

## Department of Forensic Medicine

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### General Summary

Our research projects in 2015 have focused on forensic pathology, DNA analysis, and forensic toxicology, as has happened in the past. Much of the research was based on forensic practice. The details of our research are described below.

### Research Activities

#### *Forensic Pathology*

##### 1. The relation between dangerous drugs and coronary constriction

A recent problem has been the abuse of dangerous drugs, including cannabis and amphetamines, in which a part of the chemical structure has been modified. However, what is not fully known about these drugs is their effect on humans, their lethal doses, and their long-term behavior in the body. We analyzed the findings of forensic autopsies of 4 persons who were suspected of having used dangerous drugs just before death. Of these persons, 3 had coronary atheromatous lesions and 2 were in their 20's. Therefore, our findings suggest that the abuse of a dangerous drug can produce coronary lesions.

#### *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. DNA extraction from chewing gum

We have investigated a method of extracting high-purity DNA from chewing gum. In addition, we showed that there was no correlation between chewing time and the DNA yields.

##### 3. The detection and analysis of X chromosome short tandem repeats locus

The analysis of short tandem repeats (STRs) located on the X chromosome is useful for kinship testing. We performed detection and population genetic study of a novel tetranucleotide X chromosomal STR (X-STR) locus in the present study. We analyzed the sequence structures 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.

*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 dextromethorphan and tadalafil

We detected dextromethorphan, which is a cough medicine, and tadalafil, which is a medicine for treating erectile dysfunction, in autopsy cases. Qualitative and quantitative methods of analyzing these medicines were examined with gas chromatography/mass spectrometry.

## 3. Construction of drug screening method

A drug screening method was constructed with liquid chromatography-tandem mass spectrometry. About 270 kinds of drugs can be targeted, but we plan to increase the number of targets. The addition of target drugs has been considered.

## 4. Analysis of hydrogen sulfide and metabolites

Hydrogen sulfide or its metabolites have reportedly been detected at autopsy when the cause of death is not hydrogen sulfide poisoning. From bodies in which sulfide poisoning was not the cause of death and from healthy individuals, samples of blood and urine were collected and analyzed for sulfide ions and thiosulfate ions. The presence or absence and the aging of sulfide ions and thiosulfate ions were examined.

In the blood and urine from healthy individuals, generally sulfide ions and thiosulfate ion are hardly detected. However, slightly sulfide ion and thiosulfate ion were detected in this analysis. Sulfide ion was many in samples of blood stored for a long time. Sulfide ion is believed to be present owing to the protein degrading via corruption. In contrast, the concentration of sulfide ion in long-term storage samples of urine tended to be low. For thiosulfate ion, trends in both the blood and urine were unclear.

*Radiocarbon analysis*

## 1. Establishment of date of birth

We studied estimating the date of birth from carbon-14 isolated from a tooth. To apply this method to forensic medicine, we have examined the minimum amount of enamel required for the analysis. We have found that the lower limit of enamel to be needed is approximately 60 mg.