Cell cycle dependency of ^{18}F-Choline uptake during proliferation of cultured human cancer cells

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Abstract

Recently [^{18}F] labeled choline ([^{18}F] Choline) has been developed as a promising tracer for cancer detection; including ones found in the lung, prostate gland, head and neck regions. The experimental study demonstrated [^{18}F] Choline uptake was higher in faster-growing rather than in slower-growing tumors. However, the precise mechanism remains to be elucidated. In this study, the relationship between [^{18}F] Choline uptake and the cell cycle phase in cultured human cancer cells (HeLa S3), as well as how they compare to the conventional tracer [^{18}F] FDG with PET was assessed. Synchronization of HeLa S3 cells was accomplished via a double thymidine block. Flow cytometry (FCM) was used to determine the relative DNA contents of cells to check the degree of cell synchronization. The uptake of [^{18}F] Choline and [^{18}F] FDG was determined after cell cycle synchronization.FCM findings confirmed that the cells were well synchronized. [^{18}F] Choline uptake was 87% of the peak level in the early S-phase immediately after release, gradually increased, and peaked in the G2/M phase. Subsequently, [^{18}F] Choline uptake steeply declined over the late G2/M phase to 58% in the G1 phase. The results suggest that the uptake of [^{18}F] Choline is cell cycle dependent, is associated with the proliferative activity of the tumor seen during PET imaging.