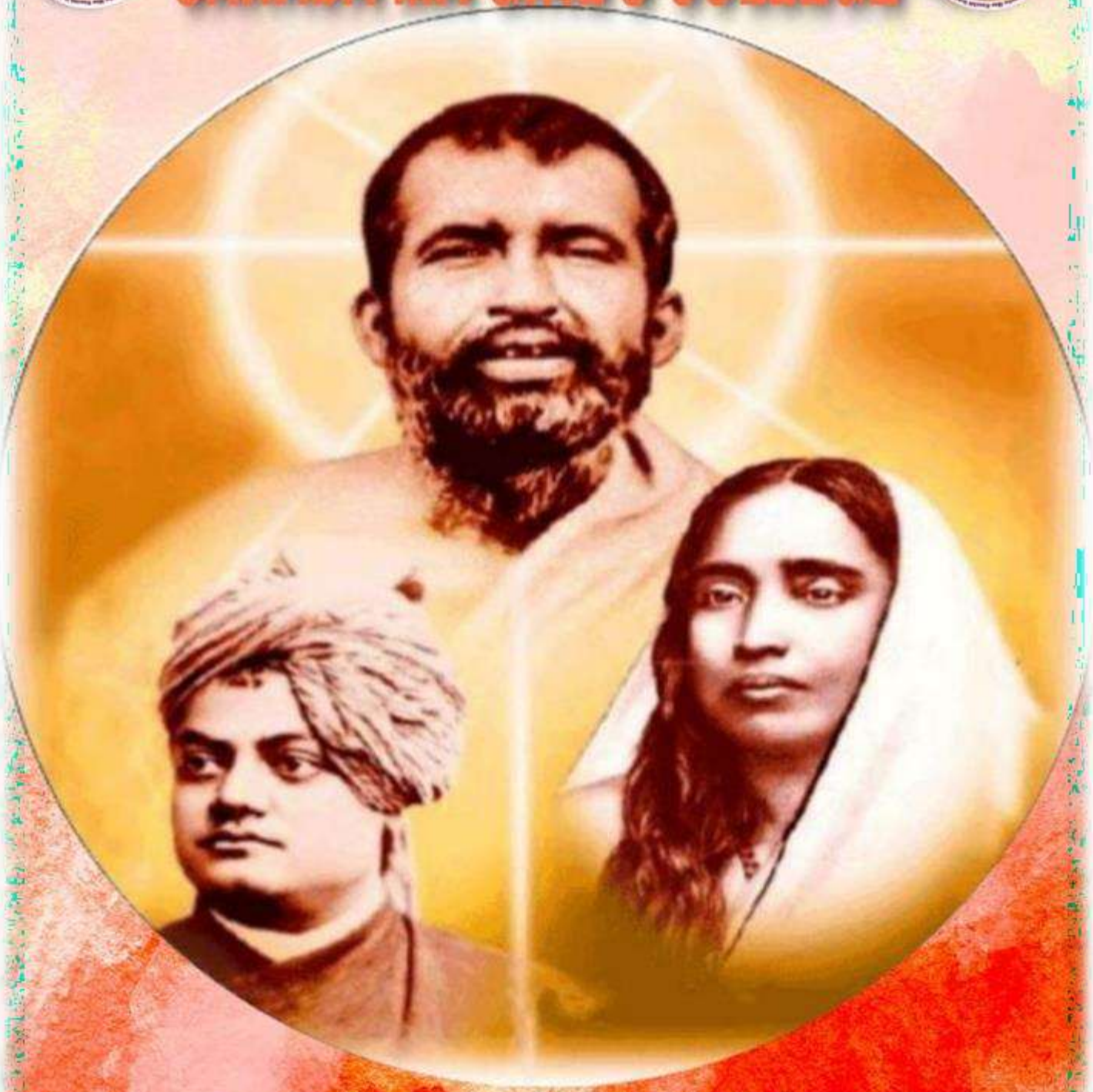
RAMAKRISHNA VIVEKANANDA MISSION
SARADA MA GIRL'S COLLEGE

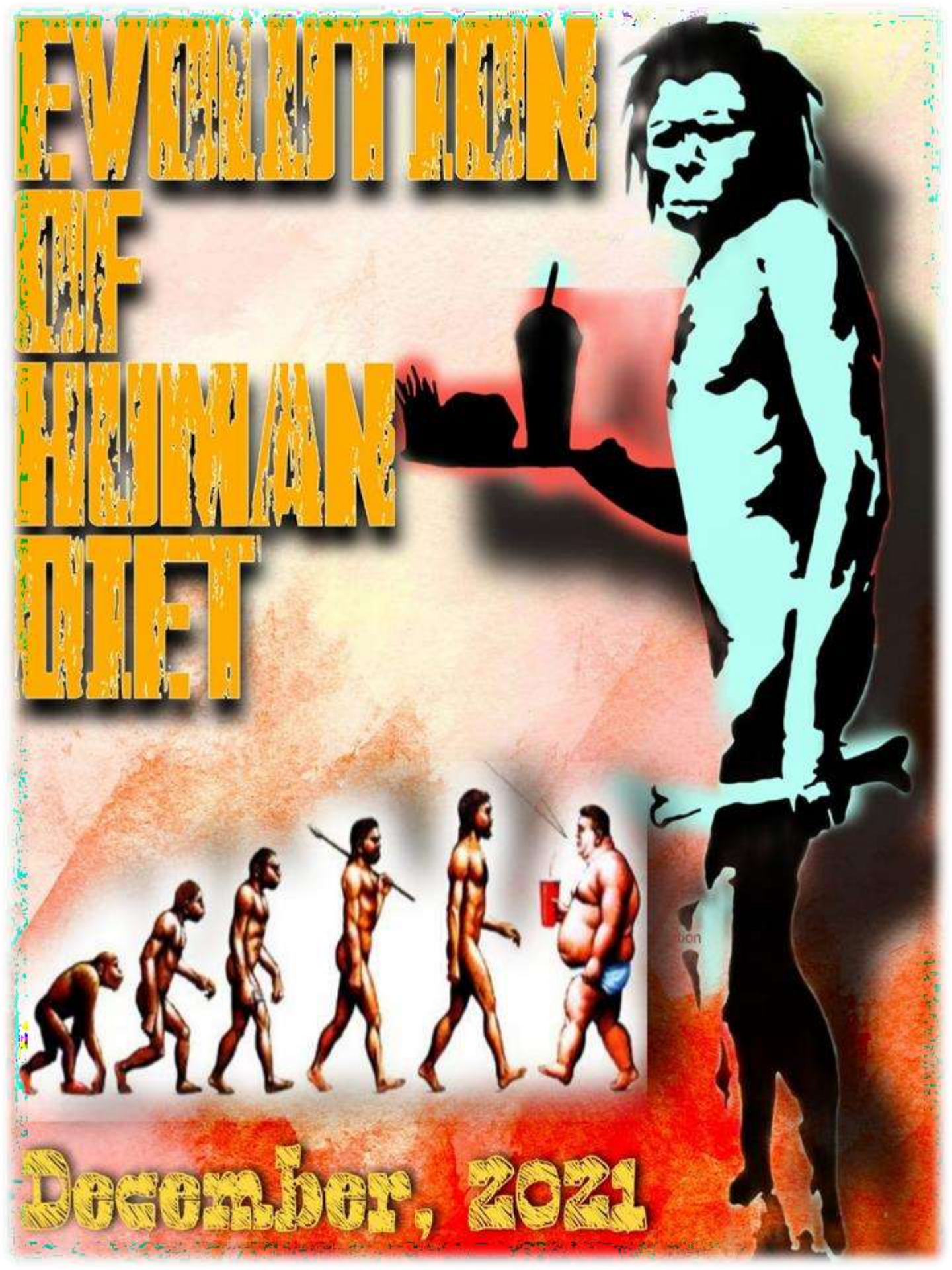


Department of Food and Nutrition
Presents...

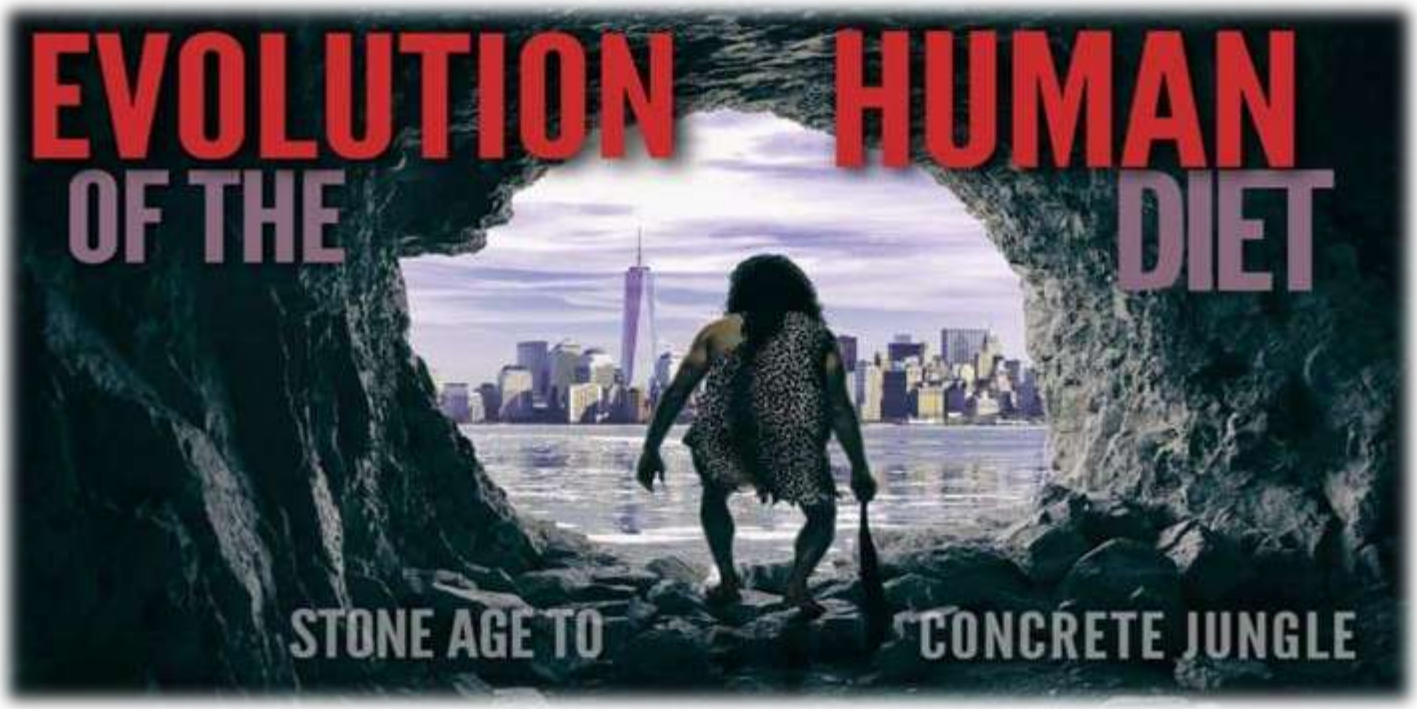
“IT IS NO JOKE TO BEAR THE AGONY OF AN EMPTY STOMACH”.

-MAA SARADA DEVI

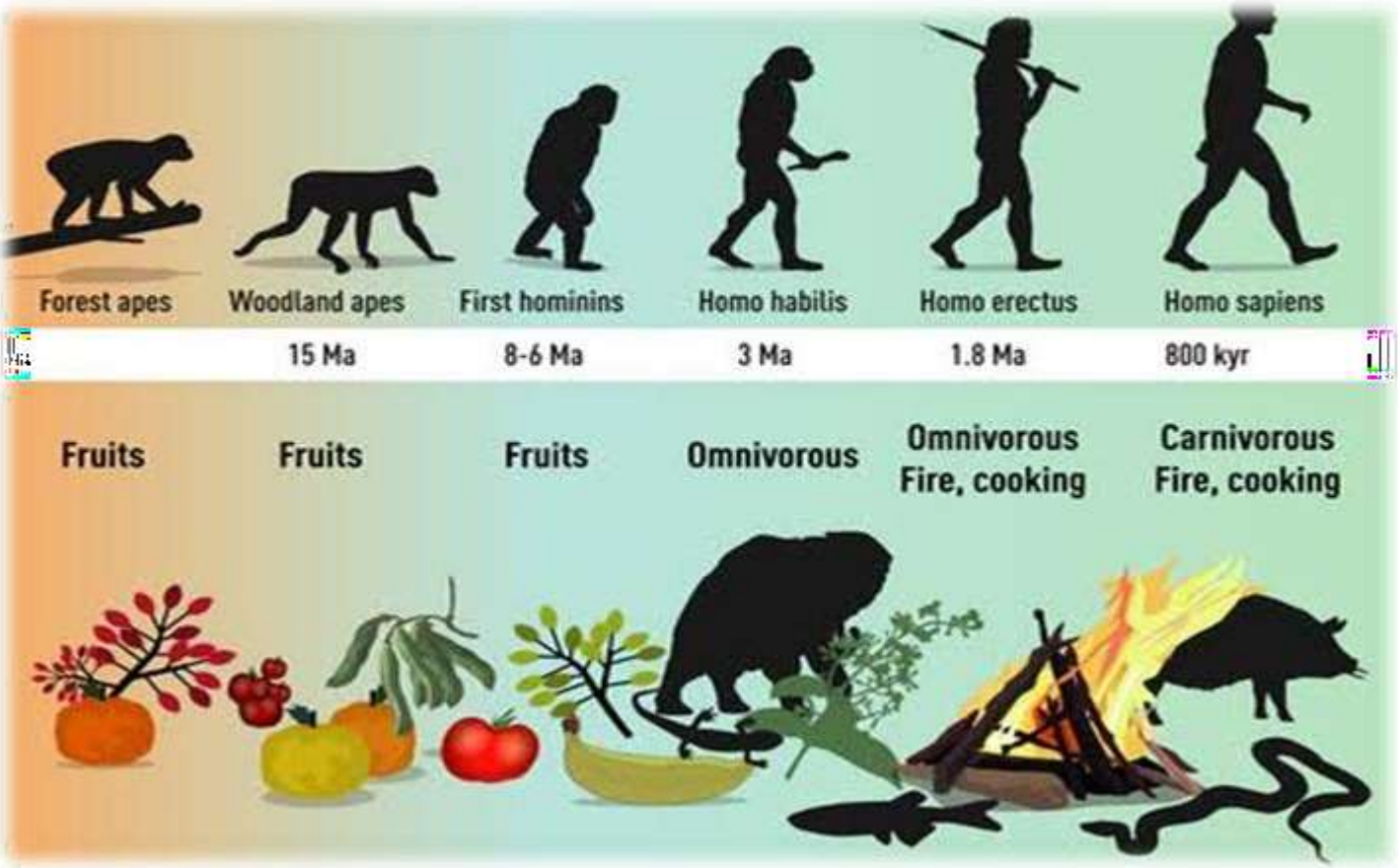
EVOLUTION OF HUMAN DIET



December, 2021

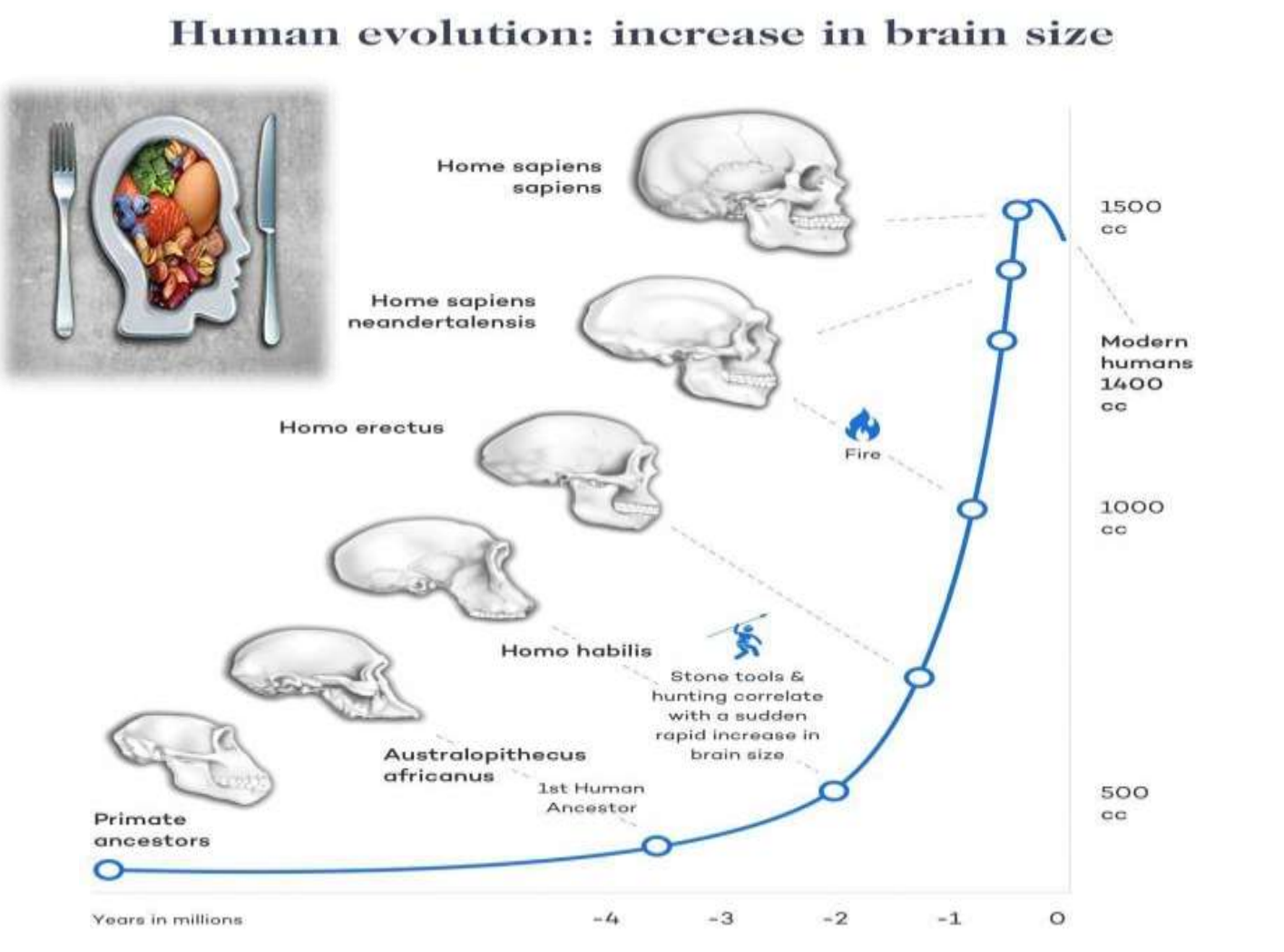


IT DID NOT JUST HAPPEN. A STORY LIES BEHIND IT.

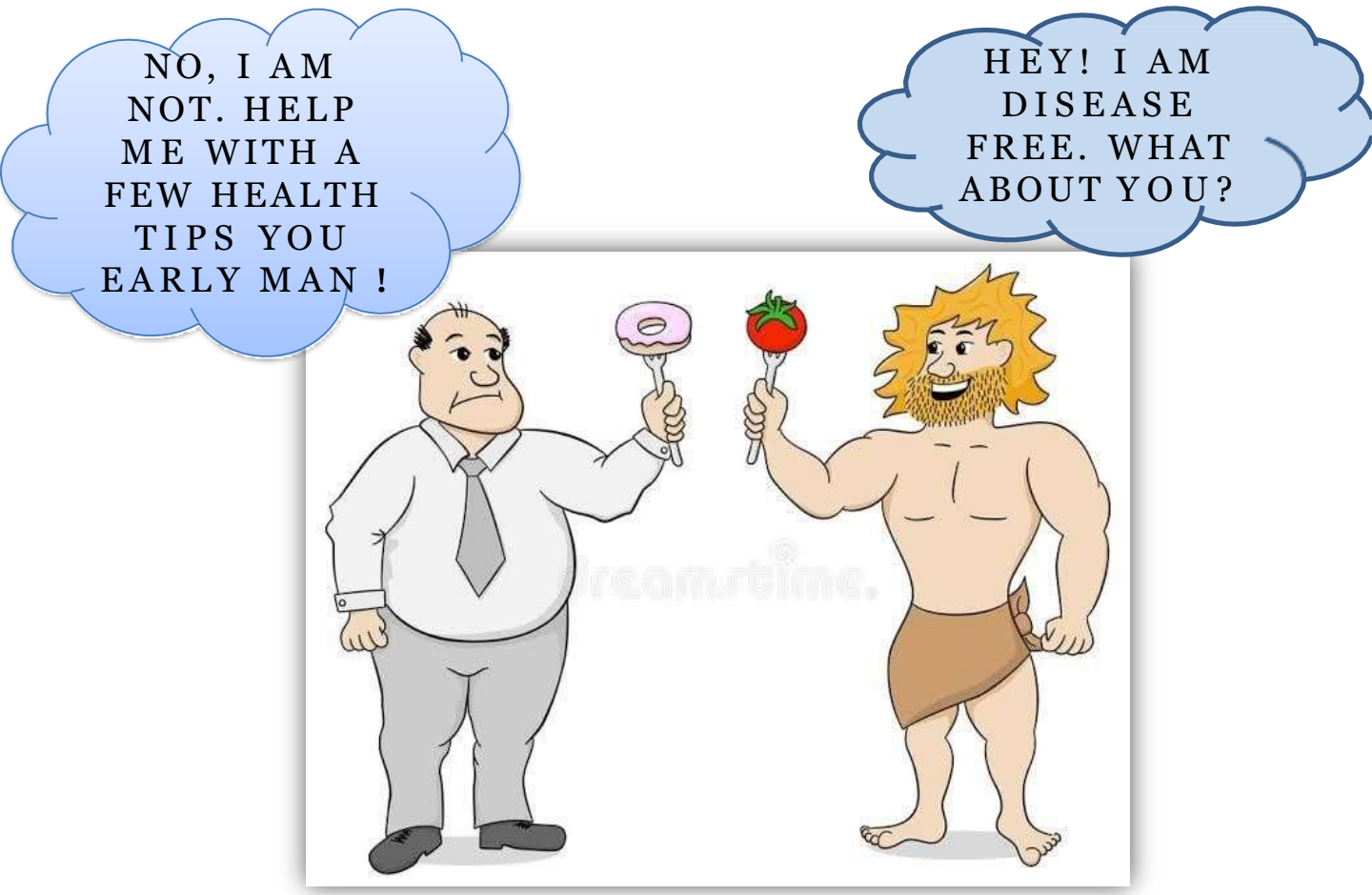


The relationship of evolution with diet and environment can provide insights into modern disease.

- Fossil evidence shows apes, and early human ancestors were fruit eaters living in environments with strongly seasonal climates.
- Rapid cooling at the end of the Middle Miocene (15–12 Ma: millions of years ago) increased seasonality in Africa and Europe, and ape survival may be linked with a mutation in uric acid metabolism.
- Climate stabilized in the later Miocene and Pliocene (12–5 Ma), and fossil apes and early hominins were both adapted for life on ground and in trees.
- Around 2.5 Ma, early species of Homo introduced more animal products into their diet, and this coincided with developing bipedalism, stone tool technology and increase in brain size.



- Early species of Homo such as Homo habilis still lived in woodland habitats, and the major habitat shift in human evolution occurred at 1.8 Ma with the origin of Homo erectus.
- Homo erectus had increased body size, greater hunting skills, a diet rich in meat, control of fire and understanding about cooking food, and moved from woodland to savannah.
- Group size may also have increased at the same time, facilitating the transmission of knowledge from one generation to the next.
- The earliest fossils of Homo sapiens appeared about 300 kyr (thousand years ago), but they had separated from Neanderthals by 480 kyr or earlier. Their diet shifted towards grain-based foods about 100 kyr ago, and settled agriculture developed about 10 kyr ago. This pattern remains for many populations to this day and provides important insights into current burden of lifestyle diseases.



THE TRANSITION STORY

The story of human body can be boiled down to five major transformations.

Transition One:

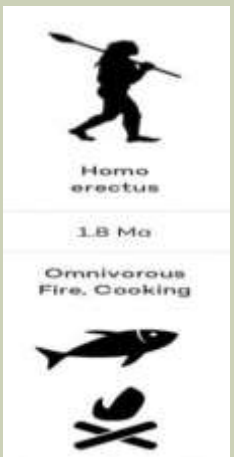
The very earliest human ancestors diverged from the apes and evolved to be upright Bipeds.

Transition Two:

The descendants of these first ancestors, the *Australopiths*, evolved adaptation to forage for and eat a wide range of foods other than mostly fruits.

Transition Three:

About 2 million years ago, the earliest members of the human genus evolved nearly modern human bodies and slightly bigger brains that enabled them to become the first Hunter-Gatherers.



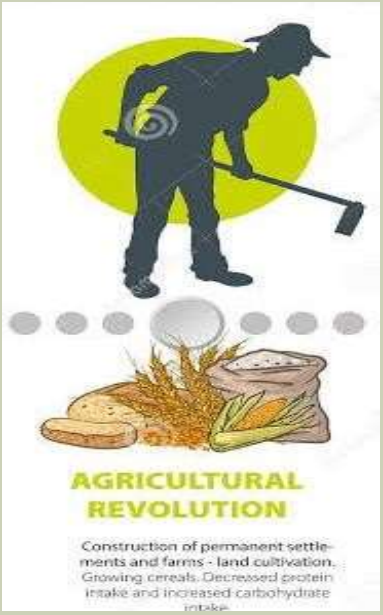
Transition Four:

As archaic human Hunter-Gatherers flourished and spread across much of the old world, they evolved even bigger brains and larger more slowly growing bodies.

Transition Five:

Modern human evolved special capacities for language, culture and co-operation that allowed us to disperse rapidly across the globe and to become the sole surviving species of human on the planet.

ANOTHER 2 TRANSFORMATIONS



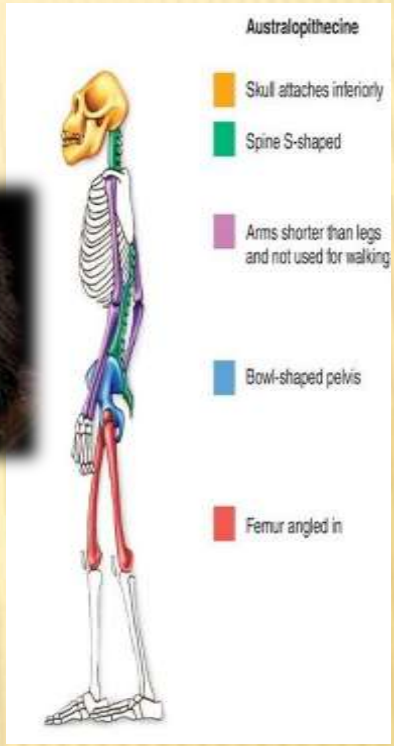
Transition Six:
The Agricultural Revolution when People started to farm their food instead of hunting and gathering.

Transition Seven:
The Industrial Revolution which started as we began to use machines to replace human work.

These two transformations didn't generate new species, it is difficult to exaggerate their importance for the story of the human body, because they radically altered what we eat and how we work.

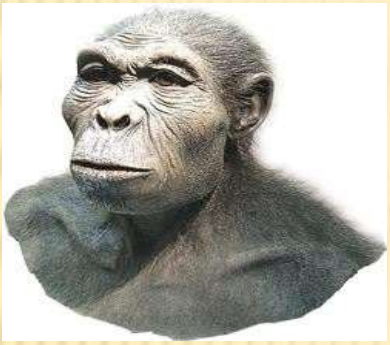
Some of these interactions have been beneficial, however others have been deleterious, including a host of novel mismatch diseases caused by contagion, malnutrition and physical inactivity.

EVERYBODY AND EVERY BODY HAS A STORY



Australopithecus (Earliest Hominid) :

- Bipedalism
- Larger Molars and Pre-molars
- Body size- 30 to 70 kgs.
- Mostly plant and fruit feeders, occasionally Carnivorous.



Early Homo (*H. habilis* and *H. rudolfensis*):

- Enlarged brain
- Reduction of face and teeth
- Lack of megadonty

Later Hominids (*H. ergaster* and *H. erectus*):

- Increase in body size around 60 kgs.
- Change in body shape
- Larger brain size
- Greater abundance of stone tools
- Reduced gut size
- Full bipedalism
- Greater use of technology

THE ADVENT OF HUMAN ERA

THE PALEOLITHIC ERA:

Diets were high in plant foods, but also incorporated high amounts of animal proteins, mainly from lean meat and sea food.

THE MIOCENE TO EARLY PLEISTOCENE ERA:

Diets consisted of foliage, leafy vegetables, fruits, seeds and nuts which supplied high amounts of fibre, plant sterols and vegetable protein.

THE NEOLITHIC ERA:

This era marks the beginning of Agricultural Revolution. Diets were rich in starchy foods (grains and legumes). It also marks the use of dairy products and vegetable oils (olive oil).

THE INDUSTRIAL REVOLUTION:

This era introduced convenience and pre-packaged foods including canned meats, condensed canned soups, hydrogenated vegetable oils and refined cereals (white bread).

EVOLUTIONARY EATING

Early Hominids :

Wide front teeth shapedlike spatulas which are well suited for biting into fruits.

The trend towards increased dietary diversity accelerated dramatically 4 million years ago in the descendants, a confusing group of species informally called *Australopiths*.

:The First Junk Food Diet:

When we ask the question “What’s for dinner?” , we have an unprecedented choice of abundant, nutritious foods available to us.

Our Australopith ancestors ate only what they could find, not in fruit filled forests as their predecessors enjoyed,but in more open habitats with fewer trees. Then the earth became slightly cooler and this lead to diminishing and scattering the availability of fruits which exerted strong selective pressures on the Australopiths favouring individuals better able to gain access to other foods.

So, it was the Australopiths who were pushed to forage regularly for lower quality foods, so called **Fallback Foods** that one eats when preferred foods are unavailable.

Australopiths had diverse and complex diets that included not only fruits but also edible leaves, stems and seeds. But some of them also started to dig for foods, thus added new, very important and highly nutritious fallback foods to their diet, it is likely that tubers, bulks and roots constituted a substantial percentage of calories and became even more important than fruits. They also regularly enjoyed insects such as termites and grubs and they must have eaten meats whenever it was possible, probably by scavenging, since being slow and unsteady bipeds.

Impact of Carnivory:

More Energy, Less Food

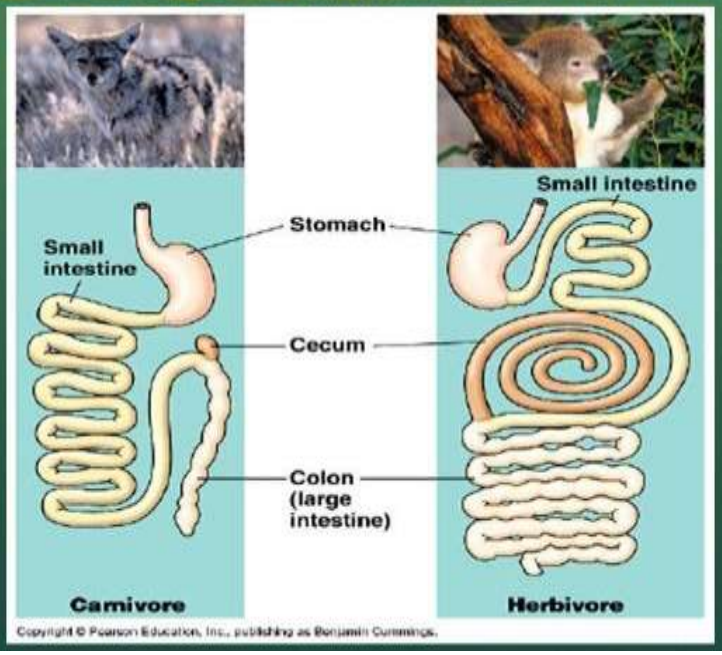
Early Hominins
2.5 to 2 million years ago

GI Tract: Humans have a smaller gut volume compared to body size.

Brain Development: Human brain metabolism is 20-25% of the resting metabolic rate while it is only 8-10% in other primate species.

Carnivore vs Herbivore GI Tract

- Simple stomach
- Short gut
- Little undigested food is egested
- Small or no cecum



- Complex gut
- Long gut
- Fermentation in stomach
- Large cecum

THE FIRST HUNTER -GATHERERS

Our bodies and the way we behave evolved to be much more recognizably 'human' at the down of the ice-stage. A truly pivotal period of change in the earth's climate that was initiated by continued global cooling.

This was the time when natural selection seems to have also favored a second, revolutionary strategy to cope with changing habitata: Hunting and Gathering.

This innovative way of life involved combining to gather tubers and other plants but incorporated several new transformative behaviors that included eating more meats, using tools to extract and process foods and cooperating intensively to share foods and other tasks.

Impact of Advanced Tools:

The Beginnings of Hunting and Food Processing

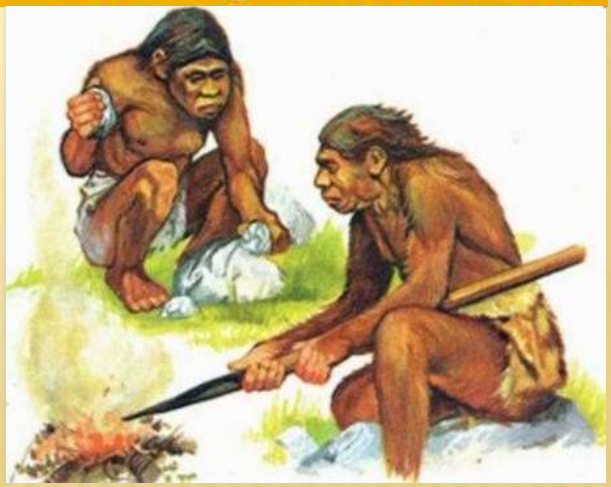
"Mesolithic" Period
20,000BC to 9,000 BC

Simple stone tools may have existed even before this time (2.5 mya)

- Road to agriculture
  - Bow-and-arrow
  - Mortars and pestles
  - Domestication before cultivation
- What was its outcome?
  - Added more variety
    - More meat
    - Grains
  - Increased Food Supply

Impact of Fire:

How Cooking Made Us Humans



The evolution of Hunting and Gathering underlies the evolution of the Human genus Homo , the most important *Homo erectus.*

Impact of Agriculture:

The Domestication of Wild Grains

Agricultural Revolution/
"Neolithic Age"

10,000 BC

- Transition from hunter - gatherers to the domestication of crops and game

- Popularity of Pastoralism: the branch of agriculture concerned with the raising of livestock.

Possible outcomes of Agriculture

- Led to health conditions including: heart disease, high cholesterol, cancers, osteoporosis, obesity, depressed immune system, premature aging, and diabetes.
- Micronutrient deficiencies: Grains can act as bulky fillers with less vitamins, minerals, carotenes, and flavonoids than fruits and vegetables.
- Reduced quality of life: reduction of stature, increase in infant deaths, reduction in life span, increase in infectious diseases, increase in anemia, diseased bones, and tooth decay.

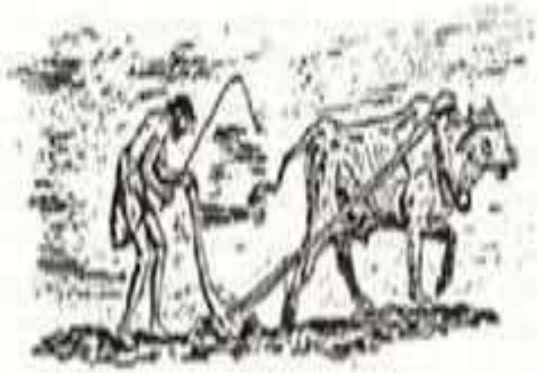
Agriculture: The Worst Mistake In The History Of The Human Race

Jared Diamond, Prof. UCLA School of Medicine

Discover-May 1987, pp. 64-66

There are at least three sets of reasons to explain the findings that agriculture was bad for health.

First, hunter-gatherers enjoyed a varied diet, while early farmers obtained most of their food from one or a few starchy crops. The farmers gained cheap calories at the cost of poor nutrition.



Second, because of dependence on a limited number of crops, farmers ran the risk of starvation if one crop failed.

Finally, the mere fact that agriculture encouraged people to clump together in crowded societies, many of which then carried on trade with other crowded societies, led to the spread of parasites and infectious disease.

Paleo Diet

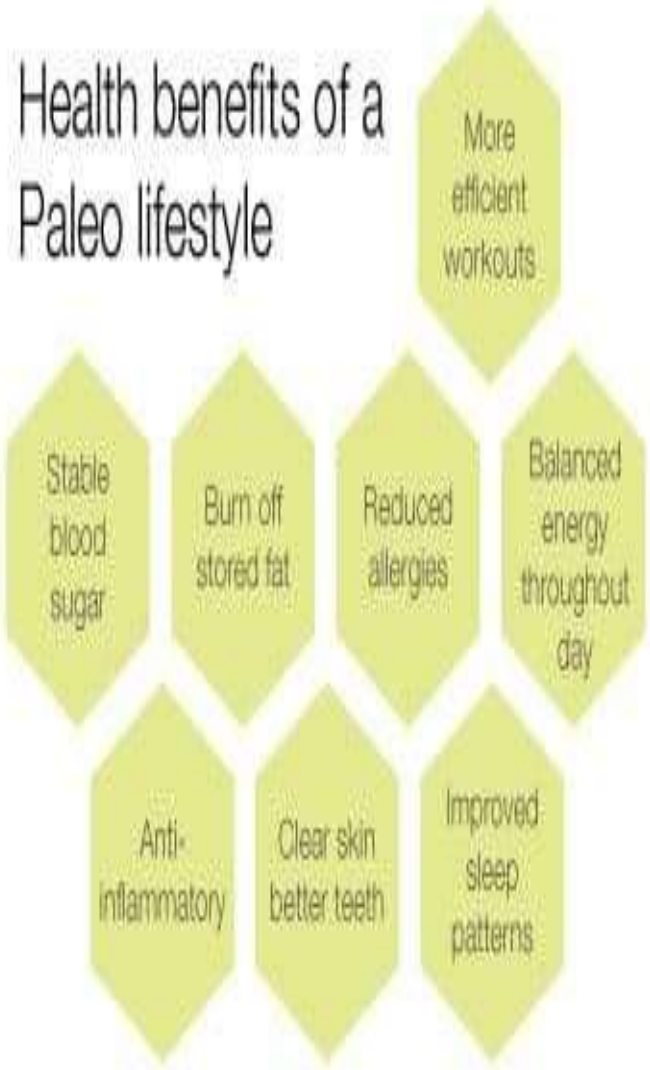
- Also known as the caveman diet or hunter-gatherer diet. The paleo diet is all about eating the way people ate in the Paleolithic era where people were mainly hunters and gatherers.

- Claim: "This Paleo way of eating and being takes us back to our roots, and it makes people feel better: they lose weight, gain muscle, have more energy, have less inflammation of all kinds, their skin looks better and they feel younger."

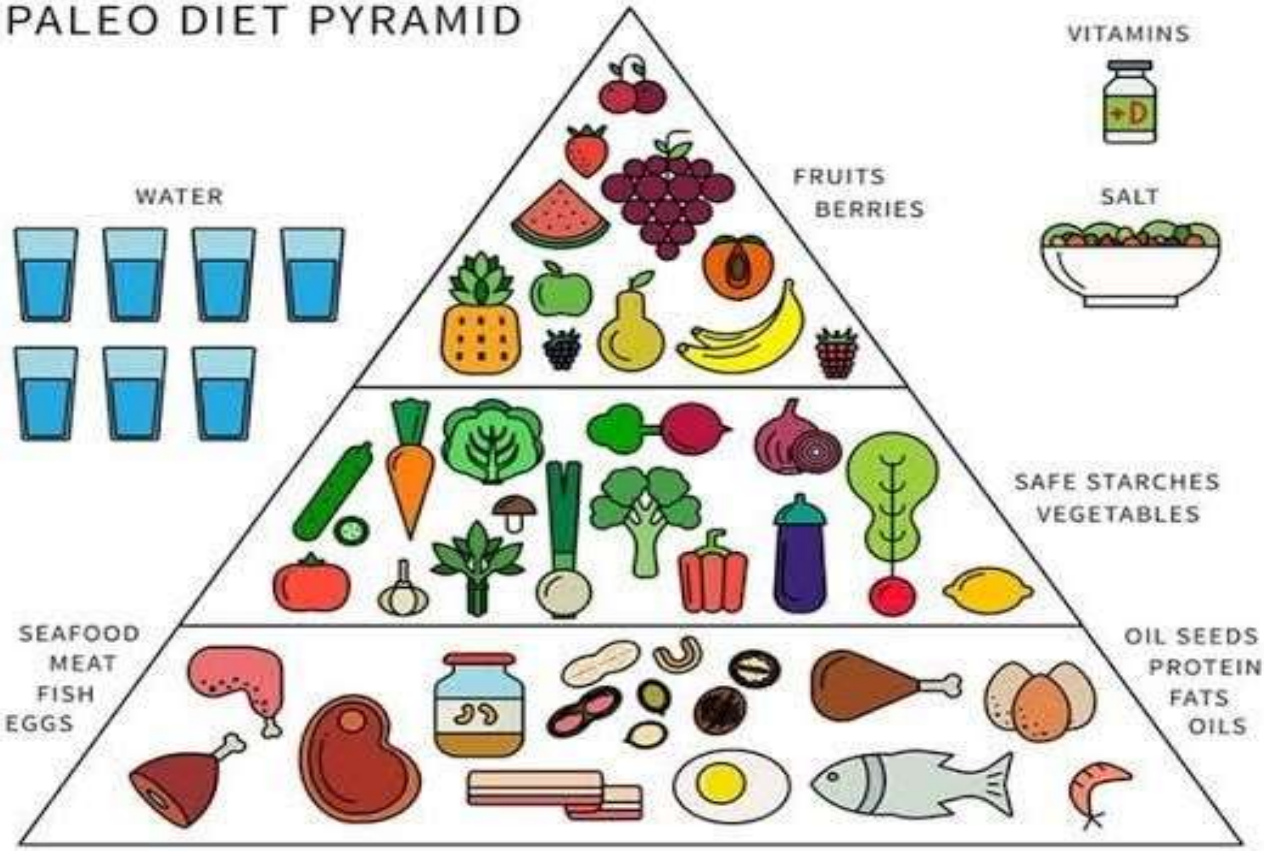
Purpose

The aim of a paleo diet is to return to a way of eating that's more like what early humans ate. The diet's reasoning is that the human body is genetically mismatched to the modern diet that emerged with farming practices — an idea known as the discordance hypothesis.

Farming changed what people ate and established dairy, grains and legumes as additional staples in the human diet. This relatively late and rapid change in diet, according to the hypothesis, outpaced the body's ability to adapt. This mismatch is believed to be a contributing factor to the prevalence of obesity, diabetes and heart disease today.



PALEO DIET PYRAMID



What?
Neolithic Era

- "Agricultural Revolution" = domestication of plants & animals
- Village Life
- Still stone tools

The Neolithic Period

- **Neolithic Revolution– significant changes caused by the development of agricultural societies.**

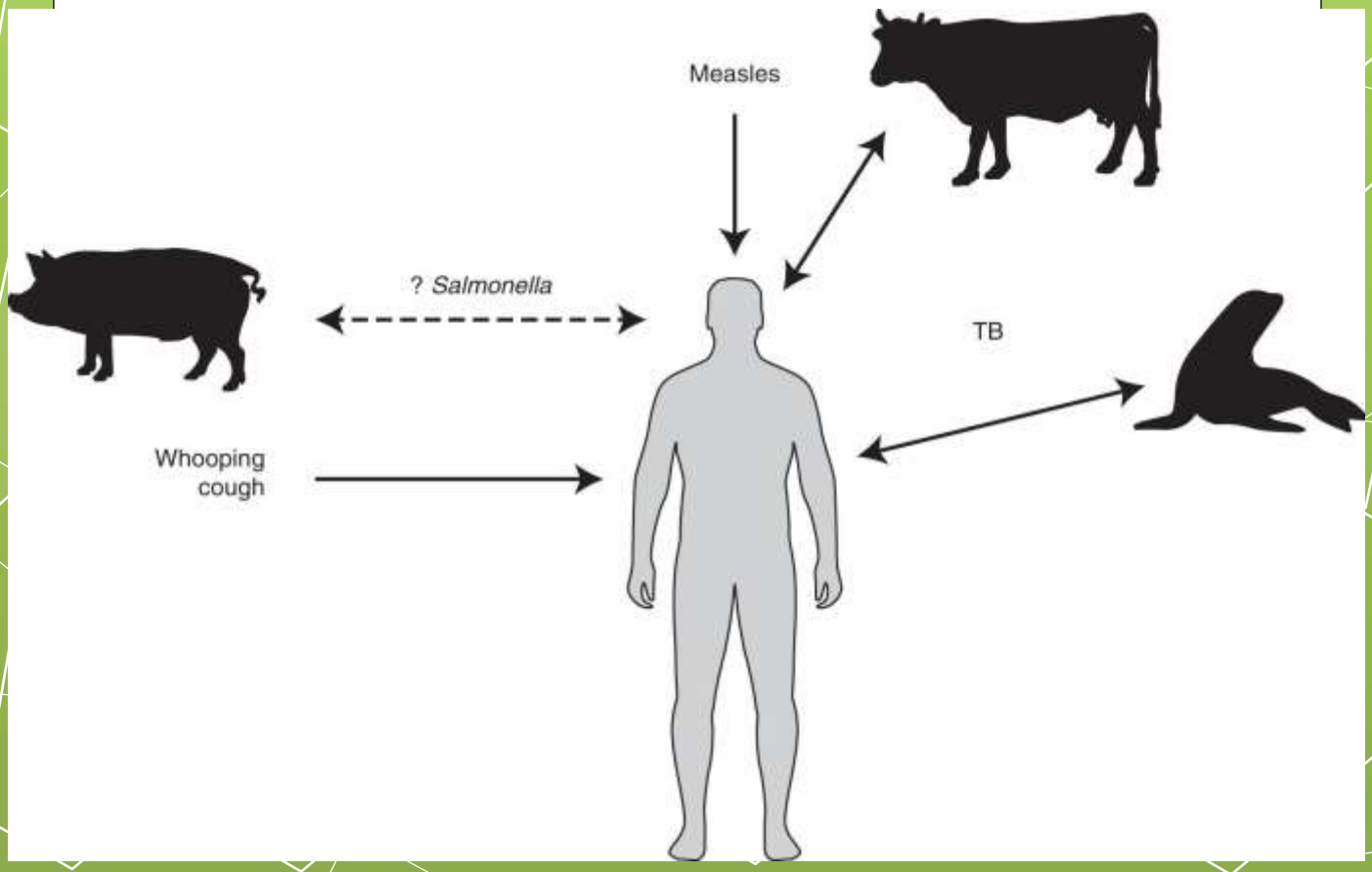
Neolithic Diet

-Fewer animals meant that people had to look for other food sources.

-**They observed plants growing and began cultivating them => They went from predators (Paleolithic) to <u>producers</u> (Neolithic).**

-Ppl. started **domesticating animals by keeping and feeding them together to get meat, milk, hides and dung.**

DISEASES



Paleolithic Vs. Neolithic Era

- Paleo = Old
- Lith = Stone
- Paleolithic means the Old Stone Age
- Last approximately from the invention of the first stone tool about 2.6 million years ago to about 10,000 B.C.E.
- Hominids and Homo Sapiens (Humans)

- Neo = New
- Lith = Stone
- Neolithic means the New Stone Age
- Begins around 10,000 B.C.E. when agriculture begins and ends around 2000 B.C.E. with the invention of metal tools
- Only Homo Sapiens (Humans)

Lifestyle

- Paleolithic
  - Nomadic
  - Groups of up to 50
  - Tribal
  - Hunters & Gathers
- Neolithic
  - Sedentary
  - Permanent settlements
  - Raise livestock/agriculture
  - Family structure changes

Health

- Paleolithic
  - Healthier diet of meat and wild plants
  - Humans were taller and lived longer compared to Neolithic people
  - People got more exercise
- Neolithic
  - Less nutritious diet of mostly grains
  - People were shorter and had a lower life expectancy
  - New diseases emerge
  - Women had more children

Gender roles are now more defined

From Hunting to Farming

Food

- Paleolithic
  - Hunters and Gatherers
  - Meat, fish, berries
  - Store only what they can carry
- Neolithic
  - Grew crops such as corn, wheat, beans
  - Storage for surplus (extra stuff)

Main Discoveries

- Paleolithic
  - Fire
  - Rough stone tools
- Neolithic
  - Agriculture
  - Tools of polished stone

THE BEGINNING OF THE INDUSTRIAL DIET, [1870-1940] MODERN ERA DIET

By the late nineteenth century, however, factory methods of modern industry had begun to be applied to food. The emergence of industrial foods and the constitution of the first industrial dietary regime occurred in North America after 1870 or so. What made this dietary regime unique was not only the rapid industrialization of food production with the early consolidation of food manufacturing corporations but also the advent of mass marketing. Mass marketing greatly facilitated the "normalization" of a diet increasingly composed of highly processed edible commodities. It also played an essential role in making the industrial diet a mass diet. The industrialization of other major sectors of the food economy, from fruit and vegetable preserving to meatpacking to ready-to-eat breakfast cereal processors, was soon to follow and would rapidly come to be dominated by giant, horizontally integrated factory establishments producing large volumes of standardized product at low prices.

1910s to 1950s: era of vitamin discovery
1950s to 1970s: fat versus sugar and the protein gap
1970s to 1990s: diet related chronic diseases and supplementation
1990s to the present: evidence debates, diet patterns, the double burde.

Emergence of new diet

The Industrial Revolution saw numerous food and beverage innovations, including:

- The canning process, an easy way to safely preserve a variety of foodstuffs
-Pasteurization, which greatly increased the safety of packaging fresh foods such as dairy and vegetables
- Mechanization of farming, which massively increased the industry's efficiency

With industrialization in full swing, the food industry continued to break barriers and create a safer and better fed population. The early 20th century would pose profound new challenges and create the systems that many rely on today.

Major Foods in this diet

- Starchy foods
- Refined processed and canned foods
- Sugar, candy bars and sweets
- Grains, Breads, Fruit juices and GMO crops
- Extracted seed and vegetable oil
- Processed meat
- Dairy and dairy products, etc.

Drawbacks of modern era diet

- Modern era diet relates to junk food that means an empty calorie which does not contain the nutrients that our body needs to stay healthy.
- It may cause under-nutrition causes nutrition deficiency and over nutrition leads to obesity, hypertension, hyperlipidemia, diabetes, and cancer.
- Another problem is that precise effect of foods on organs or tissues within the body is unclear.

NEW ERA, NEW DIET,NEW DISEASES

Abnormal chemical reaction in the body alter the normal metabolic process. Different metabolic disorders are:

- Diabetes
- Early Aging
- Abdominal obesity
- Coronary heart complexes
- Dental problems(tooth decay)

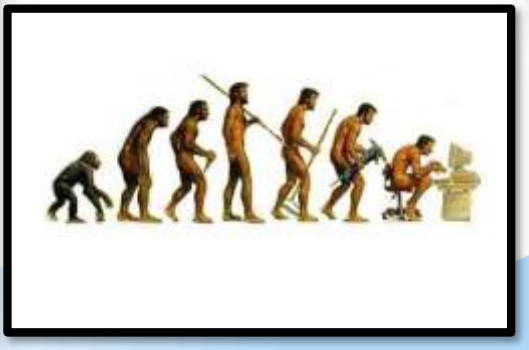
ENVIRONMENTAL CHANGES
(ENHANCES ADAPTIVE QUALITIES)

TECHNOLOGICAL AND ECONOMIC CHANGES
(THESE CHANGES HAVE ALTERED THE INFECTIOUS DISEASES WE CONTRACT, THE FOOD WE EAT, THE DRUGS WE TAKE, THE SOCIAL STRESSES WE ENCOUNTER)

CAUSES OF MISMATCH DISEASES

MIGRATION
(PAVES WAY INTO NEW ENVIRONMENTS)

CULTURAL EVOLUTION
(TRANSFORMS PEOPLE'S DIETS)



In conclusion, although the human body has come a long way over the last 6 million years, its journey is far from over.

But what is that future?

How can an evolutionary perspective help chart a better future for the human body?

There is obviously no single approach to this Gordian knot, so let's look at each of the options using the lens of evolution.

Approach 1: Let Natural Selection Sort the Problem Out

Approach 2: Invest More in Biomedical Research and Treatment

Approach 3: Educate and Empower

Approach 4: Change the Environment

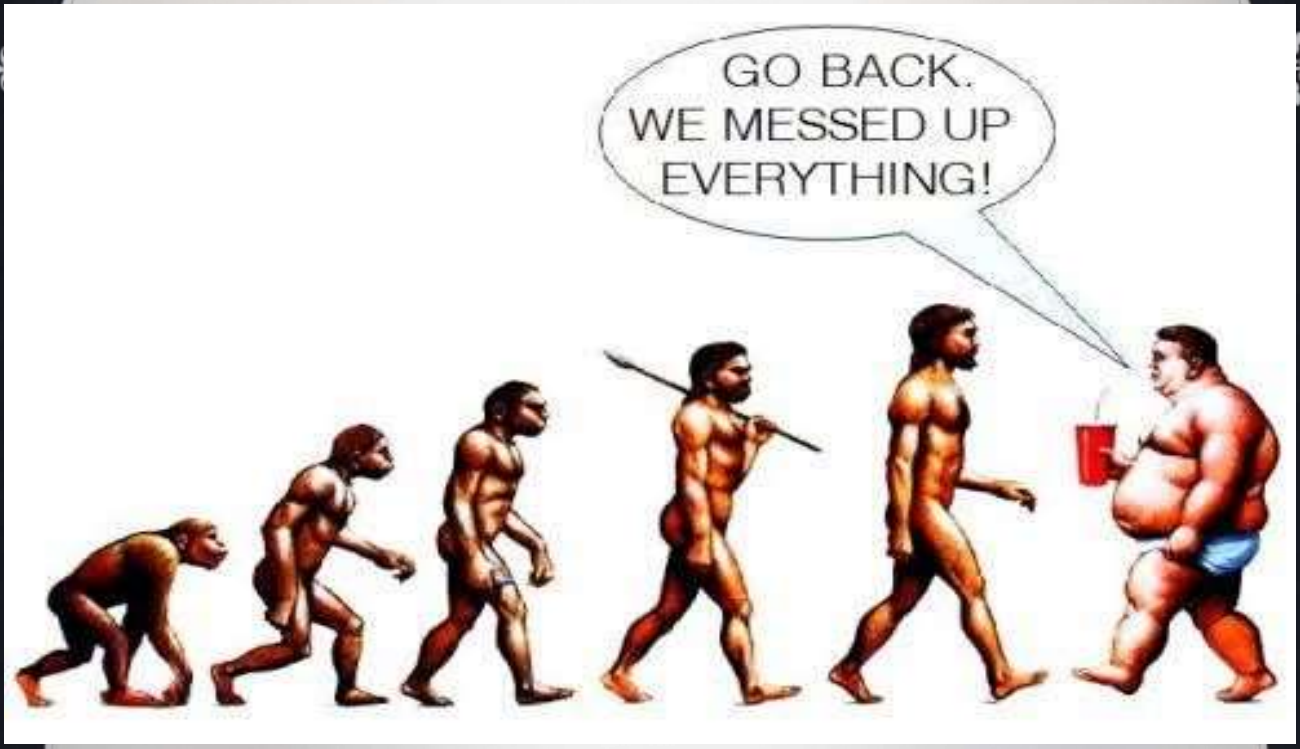
OUR OUTLOOK

1. For the foreseeable future, people will continue to get sick from mismatch diseases.
2. Future advancements in medical science will continue to improve our ability to diagnose and treat the symptoms of mismatch diseases but will not devise many actual cures.
3. Efforts to educate people about diet, nutrition, and other ways to promote health will have limited effects on their behavior in current environments.

The human body's past was molded by the survival of the fitter, but your body's future depends on how you use it.

At the end of *Candide*, Voltaire's critique of complacent optimism, the hero finds peace, declaring: "We must cultivate our garden."

To that we would add: "We must cultivate our bodies."



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THANK YOU