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ALGAL BIOTECHNOLOGY: PROPERTIES OF BIOACTIVE DERIVATIVES AND PHARMACEUTICAL APPLICATIONS

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Abstract – Continuous development of new pathologies and mutations together with the increment of drug resistance make the research of new treatments and therapies more urgent and essential. Among the renewable resources, algae and related bioactive compounds are strongly considered. Algae are eukaryotic organisms characterised by high therapeutic potential. Indeed, because of biotic and abiotic factors, algae produce a wide variety of metabolites, which are useful for treating dysfunctions and diseases. The most produced metabolites are proteins, carbohydrates, lipids, vitamins, polyphenols, and pigments, which find several applications in daily life, as indicated in Fig. 1. The different classes of metabolites are relevant to the species they belong to; they are also divided into groups according to their medical properties. Over the years, advantages and performances of algae derivatives have been demonstrated by a growing number of analyses and researches, especially in recent years. Among the various properties of algae metabolites, anti-inflammatory, antiviral, antibacterial, antioxidant and antidiabetic are the most promising. Pigments (e.g. fucoxanthin) and polyphenols are the main compounds with anti-inflammatory activity; the latter also show antiviral, antidiabetic and antibacterial effects. Other compounds with antidiabetic activity are some xanthophylls and some polysaccharides (e.g. fucoidan and alginate). Among the antioxidant metabolites of algae, the most useful are flavonoids (i.e. polyphenols), carotenoids, pigments, vitamins, minerals and enzymes. Fatty acids show antibacterial ability, while carrageenans and other polysaccharides show both antibacterial and antiviral effects. Supporting algal research is a valid strategy to improve ongoing trials, expand or confirm obtained results, discover and include new molecules in biotechnology applications with the aim to introduce novel medical and pharmacological uses in modern medicine. A typical example is related to diabetes mellitus, which is a disease in constant growth. Nowadays, numerous trials are ongoing to develop innovative and more efficient treatments and several algae are analysed with respect to this pathology. Indeed, some algal bioactive compounds, in particular polyphenol derivatives, polysaccharides and pigments, have antidiabetic properties; these metabolites inhibit the enzymes α -glucosidase, α -amylase and aldose reductase, reduce reactive oxygen species, decrease lipid peroxidation and interfere on metabolic pathways. The results are decrement of blood glucose levels and increment of insulin values, which are critical in diabetic patients.

Keywords – *Algae; algal growth; biomass; bioproducts; metabolites; therapeutic potential*

