Chap 25

Nutrition
Food + Diet

Living things as chemical factories:

Organisms maintain themselves by obtaining energy + synthesizing new chemicals.

Autotrophs ⟶ synthesize their own nutrient

Heterotrophs ⟶ need Nutrient

Nutrients are all the molecules required to support living things, could be ions Na^+, Ca^{++}, Fe^{++}...
~~to~~ organic molecules carbohydrates, fats, protein + vitamins.

What is Nutrition: Branch of Science that seeks to 1) understand food, 2) its Nutrients, 3) How body uses Nutrition 4) + How inappropriate intake of food lead to illness.

Nutrition also refers to processes by which food is used. include **Ingestion** + **digestion** + **absorption** + **assimilation**.

Digestion: Breakdown of complex food molecule to simpler ones.

Ingestion: Process of taking food in body.

Absorption: movement of nutrients from digestive system to circulatory to distribute to body organs

Assimilation: Modification + incorporation of absorbed molecule to create larger ones.

Diet is food + Drink consumed by a person day to day. It should contain minimal nutrient needed to sustain the body.

If it's deficient, ⇒ ill health.

Kcal Kilocalories is used to measure amount of energy in foods.

1 Kcal is amount of energy needed to raise temp of 1 Kg of H_2O by 1°C.

1 Cal → raise T of 1 g by 1°C.

In food unit used is Cal capital C.

1 Cal = 1 Kcal

25.2 Kind of Nutrients + their function.

Nutrients 6 groups

1) Carbo
2) lipids
3) Proteins
4) Vitamins
5) Minerals
6) H_2O

Carbohydrates; Mono- Oligo- Poly saccharide (2)

like simple sugar glucose or disacc Sucrose or poly sacc Starch. each have ≠ structure + ≠ role. Many taste sweet.

Starch is ——ain carbohydrate. broken to glucose to give energy.

Simple sugars are needed to ——ake DNA/RNA) (ribose).

- Other Complex indigestible carbohydrate can be source of dietary fiber, it slows absorption of nutrients + stimulates peristalsis (Intestinal move——at to facilitat defecation)

- Carboh deficient diet ——ake body use fats + prote as source of energy + glucose. they need to survive

fats are converted to Ketoacids. Very large amount of Ketoacid are lethal to Human. They can be obtained in case of fasting. they ↘ pH of blood.

If person do Not have fat, they use their proteins as source of energy. (happens in starvation)

This also ——y be ~~very~~ lethal, because protein degradation leads to NH_3.

If person takes excess carbohydrate in diet, they're converted to fats.

Lipids: ≠ class of fats:

fatty acids – phospholipids – steroid – triglycerides.

~~No need to~~ Every food that contains cells contains phospholipid.

Many steroid are hormone that help regulate ≠ body processes

- Vit D is a steroid synthesized in body.
- Cholesterol ... also found in food + cause health problem is ▷▷ high.
- fats are source of energy.

9 Kcal/g of fat. Compare to 4 Kcal/g of

Super ~~or~~ poke.

Fatty acid are either essential like Linoleic + linolenic or Non-essential that your body can synthesize.

Essential are needed to make important molecule needed in blood clotting, normal growth = linoleic acid intake was shown to ↓ cholesterol level

- Vit A, D, E, K can not be absorb unless fat are presence.

- Fat act as insulators to preserve heat
- it also act as shock absorbant.

Under starvation, we loose fat for energy.

- Fat give nice taste to food, give feeling of satiety.

Proteins :

They're ~~made~~ of aa. linked by peptide bond.

Protes can be → Complete contain all aa essential
→ Incomplete lack the essential aa.

Our body can synthesize the non-essential aa but Not the essential.

During prolonged fasting, we use aa as source of glucose + energy.

Prote are Not usually stored., Hence we need daily intake of protein. ~ 20 → 30g are needed/day

Prote are usually spared + Not used as energy source unless person is fasting too long.

Body has a mechanism to ensure that. through Protein-Sparing. Body use first sugar + fat to make ATP.

RBC + brain require sugar for energy which may be synthesized from some aa during fasting.

Vitamins:

Needed in g or mg quantities for activity of enzymes. They're Not synthesized in our body but must be taken in diet. See Table 25.2

for Vit

These Vitamins can be bound to enzyme very tightly we call the prosthetic group Coenzyme

Only Vit D can be synthesized in our body. using Cholesterol from cells. Vit D act as a Hormone

Many vitamins are taken as supplement. If they're water soluble like B + C → No Har but Vit A, D, E, K, lipid soluble, if taken in excess may be toxic.

Like Vit D cause stone in Kidney, tissue-bone calification.

Minerals:

Found in nature. Can't be synthesized

Table 25.3. Function of many minerals

Na^+, K^+, Ca^{++}, Fe^{++}, Mg^{++}, ... each has a function in table.

Water

Most important Molecule for life. All reactions proceed in water. It's a universal solvent.

Human body contains ~ 65% H_2O.

Bone 33% H_2O.

Blood > 90% H_2O.

Nutrient + waste are dissolved in H_2O.

Ions dissolved in H_2O act as electrolytes.

Waste are eliminated in H_2O as Urine.

H_2O evaporates from skin cools body.

all digradation of nutrient happens in H_2O.

25.3 Dietary Reference Intakes. D.R.I

DRI gives information on amount of each nutrient a person should get. Male ≠ female, old ≠ young.

pregnant, nursing mother ≠.

D.R.I are used in preparing food product labels. By law, all ingredient should be on label + How much energy they give.

See Table 25.4

25.4 Food Guide Pyramid:

It's a tool to Plan Nutritious diet.

Color + width of bands refers to food group + servings.

For fun go to www.pyramid.gov to get a dietary plans

(1) Grains

contain Carbohydrate, fiber, B vitamins, E vit, Iron, magnesium.

good as energy source + fiber.

(2) Fruits

Overall sweet plants. High in sugars

Contain Carbohydrate, fiber, water, Vit C.

(3) Vegetables

Non sweet plants.

Some provide protection against cancers like cabbage, broccoli, cauliflower, ...

Main source of Vit + fiber for digestive tract. B, A, C, E, K, Iron, Mg

Milk (V it D), protein, Carbohydrate (5)
fat, B vit, + Calcium.

Meat + Beans.

Most of people eat ~~are~~ as source of protein. Beef, Meat, chicken nuts, Pig

Beans (except for soybean) are rich in protein, less fats.
Food preparation also important in choice of fat of diet (instead of frying, bake, ...)

- Excess Protein ~~ex~~ exhaust Kidney + liver.
  that eliminate NH_3^+ as Urea + Calcium in kidney
  ~~ag~~ when found in High Protein diet

Main Component of Meat + beans: Protein, fat, B vit, Vit E, Fe.

Oils

Needing small amount: High Caloric Content.
- < 10% of calories needed should come from saturated fats.
- < 300 mg/day of cholesterol + trans fatty acids should be absent in diet

Oil like olive, corn, Sunflower used in cooking

olive, sesame oil in dressings.

- Trans fat ↗ LDL, TG, cholesterol.
- Oil contain Mono + poly unsaturated fats
  No cholesterol of Plants.
- Solid fat like butter from animals.
  beef fat, Sheep, ---

Fat can be obtained by hydrogenating oil
Most oil contain Vit-E + essential fatty acids.

Exercise: Must do at least 30 min / day.
it ↗ heart rate

25.5 Basal Metabolic Rate, Diet + Weight Control

BMR is rate at which body uses energy at rest.
This energy is used to keep body constant warm, Heart, + brain functions.
≠ factors affect BMR: age - gender - height, Height + weight.
BMR in Children is High + it ↘ with age.

Elderly has least BMR.

Men has higher BMR than women

larger person > BMR.

Most people BMR range beta 1,200 → 2,200 Kcal/day

see p 573 to estimate BMR. (25.3. How Energy work)

As most of us are not at rest, we need a High energy than BMR.

like Specific Dynamic Rate SDR:

which is the amount of energy needed to process food that we eat. = ~ 10% of total daily Kilocalorie intake.

+ type of activity done by a person (Teacher, Laborer, Athlete, Doctor ... --).

BMI Body Mass Index. = Body weight compared to height = $\frac{\text{Mass Kg (No clothes)}}{m^2 \text{ (height)}^2}$

if BMI > 25 overweight

25 → 30

if BMI > 30 → obese → Risk on Health.
we can ↓ Risk by ↑ our fitness.

Fitness is a measure of how efficient a person can function both physically + Mentally.

Read about Weight control

25.6

Eating Disorders — Obesity, Bulemia, Anorexia nervosa.

Obesity — Related to perceptions + cultural values.
+ strong psychological component

Health + life span affected.
Children physically inactive than previously.
— age live shorter than their parents

Death associated with obesity is Sedentary Death

Syndrome SDS

Food Intake >> Energy spent

Eat less, Exercise — or.

Main reason is life style more than Genetic reasons

— You overeat to solve a problem → Obesity
Social gathering / Celebration → Eat → Obesity

there is a gene involved in obesity
gene called perilipin Perilipin appear to
make people resistant to weight loss.
other people — suffer from chemical imbalance
making them feel hungry always or Not
feeling full when eating (.
- Leptin is a hormone if absent, make people
obese. It suppress appetite (shown
in animal but Not in Human.

See outlook 252

Bulemia "Hunger of an ox"
person has cycle of eating binge followed
by purging it by inducing vomiting or taking
laxative. Silent Killer. Can't be detected
easily
these people have normal weight or a bit Overweight
Both men + women affected (more woman)
Cause is psychological / depression.
symptoms of Bulimic People include the

- Excessive H2O loss - ↓ Blood volume -
- extreme mineral deficiency - Kidney Malfunction -
↗ Heart rate - loss of Rythmic Heartbeat -
Lethergy - Diarrhea - Headache -
(see rest in book p 577)

Anorexia Nervosa

Severe + Prolonged weight-loss due to voluntary severe restriction in food Intake
(Adolescent + Women)
Afraid of being overweight.
Skinny + but do Not eat so they don't become obese (afraid)
person Do Not match (height + weight) for his/her age
They Starve themselves to death.
Occupied with their image.
Symptoms: thin / dry / Brittle hair

p 577
Book

Another problem similar to Anorexia is Muscle dysmorphia = Bigorexia. building Muscle obsession.

25.7

Deficiency Diseases

Diet rich in Carbohydrates & fat, low in complete Protein

Disease Kwashiorkor (Fig 25.4)

Distental belly - slow growth - slow movement.

may lead to brain damage & death.

By including Protein rich diet, we may reverse disease.

- Other diseases are related to Vitamin Deficiency.

* Mineral deficiency. (Osteoporosis)

See Fig 25.5 starvation & stored foods.