Nanoparticles produced from propolis extract: Their applications in medicine, why not?

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Dear Editor,

As we know, propolis is a natural resinous material produced by bees from various plants. This material is used to seal and line the beehives. The quality of propolis depends on chemical compositions, geographical region and botanical origin. Propolis contains resin, wax, essential oil, pollen, minerals, phenolic acid, flavonoids, terpenes, aromatic aldehydes, alcohols, fatty acids and stilbenes. It has many benefits for human health, for instance, antioxidant, antimicrobial, antiproliferative, antitumoral, anti-inflammatory and immunomodulatory capacity. Currently, there are many types of products made from propolis, including tablets, liquids and capsules but they are quite expensive in Vietnam (15–20 USD/120 capsules). Customers can use either the original propolis or propolis extract depending on the application. In Vietnam, beekeepers are not very interested in propolis due to the low yield (approximately 0.2 kg/herd/year).

The biggest problem for propolis is its low solubility in water and poor bioavailability. Therefore, scientists must use organic solvents (acetone, ethanol, etc.) to extract the bioactive compounds. In addition, to resolve these problems, many previous studies pointed out that nanoparticles (NPs) produced from propolis extract could be used as drug delivery systems to facilitate drug absorption and are relatively safe (low toxicity) and compatible with the human body.1 Propolis extract NPs could improve the biological activities compared to the control. In fact, there are many ways to encapsulate propolis, for instance, lipid NPs, polymeric NPs, and inorganic NPs with various diameters.

In general, all studies about propolis extract NPs are very interesting; however, they only have focused on the antiproliferative, antimicrobial, immunomodulatory activities, cytotoxicity and phytochemical profiles. Those are highlights of medicine, but it is a pity that these experiments were performed in vitro.[1] In my opinion, there are some major issues that need to be resolved when researching the human body. Firstly, the interaction of unintended NPs and immune cells may create some molecular responses that negatively affect human health, stimulate infectious diseases, induce autoimmune disorders and promote cancer development.[2] Secondly, plant extract NPs can be undetected by the immune system.[3] Lastly, the data on the toxicity of plant extract NPs (both carriers and phytochemical components of extract from plants) are inadequate. So, the impact of nanoparticles on the immune system is still a grey zone. Determination of the toxicity of propolis extract NPs and evaluation of their interaction with the human immune system are quite necessary. Based on the issues mentioned above, the applications of propolis extract NPs in the human body are huge challenges for the medical field and nanotechnology, however, future studies are necessary for in vivo models. Therefore, the perspective being proposed in this study is indeed feasible. Although the development of nanomedicine is still a long way off, it looks bright and may attain great achievements in the future. For NPs produced from propolis extract, I believe that there are many exciting things to discover with this nanomaterial and they are surely advantageous for human health, at least for in vitro experiments.

CONFLICT OF INTEREST

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REFERENCES

1. Botteon CEA, Silva LB, Ccana Ccapatinta GV, Silva TS, Ambrosio SR,Veneziani RCS, et al. Biosynthesis and characterization of gold nanoparticles using Brazilian red propolis and evaluation of its antimicrobial and anticancer activities. Sci Rep 2021; 11: 1974.
2. Kononenko V, Narat M, Drobne D. Nanoparticle interaction with the immune system. Arh Hig Rada Toksikol 2015; 66: 97-108
3. Ernst LM, Casals E, Italiani P, Boraschi D, Puntes V. The interactions between nanoparticles and the innate immune system from a nanotechnologist perspective. Nanomater 2021; 11: 2991.

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