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Subcellular distribution of thallium: Morphological and quantitative study in rat myocardium

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The purpose of this study is to determine the subcellular distribution of thallium (SDTl) by electron microscopy and a newly designed fixation method that makes insoluble grains of Tl visible. *Methods:* To obtain the high dose necessary for electron microscopic visualization, we employed TlCl instead of ^{201}TlCl. EM was performed in fixed rat myocardium resected at 20 min (early phase) and 3 hr (delay phase) after intravenous injection of TlCl. To fix Tl in the cell, we used orthovanadate in our fixative. Atomic absorption spectroscopy (AAS) of Tl and quantification of subcellular distribution of ^{201}Tl (SD^{201}Tl) were studied to prove the propriety of our fixation. *Results:* AAS detected Tl in the Tl-loaded specimen but not in the control, indicating that Tl was the origin of the grains observed in the former. In the early phase, numerous grains were observed in mitochondria, sarcoplasmic reticulum (SR), myofibrils, and nuclei, but no such grains were visible in controls. In the delay phase, grains were retained in mitochondria, SR and nuclei, but not in myofibrils. Electron microscopic SDTl (%) correlated with SD^{201}Tl(%) calculated from isolated fractions. *Conclusion:* In both the early and delay phases, mitochondria are the major site of Tl and ^{201}Tl uptake.

Key words: thallium, myocardial cell, mitochondria, atomic absorption spectroscopy, electron microscopy