat Exchange Group	Fat Exchange Group
1 slice bread 2.5 tablespoons flour 3 graham crackers 1/3 cup dried beans 1/2 cup mashed potatoes	(Lean): 1 oz chuck roast 1 oz cottage cheese (Med): 1 oz T-bone 1 egg (High): 1 oz corned beef 1 tablespoon peanut butter	1 strip bacon 1 teaspoon butter 1 tablespoon cream cheese 1 tablespoon dry-roasted cashews

Free foods are those that have **less than 20 Cal/serving**. If the exchange list does not provide a serving size, you may eat them as often as you like. Examples of these foods include sugar-free sodas, coffee, tea, lettuce, sugar-free gum and cinnamon. If the exchange list does provide a serving size, you are limited to eating these foods to 2-3 times a day. Examples of these foods include unsweetened rhubarb (1/2 cup), 1 cup raw cabbage, 1 tablespoon catsup, 3 tablespoons taco sauce, 1 tablespoon unsweetened cocoa powder and 1/4 cup cooking wine.

Websites for ADA Exchange Lists

A couple of very nice sites exist (so far – already lost one in the last several years – the web is extremely flexible):

http://home.hiwaay.net/~mevinson/exchange.htm

http://www.umassmed.edu/diabeteshandbook/chap06.htm

In spite of each being a copy of each other – I prefer the format of the latter – it's much more user friendly for someone who is very visual. Otherwise, ADA wants you to buy their book of exchanges. I first ran across this system outside of any other sources in Conn's 1973 Edition of **Current Therapy**. Very powerful system when followed carefully.

Having seen this, let's set up a nutritional plan by three methods for a 175 pound male who has an activity level of 0.3. The three methods are:

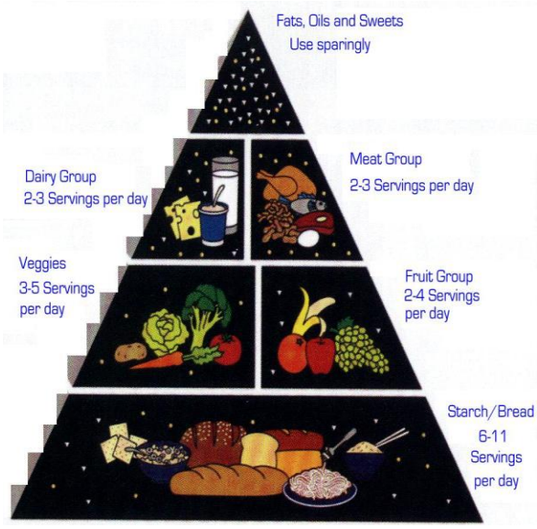
1) The Pyramid Diet (self explanatory),

2) Trial-n-Error Method/Fiasco Method and

3) Grace Burtis' Method (wonderful!).

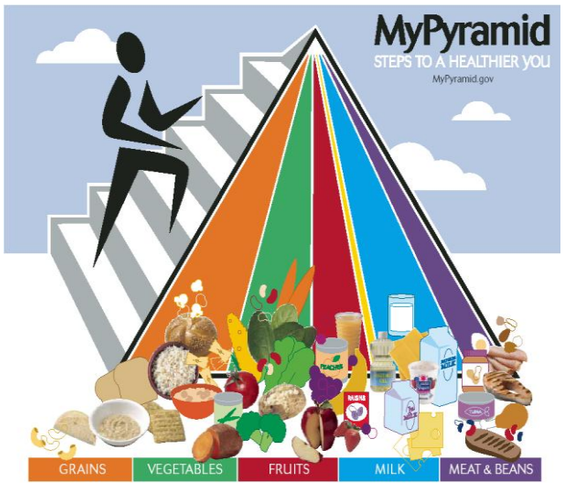
Method #1: Pyramid Guide Method -- Self-Explanatory

This method is somewhat self-explanatory – the new Pyramid is almost (in most cases) put together like how computer manufacturers write instructions for using the computers, i.e., those in the field understand the instructions – those outside the field have difficulties with the instructions. Guidance is needed with the new pyramid. Servings indicated in the pyramid are NOT equal to exchanges. Why, I have no idea – simply modifying the old pyramid to encompass the ADA Exchange System would have been fantastic – OTOH, we tend to want to re-invent the wheel every chance we get, as well.



Old Pyramid

Note that the way the pyramid is set up (upper right) is to put those food groups that you require the least of at the top of the pyramid and those that you require the most of at the bottom of the pyramid. The circles on the pyramid represent fat (naturally in the food and added) while the upside down triangles represent added sugars. As you get closer to the top note that the circles and triangles increase in number.



New Pyramid:
http://www.mypyramid.gov/

The new pyramid is illustrated at slightly upper right. How to use it follows, below:

GRAINS Make half your grains whole	VEGETABLES Vary your veggies	FRUITS Focus on fruits	MILK Get your calcium-rich foods	MEAT & BEANS Go lean with protein
Eat at least 3 oz. of whole-grain cereals, breads, crackers, rice, or pasta every day 1 oz. is about 1 slice of bread, about 1 cup of breakfast cereal, or ½ cup of cooked rice, cereal, or pasta	Eat more dark-green veggies like broccoli, spinach, and other dark leafy greens Eat more orange vegetables like carrots and sweetpotatoes Eat more dry beans and peas like pinto beans, kidney beans, and lentils	Eat a variety of fruit Choose fresh, frozen, canned, or dried fruit Go easy on fruit juices	Go low-fat or fat-free when you choose milk, yogurt, and other milk products If you don't or can't consume milk, choose lactose-free products or other calcium sources such as fortified foods and beverages	Choose low-fat or lean meats and poultry Bake it, broil it, or grill it Vary your protein routine – choose more fish, beans, peas, nuts, and seeds
For a 2,000-calorie diet, you need the amounts below from each food group. To find the amounts that are right for you, go to MyPyramid.gov.				
Eat 6 oz. every day	Eat 2½ cups every day	Eat 2 cups every day	Get 3 cups every day; for kids aged 2 to 8, it's 2	Eat 5½ oz. every day

Find your balance between food and physical activity

- Be sure to stay within your daily calorie needs.
- Be physically active for at least 30 minutes most days of the week.
- About 60 minutes a day of physical activity may be needed to prevent weight gain.
- For sustaining weight loss, at least 60 to 90 minutes a day of physical activity may be required.
- Children and teenagers should be physically active for 60 minutes every day, or most days.

Know the limits on fats, sugars, and salt (sodium)

- Make most of your fat sources from fish, nuts, and vegetable oils.
- Limit solid fats like butter, stick margarine, shortening, and lard, as well as foods that contain these.
- Check the Nutrition Facts label to keep saturated fats, *trans* fats, and sodium low.
- Choose food and beverages low in added sugars. Added sugars contribute calories with few, if any, nutrients.

MyPyramid.gov
STEPS TO A HEALTHIER YOU

U.S. Department of Agriculture
Center for Nutrition Policy and Promotion
April 2005
CNPP-15

USDA

USDA is an equal opportunity provider and employer.

Method #2 -- Trial-n-Error Method/Fiasco Method

Given the patient's sex, weight and activity level, this person requires 2730 Cal to maintain his weight. Based upon the percentages of nutrients in this person's diet, he needs 909 Cal from fat (101 g), 252 Cal from protein (63 g) and 1566 Cal from carbohydrates (392 g).

ASIDE

Fontana, Journal of the American College of Cardiology – January 2006: Assessed 25 healthy adults who had followed a severely calorie-restricted, nutritionally balanced diet for an average of 6.5 years, and 25 matched "control" subjects who ate a typical Western diet. He looked specifically at diastolic function — how well the heart relaxed between beats.

The calorie-restricted diet provided about **1,670 calories per day, made up of approximately 23 percent protein, 49 percent complex carbohydrates, and 28 percent fat.**

The Western diet delivered roughly **2,445 calories, made up of about 17 percent protein, 52 percent carbohydrates, and 31 percent fat**.

The calorie-restricted diet included at least 100 percent of the recommended daily intake for all nutrients, and it was **lower in salt** than the Western diet.

In a related editorial, Dr. Gary Gerstenblith from Johns Hopkins Hospital in Baltimore, says that while it is not likely that many individuals would follow such a low-calorie diet, "the value of the study is that it points to [a] possible mechanism explaining how aging occurs and, therefore, how it may be modified."

END OF ASIDE

Here's where the fiasco starts in the table, below, by starting with what this person likes to eat:

Number/groups of exchanges	g carbohydrates	g protein	g fat
8 bread	120	24	0
5 fruit	75	0	0
6 veggies	30	12	0
4 meat	0	28	32
SUBTOTAL	225	64	32

Protein is taken care of. We have a ways to go, so we'll add 12 fat exchanges for 60 g fat.

SUBTOTAL	225	64	92

Fat is now taken care of. Let's add 13 fruits to this for 195 g carbohydrates.

SUBTOTAL	420	64	92

Carbohydrates are now taken care of. Note that we've planned for 1680 Cal for carbohydrates, 256 Cal for protein and 828 Cal for fat. The sum of these three is 2764 Cal – a few Cal more than we were aiming to plan for. This is no big deal. Either leave as is or dump 4 fats if you're that worried about it.

The food, then, may be distributed in the following manner (patient's preference) by exchange group:

Exchange group	Breakfast	Lunch	Snack	Supper	Snack
Breads	2	2	1	2	1
Fruits	4	4	3	4	3
Veggies		3		3	
Meats	1	2		1	
Fat	4	2	1	4	1

Possible meals for one day follow:

Breakfast	Lunch	Snack	Supper	Snack (hs)
2 slices toast 1 cup applesauce 4 tablespoons raisins 1 oz Italian sausage patty 2 slices bacon 2 pats of butter	2 slices bread 1 cup grapefruit juice 4 -2" plums 1 cup broccoli 1 cup carrots 1 cup cauliflower 1 oz ground chuck 1 oz cheddar cheese 2 slices bacon	6 Saltines 15 medium Spanish peanuts 1.5 cups orange juice	1 oz ham 2 tablespoons meat gravy 2 pats butter 1 slice bread 1-6" cob corn 1 cup cooked spinach 1/2 cup cooked broccoli 1.5 cup apple juice	3-2.5" sq Graham crackers 2-walnuts (whole) 1 cup cranberry juice cocktail

Method #3: Grace Burtis' Method

By her method, daily caloric requirements are determined as tabulated, below:

Children	Adults
1000 Cal to 1 YOA	10 * IBW (ideal body weight in lbs.) for obese/inactive
Add 100 Cal for every year up to 2000 Cal @ 11 YOA	13 * IBW (in lbs.) for those over 55 YOA or sedentary
12-15 YOA girls: add 100 Cal/year to adulthood	15 * IBW (in lbs.) for desirable weight or those with moderate activity
12-15 YOA boys: add 200 Cal /year to adulthood	20 * IBW (in lbs.) for thin or very active

Calculate caloric requirements for our patient: 175 lbs * 15 = 2625 Cal/day. 30% of the calories is for fat (88 g), 12.5% for protein (compromise between WHO and ADA; 82 g), which leaves 57.5% for carbohydrates (377 g).

Next, ask the patient what his preferred number of servings of milk, veggies and fruits are -- these will become exchanges:

Group	Exchanges	Carbo's (g)	Protein (g)	Fat (g)	Cal
(Whole) milk	1	12	8	8	150
Veggies	4	20	8	0	100
Fruits	4	60	0	0	240
SUBTOTAL		92	16	8	490

To determine the exchanges from the bread/starch group, subtract the 92 g carbo's (from the table, above) from the 377 total grams of carbo's, total. This is 285 g. Divide the 285 by 15 (g carbo's per bread/starch exchange). This is 19 bread exchanges:

	Exchanges	Carbo's (g)	Protein (g)	Fat (g)	Cal
SUBTOTAL	19	377	73	8	1858

Next, subtract 73 g protein from the 82 allotted. This leaves 9 g. Divide the 9 g by 7 (g protein/meat exchange). This gives 2 meat exchanges:

	Exchanges	Carbo's (g)	Protein (g)	Fat (g)	Cal
SUBTOTAL	2	377	87	24	2058

For fat, 88 g total minus the 24, so far, equals 64 grams. Divide the 64 by 9 which gives us 7 fat exchanges:

	Exchanges	Carbo's (g)	Protein (g)	Fat (g)	Cal
SUBTOTAL	7	377	87	87	2641

NOTE: by either method there is a slight alteration in Cal intake/g intake. No Problem!
Exchange distribution is as follows:

Exchange group	Breakfast	Lunch	Snack	Supper/ Dinner	Snack
(Whole) milk	1	0	0	0	0
Breads	4	5	2	6	2
Fruits	2	0	1	0	1
Veggies	0	2	0	2	0
(High) Meats	0	1	0	1	0
Fat	4	3	2	2	2

Possible meals for one day are tabulated, below:

Breakfast	Snack	Lunch	Snack	Supper	Snack (hs)
1 cup milk 1 grapefruit 2 slices raisin bread 1 cup shredded wheat 2 teaspoons butter 2 slices bacon	1-4.5" banana 1 slice raisin bread 2 large, whole pecans	1 c broccoli ½ cup cauliflower ½ cup carrots 6 teaspoons dressing 1 cup mashed potatoes 1 hamburger bun ½ cup frozen peas 1 oz chuck roast	6-2.5" sq Graham crackers 2 tablespoons dry/roasted cashews	1 cup cooked green beans 1 oz pork chop 2 teaspoons butter 2 small plain rolls 1 cup mashed potatoes 1 cup lima beans	½ cup apple juice 1 slice raisin bread 2 large, whole pecans

Burtis also defines the Bread/starch group as 1 exchange, 15 g carbo's, 3 g protein, 0.9 g fat and 80 Cal which is probably more realistic. She, as well as others, in the dietetics/nutrition fields, suggests that for a 1#/week loss or gain, subtract or add, respectively, 500 Cal/day. Note that for either method that a healthy diet has a lot of food in it! Most weight loss diets have very little food in them. That is one reason why weight loss diets don't work! Balanced diets with regular exercise will regulate your weight better than any diet published by any paperback publisher.

Goals of "Diet Therapy"

This portion does not cover therapeutic interventions of a dietary nature -- that comes in a later course. This section covers, briefly, your role in working with patients/clients in your everyday practice, be it nursing, dietetics or nutrition.

The first goal is to provide nutrients for appropriate metabolism, i.e., not too much and not too little, e.g., diabetes mellitus.

The second goal is to rectify nutritional deficiencies.

The third goal is to keep weight regulation within REASON -- your client's, not yours (an unhappy client will not provide you with a happy practice).

The fourth goal is to help the body maintain homeostasis during disease, e.g., fluid/electrolyte and reduced protein in renal disease.

The fifth goal is to make certain that the patient is in receipt of the best nutritional support for homeostasis regardless of the disease.

The sixth goal is to work with the patient to reach healthy nutrition and to promote food intake.

The seventh goal is to keep as closely as possible to the patient's routine diet, but the bottom line is that you not only can't, you won't, save 'em all. Don't try to if you meet with great resistance. Work WITH the patient and you'll have better results than if you attempt having the "patient work for you".

The eighth goal is to minimize nutrient/drug interactions and negative impacts.

The ninth goal is to remember that, ultimately, the patient is in control of the process. To keep stress at a minimum and nutrition at a maximum and, hence, a healthier patient, "let" the

patient make many decisions with your GUIDANCE and instruction, NOT you "running the patient's life", as it were.

Remember that the patient:

1) is human,

2) may feel defensive, angry, scared, withdrawn, irritable, egocentric, depressed (being sick brings out the worst in patients: this is NORMAL),

3) is stressed ALREADY, therefore, nutrition is already snafu'd (therefore, anything you can do to assist the patient in gaining some comfort, dignity and control in strange surroundings will aid your patient -- your CUSTOMER -- in regaining nutritional homeostasis).

Remember that stress reduces the absorption of protein and vitamin C. This is not a good scenario if the stress is perpetuated.

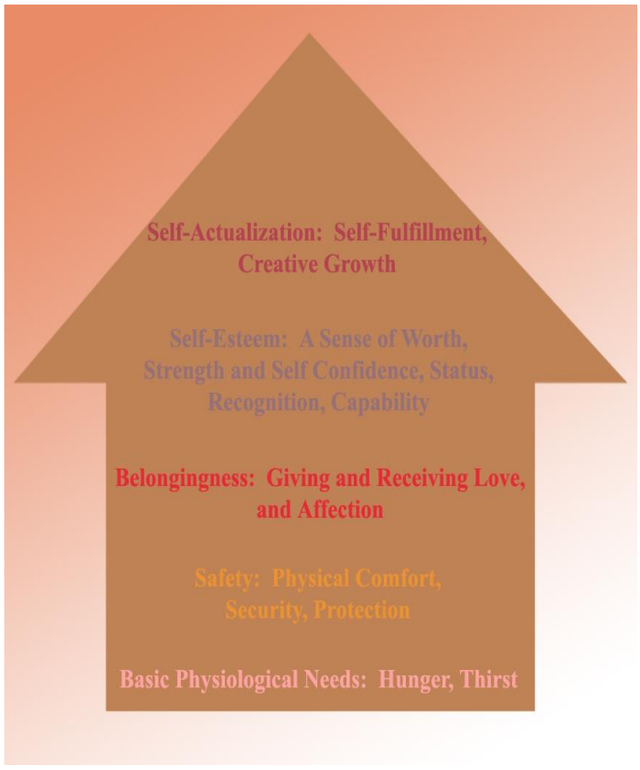
Show respect for the patient's disabilities or lack thereof. If they wish to socialize while they eat, great! If they do NOT wish to socialize while they eat, great!

Serve food at proper temperatures, with pleasantness; alleviate obnoxious odors, bed pans, emesis/kidney basins and/or urinals. Match the name of the patient, double check the diet, serve to more independent patients, first, then to the less independent. Assist with food serving (e.g., cutting) as necessary for the patient. Let the patient eat at his or her own pace and provide an opportunity for oral hygiene afterwards.

In addition, nurses will work with the nutritionists and dieticians and the patient to help "adjust" the diet as necessary, e.g., if the patient doesn't eat a food, investigate what it is about the food that makes it left-over and then substitute as necessary.

NOTE: if food is served at the same time as the patient is undergoing tests, make arrangements for the food to be brought ASAP after the tests are done -- at the CORRECT temperature!

The ultimate goal of any form of diet therapy -- be it for weight regulation or for therapeutic intervention -- is to help the patient achieve self-actualization. This is best represented by reviewing Maslow's Hierarchy of Human Needs for Positive Mental Health/Behavior, at right.



Senior Nutrition

The age group between 51 and 65 is sort of caught between being not young and not old. The table, right, summarizes some RDA's for people over 51 years of age:

Male	Parameter	Female
2300	kcal	1900
63	g protein	50
1000	mg Vitamin A	800
5	mg Vitamin D	5
80	mg Vitamin K	65
1.4	mg Riboflavin	1.2
15	mg Niacin	13
200	mg Folic acid	180
2	mg B_{12}	2
800	mg Ca	800
10	mg Fe	10
150	mg I_2	150

Before we delve into the chasm of the seniors, we need to understand some terminology that applies to this group of people.

Life expectancy is defined as the mean length of time projected to be remaining for a population of a given age.

Life span is defined as the maximum potential length of life that humans may live. The Young-Old are those in the age group 65-75 YOA, while the Old-Old are those in the age group older than 75 YOA.

Since 1940, the U.S. has been graying. In 1940, those 65 YOA or older made up 6.8% of the population. In 1990, they made up 12.7%. It has been projected that by the years 2040 and 2090 that these individuals will make up 21.7% and 25% of the population of the U.S. At present, approximately 25,000 senior citizens in the U.S. are at least 100 YOA.

Compositional Changes Caused by Aging

The age groups studied are between 25 and 85 YOA for men and 25 and 75 for women. One bone mass indicator of aging is total body calcium. Within these groups, there is a 17% average reduction in men and in women, there is a 30% reduction in total body calcium. An indicator of lean body mass is the total body potassium and protein levels. In men, there is a 37% and 12% reduction, respectively, and in women a 20% and 15% reduction, respectively.

Functional Changes Caused by Aging

For both sexes between the ages of 30 and 75 YOA, brain function decreases 8%. BMR decreases 15%, glomerular filtration rate (GFR; review BIOL 224 notes) decreases 30% after 40 YOA. Nerve conduction velocity decreases 10%, cardiac output (review BIOL 224 notes) at rest decreases 30% and maximal breathing capacity decreases 55%.

In terms of the per cent of remaining functioning tissue by the time one attains the age of 75 YOA, 82% of total body water remains. 56% of the glomeruli (review BIOL 224 notes) function in the kidney. 63% of nerve trunk fibers remain functioning, 56% of the brain mass remains and 36% of the total taste bud numbers remain functioning.

Nutrition-Related System Changes in The Elderly

As we age, taste buds undergo changes. As children and young adults, we have roughly 245 buds per papillae. By the time we're 74-85 YOA, we have but 88 buds per papillae. Sweet and salt sensitivity decreases with age. Medications required to maintain quality of life change

taste ability. Glossodynia (pain in the tongue; burning mouth syndrome) may occur. In terms of smell, there is decreased olfaction, as well.

We undergo GI changes. Decreased endogenous opioids coupled with greatly increased CCK (review BIOL 224 notes) effects will cause a decreased appetite response, a.k.a. anorexia in the elderly. Ill-fitting dentures may cause some elderly to eat improperly, i.e., LOW in fiber, whole grains, fruits, veggies. Decreased salivation causes xerostomia (dry mouth) and also decreased the ability to chew and swaller.

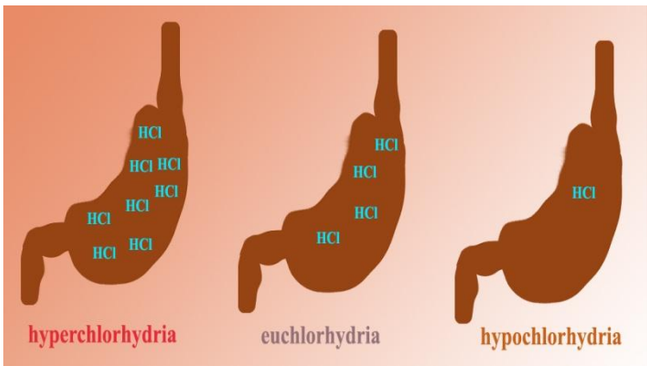
Hypochlorhydria increases with age in frequency. This decreases calcium uptake (graphic, below) and decreases non-heme iron uptake. It has NO effect on heme iron uptake. Hypochlorhydria increases bacterial overgrowth in the gut with:

1) a secondary hypovitaminosis B_{12} that leads to pernicious anemia,

2) secondary bile salt malfunction,

3) secondary fat malabsorption and

4) secondary diarrhea.



Hypochlorhydria reduces the efficiency of Ca^{2+} absorption.

Gall bladder disease increases with age (drinking adequate amounts of water can help a bit with reducing the incidence of gallstones).

40% of people over 65 YOA have some kind of pancreatic insufficiency. The motility of the colon decreases with age, causing an increase in constipation.

As we age, there are metabolic changes in our cells. Decreased glucose tolerance causes the blood sugar concentration to increase 1.5-mg% per decade of life. The table, below, summarizes the glucose concentration range-changes one would expect in a population where the "normal" blood glucose levels are 77-114 mg% (equivalent to 77-114 mg/dl):

Age in years	mg% glucose	Age in years	mg% glucose
20	77-114	60	85-122
30	79-116	70	87-124
40	81-118	80	89-126
50	83-120	90	91-128

Note that the blood glucose levels have been rounded up to give whole numbers. This glucose "intolerance", for want of a better word, may be due to 1 of 2 reasons:

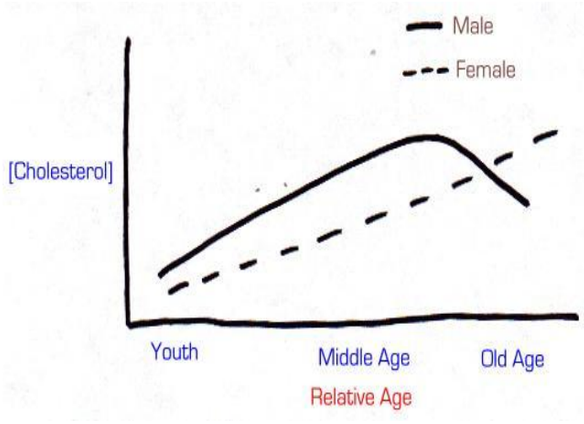
1) decreased β-cell (review your A&P notes) function and

2) increased peripheral resistance to insulin.

Keep in mind, too, that glucose tolerance tests (GTT's) for the YOUNG are INAPPROPRIATE for the ELDERLY!

Our cardiovascular system changes as we age, too. Blood vessels get stiffer with age. With increased stiffness, the vessels are less elastic, hence, blood pressure increases and is detected

as (diagnosed as) hypertension. In general, blood pressure increases in women older than 80 YOA and decreases in men older than 80 YOA.



In general, the cholesterol levels in men peak at about 60 YOA and in women, cholesterol increases until about 70 YOA -- women's' LDL increases concomitantly. The graphic, right, illustrates these trends:

Our renal system undergoes alterations, as well. Renal function decreases by 50% between 30 and 80 YOA. Renal disease effects and affects 75% of the senior population. Acid/base response is slowed (alkaline tide; review A&P notes). It becomes more difficult to handle protein, wastes and electrolytes. Americans, in particular eat FAR too much protein: 166% of the RDA. This leads to kidney diseases, as well.

As our age increases, we exhibit decreased creatinine excretion. We have increased fat on the trunk/around viscera. Decreased bone density, as we age, causes osteoporosis. The decreased length of the vertebra causes a height reduction at a rate of about 1.2-cm per 20 years. An example of this height loss is presented in the table, below:

Height in feet and inches	Height in cm	Age in years
5' 10"	**175**	**20**
5’ 9.5”	**173.8**	**40**
5’ 8”	**172.6**	**60**
5' 7.5"	**171.4**	**80**
About 5' 6.6"	**169.2**	**100**

In the musculoskeletal systems, fat and connective tissue with increasing age replace LBM -- some of this is changing by older people exercising and by receiving injections of growth hormone. We do not know enough about this regimen, yet, to declare it 100% safe. Total body protein is about 33% less than in young adults -- this comes from muscle and viscera. Hence, this leads to structural AND functional changes.

As we age, we change neurologically. Confusion increases with age. There have been, to date, NO dietary implications in refereed journals causing Alzheimer's or Parkinson's diseases.

Our immunocompetence changes. We experience decreased humoral and cell mediated immunity (review A&P notes or Microbiology notes) which results in increased illness in the elderly. This phenomenon may also explain the increase in various cancers in the elderly patient.

Probably one of the biggest changes that occurs as we age are those that affect our psychosocial "expansion". As we age, we become increasingly isolated. Because of this isolation, we decrease our diet/nutrition radically. We may "slip" into depression as we feel a sense of loss of: 1) a loved one, 2) we're unable to work as before (so, a loss of ourselves, so to speak), 3) of worth, 4) we're unable to move as well as when we were younger, 5) we don't have as much money now that we're on a "pension" and not working and 6) as we age, our body changes shape which causes changes in our perception of our body image.

As we age, our eyesight dims. A lack of physical activity coupled with all the above may lead to a sense of feeling trapped because the patient can't drive to buy food and/or can't see to prepare the food. I remember my grandmother, virtually blinded by diabetes and couldn't

smell to save her house, frying bacon in her late 80's. She felt it was done when SHE could just smell a tinge of burning. By that time it was pretty crisp :-) It was a part of her generation's independence, though, and very important to her.

All these isolative changes lead to a less than nutritional food supply at home. How is this solved? One example is the "Meals on Wheels" programs in many communities. Another is to assist the elderly relative by taking him or her to the grocery store so he or she gets out amongst others, buys food, socializes and gets some badly needed exercise. If the person is unable to walk but is otherwise not bed-ridden, get a wheel chair and push them around the store so they may still interact and participate.

Increased fear of victimization causes the elderly patient to feel like a prisoner in his or her own home. This, too, results in poor nutrition. The bottom line, here, is that for the majority of individuals who terrorize and victimize the elderly, i.e., have no biological alteration that causes them to behave in that manner, they learned from someone how to do this.

The solution -- yeah, yeah, yeah, in our current society it probably ain't gonna happen -- is to teach our children, our co-workers, supervisors, ad nauseum to have respect for others and to have high expectations from them to live up to that example instead of living DOWN to the examples of violence, negativism, abuse and intimidation we see on a daily basis in the home, on TV, in the work-place, on the street, ad nauseum.

In terms of financial awareness among the elderly, less than a third of the people who are aware of the Food Stamp Program use this resource. This would be another valuable avenue to pursue to improve the nutritional status of the elderly.

Nutritional Requirements of/for The Elderly

Energy requirements decrease with age due to normal metabolic decline and due to reduced physical activity. Per the 1989 RDA, decrease energy intake by 600 kcal/day after 51 YOA for MALES and decrease energy intake by 300 kcal/day after 51 YOA for FEMALES. BUT ... "older" people now are more active than in the past; therefore, you need to individually adjust a senior's nutritional plan. Keep in mind that diets less than 1800 kcal/day tend to be low in protein, calcium, iron and vitamins. Therefore, plan on using nutrient dense foods.

2004 Update: Not Much Change

RDA or AI [1]		Energy [2] (Kcal)	Protein [3] (gm)	Carbohy-drates [4] (gm)	Total Fat [5,6] (% Kcal)	*n*-6 PUFA (gm)	*n*-3 PUFA (gm)	Total Fiber (gm)	Drinking water, Beverages, Water in food (L)
Age 51-70	Male	2204	**56**	**130**		14*	1.6*	30*	3.7*
	Female	1978	**46**	**130**		11*	1.1*	21*	2.7*
Age 70+	Male	2054	**56**	**130**		14*	1.6*	30*	2.6*
	Female	1873	**46**	**130**		11*	1.1*	21*	2.1*

Source: http://www.fiu.edu/~nutreldr/SubjectList/D/DRI_Table_03-19-2004.pdf#search='rda%2C%20energy%2C%2051%20or%20older'

Not much has changed since 2004.

In 1989, the Food and Nutrition Board reported that 0.75 grams of protein per kg body weight was appropriate for all ages of adults. Proteins needs, though, increase greatly depending on the severity of disease and on the length of the disease. The elderly have a great deal of disease as they age.

Physical and psychological stress in the elderly leads to a NEGATIVE nitrogen balance. Infections, GI "upsets", changing metabolism due to chronic processes decrease the efficiency of nitrogen metabolism from the diet.

As a general rule, among the healthy seniors, protein deficiency is unlikely. HOWEVER ... Single or widowed elderly men are a unique group. They develop protein calorie malnutrition, quickly, which causes edema, itching, eczema, fatigue, muscle weakness and tissue wasting. All of these promote slow wound healing, impaired immune response and pre-mature death.

Due to decreased glucose tolerance, the elderly patient will develop either a transient temporary hypo OR hyperglycemia. The solutions are pretty straight forward:

1) reduce the intake of refined sugar

2) increase their intake of complex carbohydrates and

3) increase intake of soluble fiber in diet.

The patient may also be lactose intolerant -- in this day and age, that's easily dealt with utilizing OTC digestive aids.

Coronary heart disease (aka coronary artery disease; CAD) causes the greatest number of deaths of older people in the U.S. Even though these patients are elderly, decrease their kcal from lipid to 30% of their diets, too. If you take their fat too low, they won't absorb the fat-soluble vitamins well. There is research that is showing that in patients with tremendous atherosclerosis, a 10% fat diet actually shows reversal of the atherosclerotic plaque deposition. This does not mean that we all need to lower our fat intake below 25% of dietary energy, though.

Minerals are of significance, as well. With reduced LBM, requirements for minerals (e.g., for muscle activity) decreases. Mineral requirements may now be too high. Since the elderly patient is developing glucose intolerance, increase their daily chromium intake.

Dietary calcium needs to be increased for the elderly patient to help regulate/reduce/minimize the rate of osteoporosis formation.

Zinc deficiencies have been associated with decreased immune responses, anorexia, dysgeusia (difficulty tasting; causes normal foods to taste the opposite of what you'd expect), prolonged wound healing and decubitus ulcers. Excessive zinc in diets lacking Zn has not been demonstrated to reverse these!

Since hypertension is very common, reduce sodium intake to 2 grams/day. If the patient is on diuretics, increase magnesium and potassium.

Vitamin A levels are normal in the elderly. The elderly are much more sensitive to vitamin A than they were in their youth, therefore, watch their intake.

Vitamin D levels of most elderly patients' dietary intakes are less than 2/3 the RDA. This may be due to a reduction of sunlight. Without sunlight, give 300 IU of vitamin D3 per day.

Vitamin C intake, blood levels and tissue levels are reduced in the elderly -- PARTICULARLY in smokers and stressed elderly patients. Oral ascorbate does not lead to successful improvement. Scurvy is rare, EXCEPT in alcoholics and men without adequate finances. In terms of supplementation, be very careful: the elderly are very sensitive to vitamin C.

Dehydration is a very real and very major problem for the elderly. The elderly have decreased thirst feelings and have decreased water conservation at the kidney. If they develop fever, diarrhea or don't drink enough water, they may dehydrate and stay in a hospital, develop renal calculi or become constipated. As a general rule, water requirements for the elderly are on the order of 30-35 mL water per kg IDEAL body weight.

Traditional Hospital Diets

Until recently, MD's were not heavily instructed about nutrition. You may have to help them figure out what the patient's diet needs to be pre- AND post-operatively. Recently, medical schools have been adding nutrition to the curriculum for medical students. It is not, yet, at the depth of a one-semester course although it is improving. Rely on your nutritionists/dieticians and your own education to advocate for your patient.

I have summarized very succinctly the salient features of numerous diets. Each diet has a small table that goes along with it. It is uniform throughout these sections so that you get used to thinking about diets in a uniform manner.

Diet Name: Clear Liquid		
Basis for Diet: this is nutritionally inadequate; use/d for a short period of time; leaves no residue after digestion. It is used with anorexia, N/V, acute diarrhea, post-operative progression, and transition between tube feeding and oral feeding.		
Comments: Offer every 1-2 hours, small servings, 6-10 teaspoons at a time.		
Tools for the Patient: this diet decreases thirst, regulates electrolytes and water homeostasis, stimulates peristalsis in post-op patients.		
Cautions: Do not use for more than a few days: it leads to weight loss, tissue wasting and nutrient deficiencies.		
Foods Excluded:		
Milk	Fruits	Veggies
All	Whole (clear juices o.k.)	All
Breads/Starches	Meat	Fats
All	All except plain flavored gelatin	All
Beverages	Spices/Seasonings/Preservatives	
All except coffee, tea, fat-free broth, bouillion, sodas	Exclude meat soups, gravies, sauces, chili powder, black pepper, mustard seed, and nutmeg as these all INCREASE HCl production in the stomach.	

Diet Name: Full Liquid		
Basis for Diet: Consists of foods that are liquid/liquefy at room or body temperature; for chewing, swallowing difficulties, jaw wiring, acute GI problems. Use after clear liquid in post-op progression.		
Comments: offer every 4 hours or as necessary.		
Cautions: This diet is generally iron deficient, high in lactose, hence may NOT work for those with lactose intolerance. It's high in fat; high in calcium, low in fiber: may constipate the patient.		
Foods Excluded:		
Milk	Fruits	Veggies
All but non-fat dry milk	As per clear liquid	All
Breads/Starches	Meat	Fats
All	All	All
Beverages	Spices/Seasonings/Preservatives	
As per clear liquid diet	As per clear liquid diet	

Diet Name: BRAT diet
Basis for Diet: NONE! This is NO LONGER USED! It is nutritionally dangerous!
Comments: Foods that were included were Bananas, Rice, Applesauce and Toast/Tea -- B...R...A...T
Tools for the Patient: Inform health care providers that this is no longer in use!
Cautions: This diet is no longer in use!
Foods Excluded: Doesn't matter! No longer in use!

Diet Name: Soft Diet, aka, Dental Soft Diet/Mechanical Soft Diet		
Basis for Diet: An adequate diet for ease of eating/digesting. A transition diet. Most useful when patient guides its application. May be used for those who have poorly fitting dentures or who have no teeth or after CVA (cerebrovascular accident -- stroke)		
Comments: Double check gingival mastication, i.e., can they "gum" some of their food, too?		
Cautions: Low in cellulose/residue		
Foods Excluded:		
Milk	Fruits	Veggies
None	All but soft, raw, canned and frozen, dried fruits	All but diced, soft or chopped
Breads/Starches	Meat	Fats
All but soft rolls, breads, biscuits	All but minced or ground	All except chopped nuts
Beverages	Spices/Seasonings/Preservatives	
none	None	

Diet Name: Soft-Fiber Restricted		
Basis for Diet: for reducing fecal output as in GI blockage or irritable bowel syndrome; use in between full-liquid and normal diet in therapeutic progression. It's nutritionally o.k. without harsh fiber or excessive richness.		
Foods Excluded:		
Milk	Fruits	Veggies
All except milk, cottage cheese, cream cheese, cheddar and Swiss cheese	Membranes (around oranges, grapefruits); skins (around apricots, apples, pears)	Skins and fried
Breads/Starches	Meat	Fats
Hi-fiber foods	CHEWY meats	Fried eggs, all except cream, margarine, vegetable oils, fats for cooking, gravy, cream sauces
Beverages	Spices/Seasonings/Preservatives	
None	Use in moderation	

Diet Name: Low Residue		
Basis for Diet: used in acute irritable bowel syndrome, diverticulitis, before or after bowel surgery; provides a minimum of fiber (fiber is in the diet)/residue (residue is after digestion); used for chronic diarrhea brought about by anxiety; food poisoning, malabsorption processes, laxative abuses, cancer of the GI system and AIDS-related infections.		
Comments: May wish to use anti-diarrheals as necessary		
Cautions: Lacking in calcium, iron, and vitamins. Use only for a few days.		
Foods Excluded:		
Milk	Fruits	Veggies
All	All	All
Breads/Starches	Meat	Fats
All but white bread, macaroni, noodles	All but tender	All
Beverages	Spices/Seasonings/Preservatives	
All but clear soups, tea, coffee	See clear liquids diet	

Diet Name: General Diet/Diet-As-Tolerated		
Basis for Diet: For routine maintenance; to promote general health; not greater than 30% of calories from fat; 12.5% (more or less) protein and the rest complex carbohydrates.		
Comments: See section on exchange system; modify as necessary for patient's "comfort"		
Foods Excluded:		
Milk	Fruits	Veggies
None	None	None
Breads/Starches	Meat	Fats
None	None	None
Beverages	Spices/Seasonings/Preservatives	
None	None	

Diet Name: Pureed
Basis for Diet: See General diet -- same diet, just pureed for patients who have difficulty chewing and swallowing, e.g., post-CVA
Comments: Be creative and colorful to create an aesthetically pleasing plate; spices and seasonings may even help a little bit; an ounce of red wine at supper-time seems to stimulate appetite in those who are post-CVA, on cancer chemotherapy, have AIDS-related dietary suppression. D9-THC, the active ingredient in marijuana seems to help, as well, and may be a useful alternative to Marinol (the FDA-approved form of D9-THC taken orally) when inhaled if the patient is having difficulty keeping foods, liquids, oral medicines "down".
Foods Excluded: See General Diet

Diet Name: Sodium Restricted
Basis for Diet: to relieve fluid load on kidneys; to reduce pulmonary edema; to assist with sodium depleting diuretics. To manage sodium-sensitive hypertension; congestive heart failure (there is a move on now to change this to simply heart failure as not everyone develops congestion); liver dysfunction; any other disease that promotes fluid retention; steroid therapy for anti-inflammation
Comments: Most of our sodium intake is from foods in the meat, grain and milk food groups
Tools for the Patient: For this diet to work -- as with most of the diets in these 2 sections -- the best approach is to communicate clearly with and work with the patient. Remember the patient is paying you, not the other way around.
There are at least three levels of sodium restriction. These levels and their allowed intakes of sodium are following:

Mild [1]	**Moderate** [2]	**Severe** [3]
2-3 g Na/day	1-1.5 g Na/day	0.5-0.7 g Na/day
In the "Spices/Seasonings" box, below, are the restrictions for each level of sodium restriction by superscript.		
Foods Excluded:		
Milk	Fruits	Veggies
All but skimmed	None	See below
Breads/Starches	Meat	Fats
See below	Reduce animal foods and increase plant foods	Reduce anyway
Beverages	Spices/Seasonings/Preservatives	
Anything with sodium -- including softened water (that contains sodium ions)	Baking powder, baking soda, pickles, MSG, sodium acetate, sodium benzoate, salt [1,2,3] No salt at the table [1,2,3] No salty foods [2] No processed foods with sodium chloride [2] FOUR exchanges of bread per day allowed [3] All of the above PLUS low-sodium breads [3] NO beets, spinach, chard, kale, celery	

Diet Name: Fat Modified Diet		
Basis for Diet: To prevent cardiovascular disease. There are 2 fat-modifying programs: Step 1 and Step 2 diets. They are summarized in the table below:		
Step 1	**Step 2**	
Generally recognized diet for everyone. With borderline high cholesterol, follow a healthy diet and retest after 1 year -- if no changes with/following this diet, go to Step 2	Further reduce for this part	
Not more than 30% of kcal from fat (< 10% of kcal from saturated; < 10% of kcal from polyunsaturated; 10-15% of kcal from mono-unsaturated; < 300 mg cholesterol/day); 50-60% of kcal from complex carbohydrates; 10-20% of kcal from protein	Not more than 30% of kcal from fat (< 7% of kcal from saturated; <10% of kcal from polyunsaturated; 10-15% mono-unsaturated; < 200 mg cholesterol/day); 50-60% of kcal from complex carbohydrates; 10-20% of kcal from protein	
Tools for the Patient: Exercise helps, begin with assistance, i.e., MD, DO, RN, trainer; Do NOT attempt to lose too much weight too rapidly: gallstones will precipitate due to the decreased solubility of the cholesterol salts in the gall bladder.		
Foods Excluded: The table is for Step 1 diets. For Step 2, further reduce as described above.		
Milk	Fruits	Veggies
All natural cheeses, whole milk	None	Those prepared in fats/sauces
Breads/Starches	Meat	Fats
Commercial baked goods, sweets	Fatty cuts of meat, skins	Chocolate, butter, bacon, fat, yolk-dressings like mayonnaise
Beverages	Spices/Seasonings/Preservatives	
NO alcohol in excess: 1 bread exchange = 30 mL gin, whiskey, rum, vodka 75 mL dry wine 150 mL beer These promote reduced LDL's and elevated HDL's (for a healthy heart)	As necessary for patient's comfort	

Interactions between Nutrients and Drugs: A VERY Brief Introduction

Definitions

Primary nutrient malabsorption means that the nutrient gets into the bowel, but it is not taken up across the bowel. **Secondary nutrient malabsorption** means that the nutrient may or may not have crossed the bowel into the blood, and may not be utilized or may be over-utilized by the cells in the body.

Some Illustrative Drugs Causing Primary Nutrient Malabsorption:

Drug	Use	Action	Nutrients lost
Cholestyramine	Bile-binding resin	Binds bile salts and nutrients	Fat, Vitamins A, D, K, B_{12} and iron
Colchicine	Treats gout	Enzyme damage; reduces cell reproduction	Fat, B_{12}, pro-vitamin A, lactose, sodium and potassium ions
Methyl DOPA	Antihypertensive	?????	B_{12}, folate, iron
Mineral oil	Laxative	Nutrients dissolve in oil and are excreted	Vitamins A, D and K
Neomycin	Antibiotic	Binds bile salts; reduces activity of pancreatic lipase	Fat, B_{12}, nitrogen, lactose, sucrose, ionized sodium, potassium, iron, calcium
PASA	Antitubercular	Blocks reuptake of B_{12} in the bowel	Fat, folate, B_{12}
Phenolphthalein (now supposed to be off the market)	Laxative	Rapid intestinal transit	Calcium and potassium ions and Vitamin D
KCl	Potassium replacement therapy	Reduces ileal pH	B_{12}

Some Illustrative Drugs Causing Secondary Nutrient Malabsorption:

Drug	Use	Action
Cimetidine	Ulcers	Reduces B_{12} absorption
Tricyclic antidepressants (e.g., Elavil)	Antidepressant	Weight gain due to stimulated appetite
Phenobarbital	Anticonvulsant	Increases Vitamin D metabolism
Prednisone	Allergies, COPD	Reduces calcium ion transport; increases Na^+ retention
Methotrexate	DHFR inhibitor in leukemia	Reduces folate levels

Some Illustrative Drugs Causing Vitamin Antagonism:

Target vitamin	Drug that antagonizes it
K	Coumarins
Folate	Methotrexate; trimethoprim
B_6	Isoniazid; Levodopa

Effects of Oral Contraceptives on Nutrition:

Nutrient effected	Effect	Clinical result
Vitamin A	Impairs liver storage	?
Vitamin B_6	Alters trp metabolism and B_6 metabolism	Abnormal protein metabolism; mood alterations
Vitamin B_{12}	Reduces B_{12} levels	?pernicious anemia?
Folate	Reduces RBC numbers; increase folate binding protein	Megaloblastic anemia

Summary of The Additive Effects of A Drug with A Nutrient or Nutrient-like Product:

Drug	+	Alcohol or food	=	Effect
Chlorpropamide (oral hypoglycemic)	+	Alcohol	=	Shortness of breath (SOB), headache, flushing
ADH inhibitors (disulfiram, metronidazole)	+	Alcohol, alcohol-containing foods	=	Belly and chest pain, flushing, headache, N/V
Tolinase, Orinase (oral hypoglycemics)	+	Alcohol, sugar, sweets	=	Confusion, weakness, irrational behavior, unconsciousness
MAOI's (anti-depressants)	+	Cheese, red wine, chicken liver	=	CVA, hypertensive crises, headache
Isoniazid (anti-TB)	+	Yeast (foods high in tyramine)	=	N/V, restlessness

Summary of The Food Effect on Drug Absorption:

This list is not inclusive: <u>always</u> look up the medication you are either giving or taking to learn the effects of nutrients on its bioavailability.

Food Effect on Drug Absorption	
Absorption reduced by food	Absorption delayed by food
Amoxicillin, ampicillin, aspirin, isoniazid, l-DOPA, Pen-G [V-K], phenobarbital, tetracycline	Tylenol, aspirin, cephalexin, digoxin, furosemide, sulfanilamide, sulfasoxazole

Nutrient/Drug Interactions: Exhaustive; Not All-inclusive, however

Drug Name	Class/Indication	Comment
Atarax	Antihistamine/ anxiolytic	Potentiates CNS depression with EtOH
Ativan	Benzodiazepine anxiolytic	Potentiates CNS depression with EtOH
Librium	Benzodiazepine anxiolytic	Potentiates CNS depression with EtOH
Serax	Benzodiazepine anxiolytic	Potentiates CNS depression with EtOH
Xanax	Benzodiazepine anxiolytic	Potentiates CNS depression with EtOH
Haldol	Butyrophenone antipsychotic	Potentiates CNS depression with EtOH
Moban	Dihydrolindolone antipsychotic	Potentiates CNS depression with EtOH; tablets contain calcium that may interfere with tetracycline/phenytoin absorption
Thorazine	Aliphatic phenothiazine antipsychotic; retractable hiccups, too	Potentiates CNS depression with EtOH
Anafranil	Tricyclic antidepressant for obsessive compulsive disorder	Potentiates CNS depression with EtOH
Desyrel	Triazolopyridine	Potentiates CNS depression with EtOH
Elavil	Tricyclic antidepressant (endogenous sort -- see Depression diet)	Potentiates CNS depression with EtOH
Lithobid	Lithium salt for bipolar manic depressive disorder	Potentiates toxicity of indomethacin, xanthine and caffeine (SIDEBAR: caffeine is a trimethyl xanthine. 3 cups of coffee contain approximately 425 mg of caffeine and increase the FEV [see BIOL 224 notes] by 20%. The 425-mg of caffeine are equivalent to 200 mg of aminophylline (dimethylxanthine similar to theophylline). Caffeine is metabolized, partially, to theophylline.)
Nordil	MAOI for refractory depression	AVOID: cheeses, salami, chocolate (European moreso than American) wine, pickled herring, chicken livers, yeast extract, broad beans, yogurt

Drug Name	Class/Indication	Comment
Parnate	MAOI for refractory depression	AVOID: EtOH and trp
Paxil	Selective serotonin reuptake inhibitor (SSRI)	AVOID: EtOH and trp
Prozac	SSRI	AVOID: EtOH and trp (increased CNS stimulation with trp)
Mebard	Barbiturate anticonvulsant	Antagonizes vitamins D and K and oral contraceptives (SIDEBAR: penicillins, tetracyclines, cephalosporins and griseofulvin inhibit the effects of oral contraceptives. If you do NOT want to get pregnant when on one of these kinds of drugs, utilize barrier contraception.)
Mesantoin	Hydantoin anticonvulsant	AVOID: EtOH, calcium-containing antacids reduce absorption; reduces vitamins D and K levels, too.
Accutane	Retinoic acid derivative	AVOID: Vitamin A and EtOH
Achromycin V	Tetracycline antibiotic	Antacids, iron, zinc, calcium, magnesium, dairy products, urinary alkalinizers and food decrease absorption -- ALSO: inhibits oral contraceptive activity
Retin A	Retinoic acid derivative	AVOID: spices, lime (?mechanism not clear, but is a fact)
Orinase	Oral hypoglycemic	AVOID: EtOH (disulfiram-like reaction); antagonized by niacin
Tolinase	Oral hypoglycemic	AVOID: EtOH (disulfiram-like reaction); antagonized by niacin; potentiated, also, by salicylates
Bentyl	GI tract anticholinergic	Concomitant antacids inhibit absorption
Cytotec	Prostaglandin E analog	AVOID: magnesium-containing antacids
Maalox caplets	Antacid	Reduces tetracycline absorption; absorption blocked by rhubarb, spinach, bran

Drug Name	Class/Indication	Comment
Furoxone	Antimicrobial	AVOID: tyramine-containing foods
Azulfidine	Salicylate-sulfonamide	Decreases folate absorption given concomitantly
Dramamine	Antihistamine	May potentiate ototoxicity of antibiotics (especially aminoglycosides)
Cotazym	Pancreatic enzymes	May antagonize iron
Cefobid	Cephalosporins	AVOID: EtOH for AT LEAST 72 hours after the last dose
Cipro	Quinolone	AVOID: concomitant antacids, iron and zinc
Flagyl	Nitroimidazole	AVOID: EtOH during and AT LEAST 24 hours after use
Noroxin	Quinolone	AVOID: concomitant antacids and minerals; potentiates caffeine
Fulvicin P/G	Griseofulvin	Potentiates EtOH; reduces oral contraceptive activity
Drug Name	Class/Indication	Comment
Depen	Chelator in rheumatoid arthritis	Antagonized by mineral supplements
Didrome	Calcium regulator	AVOID: calcium, iron, magnesium and aluminum within 2 hours of dose
Phoslo	Phosphate regulator	AVOID: calcium supplements and antacids; may inhibit tetracycline absorption
Matulane	Procarbazine (adjunct in Hodgkin's disease)	Disulfiram reaction with EtOH; AVOID: tyramine-containing foods
Allbee with C	Vitamin supplement	Iron blocks tetracycline uptake
Materna	Pre-post-natal supplement	Iron and calcium reduce calcium absorption across the bowel -- oxymoron: why give tetracycline to a pregnant or nursing woman?!?!?!?! Ya don't! It doesn't allow the enamel to develop adequately on their kid's/fetus' teeth and they turn a mottled brown color and require dental work later on.

Drug Name	Class/Indication	Comment
Rocaltrol	Calcitriol	Hypermagnesemia with magnesium-containing antacids; reduced absorption with cholestyramine or mineral oil
Stuart Prenatal	Supplement	Iron, calcium blocks tetracycline absorption -- SO!? See Materna, above
Oral contraceptives	Oral contraceptive	Antacids and antibiotics may inhibit absorption
Axotal	Barbiturate and analgesic (primarily for tension headache)	With EtOH or NSAID's cause increased risk of GI bleed
Antabuse	EtOH deterrent	EtOH reaction with tonics, foods, after-shaves, back rubs, lab experiments where EtOH or another alcohol is present
Drug Name	Class/Indication	Comment
Habitrol	Smoking cessation aid	Quitting smoking increases caffeine metabolism -- there's nothing worse than a nervous, wired, newly quit smoker!
Asbron-G	Xanthine and expectorant (asthma, bronchitis, COPD)	AVOID: other xanthines, e.g., caffeine, theobromine
Macrobid or Macrodantin	Antibiotic	AVOID: magnesium trisilicate
K-Phos Original	Urinary acidifier	Hyperkalemia may occur with potassium supplements