

PENGANTAR ILMU GIZI DASAR

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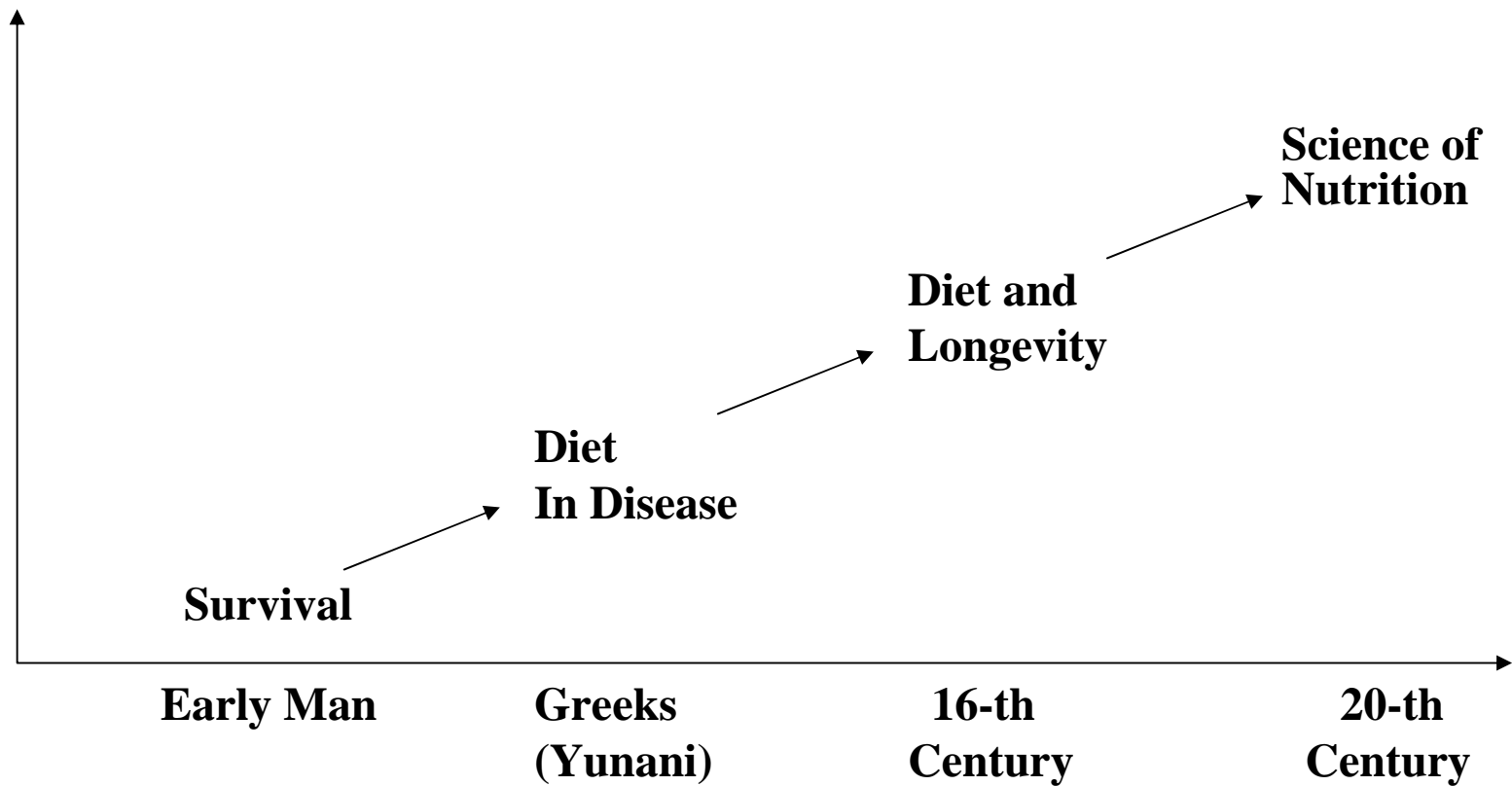
Pendahuluan

- *We are what we eat.*
- *Please tell me what you eat so I can tell you who you are*
- *Ilmu yang mempelajari hal ikhwal makanan dikaitkan dengan kesehatan tubuh (kegunaan) disebut Ilmu Gizi.*
- *Kata “gizi” berasal dari bahasa Arab “ghidza” yang berarti makanan.*
- *Dengan demikian, di satu sisi ilmu gizi berkaitan dengan makanan, sedangkan di sisi yang lain berkaitan dengan tubuh manusia.*

Pengertian

- Lusk (1931): *Nutrition may be defined as the sum of processes concerned in the growth, maintenance and repair of the living body as a whole or its constituents parts.*
- Mary Swartz (1935): *Nutrition deals with the science laws governing the requirement of human being for maintenance, growth, activity, reproduction and lactation.*
- Todhunter (1967): *Nutrition deals with: (a) the scientific laws governing the requirement of human being for maintenance, growth, activity, reproduction and lactation; (b) all that makes man a healthy, functioning, creative human being through well chosen diet.*

Sejarah Perkembangan Ilmu Gizi



Sejarah Ilmu Gizi

- **400 B.C. -- Hippocrates, the "Father of Medicine", said to his students, "Let thy food be thy medicine and thy medicine be thy food". He also said "A wise man should consider that health is the greatest of human blessings."**
- **400 B.C. -- Foods were often used as cosmetics or as medicines in the treatment of wounds. In some of the early Far-Eastern biblical writings, there were references to food and health. One story describes the treatment of eye disease, now known to be due to a vitamin A deficiency, by squeezing the juice of liver onto the eye. Vitamin A is stored in large amounts in the liver.**
- **1500's – Scientist and artist Leonardo da Vinci compared the process of metabolism in the body to the burning of a candle.**

- **1747 – Dr. James Lind, a physician in the British Navy, performed the first scientific experiment in nutrition. At that time, sailors were sent on long voyages for years and they developed scurvy (a painful, deadly, bleeding disorder). Only nonperishable foods such as dried meat and breads were taken on the voyages, as fresh foods wouldn't last. In his experiment, Lind gave some of the sailors sea water, others vinegar, and the rest limes. Those given the limes were saved from scurvy. As Vitamin C wasn't discovered until the 1930's, Lind didn't know it was the vital nutrient. As a note, British sailors became known as "Limey's".**
- **1770 -- Antoine Lavoisier, the "Father of Nutrition and Chemistry" discovered the actual process by which food is metabolized. He also demonstrated where animal heat comes from. In his equation, he describes the combination of food and oxygen in the body, and the resulting giving off of heat and water.**

- **Early 1800's – It was discovered that foods are composed primarily of four elements: carbon, nitrogen, hydrogen and oxygen, and methods were developed for determining the amounts of these elements.**
- **1840 -- Justus Liebig of Germany, a pioneer in early plant growth studies, was the first to point out the chemical makeup of carbohydrates, fats and proteins. Carbohydrates were made of sugars, fats were fatty acids, and proteins were made up of amino acids.**

- **1897 – Christiaan Eijkman, a Dutchman working with natives in Java, observed that some of the natives developed a disease called Beriberi, which caused heart problems and paralysis. He observed that when chickens were fed the native diet of white rice, they developed the symptoms of Beriberi. When he fed the chickens unprocessed brown rice (with the outer bran intact), they did not develop the disease. Eijkman then fed brown rice to his patients and they were cured. He discovered that food could cure disease. Nutritionists later learned that the outer rice bran contains vitamin B1, also known as thiamine.**

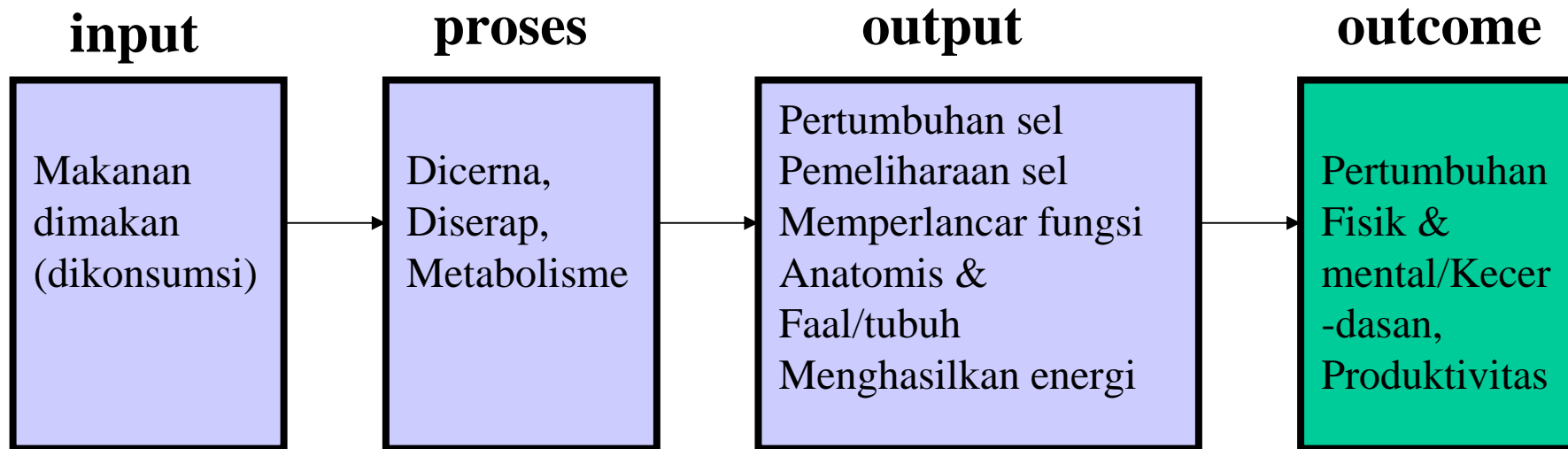
- **Dr. William Beaumont and Alexio St. Martine in the 19th century:**
 - **He determined the stomach is not a grinder**
 - **There is no spirit in the body directing some of the foods to 'good' purposes, and discarding the 'bad'**
 - **digesting takes place by digestive juices secreted from the stomach**
 - **foods are digested all at the same time but at different rates, not separately and sequentially, as was thought.**
 - **stomach rumblings are just stomach contractions**
 - **fat is digested slowly**

- **The 20th century became the era of the Golden Age of Nutrition.**
- **1912– E.V. McCollum, while working for the U.S. Department of Agriculture at the University of Wisconsin, developed an approach that opened the way to the widespread discovery of nutrients. He decided to work with rats rather than large farm animals like cows and sheep. Using this procedure, he discovered the first fat soluble vitamin, Vitamin A. He found that rats fed butter were healthier than those fed lard, as butter contains more Vitamin A.**

- **1912 – Dr. Casmir Funk was the first to coin the term “vitamins” as vital factors in the diet. He wrote about these unidentified substances present in food, which could prevent the diseases of scurvy, beriberi and pellagra (a disease caused by a deficiency of niacin, vitamin B-3). The term vitamin is derived from the words vital and amine, because vitamins are required for life and they were originally thought to be amines -- compounds derived from ammonia.**
- **1930’s – William Rose discovered the essential amino acids, the building blocks of protein.**
- **1940’s – The water soluble B and C vitamins were identified.**

- **1940's -- Russell Marker perfected a method of synthesizing the female hormone progesterone from a component of wild yams called diosgenin.**
- **1950's to the Present -- The roles of essential nutrients as part of bodily processes have been brought to light. For example, more became known about the role of vitamins and minerals as components of enzymes and hormones that work within the body.**
- **1968-- Linus Pauling, a Nobel Prize winner in chemistry, created the term Orthomolecular Nutrition. Orthomolecular is, literally, "pertaining to the right molecule". Pauling proposed that by giving the body the right molecules in the right concentration (optimum nutrition), nutrients could be used by people to achieve better health and prolong life. Studies in the 1970's and 1980's conducted by Pauling and colleagues suggested that very large doses of vitamin C given intravenously could be helpful in increasing the survival time and improving the quality of life of terminal cancer patients₂**

Ruang Lingkup Ilmu Gizi



Nutrients

- Nutrients: substance obtained from food and used in the body to promote growth, maintenance, and repair
- Most of the required nutrients are harmful when consumed in excessive amount.
- In USA most widely used estimates of nutritional requirements are the Recommended Dietary Allowances (RDAs)

Nutrients Cont

- Approximately 40 nutrients are required by the human body.
- Required Nutrients: amino acids, vitamins, minerals, energy, carbohydrates, nitrogen, water.

Nutrients

- **Six Classes**
 - Carbohydrates
 - Fats (lipids)
 - Proteins
 - Vitamins
 - Minerals
 - Water

Nutrients

- Three provide energy nutrients: carbohydrate, fat, protein
- **Carbohydrate and fat** are the major energy yielding nutrients, protein becomes major fuel only when others are not available
- **Vitamins** do not provide energy but facilitate the release of energy
- **Minerals** yield no energy but regulate the release of energy

Nutrients Groups:

- Macronutrients : Protein Carbohydrate Fat
- Micronutrients : Vitamin Mineral

Simple classification of dietary constituents

Constituent	Use
Water	To provide body fluid and to help regulate body temperature
Carbohydrates	As fuel for energy for body heat and work
Fats	As fuel for energy and essential fatty acids
Proteins	For growth and repair
Minerals	For developing body tissues and for metabolic processes and protection
Vitamins	For metabolic processes and protection
Indigestible and unabsorbable particles, including fiber	To form a vehicle for other nutrients, add bulk to the diet, provide a habitat for bacterial flora and assist proper elimination of refuse

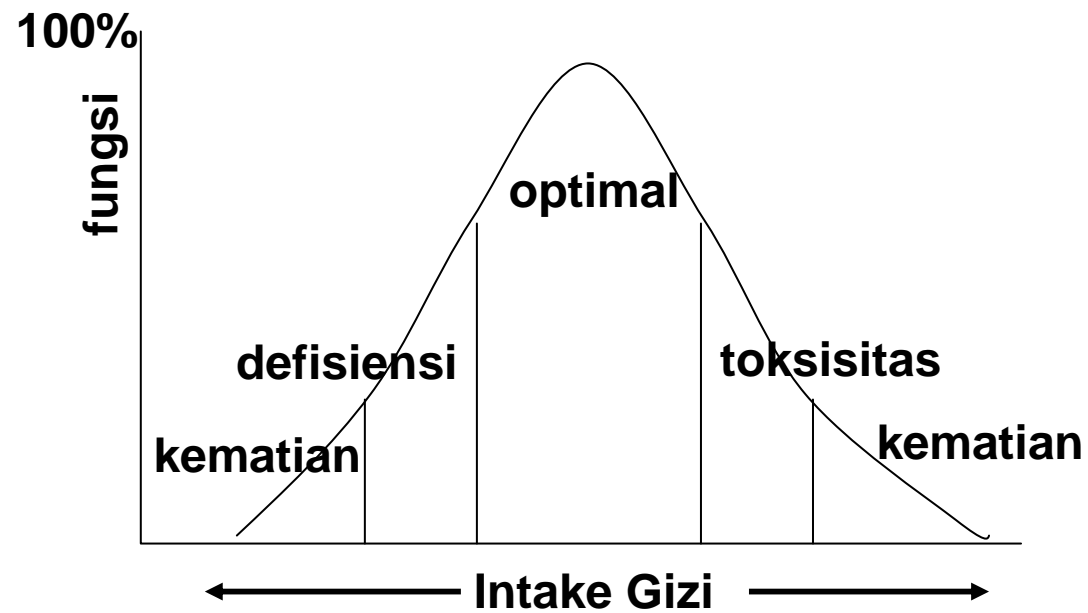
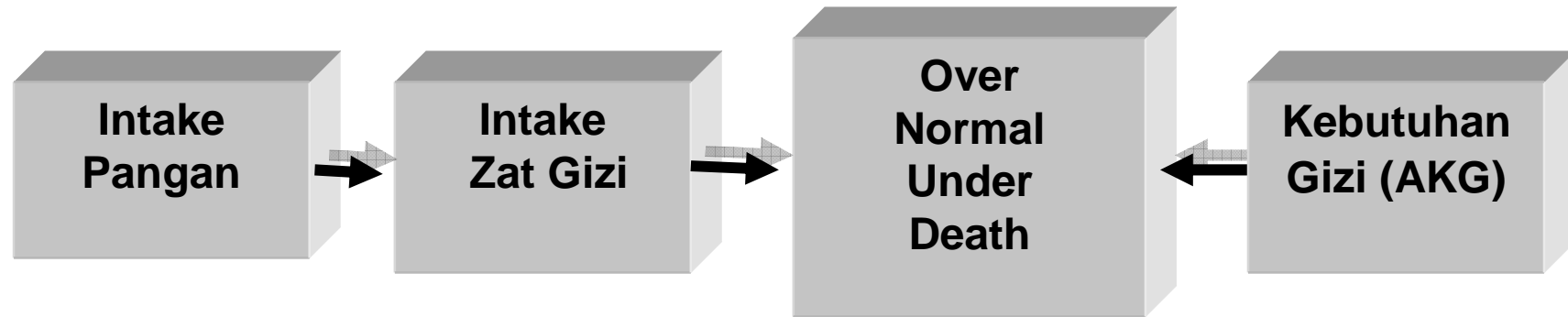
Some Important Principles

- Adequacy: enough of all essential nutrients, fiber and energy
- Balance: don't rely on one type of food for everything
- Energy Control: don't overeat
- Moderation: not too much or too little of anything.
- Variety: the spice of life; include a large number of *different* foods in your diet.

Beberapa Pengertian Penting:

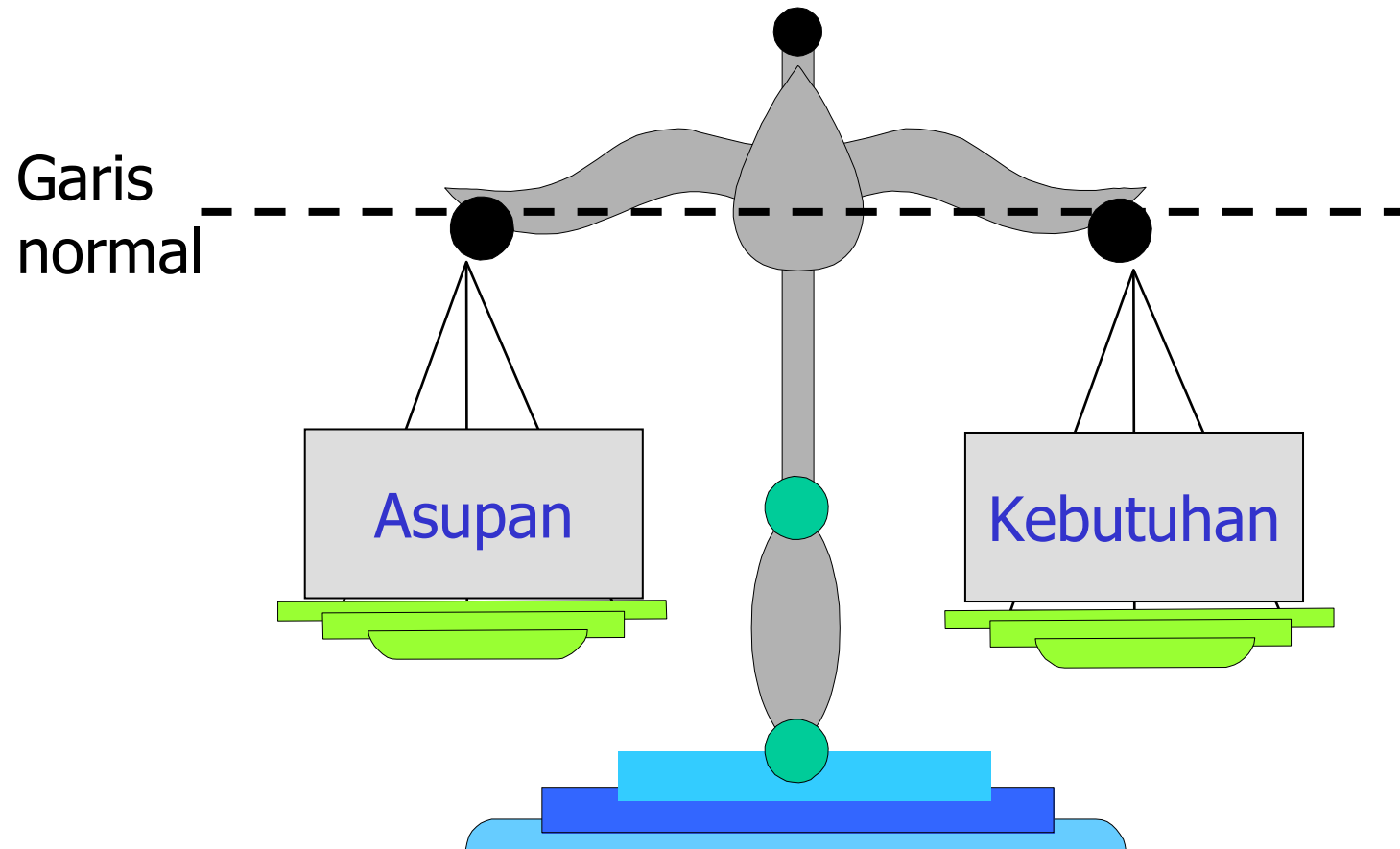
- Proses gizi (*nutrition*) : proses dari organisme dalam menggunakan bahan makanan melalui proses pencernaan, penyerapan, transportasi, penyimpanan, metabolisme dan penggunaan zat untuk pemeliharaan hidup, pertumbuhan, fungsi organ tubuh dan produksi energi.
- Keadaan Gizi (*Nutriture*): keadaan yang diakibatkan oleh keseimbangan antara konsumsi dan penyerapan gizi disatu pihak dan penggunaan oleh organisme di pihak lain, atau keadaan fisiologik akibat dari tersedianya zat gizi dalam seluler tubuh
- Status gizi (*Nutritional Status*): tanda-tanda atau penampilan yang diakibatkan dari nutriture yang dilihat melalui variabel tertentu (indikator status gizi) seperti berat, tinggi dll.

Kualitas Gizi



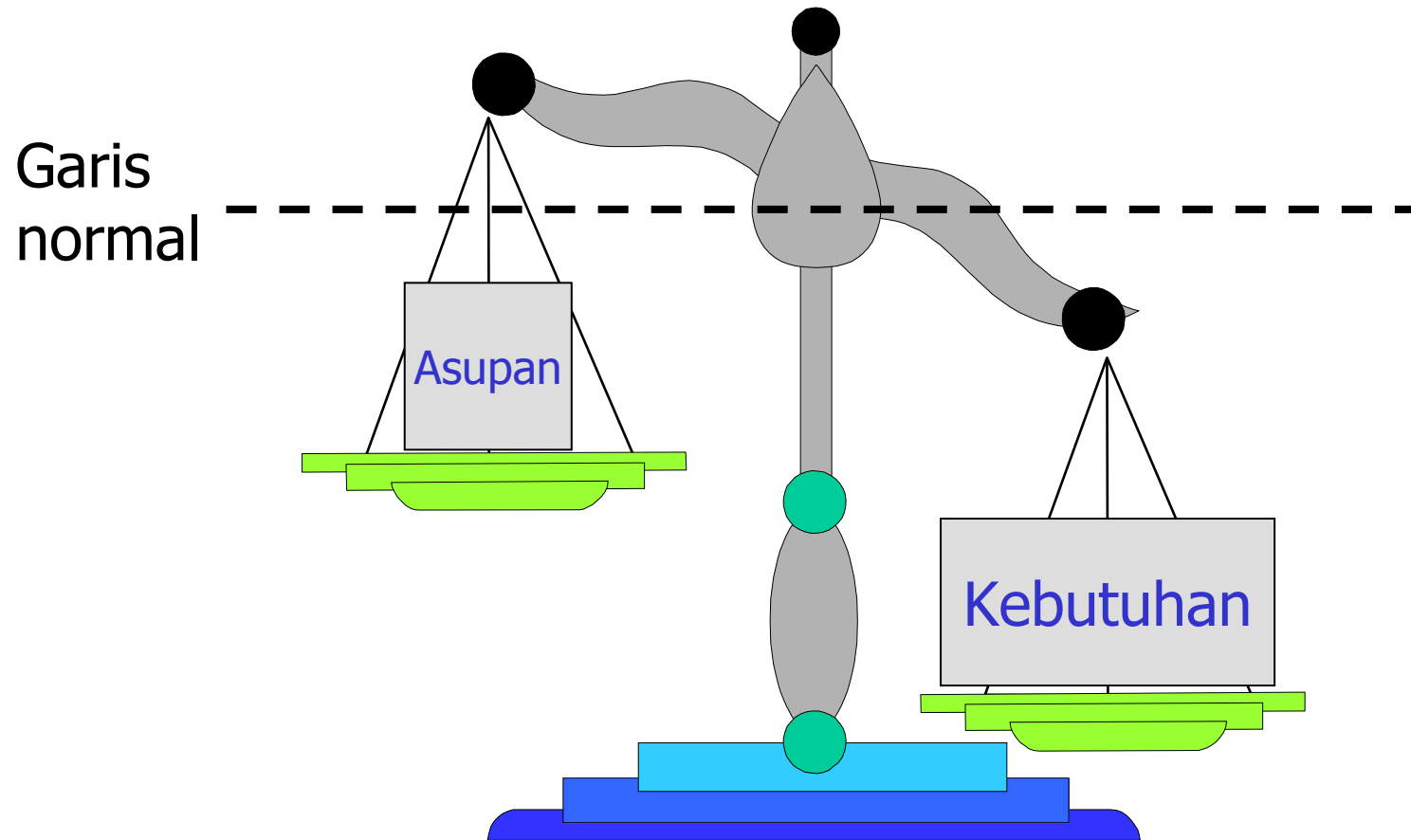
Gizi Baik = Gizi seimbang

(Asupan zat gizi = Kebutuhan zat gizi)



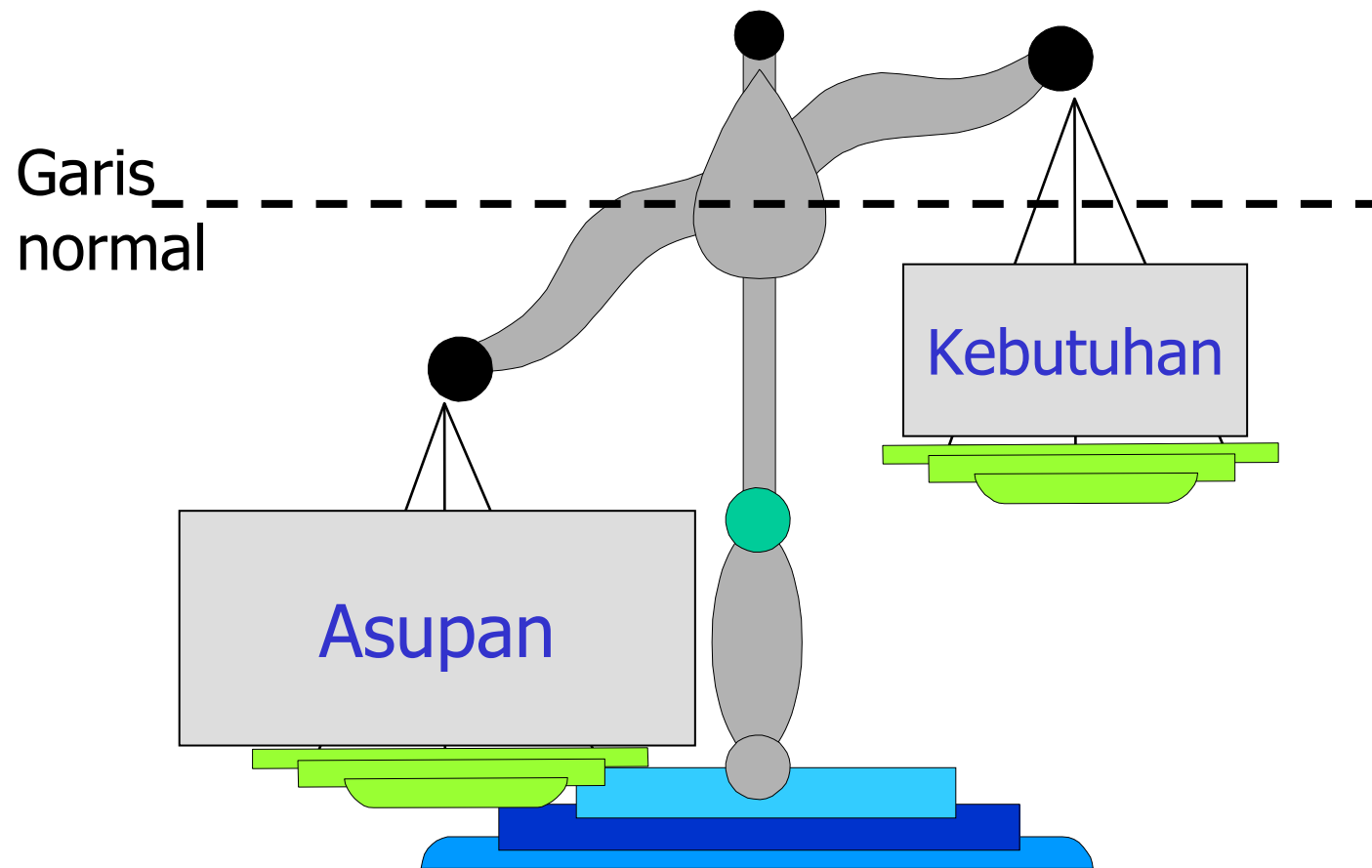
Kurang Gizi = Gizi tidak seimbang

(Asupan zat gizi < Kebutuhan zat gizi)



Gizi Lebih = Gizi tidak seimbang

(Asupan zat gizi > Kebutuhan zat gizi)



Macam Status Gizi:

- *Status Gizi Normal*: keadaan tubuh yang mencerminkan keseimbangan antara konsumsi dan penggunaan gizi oleh tubuh (*adequate*)
- *Malnutrition*: keadaan patologis akibat kekurangan atau kelebihan secara relatif maupun absolut satu atau lebih zat gizi.

Ada empat bentuk:

- *Under nutrition*: kekurangan konsumsi pangan secara relatif atau absolut untuk periode tertentu
- *Specific deficiency*: kekurangan zat gizi tertentu, misalnya kekurangan iodium, Fe dll
- *Over nutrition*: kelebihan konsumsi pangan untuk periode tertentu
- *Imbalance*: keadaan disproporsi zat gizi, misalnya tinggi kolesterol karena tidak imbangnya kadar LDL, HDL dan VLDL.

Depletion Stage	Method (s) Used
1. Dietary inadequate	Dietary
2. Decreased level in reserve tissue store	Biochemical
3. Decreased level in body fluids	Biochemical
4. Decreased functional level in tissues	Anthropometric/biochemical
5. Decreased activity of nutrient-dependent enzyme or mRNA for some protein	Biochemical/molecular technique
6. Functional change	Behavioral/physiological
7. Clinical symptoms	Clinical
8. Anatomical sign	Clinical

Sistem Pangan dan Gizi

- Subsistem Pangan: panen s/d sebelum konsumsi
- Subsistem Gizi : konsumsi s/d status gizi

Subsistem Gizi:

- merupakan resultante dari sub sistem sebelumnya
- dicerminkan oleh status gizi berkaitan dengan penyerapan dan penggunaan gizi oleh tubuh

Tahapan yang terjadi di Subsistem Gizi

- Pencernaan makanan: dari mulut s/d usus
- Penyerapan: proses zat gizi masuk ke dalam darah dan diangkut ke sel-sel
- Pemecahan dan sintesis zat gizi di dalam sel
- Penggunaan zat gizi
- Penyimpanan kelebihan zat gizi sebagai cadangan
- Pembuangan bahan-bahan yang tidak diperlukan

Pada proses pencernaan makan, perlu diperhatikan:

- Kesehatan alat pencernaan (gigi, mulut, lambung dan usus)
- Keberadaan Enzim:
 - Amilase untuk mencerna pati
 - Lipase untuk mencerna lemak
 - Laktose untuk mencerna laktosa
- Daya cerna makanan:
 - besarnya energi yang bisa dihasilkan manusia dari bahan pangan sangat tergantung dari *digestibility*.
 - Energi yang diabsorpsi dari bahan karbohidrat sebesar 98 %, lemak sebesar 95 % & protein sebesar 92 %.

Pada tahap penyerapan zat gizi, perlu diperhatikan :

- Keberadaan parasit (cacing) & infeksi (diare)
- Inhibitor, mis:
 - Tripsin inhibitor pada kedelai
 - Goitrogenik menghambat penyerapan Iodium
 - Fitat mengkelat Ca, Fe, Mg dan Zn
 - Avidin menghambat penyerapan biotin
 - Kacang kedelai mengandung enzim lipoksidase/lipoksigenase yg dpt menghamcurkan karoten (Antivitamin A)

- Enhancer, mis:
 - Penyerapan Fe lebih baik jika ada protein
 - Vitamin C membantu penyerapan Fe
(mereduksi besi feri menjadi fero dalam usus halus sehingga mudah diabsorpsi)
 - Vitamin C juga membantu absorpsi kalsium
 - Penyerapan vit. ADEK dibantu oleh lemak
 - Laktose diperlukan agar kapur dapat diabsorpsi

Pada pemecahan dan sintesis zat gizi, perlu diperhatikan:

- Keberadaan zat gizi mikro/vitamin sebagai kofaktor dan koenzim:
 - Thiamin, Niasin dan riboflavin merupakan komponen enzim yang diperlukan dalam oksidasi karbohidrat, lemak dan protein untuk menghasilkan tenaga
- Keberadaan Enzim:
 - Insulin : gula darah → gula otot
- Pengaruh antar zat gizi:
 - Karbohidrat diperlukan dalam metabolisme lemak yang normal

Pembuangan bahan-bahan yang tidak diperlukan:

- Melalui:
 - Feses: air, sisa dari karbohidrat, lemak, protein
 - Urin: air, sisa dari mineral, protein/asam amino, alkohol, kelebihan vitamin larut air
 - Keringat: air, mineral
 - Paru-paru: air, karbondioksida

Terkait dengan penggunaan zat gizi oleh tubuh:

- Kelebihan zat gizi dari kebutuhan akan disimpan:
 - Energi dirubah menjadi lemak, meyebabkan kegemukan
 - Vitamin larut lemak akan disimpan di hati
- Kekurangan energi di dalam makanan akan menyebabkan protein dipergunakan sebagai tenaga, shg dapat mengurangi jaringan protein:
 - Konsumsi karbohidrat cukup akan menghemat protein tubuh > reaksi gluconeogenesis bisa dihindarkan
- Semua zat gizi penting dalam proses pemecahan dan sintesis zat gizi, shg jika makanan tersusun seimbang akan dihasilkan kesehatan sempurna

Penggunaan Zat Gizi oleh Tubuh:

1. Basal metabolisme:

yaitu untuk memenuhi kebutuhan zat gizi minimal untuk menjalankan proses tubuh yang vital.

Faktor yang mempengaruhi

- Ukuran tubuh/komposisi
- Seks
- Umur
- Tidur
- Suhu tubuh
- Kondisi fisiologis
- Status gizi

2. Physical activity:

- Banyaknya zat gizi/energi yang dibutuhkan tergantung jenis aktivitas

3. Pembangunan/pemeliharaan dari sel/jaringan:

- Protein untuk pembangun sel pada masa pertumbuhan dan juga untuk pergantian sel rusak/pemeliharaan sel.
- Jaringan tulang dan gizi: Ca dan P

4. Pengatur/Regulator:

- Vitamin/mineral dibutuhkan sebagai kofaktor/koenzim