

Department of Forensic Medicine

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General Summary

Our main research projects in 2007 have focused on sudden unexpected infant death due to milk aspiration; diagnosis of drowning by detection of specific DNA fragments of aquatic bacteria from blood samples; identification by DNA analysis of remains of the war dead; the objective evaluation of the limits of DNA typing based on the intensity of ninhydrin treatment; age and skewed X chromosome inactivation in autopsy specimens; and quantitative analyses of medicines and poisonous substances in forensic autopsy cases.

Research Activities

Forensic pathology

1. Sudden unexpected infant death due to milk aspiration

To examine differences in the pathological findings of the lung between intravital and postmortem cases of milk aspiration, an experimental study using a murine model was carried out. The results of immunostaining with an anti-human α lactalbumin antibody and an anti-cow whey antibody indicated that milk aspirated intravitaly was distributed in the lungs more widely than was milk injected postmortem. However, the difference between them was not significant enough that they could be clearly distinguished by pathological findings alone.

2. Diagnosis of drowning by detection of specific DNA fragments of aquatic bacteria

In general, the diagnosis of death by drowning is based on the detection of diatoms in organs other than the lungs. We speculate that bacteria are more useful markers than are plankton for the diagnosis of death by drowning. From the preserved blood samples of 30 cases of drowning in fresh water, specific DNA fragments of *Aeromonas sobria*, a most common aquatic bacterium, were examined with the polymerase chain reaction (PCR). The DNA fragments of the bacterium were detected with first PCR or nested PCR in 15 of 30 cases.

DNA analysis

1. Identification of the remains of war dead by means of DNA analysis

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

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

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 stained area for DNA analysis.

3. Age and skewed X chromosome inactivation in autopsy specimens

We studied the association of age and skewed X chromosome inactivation in autopsy specimens from women. Two X chromosomes were differentiated by means of methylation-sensitive enzymes and the PCR for the human androgen receptor gene. A weak correlation was found between age and the frequency of skewed X chromosome inactivation, and we attempted to apply this finding to forensic age estimation.

Forensic toxicology

1. Quantitative analyses of medicines and poisonous substances

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

Publications

Takatsu A, Shigeta A, Sakai K, Abe S. Risk factors, diagnosis and prevention of sudden unexpected infant death. *Leg Med* 2007; **9**: 76-82.

Sakai K, Shigeta A, Abe S, Takatsu A. An autopsy case of incarcerated umbilical hernia in an adult (in Japanese). *Hoibyori* 2007; **13**: 79-82.

Inoue K¹, Tani H¹, Kaiya H¹, Abe S, Nishimura Y¹, Masaki M¹, Okazaki Y¹, Nata M¹ (¹Mie Univ), Fukunaga T (Tokyo Med Examiner's Off). The correlation between unemployment and suicide rates in Japan between 1978 and 2004. *Legal Med* 2007; **9**: 139-42.

Inoue K¹, Tani H¹, Abe S, Kaiya H¹, Okazaki Y¹,

Nata M¹ (¹Mie Univ), Fukunaga T (Tokyo Med Examiner's Off). Suicidal tendencies among the elderly in Mie Prefecture, Japan, between 1996 and 2002. *Legal Med* 2007; **9**: 134-8.

Inoue K¹, Tani H¹, Nishimura Y¹, Okazaki Y¹, Fukunaga T (Tokyo Med Examiner's Off), Abe S, Yokoyama C¹, Kaiya H¹, Nata M¹ (¹Mie Univ). The correlation between rates of unemployment and the suicide rate in Mie Prefecture, Japan. *Am J Forensic Med Pathol* 2007; **28**: 369-70.

Inoue K¹, Tani H¹, Abe S, Kaiya H¹, Okazaki Y¹, Nata M¹ (¹Mie Univ), Fukunaga T (Tokyo Med Examiner's Off). The tendency of suicide among the elderly in Mie Prefecture, Japan. *J Forensic Leg Med* 2008; **15**: 65.