Inulin is a naturally occurring polysaccharide found in many plants. It consists of β-2-1 linked D-glucose units. Polysaccharides are a growing area of research because of their potential applications as delivery systems for controlled drug release. Controlled drug delivery occurs when a polymer, whether natural or synthetic, is judiciously combined with a drug or other active agent in such a way that the active agent is released from the material in a predesigned manner. The release of the active agent may be constant over a long period, it may be triggered by the environment or other external events. In any case, the purpose behind controlling the drug delivery is to achieve more effective therapies while eliminating the potential for both under- and overdosing. Other advantages of using controlled-delivery systems can include the maintenance of drug levels within a desired range, the need for fewer administrations, optimal use of the drug in question, and increased patient compliance. While these advantages can be significant, the potential disadvantages cannot be ignored: the possible toxicity or nonbiocompatibility of the materials used, undesirable by-products of degradation, any surgery required to implant or remove the system, the chance of patient discomfort from the delivery device, and the higher cost of controlled-release systems compared with traditional pharmaceutical formulations.

Antitumoral drugs are necessary for the treatment of several colon cancers. However, it is difficult to deliver these drugs to the colon because oral administrated drugs are absorbed at the stomach and intestine where they do not reach colon; in addition, intravenous administrated drugs are eliminated from the body before reaching colon. Because inulin is not absorbed in the stomach or in the intestine, and specifically liberated in the colon. Therefore, the use of inulin-coated vesicles could represent an advance for colon cancer treatment. Here, we study the use of inulin, from different sources (chicory, artichoke, and Jerusalem artichoke), as a vehicle for the controlled delivery of colonic drugs. The capsules consisting of inulin vesicles and the higher cost of controlled-release systems compared with traditional pharmaceutical formulations.

Acknowledgments: This work was supported by grants from Fundación Séneca, Región de Murcia (FS-15230/PI/10) and European Commission (FP7-INCO 293514).

Keywords: Inulin vesicles, colon cancer, methotrexate, controlled drug delivery.

In presented study various approaches for determination of polysorbate nanoparticles’ components, Polysorbate 20 and Polysorbate 80, in beverages and nutraceuticals were tested. Potential of ultra-performance liquid chromatography coupled with a time-of-flight mass spectrometry (UPLC-TOF MS) for determination of these organic ENPs in real matrix will be demonstrated. The limit of quantification (LOQ) of organic ENPs, based on polysorbate specific in-source fragments determination, was 0.5 µg/mL. Application of DART (Direct Analysis in Real Time) ion source coupled with MS detection for fingerprinting of a range of polysorbate based nanoparticles resulting in fast screening (LOQ 1 mg/mL) method will be also discussed. Size Exclusion Chromatography (SEC) coupled with Evaporative Light Scattering Detector (ELSD) can be also used for characterisation and determination of nanoparticles in food matrices, enabling distinguishing nano materials from low molecular compounds originating from food matrices. This approach can be considered as complementary method to any selective and sensitive analytical procedure (e.g. mass spectrometric detection) and is useful for rapid identification and determination of “nano” size components in food matrices.

Keywords: organic engineered nanoparticles, polysorbate, UPLC-SEC-ELSD, UPLC-TOF MS, DART MS

Acknowledgements: This study was carried out within (i) the EU FP7 project, contract no. 245162, Nanoparticles in Food: Analytical methods for detection and characterisation (NanoLyse), (ii) the project MSMT no. 6046137305 and (iii) specific university research (MSMT no. 21/2013) supported by the Ministry of Education.