BHARATHIDASAN UNIVERSITY

Tiruchirappalli- 620024,
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Programme: M.Sc., Marine Biotechnology

Course Title : Marine Biotechnology

Course Code: 21EC3a

Unit-I

Algal Biotechnology-
Vitamins, Minerals and Omega3 Fatty acids from Microalgae

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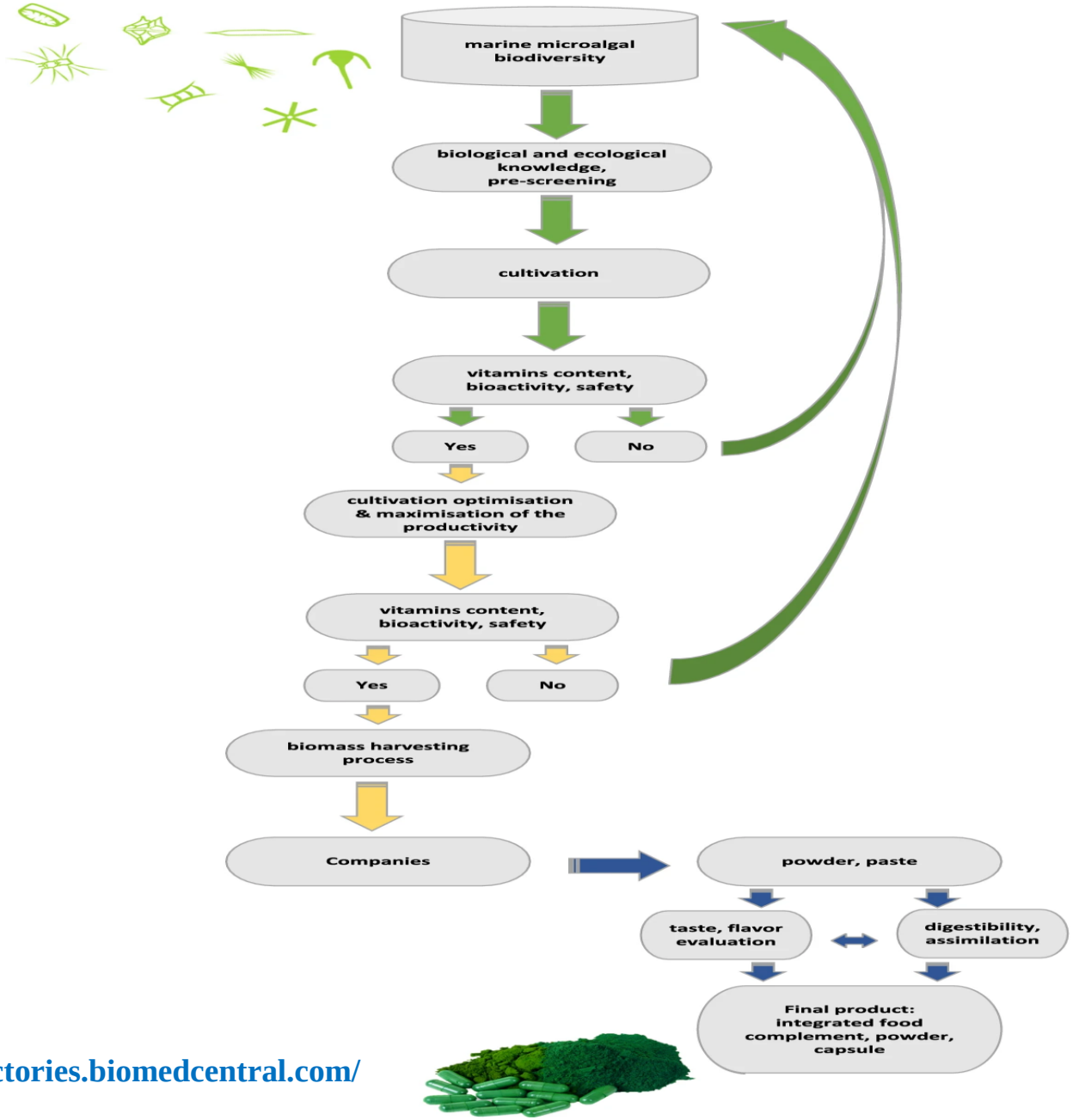
WHAT IS ALGAL BIOTECHNOLOGY?

- Algal biotechnology refers to the application of microalgae and macro algae or their derivatives, to synthesize or modify products or processes for specific use.
- Algae biotechnology is an ever-expanding field of research that aims to use the biological properties of algae to develop products and solutions for diverse sectors, from food and energy to medicines and cosmetics.
- Algae can be used as food, fodder and also as a binding agent.
- They are also used as thickening agents in food, biodiesel fuel, bacterial growth medium, etc.

VITAMINS

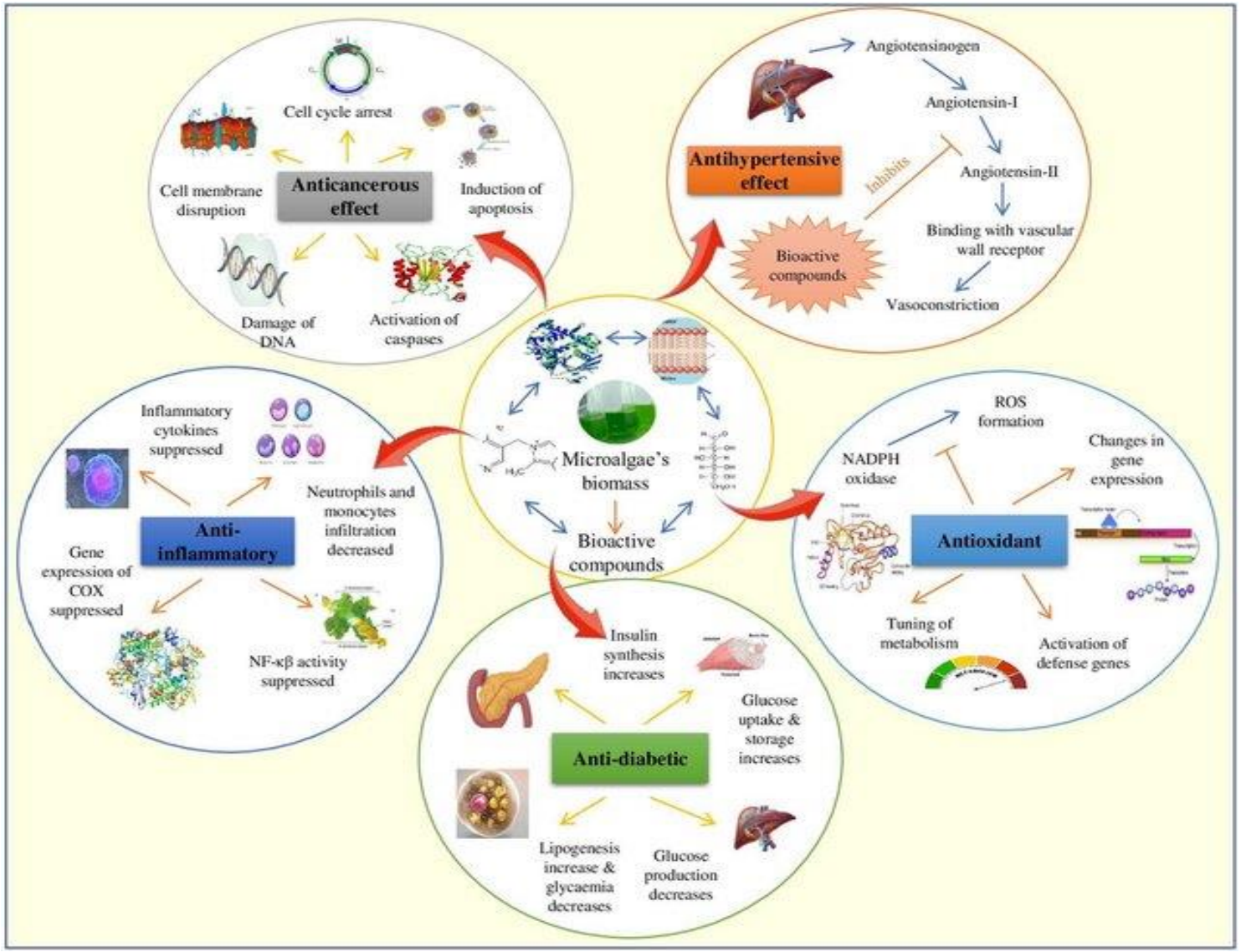
- Vitamins are the essential elements of required for the proper human development, they can only be obtained through diet and supplements.
- Microalgae are the excellent potential source of vitamins.
- Microalgae can accumulate vitamin A as precursor such a carotenes and retinol, which have been demonstrated to protect against the cancers.
- Adult can have daily consumption of 1g of cyanobacteria will provides three times their daily needs for vitamin k1 food source.

VITAMIN PRODUCTION FROM MICROALGAE

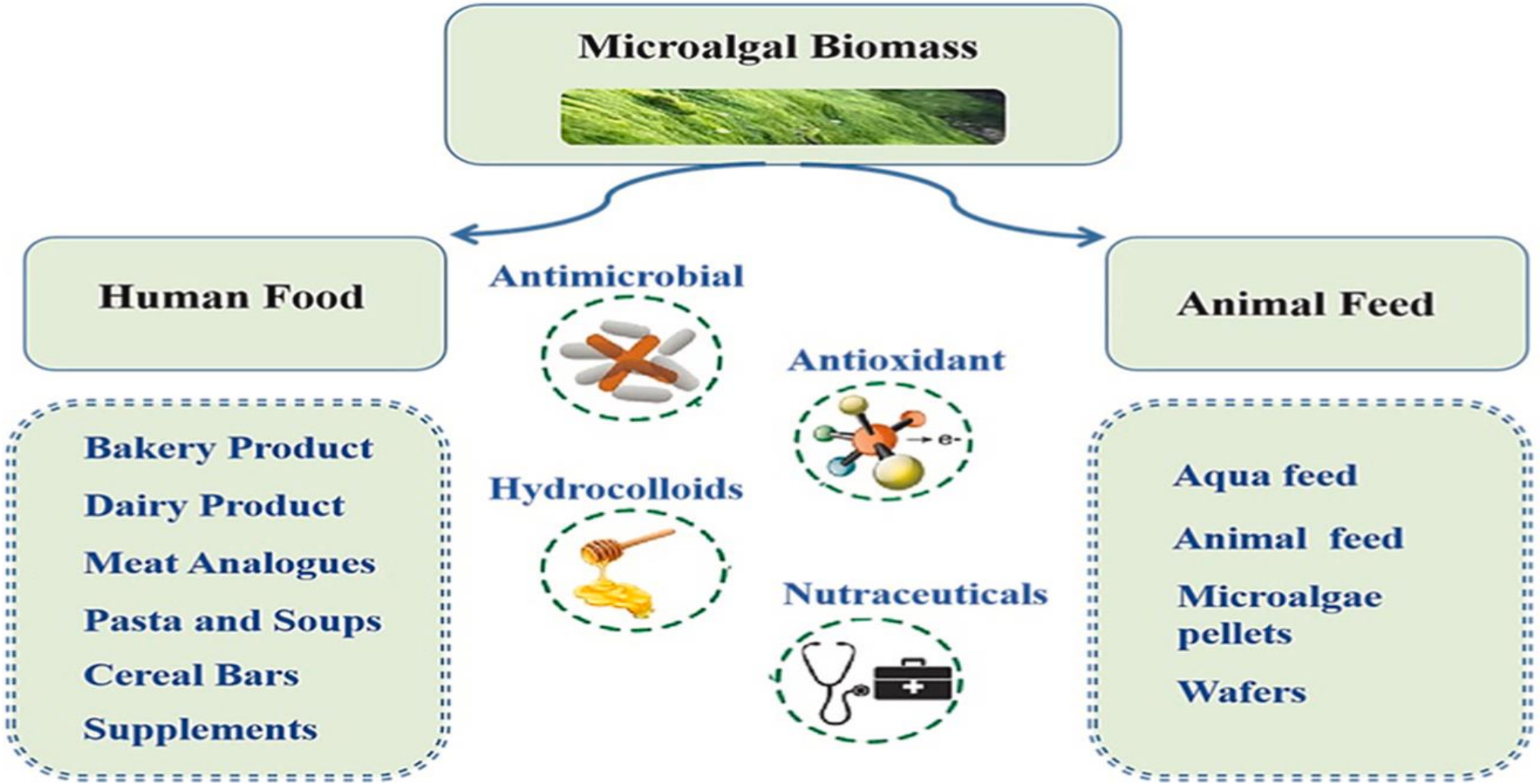


Source: https://microbialcellfactories.biomedcentral.com/

HEALTH BENEFITS VITAMINS DERIVED FROM MICROALGAE

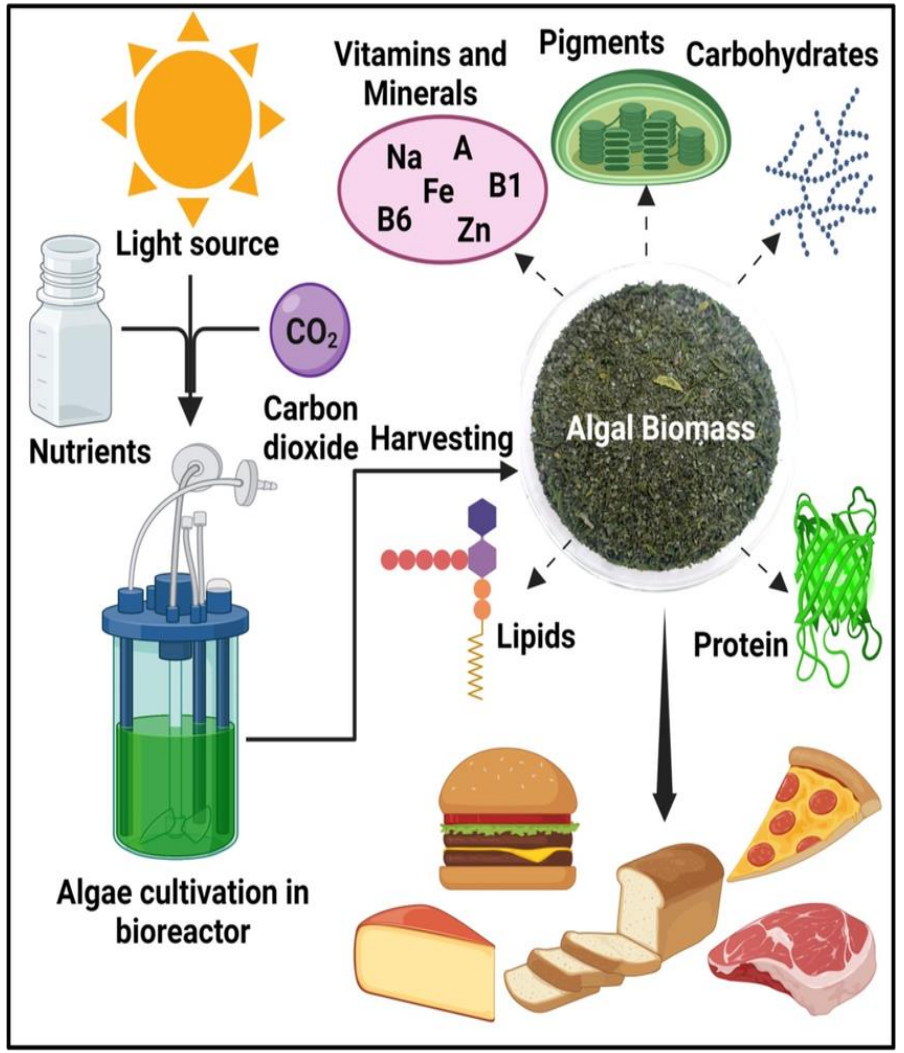


APPLICATIONS OF MICROALGAE AS A FOOD



MINERALS

- Marine algae are live in an environment with a very high concentration of salts, need to accumulate solutes that allow to regulate the osmotic balance between their cells and the environment.
- Many ions such as sodium, chlorine, and potassium are involved in this process, but certain low molecular weight carbohydrates are also involved.
- Marine algae contain a wide range of macro minerals, including sodium, calcium, magnesium, potassium, chloride, sulphate, and phosphorus, as well as microminerals (such as iodine, iron, zinc, copper, selenium, manganese, boron, nickel, cobalt, etc)
- The algae acquire from the marine environment, in which they live, a great wealth of mineral elements, being known for its high content of minerals between 8–40% of the dry weight .

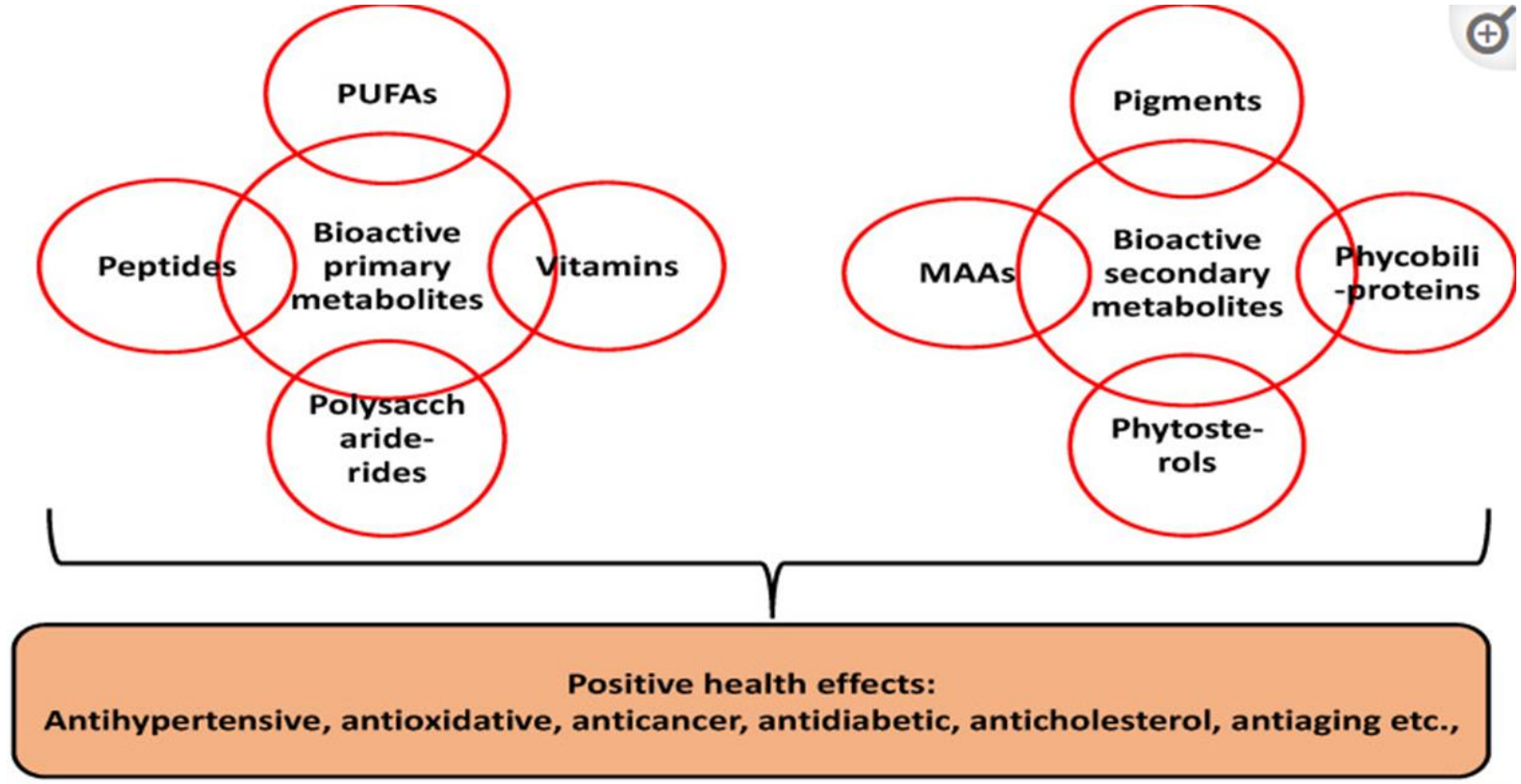


- The essential minerals such as sodium, calcium, magnesium, potassium, chloride, sulfate, phosphorus, and micronutrients such as iodine, iron, zinc, copper, selenium, molybdenum, fluoride, manganese, boron, nickel, cobalt, etc.
- the mineral composition may vary depending on the taxonomic group, geographical, seasonal and physiological variations , and even with the type of processing and mineralization method applied.
- Algae are a primary source of iodine, providing the daily iodine requirement (150 g/day).
- Because of their high mineral content, algae can be used as a dietary supplement to help achieve the recommended daily amounts of some macro minerals and trace elements.

OMEGA 3 FATTY ACIDS

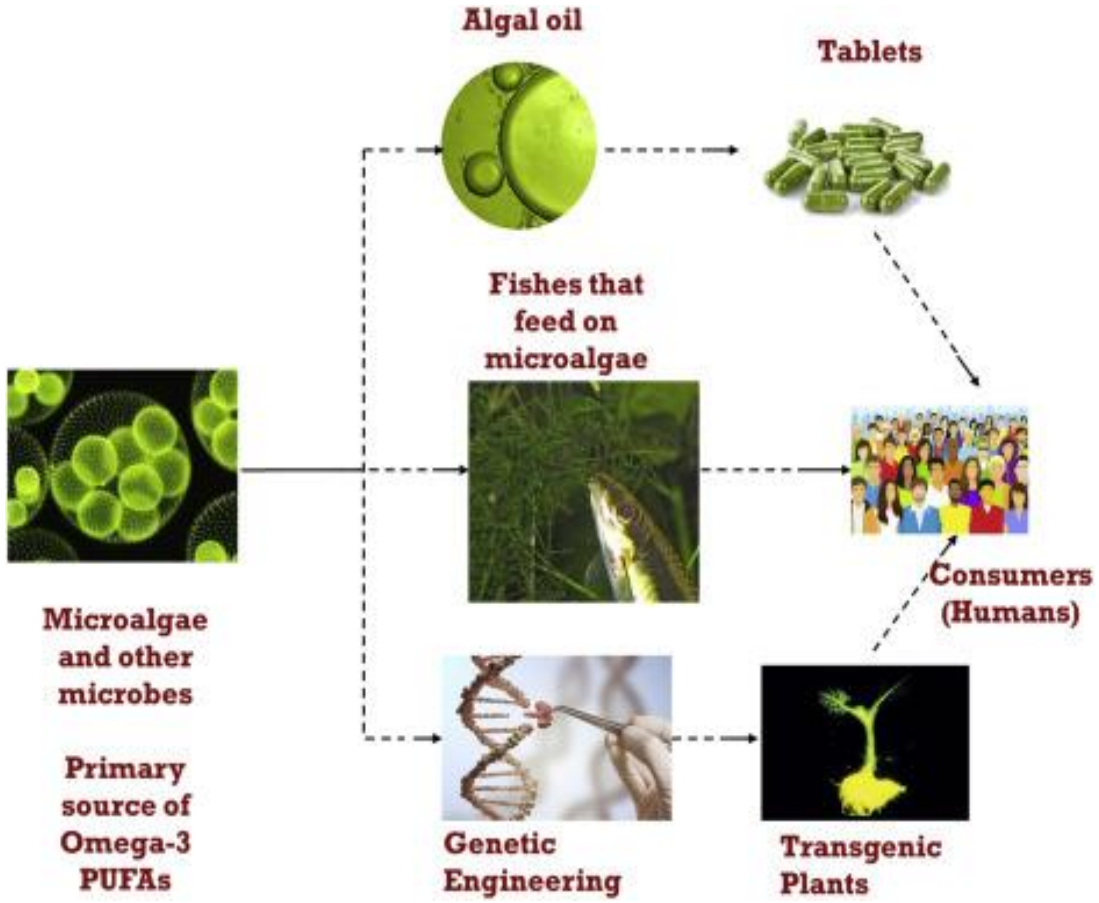
- Omega-3 fatty acids eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) provide significant health benefits and this has led to an increased consumption as dietary supplements. Omega-3 fatty acids EPA and DHA are found in animals, transgenic plants, fungi and many microorganisms.
- As primary producers, many marine microalgae are rich in EPA and DHA and present as a source of omega-3 fatty acids.
- EPA is a carboxylic acid with a 20-carbon chain and five cis double bonds.
- Several heterotrophic microalgae have been used as biofactories for omega-3 fatty acids commercially, but a strong interest in autotrophic microalgae has emerged in recent years as microalgae are being developed as biofuel crops.

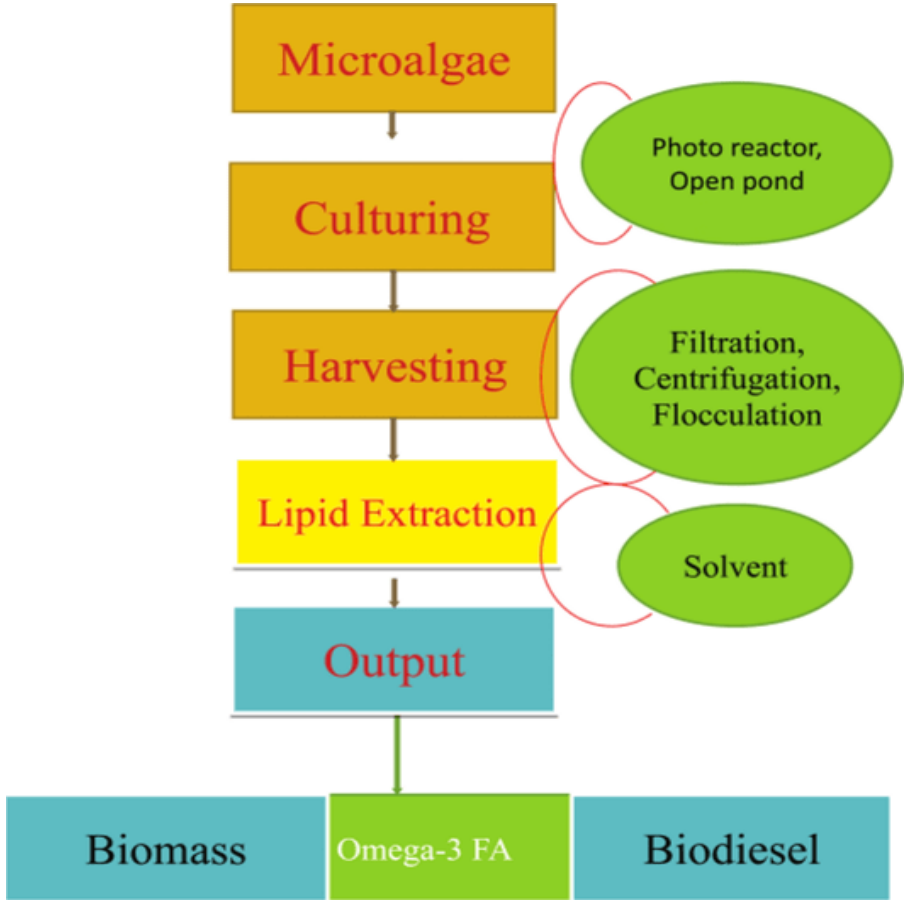
BIOACTIVE COMPOUNDS OF MICROALGAE AS FATTY ACIDS



- One group of fatty acids as blue-greens such as *Oscillatoria* and *Microcystis* were similar to those of the greens with higher amounts of the **ω3 type** compared to the **ω6 type**, whereas the other group such as *Anabaena* and *Spirulina* contained mostly ω6 acids.
- The flagellates, a taxonomically diverse group, were characterized by high amounts of long-chained polyunsaturated fattyacids (PUFA), particularly of the ω3 type.
- The ω3/ω6 ratio appears to be highest in algae in the exponential growth phase.
- PUFA in the phospholipids consist mostly ω3 acids.

PRODUCTION OF OMEGA 3 FATTY ACIDS FROM MICROALGAE





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