Analysis of Pteridines in Isogenic Breast Cancer Model

The biosynthetic pathways responsible for elevated concentrations of pteridine derivatives in urine samples of women with breast cancer are not well understood. This study aimed to characterize pteridine levels and related metabolic rates in a progressive breast cancer cell line model that included the following lineages: MCF10A (non-cancerous), MCF 10AT (premalignant), and MCF10CA1a (metastatic). Pteridine derivatives were quantified using a previously developed high-performance liquid chromatography – tandem mass spectrometry (HPLC-MS/MS) workflow alongside a newly developed pteridine extraction protocol that together enabled rapid and sensitive simultaneous determination. Intracellular and extracellular pteridine levels were compared across progressive stages of the cell lineages with folic acid and guanosine triphosphate (GTP) precursor dosing. The results of these dosing studies demonstrated that most of the cellularly-created pteridines either remained in the extracellular space or were extracellularly transported, as over 99% of the total pteridine mass in most treatment groups was found in extracellular samples. Additionally, the pattern of pteridine production suggests that there are reactions in the biosynthetic pathway which are altered due to the presence of cancer, suggesting possible cancer-induced changes that can be monitored in future breast cancer diagnostic procedures using only urine samples.

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