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ABSTRACT

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Effect of Lunar Dust on Humans —Lunar Dust: Regolith—

Nippon Eiseigaku Zasshi, 65, 479–485 (2010)
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We reviewed the effect of lunar dust (regolith) on humans by the combination of the hazard/exposure of regolith and microgravity of the moon. With regard to the physicochemical properties of lunar dust, the hazard-related factors are its components, fibrous materials and nanoparticles. Animal exposure studies have been performed using a simulant of lunar dust, and it was speculated that the harmful effects of the simulant lies between those of crystalline silica and titanium dioxide. Fibrous materials may not have a low solubility judging from their components. The nanoparticles in lunar dust may have harmful potentials from the view of the components. As for exposure to regolith, there is a possibility that particles larger than ones in earth (1 gravity) are respirable. In microgravity, (1) the deposition of particles of <1 μm in diameter in the human lung did not decrease, (2) the functions of macrophages including phagocytosis were suppressed, (3) pulmonary inflammation was changed. These data on hazard/exposure and microgravity suggest that fine and ultrafine particles in regolith may have potential hazards and risks for humans.

Nano-Safety Science for Assuring the Safety of Nanomaterials

Nippon Eiseigaku Zasshi, 65, 487–492 (2010)
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Developments in nanotechnology have fostered the widespread use of a diverse array of nanomaterials such as nanosilicas and carbon nanotubes. Nanomaterials are already being used in electronics, sunscreens, cosmetics, and medicines, because they have unique physicochemical properties, such as conductivity, strength, durability, and chemical reactivity. The advent of nanomaterials has also provided extraordinary opportunities for biomedical applications. However, the increasing use of nanomaterials has raised public concern about their potential risks to human health. In particular, recent reports have indicated that carbon nanotubes induce severe inflammation and mesothelioma-like lesions in mice. In this regard, we have attempted to elucidate the pharmacodynamics and safety of nanomaterials in order to develop novel, safe nanomaterials and to establish scientifically based regulations. In this review, we introduce our data on the safety of nanosilicas, particularly the relationships among their physical properties (predominant grain size, configuration, and surface charge), pharmacodynamics, and safety. Our study will help to improve the quality of human life by establishing standards for the safe use of nanomaterials.

Immunological Effects of Silica/Asbestos

Nippon Eiseigaku Zasshi, 65, 493–499 (2010)
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Silica and asbestos cause pneumoconioses known as silicosis and asbestosis, respectively, that are each characterized by progressive pulmonary fibrosis. On the other hand, silicosis patients often suffer from a type of immunological dysregulation that gives rise to autoimmunity. These epidemiological findings suggest that silica may affect the immune system in humans. In addition, as asbestos itself is a mineral silicate, it may possess generalized immunotoxicological effects similar to those associated with silica particles. Because asbestos-exposed patients are well-known to often develop malignant diseases such as lung cancer and mesothelioma, one silica-like dysregulatory outcome that needs to be considered (apart from autoimmunity) is an alteration in host tumor immunity. In this review, the immunotoxicological effects of both silica and asbestos are presented and discussed in terms of immune system dysregulation as manifested by the onset of autoimmunity or alterations in host tumor immunity.

Effects of Tai Chi Exercise on Physical and Mental Health

Nippon Eiseigaku Zasshi, 65, 500–505 (2010)
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Recently, Tai Chi, which is one of the Chinese traditional martial arts, has been receiving attention. The main feature of Tai Chi is its flowing movements including loosening up, relaxing, and practicing meditation with slow abdominal respiration. Tai Chi is widely taken as part of health-promotion activities or rehabilitation training, and significant mental and physical effects have been reported so far. In this review report, Tai Chi was confirmed to be beneficial not only as a rehabilitation training for old people or patients with various diseases but also as an exercise for healthy people. These findings suggest the potential of Tai Chi as a complementary and alternative therapy.

Cholesterol Controversy: Cutoff Point of Low-Density Lipoprotein Cholesterol Level in Guidelines by Japan Atherosclerosis Society

Nippon Eiseigaku Zasshi, 65, 506–515 (2010)
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In 2007, the Japan Atherosclerosis Society published the Guidelines for prevention of atherosclerotic cardiovascular diseases. However, the guidelines have several flaws with regard to the cutoff level of serum low-density lipoprotein cholesterol (LDL-C). First, LDL-C level is used instead of serum total cholesterol (TC) level in the guidelines. In this case, they must show at least some basic data on the relationship between LDL-C level and mortality or morbidity from coronary heart disease (CHD). Second, it was recommended that the LDL-C level be below 140 mg/dL or 3.6 mmol/L (corresponding to a TC level of 220 mg/dL or 5.7 mmol/L, respectively). These levels are unreasonable considering that the TC levels of 240–260 mg/dL are optimal in terms of all-cause mortality for the Japanese population. Third, although there are big differences in mortality and morbidity from CHD between sexes, they discussed the matter without considering these differences. Last but not least, the conflict of interest of the editors of the guidelines has never been disclosed. The Japanese population has a lower CHD mortality and incidence than populations from other industrialized countries despite an increase in serum TC level in the former. In populations with a markedly lower coronary mortality or morbidity such as the Japanese population, it is still important to determine the optimal cutoff level of LDL-C to prevent the development of CHD and other atherosclerotic diseases.

Construction of Maladaptive Behavior Scale in Japanese

Nippon Eiseigaku Zasshi, 65, 516–523 (2010)
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Objectives: To evaluate child development, social competence, like intellectual ability, is an important aspect. The social competence of a child is prescribed by behaviors suitable for the society (adaptive behaviors) and behaviors not suitable for the society (maladaptive behaviors). The Vineland Adaptive Behavior Scales (VABS) have been widely administered to children in a semi-structural interview to evaluate social competence. The Social Competence test (S–M test) widely used in Japan is a translated version of the Vineland Social Maturity Scale for adaptive behaviors. Since only the region of adaptive behaviors was translated into Japanese, we attempted to develop a Maladaptive Behavior Scale in Japanese based on the VABS to evaluate the social competence of children.
Methods: The Maladaptive Behavior Scale of the VABS was translated into Japanese and back-translated to ensure appropriate translation. It was administered to children belonging to the birth cohort of the Tohoku Study of Child Development at the age of 66 months. The subjects for analysis in this study were 451 children (230 boys, 221 girls).
Results: To assess internal consistency, we used the standardized Cronbach alpha coefficient and the result was 0.81. The correlation coefficient between the scores of the S–M test and those of the Maladaptive Behavior Scale was −0.15. The correlation coefficient between the scores of the Child Behavior Checklist at 30 months and those of the Maladaptive Behavior Scale was 0.44.
Conclusion: These results suggest that the Maladaptive Behavior Scale may be a reliable instrument for assessing maladaptive behavior in Japanese children.

Relationship between Emotional Labor and Job-Related Stress among Hospital Nurses

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Objectives: To clarify the effects of factors of emotional labor, defined as the suppression of own emotions to better maintain other peoples' emotional conditions, on job-related stress responses among hospital nurses, the relationship between emotional labor and job-related stress was analyzed.
Subjects and methods: A self-reported questionnaire was distributed among 147 nurses of five hospitals in Japan. Complete answers were

collected from 123 nurses (83.7%, 107 females and 16 males). Emotional labor was assessed by the Emotional Labor Inventory for Nurses (ELIN) (26 items), which consisted of five subscales, i.e., "suppressed expression," "surface adjustment," "deep adjustment," "exploring and understanding" and "expression on caring." Job-related stress was evaluated using the Brief Job Stress Questionnaire (BSQ) consisting of 57 items. Stepwise multiple regression analysis was performed to examine the relationships of stress responses (BSQ) with ELIN and job stressors (BSQ).

Results: Subjects working in an inpatient department showed significantly higher total ELIN scores than those working in an outpatient department. The stepwise multiple regression analysis showed the following: Scores on "anger" and "fatigue" in BSQ positively related to "suppressed expression" scores in ELIN; those on "anxiety" positively related to "deep adjustment" scores; and those on "depression" positively related to "surface adjustment" scores. Similarly, scores on negative stress responses (BSQ) such as "anger," "fatigue," "anxiety," "depression," and "somatic stress responses" positively related to scores on job stressors (BSQ), e.g., physical work load, whereas "vigor" scores positively related to "job worthwhileness" in BSQ.

Conclusion: The aspects of "suppressed expression," "deep adjustment," and "surface adjustment" of emotional labor seem to be the major occupational stressors for nurses, as well as job-related stressors measured by BSQ. Working in an inpatient department appears to be a potent stressor for nurses.

Preferential Induction of Apoptosis in Regulatory T Cells by Tributyltin: Possible Involvement in the Exacerbation of Allergic Diseases

Nippon Eiseigaku Zasshi, 65, 530–535 (2010)
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Objectives: Tributyltin (TBT) has been recognized as a particularly important pollutant. Human exposure to TBT persists via consumption of TBT-containing meat and fish products. Although it is well known that high-dose TBT exerts immunotoxic effects such as thymic atrophy, the effect of low-dose TBT exposure on immune responses remains elusive. Our previous studies demonstrated that TBT at environmentally relevant doses promoted T helper (Th)2 polarization via enhancement of Th2 differentiation and preferential induction of apoptosis in Th1, which is associated with the exacerbation of Th2-driven allergic airway inflammation. In the present study, we explored the possibility that TBT might preferentially induce apoptosis in $Foxp3^+$ regulatory T cells (Treg), which play an indisputable role in the negative regulation of immune responses.

Methods: We established several independent Treg and Th2 clones and their susceptibilities to TBT-induced apoptosis were examined. To examine whether the susceptibility to TBT-induced apoptosis may be due to the level of glutathione (GSH), we measured the basal GSH levels in Treg and Th2 clones. Intracellular GSH level was measured using high-performance liquid chromatography (HPLC) with a gold electrode.

Results: We show that TBT preferentially induces apoptosis in Treg clones rather than in Th2 clones. The basal levels of GSH in Treg clones were significantly lower than those in Th2 clones.

Conclusions: The increased susceptibility of Treg clones to TBT-induced apoptosis appeared to result from lower GSH levels in Treg clones, which may detoxify the reactive oxygen species (ROS) induced by TBT treatment. Our results suggest that the preferential induction of apoptosis in Treg over Th2 contributes to the exacerbation of Th2-driven allergic diseases by TBT.