H165 An Immunohistochemical Study of Central Nervous System (CNS) Damage in Two Drug Abusers (Synthetic Cannabinoids, Synthetic Cathinones, and Phenethylamine Derivatives)

Mio Takayama, PhD, Fukuoka University, Fukuoka 814-0180, JAPAN; Masayuki Kashiwagi, PhD, Fukuoka University, Fukuoka 814-0180, JAPAN; Aya Matsusue, PhD, Fukuoka University, Fukuoka 814-0180, JAPAN; Brian Joseph Waters, MS, Fukuoka University, Department of Forensic Medicine, Fukuoka 814-0180, JAPAN; Kenji Hara, PhD, Fukuoka University, Fukuoka 814-0180, JAPAN; Natsuki Ikematsu, BPharm, Fukuoka University, Fukuoka 814-0180, JAPAN; Shin-ich Kubo, PhD, Fukuoka University, Fukuoka 814-0180, JAPAN*

Learning Overview: After attending this presentation, attendees will understand the immunohistochemical changes that occur in the brains of abusers of novel psychoactive substances.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by addressing the abuse of novel psychoactive substances, such as synthetic cannabinoids, synthetic cathinones, and phenethyl amine derivatives, and how they affect the brains of users.

Introduction: Drug abuse remains a major social problem in society today. In forensic autopsy cases, drugs such as methamphetamine, amphetamine, and illegal herbal products are occasionally detected. This study examines CNS damage immunohistochemically in drug abusers.

Materials and Methods: Two cases were selected from cases autopsied at Fukuoka University within 48 hours of the postmortem interval, where synthetic cannabinoids, synthetic cathinones, or phenethylamine derivatives were detected. Case 1 involved a man in his early 30s. Toxicological analysis revealed the presence of 6-APB, 6-MAPB, DL-466, α-PHP, and mepirapim in the blood and urine. His cause of death was acute drug intoxication. Case 2 also involved a man in his early 30s. Toxicological analysis revealed methamphetamine, amphetamine, DL-466, α-PHP, N-fluoropentyl-AB-PINACA, and 5-Fluoro-AMB in the blood or urine. His cause of death was asphyxia by choking on regurgitated stomach contents. The hippocampus and cerebellum were collected from formalin-fixed forensic autopsy brains from each case. Histochemical stainings were observed with Hematoxylineosin (HE) and Luxol Fast Blue (LFB). Immunohistochemical stainings were performed using antibodies against MAP2 (1: 200, Abcam plc, UK), Glucose Transporter 5 (GLUT5) (1: 200, Abcam plc, UK), GFAP (1: 1000, Abcam plc, UK), and Iba-1 (1: 350, Abcam plc, UK) with the EnVision™ Detection System/HRP according to the manufacturer's instructions. MAP2 and GLUT5 were for neurons, GFAP was for astrocytes, and Iba-1 was for microglia.

Results: The histochemical stainings from Case 1 showed morphological changes in the neurons from Dentate Gyrus (DG) to CA3 in the hippocampus. Fewer granule cells in the granular layer of the cerebellar cortex were observed. Immunohistochemically, the immunoreactivity of the pyramidal cells lessened from CA2 to CA1 with MAP2, and in DG with GLUT5. An increase of GFAP-positive astrocytes in DG and Iba-1-positive microglia overall in the hippocampus were observed. In the cerebellar cortex, the immunoreactivity of granule cells in the granular layer lessened with MAP2. GFAP-positive astrocytes increased in the granular layer, and the fibers of the astrocytes were rosary-shaped in the cerebellum. In Case 2, histochemical stainings showed no significant findings in the hippocampus and cerebellum. Immunohistochemically, the MAP2-positive pyramidal cells from CA3 to Subiculum (SUB), and GLUT5-positive pyramidal cells in SUB and from DG to CA3 were observed. GFAP-positive astrocytes increased in the pyramidal cell layer. Immunoreactivity of MAP2-positive and GLUT5-positive were shown in Purkinje cells and molecular cells.

Conclusion: The hippocampus and cerebellum in the brains of two drug users who abused synthetic cannabinoids, synthetic cathinones, or phenethylamine derivatives were examined immunohistochemically. Some morphological and immunoreactive changes were observed in the neurons, astrocytes, and microglia. To understand more clearly about the pathological findings of the relationship between drug abuse and damage to the brain, more cases and other immunohistochemical stainings need to be examined.

Neuropathology, Drug Abuser, Immunohistochemistry