Intracellular determination of elements in mammalian cultured cells by total reflection X-ray fluorescence spectrometry

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TXRF (total reflection X-ray fluorescence spectrometry), a rapid and reliable multi-element method, was applied to quantify intracellular concentrations of trace and non-trace elements in different mammalian cell lines. The coordinated variations in their intracellular contents were determined when the extracellular concentration of one of them was modified. The results indicate that TXRF permits the detection of total trace metal contents using a minimum amount of cells [(1-2)×106), while (4-6)×106 cells were sufficient to determine their cytosol/pellet distribution. In the six cell lines analyzed, the order of relative abundance for trace and non-trace elements was Cu<Fe<Zn and Ca<S, respectively. One of the cell lines was exposed to increased amounts of extracellular copper (0.44 to 100 ?mol l-1), and then transferred to a culture medium containing a minimum concentration of the metal (0.44 ?mol l-1). Under this condition, it was possible to measure both the rise (28-fold) in the in