

Department of Forensic Medicine

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General Summary

Our main research projects in 2013 have focused on forensic pathology, DNA analysis, and forensic toxicology. Much of the research was based on forensic practice. The details of our research are described below.

Research Activities

Forensic pathology

1. Analysis of the association between the degeneration of cardiac sympathetic nerves in the subepicardium and unexpected cardiac death

The degeneration of cardiac sympathetic nerves can be found in heart diseases, including ischemic heart disease and cardiomyopathy, and in several diseases with autonomic disorders, including Parkinson disease and diabetes mellitus. However, the relation between the degeneration of cardiac sympathetic nerves in the subepicardium and unexpected cardiac death (UCD) has not been sufficiently examined. Cardiac tissues from forensic autopsy cases were analyzed with immunohistochemical staining for tyrosine hydroxylase and neurofilament. However, the rate of degeneration of sympathetic nerves in the subepicardium of persons with UCD did not differ significantly from that in persons without UCD. Therefore, our results suggest that the degeneration of cardiac sympathetic nerves in the subepicardium does not have a significant effect on UCD, compared with other arrhythmogenic factors.

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, 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. Studies of a simple DNA extraction method from various types of forensic samples: Application to chewing gum

We studied a method of DNA extraction from chewing gum. We have investigated the relationship between the amount of extracted DNA and several factors: the weight of chewing gum, the chewing interval, and the number of oral mucosa cells in the chewing gum.

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 (GC/MS), and spectrum photometry in tissue specimens obtained at autopsy.

2. Examination of a method for analyzing meconin

We detected meconin in an autopsy case. Meconin is an organic compound included in opium which can be detected in the urine after opium inhalation. Therefore, detection of meconin from biological specimens is important in opiate diagnosis. Qualitative and quantitative methods of analyzing meconin with GC/MS were examined.

3. The smoking rate in Japan remains high, and the risk of nicotinic ingestion by smoking cigarettes, including passive smoking, was examined.

Nicotine is believed to have enormous effects on embryos, infants, and young children, who have low metabolic capacity. In addition, caffeine can cross the placenta. In specimens obtained at the autopsies of infants, we analyzed nicotine and caffeine with GC/MS to examine nicotine and caffeine exposure to infants. However, neither nicotine nor caffeine was detected in 19 specimens examined.

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

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