

Effect of thimerosal, a preservative in vaccines, on intracellular Ca^{2+} concentration of rat cerebellar neurons

Toshiko Ueha-Ishibashi¹, Yasuo Oyama*, Hiromi Nakao, Chisato Umebayashi, Yasutaka Nishizaki, Tomoko Tatsuishi, Kyoko Iwase, Koji Murao², Hakaru Seo³

Laboratory of Cellular Signaling, Faculty of Integrated Arts and Sciences, The University of Tokushima, Tokushima 770-8502, Japan

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Abstract

The effect of thimerosal, an organomercurial preservative in vaccines, on cerebellar neurons dissociated from 2-week-old rats was compared with those of methylmercury using a flow cytometer with appropriate fluorescent dyes. Thimerosal and methylmercury at concentrations ranging from 0.3 to 10 μM increased the intracellular concentration of Ca^{2+} ($[\text{Ca}^{2+}]_i$) in a concentration-dependent manner. The potency of 10 μM thimerosal to increase the $[\text{Ca}^{2+}]_i$ was less than that of 10 μM methylmercury. Their effects on the $[\text{Ca}^{2+}]_i$ were greatly attenuated, but not completely suppressed, under external Ca^{2+} -free condition, suggesting a possibility that both agents increase membrane Ca^{2+} permeability and release Ca^{2+} from intracellular calcium stores. The effect of 10 μM thimerosal was not affected by simultaneous application of 30 μM L-cysteine whereas that of 10 μM methylmercury was significantly suppressed. The potency of thimerosal was similar to that of methylmercury in the presence of L-cysteine. Both agents at 1 μM or more similarly decreased the cellular content of glutathione in a concentration-dependent manner, suggesting an increase in oxidative stress. Results indicate that thimerosal exerts some cytotoxic actions on cerebellar granule neurons dissociated from 2-week-old rats and its potency is almost similar to that of methylmercury.

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1. Introduction

Thimerosal is an organomercurial preservative in vaccines to prevent contamination with harmful microbes and its derivative is ethylmercury. There is a concern on the part of public health community that adverse health consequences by thimerosal may occur among infants during immunization schedule although it is generally believed that the safety of thimerosal use for humans have been established (Mahaffey, 1999; Ball et al., 2001).

* Corresponding author. Tel.: +81-886-56-7256; fax: +81-886-56-7256.

E-mail address: oyama@ias.tokushima-u.ac.jp (Y. Oyama).

¹ Present address: Clinical Trial Support Center, Kumamoto University Hospital, Kumamoto 860-8556, Japan.

² Present address: National Institute of Minamata Disease, Minamata 867-0008, Japan.

³ Present address: Department of Pharmacy, Yatsushiro General Hospital, Yatsushiro 866-0862, Japan.