Various endogenous glial reactions to the neuronal death induced by neurotoxicity of 5,7-DHT in the C.N.S.

Seung Mook Jo, Seong Ahn Nam, Jae Chul Lee, Moo Ho Won, Myung Hoon Chun*.

Department of Anatomy, Hallym University College of medicine, Chunchon, Korea
Department of Anatomy, Catholic University College of medicine, Seoul, Korea*

This study was designed to investigate the glial reaction to the neurodegenerative changes induced by the cytotoxic effects of 5,7-dihydroxy-tryptamine (5,7-DHT) on serotonergic neurons of the dorsal raphe nucleus (DRN) in rat brain, and on indoleamine-accumulating cells (IACs) in cat retina by light and electron microscopy. Male adult rats (n=50) and either sex wild cats (n=20) were used as experimental animals. 200 μg and 100 μg of 5,7-DHT dissolved in 0.9 % normal saline was once injected into the lateral ventricle of the rat brain and the vitreous body of the cat eyeball, repectively. The rats and cats were sacrified at 1, 3, 7, 14 and 21 days after the injection of 5,7-DHT.

The cytotoxicity of 5,7-DHT resulted in severe neurodegeneration of the serotonergic neurons in the rat DRN. Most degenerated cells mainly showed necrotic changes, but a few exhibited apoptotic features. Most IACs in the cat retina also underwent dark degeneration characterized by darkening of the cytoplasm, but a few amacrine cells showed a typical filamentous degeneration characterized by filling of neurofilaments in the cytoplasm.

Endogenous glial reactions induced by the cytotoxicity of 5,7-DHT were observed in the rat DRN. Microglia and astrocytes showed more prominent glial reaction in early and late stages of the experiment. In addition, microglia phagocytosed and removed the degenerated cells, but astrocytes never participated in the phagocytosis. However, the degenerated cells in cat retina were phagocytosed by both microglia and astrocytes. The immunoreactivity for glial fibrillary acidic protein (GFAP) in Müller cells was increased by 3 day, but thereafter abruptly decreased.

These results domonstrated that most 5,7-DHT-accumulating neurons showed necrotic changes in both rat brain and cat retina, but the glial reactions to the neurodegenerative processes were distinctively different. These suggest that the response of endogenous glial cells may vary according to the target organs and ther affected neuronal types.