Department of Forensic Medicine

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General Summary

Our main research projects in 2012 have focused on analysis of the ubiquitin proteasome system and the autophagy lysosome system in the central nervous system, identification of war-dead remains through DNA analysis, the objective evaluation of the limits of DNA typing based on the intensity of ninhydrin treatment, and quantitative analyses of medicines and poisonous substances in forensic autopsy cases.

Research Activities

Forensic pathology
1. Analysis of the ubiquitin proteasome system and the autophagy lysosome system in the central nervous system

Research associated with the ubiquitin proteasome system and the autophagy lysosome system, which play major roles in the degradation of intracellular proteins and organelles, has recently advanced in various areas of medical science. Tissue obtained at autopsies performed at the Department of Forensic Medicine in cases of traumatic intracranial injury were examined to investigate how the ubiquitin proteasome system and autophagy lysosome system are induced in traumatic intracranial injury. We found that the degradation of both pathways was induced in the injured cortex soon after trauma; this finding suggests that the pathway involved in the degradation of unnecessary substances or cells where degradation is activated may differ or change over time after the traumatic event in the central nervous system. Furthermore, beading of the astrocytic processes (clasmato-dendrosis) following head trauma was associated with the protein degradation pathways.

DNA analysis
1. Identification of war-dead remains with DNA analysis

We performed identification of war-dead remains buried in the former Soviet Union by means of DNA analysis as part of the war-dead remains return project of the Ministry of Health, and Labour and Welfare. For genetic markers we used single nucleotide polymorphisms of hypervariable regions of mitochondrial DNA and short tandem repeats of nuclear DNA.

2. The objective evaluation of the limits of DNA typing based on the intensity of ninhydrin treatment

Shed epithelial cells on a sheet of paper were stained with ninhydrin reagent, and DNA typing was performed. We studied the relationship between the intensity of the purple staining after ninhydrin treatment and the limits of DNA typing as mitochondrial DNA polymorphisms, and we attempted to perform an objective evaluation to determine the
target of the staining area for DNA analysis.

3. Examination of the DNA extraction method from oral mucosa cells
We examined a simple and easy method for extracting DNA from a living body. Oral mucosa cells were collected from liquid discharged by subjects after they rinsed their mouths. We examined a DNA extraction method to apply commercial DNA extraction kits, and to react oral mucosa cells at constant temperature in one kind of reaction solution for only 10 minutes. A suppressant effect of the DNA extract on an inhibitor of the polymerase chain reaction was confirmed.

**Forensic toxicology**

1. Quantitative analyses of medicines and poisonous substances
Medicines and poisonous substances (abused drugs, alcohol, carbon monoxide, cyanide, and agricultural chemicals) suspected to have caused deaths were quantitatively analyzed with gas chromatography, gas chromatography/mass spectrometry, and spectrum photometry in tissue specimens obtained at autopsy.

2. Examination of a method for analyzing nitrous acid and nitric acid
We detected nitrous acid and nitric acid in an autopsy case. Qualitative and quantitative methods of analyzing nitrous acid and nitric acid with gas chromatography/mass spectrometry were examined. With quantitative analysis, high concentrations of nitrous acid and nitric acid were detected. The results were useful for determining causes of death.

**Radiocarbon analysis**

1. Establishment of age estimation
We studied the estimation of date of birth from carbon-14 isolated from dentin. We have investigated a method of specifying the age range from only a single tooth by measuring carbon-14 in incisal (occlusal) and root regions of the dentin separately.

**Publications**


