

## ***Abstracts from Nippon Eiseigaku Zasshi (Japanese Journal of Hygiene) vol. 66, no. 4***

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### **Exposure to Nanoparticle-Rich Diesel Exhaust Affects Hippocampal Functions in Mice**

Nippon Eiseigaku Zasshi, 66, 628–633 (2011)  
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Epidemiological studies have indicated associations between day-to-day particulate air pollution and increased risks of various adverse health outcomes. Although an association between exposure to diesel exhaust particles (DEPs) and the development of pulmonary inflammation has been reported, there are limited reports on the neurotoxic effects of DEPs, particularly those of nanoparticle-rich diesel exhaust (NRDE). In this minireview, we highlighted the effects of NRDE which was generated in the National Institute for Environmental Studies, on hippocampus-dependent spatial learning ability and the expression of memory-function-related genes, neurotrophins, and proinflammatory cytokines in a mouse model.

### **Effects of Nanoparticle-Rich-Diesel Exhaust on Steroidogenesis in Rats and the Mechanism Underlying Such Effects**

Nippon Eiseigaku Zasshi, 66, 634–637 (2011)  
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Diesel exhaust (DE) is one of the major air pollutants in the world. DE disrupts steroid hormone levels, which may result from the

disruption of spermatogenesis. Steroidogenesis occurs not only in the testis but also in the brain. Therefore, we investigated the effects of nanoparticle-rich DE (NR-DE) on steroidogenesis in both the testis and hippocampus. Exposure to NR-DE at concentrations comparable to the environmental standard for particulate matters 2.5 (PM<sub>2.5</sub>) in Japan increased plasma testosterone level. This exposure increased the expression levels of genes involved in steroidogenesis in the testis, but not in the hippocampus, suggesting that NR-DE disrupts steroid hormone balance. This finding suggests the need to reconsider the environmental limit of PM<sub>2.5</sub> in Japan.

### **Exposure to Nanoparticle-Rich Diesel Exhaust May Cause Liver Damage**

Nippon Eiseigaku Zasshi, 66, 638–642 (2011)  
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Diesel exhaust (DE) is one of the air pollutants in the world, and exposure to DE is an environmental health concern. Most studies amongst the limited number of studies on hepatotoxicity have focused on genotoxicity or mutagenicity. However, DE exposure may cause liver damage because one prospective study suggests that DE exposure is associated with increased mortality due to arteriosclerosis and cirrhosis of the liver. Peroxisome proliferator-activated receptor (PPAR)  $\alpha$  plays a role in the regulation of lipid homeostasis and inflammation and thereby may be involved in the progression of atherosclerosis. We investigated whether nanoparticle-rich diesel exhaust (NR-DE) affects the liver and how PPAR $\alpha$  is involved in the NR-DE induced effects. We report these results briefly in this minireview. Our results suggest NR-DE-induced hepatic inflammation and dyslipidemia. PPAR $\alpha$  may be involved in the development of these disorders.

## Effect of Forest Therapy on the Human Psycho-Neuro-Endocrino-Immune Network

Nippon Eiseigaku Zasshi, 66, 645–650 (2011)

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Traditional thinking considered the nervous system, endocrine system and immune system to be independent of each other. However, it is now widely accepted that these systems interact through the psycho-neuro-endocrino-immune network. The nervous system affects the endocrine and immune systems by releasing neurotransmitters through the hypothalamus in the hypothalamic-pituitary portal circulation. The endocrine system affects the nervous and immune systems by secreting hormones and the immune system feeds back to the nervous and endocrine systems via cytokines. Forest therapy reduces sympathetic nervous activity, increases parasympathetic nervous activity, and regulates the balance of autonomic nerves. As a result, forest therapy decreases blood pressure and heart rate and has a relaxing effect. Forest therapy affects psychological responses via the brain and nervous system thereby decreasing the scores for anxiety, depression, anger, fatigue, and confusion, and increasing the score for vigor in the POMS test. Forest therapy acts on the endocrine system to reduce stress hormone levels such as urinary adrenaline, urinary noradrenaline, salivary cortisol, and blood cortisol levels and shows a relaxing effect. Forest therapy also acts directly and indirectly on the immune system to promote NK activity by increasing the number of NK cells and intracellular levels of anticancer proteins such as perforin, granulysin and granzymes. Taken together, forest therapy brings various effects on human health via the psycho-neuro-endocrino-immune network.

## Preventive Medical Effects of Nature Therapy

Nippon Eiseigaku Zasshi, 66, 651–656 (2011)

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Five million years has passed since a subset of primates recognizably became human. Because we have already spent more than 99.99% of our evolutionary history in natural environments, it is thought that we are essentially adaptive to nature. However, we live in a society characterized by urbanization and artificiality, despite our physiological functions still being adapted to nature. We conducted experiments involving 420 subjects at 35 different forests throughout Japan. As a result, these subjects sitting in natural surroundings showed decreases in the following physiological indices compared with the urban control group: 12.4% decrease in cortisol level, 7.0% decrease in sympathetic nervous activity, 1.4% decrease in systolic blood pressure, and 5.8% decrease in heart rate. This shows that stressful states can be relieved by forest therapy. It should also be noted that parasympathetic nerve activity increased by 55.0%, indicating a relaxed state. The results of walking experiments were also similar. Li et al. demonstrated that immune functions are enhanced by forest therapy. Middle-aged employees volunteered to participate in these experiments. NK (natural killer cells) activity, as an indicator of immune function, increased by 56% on the second day and returned to normal levels. A significant

increase of 23% was maintained for 1 month even after these subjects returned to urban life, clearly illustrating the preventive medical effects of nature therapy. We expect nature therapy to play an increasingly important role in preventive medicine in the future.

## Subjective Relaxing Effect of a Hospital's Rooftop Forest on Elderly Patients Requiring Care—Using a Simplified Emotional Score—

Nippon Eiseigaku Zasshi, 66, 657–662 (2011)

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**Objectives:** To clarify the relaxing effects of a 5-min stay in a hospital's rooftop forest on elderly patients requiring care.

**Methods:** This was a within-subject, cross-sectional study. The participants were 30 elderly female patients requiring help in walking, aged  $81.2 \pm 6.4$  (mean  $\pm$  SD). A simplified emotional 7-point rating scale from  $-3$  to  $3$  for 5 pairs of emotions, which was derived from the two-question Whooley Depression Screen, was used as a subjective indicator. The experimental areas were the rooftop forest that covered an area of  $122 \text{ m}^2$  on the rooftop of a four-story health service facility and an outdoor car park area (as the control area). The participants were instructed to sit still in a wheelchair and view the scenery for 5 min in each experimental area and were then assessed. Data from the participants during exposure to the rooftop forest were compared with those during exposure to the control area. First, 15 participants moved to the rooftop forest from the preroom, and the other 15 moved to the outdoor car park area, and then they moved to the other site to eliminate any order effect.

**Results:** In the rooftop forest, the mean scores of the simplified emotional rating were 1.70 (1.17 for control) for "hopeful", 1.70 (1.17) for "interest in doing things", 1.53 (1.10) for "enjoyment", 1.67 (1.17) for "calm", and 2.03 (1.30) for "secure". The scores were all significantly higher than those in the control ( $p < 0.01$ ).

**Conclusion:** It was demonstrated that a visit to the rooftop forest induced a significant subjective relaxing effect in elderly female patients requiring care.

## Physiological Benefits of Forest Environment—Based on Field Research at 4 Sites—

Nippon Eiseigaku Zasshi, 66, 663–669 (2011)

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**Objective:** To provide scientific evidence of the health benefits of forest therapy in terms of physiological indices.

**Design:** Within-group comparison made by conducting field experiments.

**Participants:** Forty-eight young male adults.

**Methods:** Field experiments were conducted at four local sites in Japan. At each site, 12 adults participated in a 3-day experiment. To

compare physiological reactions between two environmental stimuli, experiments were conducted in forest and urban environments. The participants were randomly assigned to visit either the forest or an urban setting and were instructed to view the landscape in a seated position. The physiological reactions of each participant were recorded before, during, and after viewing the stimuli, and the differences in physiological indices were compared between the two groups.

**Results:** Physiological data revealed that participants demonstrated significantly different reactions in the forest and urban environments. Analysis of heart rate revealed that participants showed a significantly higher  $\ln(\text{HF})$  and a lower  $\ln(\text{LF}/\text{HF})$  in the forest environment than in the urban environment. Systolic and diastolic blood pressures, pulse rate, and salivary cortisol concentration significantly decreased in the forest environment compared with the urban environment. Subjective evaluation data were generally in accordance with physiological reactions, showing significantly higher scores for “comfortable, natural, soothed, and refreshed feelings” in the forest environment than in the urban environment.

**Conclusions:** This study provided very clear scientific evidence of the physiological effects of forest therapy. Our data indicate that forest therapy can decrease stress and facilitate physiological relaxation.

### Psychological Relaxation Effect of Forest Therapy—Results of Field Experiments in 19 Forests in Japan Involving 228 Participants

Nippon Eiseigaku Zasshi, 66, 670–676 (2011)  
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**Objectives:** In the present study, we aimed to clarify the psychological effects of shinrin-yoku (taking in the atmosphere of the forest) by conducting field experiments.

**Methods:** The experiments were conducted in 19 forested and urban areas in Japan during the 2007–2010 period. Twelve male students participated at each of the 19 areas (a total of 228 persons). Subjective ratings of “comfortable-uncomfortable”, “soothing-stimulating”, and “natural-artificial” feelings were conducted after each of the participants had viewed the scenery for 15 min in the forested and urban areas. A postviewing questionnaire on “stressed-refreshed” feelings was also administered and the Profile of Mood State (POMS) questionnaire was employed to assess six aspects of mood before and after viewing the sceneries.

**Results:** The forest environments were perceived as significantly more “comfortable”, “soothing”, and “natural” than the urban environments after viewing the sceneries. The score for “refreshed feeling” was also significantly higher in the forested areas. The score for the “vigor” subscale of POMS was significantly higher after viewing the scenery in the forested areas, whereas the scores for negative feelings such as “tension-anxiety”, “depression-dejection”, “anger-hostility”, “fatigue”, and “confusion” significantly decreased.

**Conclusion:** Collectively, these results suggest that the forest environments have significant beneficial and relaxing effects on human’s moods compared with the urban environments.

### Report on How to Stimulate Local Economy Using Forest Therapy and on Effect of Forest Therapy in Akazawa

Nippon Eiseigaku Zasshi, 66, 677–681 (2011)  
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In 2006, the Akazawa National Forest was accredited as a base of forest therapy. On the assumption that forest therapy is effective for the prevention of lifestyle-related diseases, we started a project to prove the medical effectivity of forest therapy. We also attempted to find a way to stimulate the local economy using forest therapy. As an application of forest therapy for local economy stimulation, we established a clinic in the Akazawa National Forest and offered medical advice and suggested hiking routes. About 150 people visit this clinic each year. We are also offering forest therapy in combination with a complete medical check up. We measured the concentration of the amylase in the saliva from the group who underwent forest therapy and from another group who carried out the same task in the city as a control. We found a significant difference between the two groups. We also measured the levels of 8-OHdG and HRV before and after the forest therapy. In the people who showed a markedly high oxidative stress before the therapy, we observed a significant decline of oxidative stress. It was difficult to measure the effects of forest therapy objectively. However, through this project, we consider that we will be able to obtain some positive effects that will support the usefulness of forest therapy. We still need to continue our research and collect data to prove its usefulness.

### Recent Evidence from Epidemiological Studies on Methylmercury Toxicity

Nippon Eiseigaku Zasshi, 66, 682–695 (2011)  
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More than 50 years have passed since the outbreak of Minamata disease, and large-scale methylmercury poisoning due to industrial effluents or methylmercury-containing fungicide intoxication has scarcely happened in developed countries. On the other hand, widespread environmental mercury contamination has occurred in gold and mercury mining areas of developing countries. In this article, we provided an overview of recent studies addressing human health effects of methylmercury, which we searched using the PubMed of the US National Library of Medicine.

The following suggestions were obtained for low-level methylmercury exposure: (1) in recent years, the proportion of human studies addressing methylmercury has tended to decrease. (2) Prenatal exposure to methylmercury through fish intake, even at low levels, adversely affects child development after adjusting for polychlorinated

biphenyls and maternal fish intake during pregnancy, whereas maternal seafood intake has some benefits. (3) Long-term methylmercury exposure through consumption of fish such as bigeye tuna and swordfish may pose a potential risk of cardiac events involving sympathovagal imbalance. (4) In measuring methylmercury levels in preserved umbilical cord collected from inhabitants born in Minamata areas between 1945 and 1989, the elevated concentrations ( $\geq 1 \mu\text{g/g}$ ) were observed mainly in inhabitants born between 1947 and 1968, and the peak coincided with the peak of acetaldehyde production in Minamata. (5) Since some developing countries appear to be in similar situations to Japan in the past, attention should be directed toward early recognition of a risky agent and precautions should be taken against it.

### Present Situation and Future Perspectives on Newborn Hearing Screening System in Japan

Nippon Eiseigaku Zasshi, 66, 696–703 (2011)

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Childhood hearing impairment is a serious and relatively common condition. The earlier childhood hearing impairment is diagnosed, the less developmentally disadvantaged children become. Newborn hearing screening (NBS) programs have been implemented in Japan. NBS is important for identifying hearing loss at an early age and for adequate intervention at an early developmental stage. According to a survey questionnaire by the Japan Association of Obstetricians and Gynecologists, 62% of the newborn babies were audiological and medically examined. The average age of examinees has become younger since the beginning of NBS. Here, we summarized the NBS programs in Japan including behavioral audiometry and examinations of auditory brainstem response, auditory-steady state response, and otoacoustic emissions. NBS can lead to advantages in terms of language developmental outcome for children with hearing impairment. However, there is no sufficient support system existing for children who are advised to undergo further auditory diagnostic tests after NBS. It is necessary for government agencies, medical and educational institutions to communicate together for clarifying their responsibilities in order to support the children with hearing impairment.

### Changes in Core Temperature during Snow Shoveling among Healthy Young Males in Heavy-Snowfall Area of Chugoku Region in Japan

Nippon Eiseigaku Zasshi, 66, 704–710 (2011)

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**Objectives:** There are several recommendations on the prevention of hypothermia during snow shoveling. However, there seemed to be insufficient evidence supporting these recommendations because they are not based on data from actual snow shoveling research. The purpose of this study was to investigate changes in brain temperature

(tympanic temperature) and visceral temperature (rectal temperature) during snow shoveling among healthy young males.

**Methods:** Eight healthy young males (age,  $23.6 \pm 2.4$  years; weight,  $69.7 \pm 6.1$  kg; height,  $172.8 \pm 7.3$  cm) performed snow shoveling with an ordinary-size shovel for 15 min at their own pace in a rural snowfall area in December, 2009. Rectal temperature (Tre) and tympanic temperature (Tty) were measured 5 times (at rest, 5th (Ex5), 10th (Ex10), and 15th (Ex15) minute of snow shoveling; and 5th (Rec5) minute of recovery phase). The room temperature was  $18.6 \pm 0.7^\circ\text{C}$  and the atmospheric temperature was  $3.8 \pm 2.6^\circ\text{C}$ .

**Results:** Tre continued to increase from at rest to Ex15. Tre at Ex15 ( $37.7 \pm 0.3^\circ\text{C}$ ) was significantly higher ( $p < 0.05$ ) than that at rest ( $37.2 \pm 0.3^\circ\text{C}$ ). Tty at rest ( $36.7 \pm 0.2^\circ\text{C}$ ) and Tty at Ex5 ( $36.6 \pm 0.3^\circ\text{C}$ ) decreased significantly ( $p < 0.05$ ) at Ex10 ( $36.2 \pm 0.6^\circ\text{C}$ ). A significant negative correlation between changes in Tre and Tty were observed during snow shoveling ( $r = -0.49$ ,  $p < 0.05$ ).

**Conclusion:** Discrepancy between changes in brain temperature (tympanic temperature) and visceral temperature (rectal temperature) should be taken into consideration in the prevention of disease development during snow shoveling in a cold environment.

### Intra- and Inter-individual Variation in Urinary Iodine Concentration

Nippon Eiseigaku Zasshi, 66, 711–716 (2011)

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**Objectives:** To quantitatively assess the intra- and inter-individual variation of urinary iodine concentration in Japanese to determine whether urinary analysis is applicable to assessing habitual iodine intake in subjects on an individual basis.

**Methods:** Five urine samples (first void) were taken from each of the 14 healthy female subjects at 2–3 week intervals over 4–5 months. Information on diet and medication use on the previous day of urine sampling was obtained by a questionnaire during each urine sampling. The concentration of iodine in urine samples was measured by inductively coupled plasma mass spectrometry (ICP-MS). Intra- and inter-individual variation was assessed by intra class correlation coefficient (ICC).

**Results:** The median concentration of iodine in 70 urine samples was  $91 \mu\text{g/g-cre}$  (range 15–4400  $\mu\text{g/g-cre}$ ). The mean iodine concentration in urine samples from subjects who took iodine-rich foods/medications on the day before sampling was statistically significantly higher than that from subjects who did not take such foods/medications ( $p < 0.01$ ,  $t$  test). The ICC of urinary iodine concentration of the 14 subjects was 0.55, indicating good reproducibility; however, this was 0.28 when one subject who routinely used an iodine-containing gargle was excluded from analysis.

**Conclusions:** Urine sampled on a single occasion is not a suitable medium for the assessment of long-term intake levels of iodine in subjects on an individual basis.

### Effectiveness of Support for Asbestos Health Consultation in Health Centers

Nippon Eiseigaku Zasshi, 66, 717–723 (2011)

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**Objective:** In this research, we aimed to evaluate the support for asbestos health consultation in health centers.

**Method:** In this exploratory descriptive study, a self-administered original questionnaire was developed and used. Among all 517 health centers, valid responses were returned from 323 (62.5%) consenting centers.

**Result:** Consultations in the previous year ranged from 0–108 cases, with a facility median of 3.0 cases. Among staff members, 86.4% did not receive training and 35.4% had never used the manual. Workplaces that use asbestos within their jurisdiction were recognized by 39.2% of staff members, and 16.7% of these members always supported consultants psychologically. The staff members were not confident about asbestos health consultation: 71.2% for general questions, 76.2% for questions about asbestos-related diseases, and 76.4% for questions about risk of asbestos-related diseases; 51.4% were not confident about the Asbestos-Related Health Damage Relief System. Health center staff members who were significantly more confident were those who had more staff to work with; dealt with many consultations in the previous year; recognized the workplaces using asbestos within their jurisdiction; often used the manual and often psychologically supported consultants. According to the covariance structure analysis model, the ‘use of support systems’ consisting of ‘the use of manual’, ‘training attendance’ and ‘recognition of workplaces that use asbestos’ positively affected the frequency of psychological support ( $p < 0.01$ ) which promoted the confidence of staff members ( $p < 0.01$ ). The use of support systems also promoted the confidence of staff members directly ( $p < 0.05$ ).

**Conclusions:** The support systems such as training, use of manual, and a list of workplaces using asbestos were effective in building the confidence of health center staff in relation to asbestos health consultation, although the use of these support systems was low.

### Physical and Mental Features of Elderly Persons Who Experienced Group Exercise for Care Prevention

Nippon Eiseigaku Zasshi, 66, 724–730 (2011)  
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**Objectives:** This study was conducted to clarify the physical and mental features of elderly persons who experienced group exercise for care prevention.

**Method:** A group consisting of 92 elderly persons who had finished the group exercise program, one of the care prevention projects, in a town was surveyed (the experienced group) by anonymous self-administrative questionnaire. One hundred twenty-three elderly persons who had been attending community meetings were used as the control group.

**Result:** Valid responses were obtained from 66 persons in the experienced group (valid response rate 71.7%) and 102 persons in the control group (valid response rate 82.9%). Fifty-nine sex- and age-matched persons from each of the groups were selected for the analysis. Significant differences were not observed in the attributes between the two groups. In 4 of 5 items of Instrumental Activities of Daily Living, the percentages of respondents who answered “possible to do alone” were significantly higher in the experienced group. In 6 of 14 items of “painful activities of daily life”, the percentages of respondents were significantly lower in the experienced group. In 3 of 20 items on “relation with society”, the scores were significantly higher in the experienced group. More persons actively went out or participated in social events in the experienced group. In the items of depression, the scores were significantly lower in the experienced group. There were significantly more persons who exercised daily in the experienced group.

**Conclusions:** It was easy to expect that the experienced group can maintain their functions in daily life and their physical and mental activities. Thus, it is suggested that group exercise has good effects on elderly persons in terms of care prevention.

### Effects of Healthcare Advice with Particular Focus on Metabolic Syndrome: Differences by Advice Level from National Health Insurance Data

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**Objectives:** The Health Checkups and Healthcare Advice with Particular Focus on Metabolic Syndrome (*Tokutei Kenshin Hokenshido*) started in 2008. In this study, we examined the effects of healthcare advice with attention to the difference in effect according to the level of advice.

**Methods:** We used data from insured individuals who received health checkups in 2008 and 2009, and healthcare advice in 2008 under the National Health Insurance system, in all municipalities in Yamaguchi prefecture. The numbers of subjects were 155 for intensive advice (*Sekkyokuteki*) and 735 for moderate advice (*Doukizuke*). We compared the changes in the results of health checkups according to the level of advice, and examined the effect adjusted for sex, age, and baseline data of health checkups in 2008.

**Results:** Other than systolic blood pressure and hemoglobin A<sub>1c</sub>, all items showed a significant improvement in all the subjects. The improvements in body weight, BMI, waist circumference, and HDL-cholesterol in subjects who received intensive advice were significantly larger than those in subjects who received moderate advice. However, among the subjects under 65 years old, only waist circumference and FBS showed a significant difference between intensive and moderate advices. After adjustment for sex, age, and baseline data, there was no relationship between the level of advice and the change in results of health checkups.

**Conclusions:** Although our findings are not conclusive and further studies are required, they suggest that the effects of intensive and moderate advice are not significantly different. In addition to improving the effect of healthcare advice, a rethinking of provision of healthcare advice is essential: moderate advice might be more appropriate considering the limited resources and budget in communities.

### Quasi-Experimental Study of Effects of “Healthcare Advice with Particular Focus on Metabolic Syndrome”

Nippon Eiseigaku Zasshi, 66, 736–740 (2011)  
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**Objectives:** The “Health Checkups and Healthcare Advice with Particular Focus on Metabolic Syndrome” (*Tokutei Kenshin Hokenshido*) started in 2008. We conducted a quasi-experimental study to elucidate the effects of healthcare advice.

**Methods:** We used data from insured individuals who received health checkups in 2008 and 2009 under the National Health Insurance system, in all municipalities in Yamaguchi prefecture. We compared changes in the findings of health checkups in 2008–2009 between intervention subjects who received healthcare advice from 2008 and

control subjects who did not receive advice. The control group was matched with the intervention group in terms of area, sex, age, and level of advice.

**Results:** Data from 786 subjects in the intervention group and 1224 in the control group were analyzed. The following showed significant differences in the change in health checkup data between the intervention and control groups: body weight,  $-1.1$  kg; BMI,  $-0.4$  kg/m<sup>2</sup>; waist circumference,  $-1.1$  cm; triglyceride,  $-6.7$  mg/dl; HDL-cholesterol,  $+1.0$  mg/dl; LDL-cholesterol,  $-2.4$  mg/dl; GPT,  $-1.4$  IU/dl;  $\gamma$ GTP,  $-2.4$  IU/dl. There was no significant difference in blood pressure, FBS, or HbA1c.

**Conclusions:** This quasi-experimental study demonstrated a moderate but significant effect of healthcare advice, although several items including blood pressure and blood glucose did not show significant improvement.

### Which Zoonoses should the General Population be More Awareness of? —Qualitative Research Targeted at Veterinarians—

Nippon Eiseigaku Zasshi, 66, 741–745 (2011)  
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**Objectives:** The purpose of this study was to determine which zoonoses should the general population be more aware of.

**Methods:** We conducted qualitative research (Delphi method) on thirty veterinarians who were selected from the whole country.

**Results:** Twenty-four diseases were selected. The reasons for their selection were classified into three categories: “Amount of knowledge, attitude and behavior”, “Clinicoepidemiologic characteristics” and “Social characteristics”. More than half of the top ten zoonoses are those that are not transmitted from humans to humans, with rabies in the first place, avian influenza (with its high pathogenicity) in the second place and psittacosis in the third place.

**Conclusions:** From the top ten diseases, it is considered that the prevention of animal-to-human transmission should be emphasized. In addition, from the reasons for the selection, it is suggested that it is necessary to review social characteristics, such as the inadequacy of quarantine and the insufficiencies of legal systems. As for the

zoonoses that are transmitted from humans to humans, it will be indispensable in the future to widely spread information on zoonoses and enlighten the general population about them. It is thought that this survey can be a basis for selecting a zoonosis that should be given priority in enlightening the general population.

### Bibliographical Study of the Toxicity of Organic Mercury Compounds—In Relation to the Identification of Causal Substance of Minamata Disease—

Nippon Eiseigaku Zasshi, 66, 746–749 (2011)  
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**Objectives:** The aim of this study is to correct the misunderstanding that the toxicity of organic mercury compounds is unknown at the time of the outbreak of Minamata disease (May 1, 1956).

**Results and discussion:** Two case reports of organic mercury (methylmercury) intoxication were published already in 1865 and 1866. The conversion of inorganic mercury added in acetoaldehyde synthesis was already pointed out in 1921. In 1930 several cases of organic mercury poisoning among workers engaged in acetoaldehyde production were reported. Many reports on not only in occupational exposure but a oral exposure via the ingestion of flour made from grains treated with organic mercurials were available at the time of the outbreak of Minamata disease (May 1, 1956). These reports pointed out the toxic effects of organic mercury on the central nervous system, and indicated clearly that the causal substance of Minamata disease must be the organic mercury compounds (methylmercury) from the Chisso plant. The identification of methylmercury as the causal substance by the authority was presented in 1968 when acetoaldehyde production in the Chisso plant was closed. Most of these reports except that of (Hunter et al.) were not referred to in the study of Minamata disease. Inadequate referencing should be pointed out.

**Conclusion:** Several reports indicated that the causal substance of Minamata disease must be methylmercury from the Chisso Plant. However, most of these reports were not referred to during the study of Minamata disease. Inadequate referencing of literatures should be pointed out.