

# Nanocarriers to improve solubility, stability, and optimise bioefficacy of natural products

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Over the millennia, plants have represented for Humankind the main source of food, but also a vast resource to maintain health, for prophylactic properties or to cure human and animal diseases. Presently, between 65 and 80% of populations in developing countries use medicinal plants as therapeutic remedies for their primary healthcare and in Europe and USA there is an increasing demand of botanical products both on the form of food supplements and herbal medicinal products. Botanicals on the market are mainly based on traditional (infusions or decoctions), conventional and innovative (supercritical or subcritical) extracts, but the number of marketed isolated constituents is also increasing. Conversely, the clinical use of many of these isolated constituents and several extracts is limited due to the need of repeated administrations or high doses because of low hydrophilicity and intrinsic dissolution rate(s), or physical/ chemical instability. Other limits are low absorption, poor pharmacokinetics and bioavailability, scarce biodistribution, first pass metabolism, trivial penetration and accumulation in the organs of the body. Nowadays, the design and production of appropriate drug delivery systems, in particular nanosized ones (between 50 and 300 nm), have already entered into clinical use and can offer an advanced approach to optimized the therapeutic efficacy of extracts and isolated constituents [1-4]. Novel nanoformulations (Figure 1) based on drug delivery systems, namely polymeric nanoparticles and lipid based-nanocarriers including micelles, vesicles, nanocochleates, microemulsions and nanoemulsions, represent successful examples overcoming these limitations. Emerging molecules with pleiotropic functions such as curcumin [5-9], salvianolic acid B [10-11], artemisinin [12-16], verbascoside [17-18], andrographolide [19-20] and several extracts, namely *Serenoa repens* [21], *Vitex agnus-castus* [22], *Silybum marianum* [23], *Salix alba* [24] and thyme essential oil [25] have been successfully formulated in nanocarriers.

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