

## ***Abstracts from Nippon Eiseigaku Zasshi (Japanese Journal of Hygiene) vol. 69, no. 3***

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### **Crosstalk Between Metals and Neurodegenerative Diseases**

Nippon Eiseigaku Zasshi, 69, 155–165 (2014)

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Trace elements including iron, zinc, copper, and manganese play essential roles in the maintenance of brain functions. Accumulating evidence suggests that dyshomeostasis of trace elements is implicated in the pathogenesis of neurodegenerative diseases including Alzheimer's disease, vascular type of dementia, prion diseases, and dementia with Lewy bodies. These diseases share similarity in the formation of  $\beta$ -sheets containing amyloid fibrils from disease-associated proteins, including the  $\beta$ -amyloid protein (A $\beta$ P), the prion protein,  $\alpha$ -synuclein, and polyglutamine, and the introduction of apoptotic degeneration. Trace elements can bind to these proteins and cause their conformational changes. Furthermore, these proteins reportedly play crucial roles in the regulation of trace elements. Considering that these proteins colocalize in synapses, it is possible that the interactions between the disease-associated proteins and trace elements are based on the physiological roles of these proteins. We review here the current understanding of the pathology of neurodegenerative diseases based on metal binding to disease-associated proteins and on the disruption of metal homeostasis.

### **Immunological Disorders of Diabetes Mellitus in Experimental Rat Models**

Nippon Eiseigaku Zasshi, 69, 166–176 (2014)

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A comprehensive understanding of the pathogenic mechanism is the prerequisite for proper disease management. However, the mechanisms of diabetes mellitus and diabetic complication remain

extremely complicated and unresolved. While immune reactions are involved in the pathogenesis of diabetes and diabetic complication, the diabetic condition itself can influence immune responses. Furthermore, both diabetes and immune reactions are regulated by genetic and environmental factors. As a result, animal models have evolved to be powerful research tools to elucidate the complicated mechanisms for the pathogenesis of diabetes. Recently, various animal models of diabetes have been developed in rats, which provide advantages over mouse models in the scale of tissue samples and variation in type 2 diabetes models. In this review, we introduced rat models of diabetes and summarized the immune reactions in diabetic rats to propose the relationship between immune reactions and diabetes. Type 1 diabetes is induced by self-reactive cellular immune reactions. On the other hand, type 2 diabetes in rat models is associated with augmentation of innate immune reactions and increased humoral immunity. For example, helper T (Th) 1/Th17 cells are prevalent in non-obese type 1 diabetes rats (diabetes-prone Bio-Breeding rats), while non-obese type 2 diabetes rats (Goto-Kakizaki rat) show higher levels of natural IgM and T cell ratios with elevated Th2 cells compared with Wister rats. The investigation of immunological disorders in various diabetic rat models is useful to elucidate complicated mechanisms for the pathophysiology of diabetes. In future studies, immunological experimentations altering Th1/Th17 or Th2 cell levels and natural immune reactions may lend support to understanding the causes of diabetes and predicting the pathological conditions in diabetes.

### **Daily Inorganic Arsenic Intake of the Japanese Estimated by a Probabilistic Approach**

Nippon Eiseigaku Zasshi, 69, 177–186 (2014)

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**Objective:** The objective was to estimate the inorganic arsenic (iAs) intake of the general Japanese adult population by a probabilistic approach.

**Methods:** Bioaccessible iAs concentrations in rice ( $n = 56$ ) and hijiki ( $n = 32$ ), the two food items that are the major iAs sources for the Japanese, were measured by liquid chromatography-ICP mass spectrometry. The concentration in cooked rice was estimated from the

measured concentration in a raw rice sample while taking into consideration the loss of iAs during cooking. The iAs concentration in hijiki was measured using soaked hijiki samples. The daily consumption of cooked rice and soaked hijiki was taken from published data. The distribution profile of daily iAs intake was estimated by multiplying the bioaccessible iAs concentration in cooked rice and soaked hijiki samples by the amount of these samples consumed daily, which were randomly extracted according to the respective distributions. This process was repeated 10,000 times.

**Results:** The distribution profiles of iAs concentration in rice and hijiki were normal and log-normal, respectively, and those of the amount of cooked rice and soaked hijiki consumed were beta and log-normal, respectively. The daily bioaccessible iAs intake values were estimated to be 19 and 59  $\mu\text{g}/\text{day}$  at 50 and 95 percentile. At 50 percentile iAs intake, the contributions from rice and hijiki were estimated to be equal, whereas the contribution from hijiki increased with the estimated total daily iAs intake.

**Conclusions:** The iAs intakes of Japanese subjects estimated in previous duplicated portion studies were fairly consistent with the present estimation. Moreover, it was confirmed that the cancer risk derived from dietary iAs intake of the general Japanese population was not negligible.

### Examination of Correlation Between Medical Expenses with Average Life Expectancy According to Municipality and Gender

Nippon Eiseigaku Zasshi, 69, 187–198 (2014)

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**Objectives:** To determine the influence of medical expenses on life expectancy.

**Methods:** The expenses of 1,718 municipalities were divided into total expenses, hospitalization expenses and expenses other than hospitalization and dental expenses. (1) The correlation of life expectancy with sex was considered. (2) The correlation between expenses and life expectancy was considered. (3) The correlation of life expectancy or expenses with the numbers of doctors, dentists, facilities and beds was considered. (4) Using the Mahalanobis-Taguchi method, a unit space was formed by 10 municipalities with a high life expectancy, and  $D^2$  was calculated. When  $D^2$  was outside the unit space, the expenses were not as much as those of the 10 municipalities with a high life expectancy.

**Results:** (1) Life expectancy showed a positive correlation with gender. (2) Male life expectancy showed a negative correlation with total and hospitalization expenses, and a positive correlation with dental expenses. A positive correlation was found between each of expenses and female life expectancy. Total expenses, hospitalization expenses and expenses other than those on hospitalization showed a negative correlations with life expectancy in Hokkaido. Dental expenses showed a negative correlation with life expectancy in Chubu, hospitalization expenses showed a negative correlation with life expectancy in Kyushu. Total, hospitalization and dental expenses showed positive correlations with life expectancy in Tohoku, and

dental expenses showed a positive correlation with life expectancy in Kanto and Chubu. (3) Total expenses, hospitalization expenses and expenses other than those on hospitalization were found to correlate with the number of doctors. Dental expenses were found to correlate with the numbers of doctors, facilities, and beds. (4) The difference in among estranged municipalities was considered. Life expectancy was significantly short in estranged municipalities, and the total expenses and hospitalization expenses were large.

**Conclusions:** The relationship of medical expenses with life expectancy became clear. It was assumed that medical performance was poor in estranged municipalities.

### Mental Health Survey of Truck Drivers

Nippon Eiseigaku Zasshi, 69, 199–204 (2014)

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**Objectives:** The health management of truck drivers has long been considered extremely important from the perspective of prevention of diseases and traffic accidents. Today, truck drivers may have various underlying health problems, including psychological burden caused by deregulation with the enforcement of the Trucking Business Act, rising fuel costs, and even economic stagnation. In this study, we investigated the mental health of individuals working in transportation and logistics sectors, which ensures the secure supply and sound development of safe and high-quality transportation services.

**Methods:** To ascertain the mental health status in this population, we used the General Health Questionnaire (GHQ30), an assessment of mental health and currently the general health questionnaire most widely used by the department of psychosomatic medicine and other clinical departments.

**Results:** Although the mean GHQ30 score of all the subjects in this study was below the cutoff point of 6–7, which separates individuals with mental health problems from those who without 30 % of the subjects were classified as having mental health problems, revealing the need for routine screening of the mental health status and severity of symptoms of truck drivers.

**Conclusions:** There is growing recognition of the importance of establishing mental healthcare services in the workplace because of the sharply increasing number of applications for workers' compensation due to suicides from overwork. In this study, 16.7 % of truck drivers expressed suicidal thoughts, indicating that it is necessary to conduct follow-up surveys of the mental conditions of truck drivers in order to put in place appropriate mental health measures.

### Determination of Amounts of Tar, Nicotine, Carbon Monoxide, and Tobacco-Specific Nitrosamines in the Fillers of and Mainstream Smoke from Privately Imported Cigarettes

Nippon Eiseigaku Zasshi, 69, 205–210 (2014)

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**Objective:** The tobacco tax in Japan was increased in October, 2010. Subsequently, the quantity of sales of domestic cigarette products

decreased temporarily. However, smokers could import cigarettes directly through the internet. Because of the high value of the yen and the low price of foreign cigarettes, an individual could import cigarettes easily; however, the contents and emissions from privately imported cigarettes have not been investigated yet. In this study, we carried out a comparative analysis of domestic and privately imported cigarettes.

**Methods:** Privately imported cigarettes from five brands and domestic cigarettes from the brand “Mild Seven” were selected for the study. For the fillers of the cigarettes, the levels of nicotine and tobacco-specific nitrosamines (TSNAs) were determined by methods that are usually used for cigarette products. For the mainstream smoke, the levels of tar, nicotine, carbon monoxide, and TSNAs were also determined by the methods used for cigarettes.

**Results:** The average nicotine and TSNA levels in the fillers of the domestic cigarettes were  $15.1 \pm 0.19$  mg/g and  $1,920 \pm 85.1$  ng/g, respectively. The amounts of nicotine and tar in the mainstream smoke from the privately imported cigarettes were lower than those from the domestic cigarettes. However, the levels of TSNAs in the mainstream smoke from the privately imported cigarettes were higher than those from the domestic cigarettes.

**Conclusions:** The amounts of TSNAs in the fillers of and mainstream smoke from the privately imported cigarettes were higher than those from the domestic cigarettes. Japanese smokers should be careful about consuming privately imported cigarettes because there is a variation in the amount of hazardous constituents in these cigarettes, even when they are from the same brand.

### Evaluation of Electronic Money System for Remuneration of Research Participants in Epidemiological Study

Nippon Eiseigaku Zasshi, 69, 211–214 (2014)  
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In a long-term large cohort study, we introduced an electronic money system for remuneration of research participants. In comparison with the delivery of cash vouchers, the operation and mailing cost, and the processing time were significantly reduced. The workers were also able to save the time and effort they spent on the inventory management of cash vouchers. In addition, risk management was improved, as demonstrated by the reduction of complaints and associated problems such as nonarrival or content differences of cash vouchers. This is because only card points as additional money need to be added once the electronic money card has been distributed to the recipients. Furthermore, the psychological stress of workers associated with inventory management and ensuring cash voucher enclosure was also reduced.

### Age, Period, and Birth Cohort-Specific Effects on Cervical Cancer Mortality Rates in Japanese Women and Projections for Mortality Rates over 20-Year Period (2012–2031)

Nippon Eiseigaku Zasshi, 69, 215–224 (2014)  
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**Objectives:** We aimed to determine the effects of age, period, and birth cohort on cervical cancer mortality rate trends in Japanese women, by age-period-cohort (APC) analysis. Additionally, we analyzed projected mortality rates.

**Methods:** We obtained data on the number of cervical cancer deaths in Japanese women from 1975 to 2011 from the national vital statistics and census population data. A cohort table of mortality rate data was analyzed on the basis of a Bayesian APC model. We also projected the mortality rates for the 2012–2031 period.

**Results:** The period effect was relatively limited, compared with the age and cohort effects. The age effect increased suddenly from 25–29 to 45–49 years of age and gently increased thereafter. An analysis of the cohort effect on mortality rate trends revealed a steep decreasing slope for birth cohorts born from 1908 to 1940 and a subsequent sudden increase after 1945. The mortality rate projections indicated increasing trends from 40 to 74 years of age until the year 2031.

**Conclusions:** The age effect increased from 25–29 years of age. This could be attributable to the high human papilloma virus (HPV) infection risk and the low cervical cancer screening rate. The cohort effect changed from decreasing to increasing after the early 1940s. This might be attributable to the spread of cervical cancer screening and treatment before 1940 and the high HPV infection risk and reduced cervical cancer screening rate after 1945. The projected mortality rate indicated an increasing trend until the year 2031.

### Considering the Effects Purchase Food Balance Guide Utilizing Cable Television Has on the User

Nippon Eiseigaku Zasshi, 69, 225–234 (2014)  
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**Objectives:** The aim of this study was to empirically investigate the needfulness of the Purchased Foodstuffs Balance Guide as designed for its users and also consider its influence on better dietary habits.

**Methods:** The participants included 89 students who attended City A's Senior Citizens' College, and the reality of their ICT and dietary habits were surveyed. Next, 27 cable television subscribers were asked to be monitors for testing the Guide. The study took place during a period of September 2013 to March 2014.

**Results:** The results indicated that, for the senior citizens, ICT use was centred on communication with their families and that their awareness or desire was a low in terms of the functions of information transmission, entertainment and receipt of services. Next, after using the Purchased Foodstuffs Balance Guide, its needfulness and its influence on better food habits were examined. As a result, the most frequent response by the participants was that they 'understood (their own) purchasing tendencies' (36.0 %), followed by the three items: 'The Guide is useful for managing my nutrition', 'The Guide enabled me to know what foodstuffs are required to supplement my diet' and 'I became more careful about purchasing foodstuffs in a balanced way.'

**Conclusions:** The study showed that 70 % of the participants felt that the Purchased Foodstuffs Balance Guide was useful and make decisions when purchasing food using the Guide. This indicates the possibility that the Guide exerts a positive influence on users' awareness of nutritional balance, foodstuff purchasing choices and dietary habits.

**Objective:** To verify the effect of smoking prevention education for nursing students using the improved tobacco smoke collection method.

**Methods:** The improved tobacco smoke collection method allows mainstream smoke and sidestream smoke from a cigarette to be separately extracted using a closed system. After collection, we performed gas measurement using a gas detection tube and the Schiff reagent method. We provided a lecture incorporating the experimental method for an experimental group (42 students), but only the lecture without the method for a control group (43 students). We surveyed the changes in The Kano Test for Social Dependence (KTSND) scores before and after the lecture and 1 month later.

**Results:** In the experimental group, the total scores of the KTSND were  $10.2 \pm 5.0$  (mean  $\pm$  standard deviation) before the lecture,  $5.8 \pm 4.1$  after the lecture, and  $6.9 \pm 4.8$  1 month later. On the other hand, the scores were  $10.7 \pm 5.7$ ,  $7.5 \pm 5.8$ , and  $9.7 \pm 5.5$  in the control group before, after, and 1 month after the lecture, respectively. It is considered that the students understood "smoking is harmful to health" since this gas analysis method can be used to check for harmful gases visually.

**Conclusion:** Result of this study suggest that this experimental method is useful for educating nursing students on the harmful effects of smoking.

## Effect of Smoking Prevention Education Using Improved Tobacco Smoke Collection Method

Nippon Eiseigaku Zasshi, 69, 235–241 (2014)

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