

Analysis of Ergot Alkaloids by HPLC

*Ergot is the common name of *Claviceps purpurea*, a fungal growth that occurs on rye and other grains. It appears as dark deformed grain kernels on the plants. When ingested, even after the grain has been used to make bread, ergot causes toxic reactions including convulsions, hallucinations, and dry gangrene that leads to loss of limbs. Epidemics of ergotism have been recorded throughout history. This often-fatal condition has since been traced to alkaloids found in the fungus. Although toxic, the pharmacological importance of the ergot alkaloids has long been recognized and exploited. These alkaloids are serotonin antagonists with affinity for dopamine and nor epinephrine binding sites. Ergot alkaloids are also precursors to lysergic acid derivatives.*

Effective analysis of the various ergot alkaloids is often difficult. The similarity of their respective chemical structures means that the stationary phase must resolve the subtle differences in their structures (see figure 1). Also, the nitrogens in ergot alkaloids have a high affinity for the acidic silanols present on the surface of the silica supports favored for HPLC stationary phases. This affinity leads to excessive peak tailing and even adsorption to the stationary phase on conventional HPLC columns. For this reason only highly deactivated columns like Wakosil II™, are suitable for the analysis of the ergot alkaloids.

There are several possible approaches to the separation of ergot alkaloids including reverse phase, anion exchange and cation exchange HPLC. However, anion and cation exchange are unlikely to resolve structurally similar compounds due to their almost identical ionic characteristics. Reverse Phase HPLC is therefore the method of choice for the analysis of similar organic molecules. In this case a Wakosil II 5C18 RS column was chosen to analyze ergot alkaloids due to its excellent deactivation and high selectivity for structurally similar compounds. The selectivity of the Wakosil II 5C18RS column is illustrated in Figure 2 where a series of ergot alkaloids are well resolved from each other despite their structural and chemical similarity. For example, elymoclavine and lysergol (figure 1) only vary by the position of a double bond and yet are baseline separated by the Wakosil II 5C18 RS column. The excellent separation of these compounds is also evidence that the deactivation of the Wakosil II column and addition of a small amount of triethylamine (TEA), has prevented the strongly basic amine groups of the ergot alkaloids from interacting with any silanols that usually interfere with this analysis.

Figure 1. Ergot Alkaloid Structures

