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Isofraxidin: Synthesis, biosynthesis, isolation, pharmacokinetic and pharmacological properties

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Isofraxidin (7-hydroxy-6, 8-dimethoxy coumarin) (IF) is a hydroxy coumarin with several biological and pharmacological activities. The plant kingdom is of the most prominent sources of IF, which, among them, Eleutherococcus and Fraxinus are the well-known genera in which IF could be isolated/extracted from their species. Considering the complex pathophysiological mechanisms behind some diseases (e.g., cancer, neurodegenerative diseases, and heart diseases), introducing IF as a potent multi-target agent, which possesses several herbal sources and the multiple methods for isolation/purification/synthesis, along with the unique pharmacokinetic profile and low levels of side effects could be of great importance. Accordingly, a comprehensive review was done without time limitations until February 2020. IF extraction methods include microwave, mechanochemical, and ultrasound, along with other conventional methods in the presence of semi-polar solvents such as ethyl acetate (EtOAc). In addition to the isolation methods, related synthesis protocols of IF is also of great importance. From the synthesis point of view, benzaldehyde derivatives are widely used as precursors for IF synthesis. Along with the methods of isolation and biosynthesis, IF pharmacokinetic studies showed hopeful in vivo results of its rapid absorption after oral uses, leading to different pharmacological effects. In this regard, IF targets varieties of inflammatory mediators including nuclear factor kappa-light-chain-enhancer of activated B cells (NF-κB), tumor necrosis factor-α (TNF-α), and matrix metalloproteinases (MMPs). thereby indicating anticancer, cardioprotective, and neuroprotective effects. This is the first review on the synthesis, biosynthesis, isolation, and pharmacokinetic and pharmacological properties of IF in combating different diseases.

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