Parenteral nutrition (PN) has transformed modern medicine by enabling survival for patients who cannot be fed via the gastrointestinal tract. PN is the daily intravenous supply of all nutrients necessary for the proper functioning of the body, i.e., amino acids, glucose, fats, electrolytes, vitamins, and trace elements. However, its composition does not fully reflect the profile of substances absorbed from the gastrointestinal tract into the bloodstream under the conditions of oral feeding. Patients receiving PN are developed deficiencies in substances of plant origin, including **carotenoids** such as **lycopene and lutein**, which are found in abundance in tomatoes, spinach, brussels sprouts, and other vegetables, and while not considered essential, they are characterized by pro-health properties.

PN is implemented in patients suffering from chronic bowel failure, chronic or necrotizing enteritis, and short bowel syndrome. Although new components of PN with greater safety and improved pharmacokinetic and pharmacodynamic properties continue to appear in the pharmaceutical market, complications related to PN are still prevalent. **Intestinal failure-associated liver disease (IFALD)** manifested by severe cholestasis or steatosis is one of the most common and serious complications of PN therapy. There are currently no effective treatment strategies for IFALD. To mitigate its symptoms, it is necessary to stop or restrictively limit PN infusion and implement pharmacological treatment. However, this leads to a deterioration in the nutritional status of patients and forces PN to be reintroduced. Previous therapies alleviate symptoms but continued PN causes them to come back. In this context, the search for new strategies to prevent or treat IFALD is warranted.

The aim of this project is to develop **intravenous PN-compatible (nano)carriers for selected non-provitamin A carotenoids (NPVACs)** and to investigate their potential preventive and/or therapeutic effects in patients exposed to IFALD.

A sterile and PN-compatible pharmaceutical formulation containing NPVAC(s) will be obtained. For this purpose, and to prepare the formulation with the best physicochemical and pharmacological properties, various drug delivery systems will be investigated**: micelles and lipid emulsions**. Both the impact of individual NPVACs and their potential synergistic effects in the prevention and treatment of cholestasis will be determined.

Improving patients' quality of life, increasing the safety of therapy, and reducing the frequency of adverse effects of PN are in line with the current recommendations of global scientific societies undertaking the problem of clinical nutrition**. Conducting pioneering research on the role of NPVACs in patients receiving PN may become a turning point for the modern concept of clinical nutrition.**