Evaluation of SubMagna™ SL HMW Micellar Formation Using Fluorescence Microscopy

SUMMARY: Green fluorescent protein (GFP) was used in this study to mimic the peptide semaglutide. When GFP is incorporated in SubMagna and the formulation is exposed to water, there is spontaneous formation of micelles which is a favorable attribute for the delivery of medications.

Introduction:

Green fluorescent protein (GFP) is a protein that exhibits bright green fluorescence when exposed to blue light. It is commonly used in scientific research as a marker to visualize proteins.

Micelles are lipid vesicles that can encapsulate drugs or other molecules, making them useful in drug delivery and research. When observing micellar formation, GFP may incorporate into the micellar membrane and/or encapsulate within the micelle. Using fluorescence microscopy, GFP is a valuable tool to track the localization and distribution of micelles.

Methodology:

GFP (Abcam, Boston, MA) was used in this study to represent the peptide semaglutide. GFP was mixed with SubMagna SL HMW to make a final concentration of 0.1 mg/mL. The mixture was added to water to make a 1:1 dilution with gentle mixing to mimic administration and contact of the formulation with saliva. The distribution of GFP in SubMagna was observed under microscopy using blue light or white light at 40x magnification.

Results and Discussion:

When SubMagna is exposed to water, there is spontaneous formation of vesicles (micelles), as displayed in Figure 1.

The white light evaluation shows the GFP inside the micelles, but it is not evident because the images are colorless. On the other hand, the blue light evaluation shows clearly the fluorescent protein encapsulated inside micelles and distributed on the membranes.

The spontaneous micellar formation of SubMagna when in contact with water is a favorable attribute for the delivery of medications. It avoids the instability issue often associated with micelles. Moreover, micelles contain lipid bilayers composed of phospholipids and cholesterols, mimicking the structure of cell membranes. Thus, micelles can fuse with cell membranes to release the drug instead of relying on endocytosis. This mechanism ensures rapid drug delivery, independent of drug molecular size, and reduces risk of drug degradation.

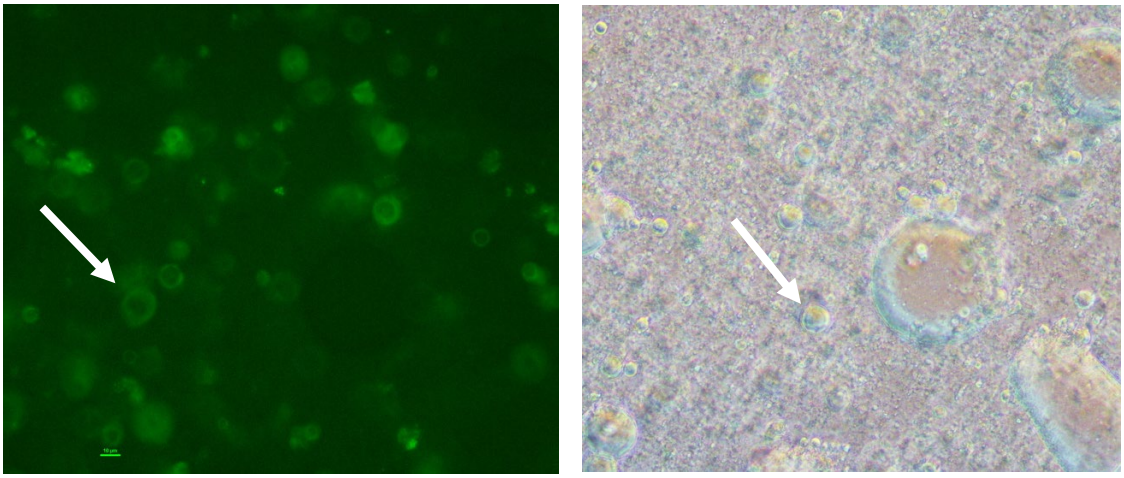

Figure 1. *Fluorescence microscopy: GFP 0.1 mg/mL in SubMagna using blue light (left) and white light (right), at 40x magnification; white arrows highlight selected micelles.*