

Department of Forensic Medicine

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General Summary

Our main research projects in 2018 have focused on forensic pathology, DNA analysis, and forensic toxicology, as they have in the past. Much of the research was based on forensic practices. The details of our research are described below.

Research Activities

Forensic Pathology

1. Values of acrolein and several markers of patients dying in bathtubs

In Japan, many people die in bathtubs, where transient ischemic attack is believed to be contributory. We determined the values of protein-conjugated acrolein, polyamine oxidases (such as spermine oxidase and acetyl polyamine oxidase), and several markers in 10 cases of death in bathtubs and 10 control cases examined at forensic autopsies. We found that the values of these variables did not differ significantly between the groups. This lack of difference might be due to transient ischemic attack not playing a role in bathtub deaths, the low number of cases, and the values undergoing postmortem change. Therefore, future studies should involve a greater number of cases and the intergradation of each value due to the time since death.

DNA analysis

1. Identification of war-dead remains with DNA analysis

We performed identification of war-dead remains that had been recovered and repatriated from the former Soviet Union and areas further south 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 region of mitochondrial DNA and short tandem repeats (STRs) of nuclear DNA.

2. The detection and analysis of X chromosome STR loci

The analysis of STRs of the X chromosome is useful in kinship testing. We performed a detection and population genetic study of a novel tetranucleotide X chromosome STR (X-STR) locus. We analyzed the sequence structure of novel X-STRs, the appearance frequency of alleles, and forensic statistics data. We registered this data with the International Nucleotide Sequence Database Collaboration. We are planning to investigate the relevance with other X-STRs by linkage analysis.

3. Human height prediction by forensic DNA phenotyping

We examined human height prediction of human by forensic DNA phenotyping. Our analysis of human height and 16 single nucleotide polymorphisms (SNPs) showed a weak correlation. To accurately predict human height, the number of the smallest SNP should be used.

After having analyzed more SNPs, we believe that the SNP should be chosen with the contribution ratio being considered.

Forensic toxicology

1. 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, liquid chromatography-tandem mass spectrometry, and spectrum photometry in tissue specimens obtained at autopsy. Fluoride was quantitatively analyzed with the standard addition method.
2. We have constructed methods for drug screening using liquid chromatography-tandem mass spectrometry. Approximately 280 types of drug are targeted, but more target drugs should be added.
3. Analysis of fluoride was performed with gas chromatography-mass spectrometry for a forensic autopsy of a deceased person who was suspected to have consumed hydrofluoric acid. Fluoride was detected in the femoral vein blood. Therefore, the consumption of hydrofluoric acid was confirmed.

Radiocarbon analysis

1. Establishment of date of birth

We studied the estimation of date of birth from levels of carbon-14 isolated from the enamel or dentin of teeth. This method was used for postmortem examination, and its usefulness and problems were discussed. We also examined the effect of dental caries on the carbon-14 level. To apply this method to forensic medicine, we have examined the minimum amounts of enamel and dentin required for the analysis.

Publications

Takasu S, Matsumoto S, Kanto Y, Iwadate K.

Utility of soluble lectin-like oxidized low-density lipoprotein receptor-1 (sLOX-1) in the postmortem

diagnosis of ischemic heart disease. *J Forensic Leg Med.* 2018; **55**: 45-51.