Application of Polyphenol nanoformulations for cancer

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Abstract

Polyphenols have been utilized for the prevention and treatment of several illnesses due to their significant antioxidant, anti-inflammatory, immunomodulatory and especially antineoplastic effects. Neoplasms are formed due to the uncontrolled cell proliferations which lead to one of the main global health concerns, cancer. Despite their remarkable health-promoting effects, polyphenols have a low oral bioavailability which limits their clinical application. One of the ways to solve this problem is nanonization. Nanoformulations of natural polyphenols as bioactive agents, like resveratrol, curcumin, quercetin, epigallocatechin-3-gallate, chrysin, baicalein, luteolin, honokiol, silibinin, and coumarin derivatives, cause the better efficacy for the prevention and treatment of cancer. Nanonization and nanoformulation methods for phytochemical agents have great impacts on targeted therapy and bioavailability, as well as the stability of these agents. Nowadays, lots of formulations are designed for delivery of polyphenolic compounds, including liposomes, solid lipid nanoparticles, gold nanoparticles, nanosuspensions and polymeric nanoparticles that all these mentioned formulations and vehicles have resulted in increased intracellular concentration, better antineoplastic activity, controlled release of the drugs and improvement of proapoptotic activity against tumor cells. In conclusion, natural polyphenols have some barriers in terms of their bioavailability and their toxicity for the normal cells which can be overcommed by utilizing nanoformulation-based technologies that can improve the bioefficacy of the mentioned drugs. Therefore, nanonization process can boost the effects of natural polyphenols against cancer by diverse mechanisms. Future mechanistic, preclinical, and clinical studies are essential to confirm the safety and efficacy of polyphenol nanoformulations in the treatment of malignancies.

Image

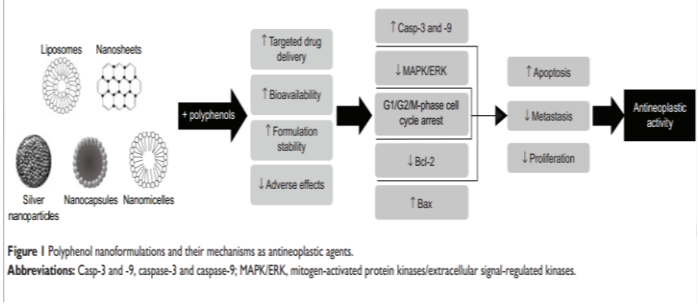


Figure 1 Polyphenol nanoformulations and their mechanisms as antineoplastic agents.
Abbreviations: Casp-3 and -9, caspase-3 and caspase-9; MAPK/ERK, mitogen-activated protein kinases/extracellular signal-regulated kinases.

Recent Publications

1. Anticancer Efficacy of Polyphenols and Their Combinations.

   Niedzwiecki A, Roomi MW, Kalinovsky T, Rath M.Nutrients. 2016 Sep 9; 8(9). Epub 2016 Sep 9

2. Selecting optimum protein nano-carriers for natural polyphenols using chemoinformatics tools.

   Metwally AA, El-Ahmady SH, Hathout RM.Phytomedicine. 2016 Dec 15; 23(14):1764-1770. Epub 2016 Oct 28

3. Immunoliposome encapsulation increases cytotoxic activity and selectivity of curcumin and resveratrol against HER2 overexpressing human breast cancer cells.

   Catania A, Barrajón-Catalán E, Nicolosi S, Cicirata F, Micol V.Breast Cancer Res Treat. 2013 Aug; 141(1):55-65.

4. Single-step green synthesis and characterization of gold-conjugated polyphenol nanoparticles with antioxidant and biological activities.

   Sanna V, Pala N, Dessì G, Manconi P, Mariani A, Dedola S, Rassu M, Crosio C, Iaccarino C, Sechi M.Int J Nanomedicine. 2014; 9:4935-51. Epub 2014 Oct 23

5. Improving the efficacy of plant polyphenols.

   Biasutto L, Mattarei A, Sassi N, Azzolini M, Romio M, Paradisi C, Zoratti M.Anticancer Agents Med Chem. 2014; 14(10):1332-42

Biography

Yasamin Davatgaran Taghipour received her MSc degree in medical nanotechnology at Tehran University of Medical Sciences in 2016. She is really optimistic about future of the field of nanomedicine and she involves herself in writing different review papers about the field of nanomedicine and she has wrote research papers about biosensors and their applications in nanomedicine. she is expertise in preparation and synthesizing gold and silver nanoparticles. she is a real teamworker person and she likes forming new teams and getting professionally toghether.

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