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# Introduction

In recent years, population ageing and age-related diseases, such as cancer, cardiovascular disease, diabetes, inflammatory disorders and neurodegenerative disorders, have increased markedly, mainly as a result of chronic oxidative stress. Oxidative stress is an abnormal state in which cells or tissues experience an imbalance between the production of pro-oxidants and antioxidant defence systems (Smaga et al., 2015; Liguori et al., 2018; Salehi et al., 2020). The biological consequences of oxidative stress are manifold: it can increase cell proliferation and adhesion, promote the expression of proteins associated with apoptosis, trigger inflammation and the formation of autoantibodies, abnormal proteins and oxidised lipids, and, in cases of severe stress, disrupt cell membranes, leading to immediate cell destruction and lysis, mutations, carcinogenesis, fibrosis and foetal malformations (Poprac et al., 2017; Tramutola et al., 2017).

Several models are used to study oxidative stress. Among these, the red blood cell (RBC) model is often considered the most relevant, although other models, including animal models, isolated organs and cell cultures, are also employed in this field (Pandey and Rizvi, 2010). Red blood cells undergo a continuous cycle of oxygenation and deoxygenation as part of their primary function; this process produces erythrocyte reactive oxygen species (EROS) (Yang et al., 2016). Furthermore, because their membranes contain high levels of polyunsaturated fatty acids and the cells contain iron-rich haemoglobin, they are extremely vulnerable to oxidative damage (Yang et al., 2016; Zheng et al., 2016).

The body has a highly effective antioxidant defence system capable of reducing the concentration of reactive oxygen species and limiting oxidative stress. This system can be supplemented by external sources, particularly antioxidants naturally found in plants. Plants are a rich source of antioxidants, containing mixtures of secondary metabolites, including phenolic compounds such as flavonoids and tannins, which may act individually or synergistically as therapeutic agents in the treatment of various diseases. They have long been used in traditional and modern medicine, particularly to treat bacterial infections, a major health issue because of the growing resistance of bacteria to antibiotics (Seragui et al., 2013; Bellik and Selles, 2017; Xu et al., 2017).

Plant extracts such as fennel (*Foeniculum vulgare*), peppermint (*Mentha piperita*) and thyme (*Thymus vulgaris*) have been shown to be effective not only against bacteria but also against fungi, yeasts and viruses (Jürgen et al., 2009). Other plants are also being studied for their therapeutic potential in various conditions, particularly wound healing, a dynamic and complex biological process involving several phases that lead to the restoration of tissue integrity and the re-establishment of homeostasis. These include *Aloe vera*, the essential oil of *Lavandula angustifolia* (lavender) and extracts of *Centella asiatica* (gotu kola), which are recognised for their wound-healing properties, including the promotion of cell regeneration, reduction of inflammation, antiseptic effects and stimulation of collagen production (Gattefossé, 1937; Brinkhaus et al., 2000; Hamman, 2008). Herbal remedies offer a promising alternative in primary care systems and an important avenue for the development of medicines inspired by traditional practices (Daglia, 2012).