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Nano-sized starch - opportunities for encapsulation

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Nanoparticles (NPs) are the right choice for strategic development of new drug delivery systems with novel applications in food, cosmetics and healthcare [1]. Starch is a non-allergenic abundant polysaccharide in nature, renewable and biodegradable making it an ideal candidate as reagent for green bioformulations. Starch models are described as concentric semi-crystalline multistate structures that are involved in the production of new nano-elements. The disruption of amorphous domains of semi-crystalline granular by acid hydrolysis will produce starch nanocrystal, while gelatinized starch will form starch in the form of starch nanoparticles (SNPs) [2].

Several methods have been known to produce SNPs such as high-pressure nanoemulsification, cross-linking, microemulsion/antisolvent nanoprecipitation [1-6]. The final properties of the SNPs are strongly influenced by the synthesis route and conditions so it will determine its final applications. For example, there has been indications of the bacterial inhibition properties of starch nanoparticles (SNPs) loaded with antibiotics or biocide metals, such as Ag, but it has been reported that bactericidal properties of the NPs are size dependent being more effective on 1-10 nm range [7]. A soft chemistry technique that allows size control with a growing interest is the microemulsion method [5] since it does not require sophisticated equipment, hazardous reagents and extreme conditions.

Recently, there has been also an increased use of magnetic iron oxide NPs (IONPs) for

various biomedical applications being used as promising agents in detection and analysis, or in different therapies such as targeted drug delivery since they have a high magnetic moment and posse superparamagnetic properties. These type of magnetic NPs can be manipulated under the influence of an external magnetic field being able to act in a specific site of action which enables controlling and recovery later on for reuse or recycle. It has also been demonstrated the feasibility of producing loaded magnetic iron oxide impregnated SNPs for controlled drug release by a synthesis based on the microemulsion method known as emulsion crosslinking [8].

In this presentation, up-to-date information regarding the synthesis of SNPs used for encapsulation and its novel bioapplications both in food and healthcare will be presented.

References

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