Measurement of intracellular accumulation of anthracyclines in cancerous cells by direct injection of cell lysate in MEKC/LIF detection

Authors

Julius Mbuna,
Takashi Kaneta
Totaro Imasaka

Abstract

Anthracyclines are chemotherapeutic drugs that are broadly used in the treatment of various types of solid cancers and leukemia. Herein, we report on a novel analytical method for intracellular accumulation of anthracyclines using MEKC/LIF detection. An aqueous separation system permitted the injection of cell lysates directly into the capillary. The MEKC migrating solution was made up of borate buffer at pH 9.22 containing sodium taurodeoxycholate, (2-hydroxypropyl)-γ-CD, and SDS. The anthracyclines, Doxorubicin (DOX) and epirubicin (EPI) were detected by LIF using a Nd:YAG laser (532 nm) or an argon ion laser (488 nm) for excitation. Two cell lines, human humerus tumor cells (RDES) and human lung tumor cells (A549), were treated with a mixture of the two anthracyclines for fixed periods of time, and then intracellular concentrations were determined by injecting cell lysates directly. Recovery values of 96.0–100.8% were obtained for DOX and EPI. Reproducibility quantified by RSD was less than 3.9% intraday and 6.7% interday at concentrations ranging between 50 and 500 nM. The uptake of EPI was found to be slightly less than that of DOX for A549, but higher levels of EPI were observed in RDES. Intracellular accumulation of anthracyclines was greater in RDES than in A549, but both types of cells excreted anthracyclines after 12 h. These results indicate that MEKC with an aqueous medium is useful for investigating intracellular uptake and accumulation of drugs, since cell lysates can be used directly with no pretreatment such as deproteination or solvent extraction of analytes.