# Department of Forensic Medicine

Kimiharu Iwadate, *Professor*

Kenji Fukui, *Assistant Professor*

Kyoko Maebashi, *Assistant Professor*

## General Summary

Our main research projects in 2016 have mainly 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. Values of Acrolein and several markers, of which patients died in the bath tabs

In Japan, many people die in the bath tabs, and it is said that transient ischemic attack (TIA) is contributory to death there. We determined the values of protein conjugated acrolein (PC-Acro), polyamine oxidase (SMO, AcPAO etc.) and several markers, of 10 cases died in the bath tabs and 10 control cases, in our forensic autopsy. In the results of analysis, we are not able to get significantly different between groups. It might be because TIA doesn't play a part in death in the bath tabs, number of cases are too low, and the value fluctuate due to postmortem change. Therefore we need to increase number of cases and study 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 recovered and repatriated from the former Soviet Union and southern area by means of DNA analysis as part of the war-dead remains return project of the Ministry of Health, Labor and Welfare. For genetic markers we used single nucleotide polymorphisms of hypervariable region of mitochondrial DNA and short tandem repeats of nuclear DNA.

2. The detection and analysis of X chromosome Short tandem repeats (X-STR) locus

The analysis of STRs located on the X chromosome is known to be useful in kinship testing.

We performed detection and population genetic study of a novel tetranucleotide X-STR locus in the present study. We analyzed sequence structure of novel X-STR, appearance frequency of Alleles and forensic statistics data. And we registered these data with the International Nucleotide Sequence Databases (ISDN). We are going to investigate relevance with other X-STR by linkage analysis.

3. Analysis of diverse aquatic microbes by a metagenomics approach

We performed the metagenome analysis of the aquatic microbes included in the water of the Tama River. We showed that we could distinguish fresh water and seawater by a specific microbe. In addition, we showed that we could suppose a collection place of the

water by a microbe.

*Forensic toxicology*

1. Medicines and poisonous substances (abuse 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.

2. We have constructed methods for drug screening using liquid chromatography–tandem mass spectrometry. Approximately 270 types of drugs are targeted. It has been considered to add target drugs.

3. Analysis of wood-tar creosote was conducted using a gas chromatograph mass spectrometeron a dissection of a forensic autopsy suspected of taking large quantities of SEIROGAN®. The ingredients of SEIROGAN® are wood-tar creosote, powdered geranium herb, powdered phellodendron bark, powdered glycyrrhiza, citrus unshiu peel powder, scopolia extract and so on. The main component wood-tar creosote is a mixture of phenolic compounds (phenol, creosol, cresol, guaiacol, 4-ethylguaiacol, etc.) produced by thermal decomposition of constituents of wood. High concentrations of wood-tar creosote components were detected in the urine. Several components were detected in trace amounts from blood, stomach contents, thoracic fluid and various organs, but were not detected from the stomach gas. The elapsed time after ingestion of SEIROGAN® is unknown. However, it was estimated that it was not detected immediately after taking a large dose because it was detected only in trace amounts from gastric contents and was detected at high concentration from urine.

*Radiocarbon analysis*

1. Establishment of date of birth

We studied the estimation of date of birth from carbon-14 level isolated from tooth enamel and/or dentin. This method was applied in the case of postmortem examination and its usefulness and problems were discussed. We also examined the effect of dental caries to carbon-14 level. To apply this method to the forensic practice, we have examined the amount of minimum enamel and dentin required for the analysis.

## Publications

**Nishi T, Fukui K, Iwadate K.** Analysis of four novel X-chromosomal short tandem repeats within 71 kb of the Xp22.3 region. *Int J Legal Med.* 2017; **131:** 1229-33.

**Matsumoto S, Takasu S, Iwadate K.** Blood levels of acrolein, polyamine oxidases, and several other markers in cases of bathtub death. *Jikeikai Med J.* 2018; **65:** 1-5.