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Commentary

A Brief Overview on Micellar Liquid Chromatography and its Significance

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DESCRIPTION

Micellar Liquid Chromatography (MLC) is a reversed-phase liquid chromatographic technique in which the stationary phase is nonpolar and the mobile phase is an aqueous surfactant solution at a concentration greater than the Critical Micellar Concentration (CMC). The addition of a surfactant to the mobile phase in RP-HPLC changes the chromatographic behaviour in contrast to aqueous-organic mobile phases because it produces a pseudo-stationary phase into which analytes can partition. The stationary phase, bulk solvent, and micellar pseudophase all have a role in analyte retention in MLC. As a result, compounds are sorted based on how well they partition between these three phases. Surfactants are commonly utilized to create micelles in the mobile phase, although surfactant-coated stationary phases can also be used. Partitioning in water-insoluble species happens mostly by direct analyte transfer between the micellar pseudophase and the stationary phase.

Micellar Liquid Chromatography has been explored as a potential GAC method since it does not need or decrease the usage of organic solvents. Indeed, mobile phases are made up of aqueous solutions containing a surfactant and a tiny amount of organic modifier (usually less than 15% v/v). Furthermore, due to the biodegradable nature of the surfactants utilized, these micellar mobile phases are non-flammable, have minimal toxicity, and do not create hazardous waste. The most often utilized surfactant in MLC, Sodium Dodecyl Sulphate (SDS), is a fatty alcohol sulphate that is aerobically degraded. However, in order to enhance MLC separations, organic solvents must frequently be added to aqueous micelle solutions. Propanol, butanol, and pentanol are the most often utilized organic modifiers in MLC because they are less hazardous than MeOH or ACN. Another significant benefit of MLC is sample treatment. In fact, micelles' high solubilizing capacity enables for direct drug injection into complicated matrices (e.g., biological fluids and dosage forms) without the requirement for sample preparation beyond filtering. MLC is also compatible with current RP-HPLC systems. As a result, it does not need any changes to current RP-HPLC equipment.

MLC is a potential method for developing green chromatographic technologies in pharmaceutical research. Furthermore, MLC facilitates sample preparation for difficult biological sample analysis. UV, fluorescence, and even electrochemical detections may all be hyphenated. However, such procedures need a large number of variables, including the type and concentration of surfactants, as well as the nature and proportion of organic solvents, resulting in chromatographic advancements that are highly challenging. Retention mechanisms are typically difficult to predict or understand due to the variety of the mobile phase.

The prediction of HIA was achieved using an MLC technique that employed a physiologically similar bile salt-lecithin mixed micellar solution. When chemicals were injected into the MLC system, this approach had a substantial influence on their elution and the sort of interaction they had. The bile salt-phospholipid combination showed a better potential for solubilizing compounds than the separate bile salt systems employed before, as evidenced by the behaviour of all compounds into binding solutes favoring the produced micelles. When compared to earlier models, this created MLC approach has a stronger prediction capacity for HIA (R2 PRED=81%).

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