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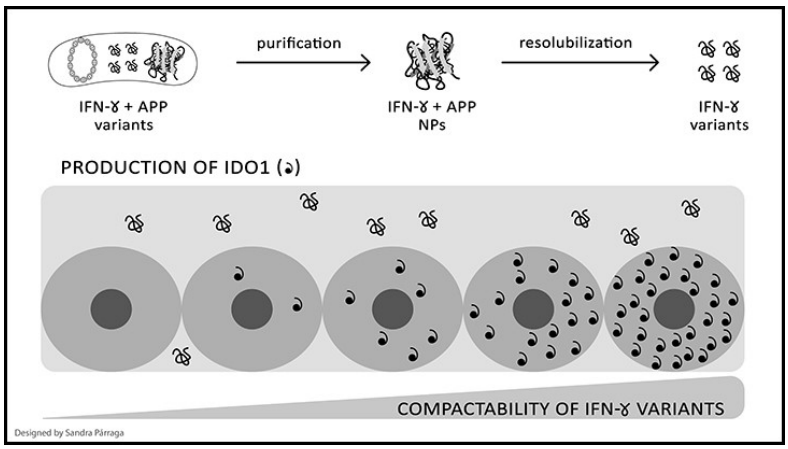
Accurate and more effective formulations for administering proteins



Recombinant proteins, biological molecules with therapeutic potential, represent an advance in human and animal health as is the case of insulin. These, however, once administered are quickly degraded. In this sense and in infectious diseases, the group of Nanobiotechnology of the UAB is studying nanoparticles that contain the interferon-gamma protein (IFN-γ) and that activate the defenses of dairy cows. These nanoparticles even improve its biological performance.

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Recombinant proteins have a great socioeconomic impact, mainly in the industrial and biopharmaceutical sectors. Access to large quantities of high-purity proteins has contributed to improving the quality of life of many patients who need an extra supply of this type of biomolecules. The first protein produced in a recombinant expression system was insulin. Moreover, the proportion of people with diabetes in Catalonia is around 7.5% and many of them need insulin to treat the disease. Therefore, access to recombinant proteins has a great impact on our quality of life and well-being and can help us to solve some of the unmet biomedical needs.

One of the weak points of protein-based treatments is their low stability. It has been determined

that only a small part of the protein that is administered is what is finally available to perform the necessary biological function. In order to improve this aspect, new formulas are being developed with the aim of protecting proteins. In our group, for some time, we have been working on alternative treatments to the use of antibiotics in animal health and we have identified proteins, as interferon gamma (IFN-γ), that can stimulate the immune system of the cattle during periods infection risk. Interferon gamma is also a protein factor with low stability when locally administered (intramammary).

In this work, in the bacterial cells that we have used to produce interferon gamma, we have obtained nanoparticles that contain this protein. Once purified, these nanoparticles release active interferon gamma in a sustainable manner in cell cultures where the production of enzymes (IDO1) involved in the regulation of the immune response is induced. We have observed that by adding special amino acids to interferon gamma (APP peptides), we can obtain different nanoparticles in which the release of the interferon can be more efficient and, at the same time, modified interferon can have a higher biological activity than natural version. These results show that the combination of mixed strategies between different areas of knowledge such as microbiology, biotechnology and bioengineering can offer new strategies for dealing with alternative approaches to the use of antibiotics and therefore may reduce the selection of resistant microorganisms. This protein formulation is proposed as a possible alternative format to administer proteins in treatments related to infectious diseases and, moreover, we believe that it opens new ways of study for other types of indications for animal and human health.

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References

Carratalá José Vicente, Cano-Garrido Olivia, Sánchez Julieta, Membrado Cristina, Pérez Eudald, Conchillo-Solé Óscar, Daura Xavier, Sánchez-Chardi Alex, Villaverde Antonio, Arís Anna, Garcia-Fruitós Elena, Ferrer-Miralles Neus. (2020). **Aggregation-prone peptides modulate activity of bovine interferon gamma released from naturally occurring protein nanoparticles**. *N. Biotechnol*. 2020 July 25;57:11-19. doi: 10.1016/j.nbt.2020.02.001.

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