Platform SFC-UV Method for GMP Analysis of Vitamin E in a Range of Vitamin E Supplement Matrices

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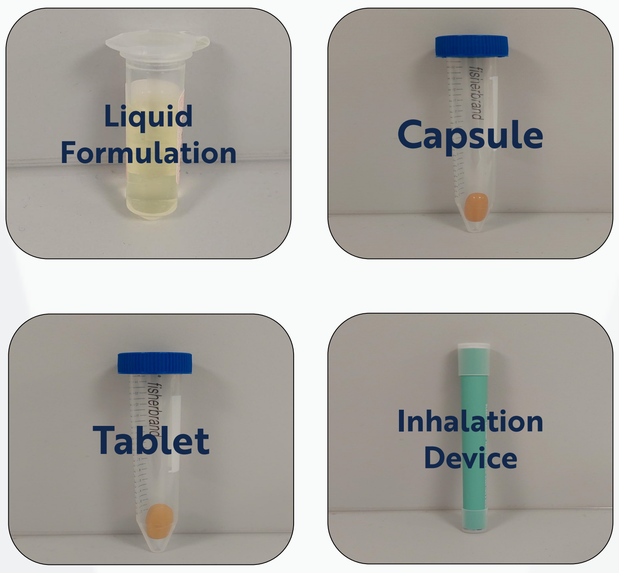
Introduction

- Vitamins are a large group of essential compounds that play an important role in metabolic reactions and cellular processes in the human body.
- Vitamin E is a collective name for a group of fat-soluble compounds containing four tocopherols and four tocotrienols.
- A deficiency in vitamin E can cause health problems while an excess intake can lead to vitamin toxicity or hypervitamintosis.
- Vitamin intake depends on diet. Many people therefore take supplements to maintain their intake of vitamins which can come in a variety of forms such as tablets, gummies, beverages, and inhalation devices.
- It is important to ensure that products contain the labelled amounts of vitamin E and therefore require quality control assays.
- Supercritical fluid chromatography (SFC) heats and pressurizes carbon dioxide beyond its critical point to form a supercritical fluid. In this state, the phase combines the diffusivity and viscosity of a gas phase with the density and solvation power of a liquid phase.
- This method describes a platform SFC-UV method for GMP analysis that can be used to determine vitamin E content with a flexible sample extraction workflow to suit the variety of supplement matrices on the market.

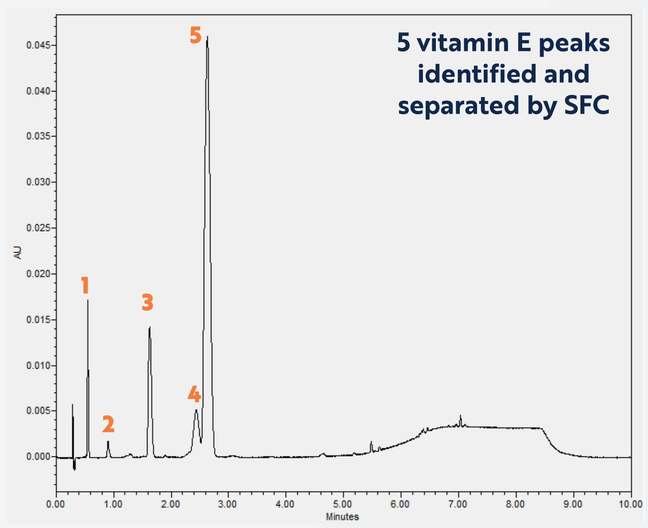
Sample Type



Sample Extraction

- "Dilute and shoot"
- Enzymatic Digestion
- Liquid-Liquid Extraction
- Solid Phase Extraction

Analysis



System Setup
Acquity UPC2 with PDA detector using wavelength at 293 nm
Column: Torus 1-AA 3.0 x 100 mm, 1.7 µm
Phase A: CO_2 / Phase B: methanol

Results

- With a large variety of sample types containing vitamin E, there is no one method capable of extracting them all. Therefore, a range of different extractions are required.
- A final solvent of hexane is used which is suitable for a single platform SFC-UV method for analysis.
- There are a range of techniques used for the analysis of fat-soluble vitamins such as vitamin E.
- Reverse phase or normal phase liquid chromatography consume large volumes of organic solvents which can be environmentally unfriendly, toxic and expensive.
- Gas chromatography presents a risk of thermal degradation of vitamins even when derivation is done prior to analysis.
- SFC presents a sustainable and faster alternative due to its minimal use of organic solvents, higher mass transfer rate and ability to separate compounds of widely different polarities.

Conclusion

- A platform method to separate and quantify vitamin E using an Acquity UPC2 SFC-UV system and Empower 3 software has been developed for GMP analysis.
- A range of sample preparation workflows can be used to suit the sample matrix ranging from simple "dilute and shoot" methods to enzymatic digestion for complex gelatine encapsulated capsules.
- This provides a more sustainable, efficient and adaptive solution for vitamin E assays on supplement products in a variety of forms.