CRI/ICEIT
NEWSLETTER

VOL. 11 NO. 3 – July 2001
ISSN 0858-2793
BANGKOK, THAILAND

Chulabhorn Research Institute

INTERNATIONAL CENTRE FOR ENVIRONMENTAL AND INDUSTRIAL TOXICOLOGY (ICEIT)

CRI's ICEIT has been designated as a
"UNEP Centre of Excellence for Environmental and Industrial Toxicology".

CRI Receives ASEAN Foundation Grant for Regional Training Programs in Environmental Toxicology

An agreement was signed by HRH Princess Chulabhorn, president of CRI and H.E. Mr. Wisber Loeis, executive director of the ASEAN Foundation for a project for human resource development in Environmental Toxicology for new member countries and other ASEAN countries.

The signing ceremony was held in the Institute's reception rooms and attended by over sixty dignitaries from ASEAN member countries, embassies and government organisations that support and participate in the work of the Institute.

HRH Princess Chulabhorn gave the welcoming address which was followed by speeches by H.E. Mr. Wisber Loeis, and by H.E. Mr. Nobutoshi Akao, the Japanese Ambassor to Thailand, prior to the formal signing of the agreement.

In her address, Her Royal Highness stated that CRI was founded with one of its principal objectives being the promotion of regional as well as national cooperation in scientific research and training.

(Continued on page 2)

CRI Receives ASEAN Foundation Grant for Regional Training Programs in Environmental Toxicology

(Continued from page 1)

The present agreement signed with the ASEAN Foundation further strengthened this objective. Human resource development was a long term endeavour since the training and retraining of personnel has to be on a continuing basis in order to provide a critical mass of trainers with the necessary multiplier effect to meet the region's needs for sustainable economic development. Such development will only be possible if there is a sound understanding of environmental and industrial toxicology.

Her Royal Highness concluded her address by stating that now the ASEAN Foundation had undertaken to fund the regional training project for ASEAN countries, CRI looked forward to providing a more intensive and comprehensive training program to serve the needs of the region. In this way CRI would be able to share with other ASEAN countries the resources and expertise in environmental toxicology that the institute had built up and developed over the last decade.

CARCINOGENIC EFFECTS OF ARSENIC IN DRINKING WATER

Scientists claim that arsenic may be hazardous even in minute quantities, and although they are not sure how arsenic attacks the body's cells, a new US study by scientists at Dartmouth Medical School indicates that the substance disrupts the activity of hormones called glucocorticoids, which help to regulate blood sugar and suppress tumors.

Arsenic interferes with these processes by binding to the glucocorticoid receptors in cells and changing their structure. The study suggests that arsenic, instead of causing cancer by itself, promotes the growth of tumors triggered by other carcinogens.

Strong evidence of the toxic effect of arsenic in drinking water comes from a long-term study of 40,000 villagers in south-western Taiwan whose wells have high arsenic levels.

In villages with the most severely contaminated wells, the death rates from bladder cancer were dozens of times above normal. Similar studies in Argentina and Chile later corroborated those findings. In a region of northern Chile, for example, researchers determined that 7 percent of *all* deaths among people over the age of 30 could be attributed to arsenic.

In the Taiwan study, the lowest median level of arsenic was 170 micrograms per liter. To determine the risk at the 50- and 10-microgram levels, epidemiologists extrapolated the health effects in a linear way (that is, half the exposure leads to half the cancer risk). Some toxicologists have criticized this approach, saying that arsenic concentrations may have to exceed a threshold level to cause cancer. But new research suggests that if this threshold exists, it is most likely well below 10 micrograms per liter, and indeed the Darthmouth Medical School Study found that arsenic-induced effects appeared at concentrations as low as two micrograms per liter.

Source: Scientific American, Vol. 284, No.6, June 2001.

THE USE OF BRAKE FERN IN THE REMEDIATION OF ARSENIC-CONTAMINATED SOILS

Researchers have found that the fern *Pteris vittata* (brake fern) is extremely efficient in extracting arsenic from contaminated soils and converting it into its ground level biomass. Brake fern is mesophytic and is widely cultivated and naturalized in many areas that have a mild climate. Researchers from the University of Florida found brake fern growing on a site in Central Florida contaminated with chromated copper arsenate. Graphite furnace atomic absorption spectroscopy was used to analyse the fronds of plants growing at the site for total arsenic. Of 14 plant species studied, only brake fern contained appreciable amounts of arsenic (3,280 – 4,980 p.p.m). Additional samples of the plant and soil from the contaminated site (18.8 – 1,603 p.p.m. As) were collected as well as from an uncontaminated site (0.47 – 7.56 p.p.m. As).

Brake fern extracted arsenic efficiently from these soils into its fronds with plants growing on the contaminated site being found to contain 1,442 – 7,526 p.p.m. arsenic and those from the uncontaminated site 11.8 – 64.0 p.p.m. These values are considerably higher than those typical for plants growing in normal soil, which contain less than 3.6 p.p.m. of arsenic.

The US researchers believe that brake fern has great potential to remediate arsenic-contaminated soils cheaply and could also aid studies of arsenic uptake, translocation, speciation, distribution and detoxification in plants.

Source: Nature, Vol. 409, No. 6820, February 2001.

LEAD CONTAMINATION FROM CERAMIC MICROWAVE OVENWARE

Research carried out in the Department of Environmental Health Science of the Faculty of Public Health, Mahidol University, Thailand has identified significant factors affecting the amount of lead leached from ceramic ovenware used in domestic microwave ovens.

In this research, the amount of lead leached from 162 samples of decorated and non-decorated ceramic ware was measured in relation to 3 factors, namely pH, heat levels and extraction time.

Degrees of lead leaching from ceramic ware might depend on a number of factors including the firing temperature, glazing times and the dyes used for decoration. Some oxides of metals used in the dyes, especially copper oxide, could increase lead solubility. In the fire glazing process, silica is mixed with a metal oxide, usually lead oxide, which has suitable surface tension and low viscosity, thus facilitating the firing process.

In the tests carried out in this research project, measurements of lead leaching were made at three pH levels (3.5, 4.5 and 6.5) and at three heat levels for each pH value (set at 3, 6 and 9 on the oven dial). Samples were collected at 5, 10 and 15 minute intervals and the amount of lead leached was measured using an Atomic Absorption Spectrophotometer. The results of the tests showed that the leaching of lead from decorated ceramic ware ($\bar{x}$ = 0.401 ppm) was significantly higher ($\rho<0.001$) than from the non-decorated ware ($\bar{x}$ = 0.025 ppm). Moreover, the combination of acid, heat and leaching time increased the amount of lead leached and accelerated the leaching process, particularly from decorated ceramic ware.

The research should help to raise public awareness of the importance of appropriate selection of ceramic ware to be used in microwave ovens.

Source: Journal of Public Health, Vol. 29, No. 3, Faculty of Public Health, Mahidol University, 1999.

An Animal Study on the Effects of Cadmium Exposure

A recently published study has investigated the effects of cadmium (Cd) exposure on spontaneous locomotor activity in rats. Previous animal experiments using high dose and long duration of exposure to Cd have revealed neurological symptoms and loss of motor coordination in the exposed animals.

In the present study, rats were exposed for 1 hour to increasing concentrations of Cd through inhalation of cadmium chloride aerosol using nose-only inhalation chambers.

A 4-fold increase in lung Cd concentration 48 hours post-exposure to the highest Cd aerosol concentration was followed by approximately 2-3 fold increases in Cd concentrations of liver and kidneys. The increase in the tissue Cd concentration following inhalation exposure indicates deposition or absorption of the soluble CdCl in the lungs.

Exposure to Cd aerosol through inhalation resulted in decreased spontaneous locomotor activity. The decrease was dependent on Cd concentration in air and post exposure duration. Earlier investigations have reported similar effects in rats following oral and parenteral administration of low Cd doses.

Few studies have been conducted on the neurological response to Cd accumulation in tissues following inhalation exposure of Cd aerosols. Change in locomotor activity from a single 1 hour inhalation exposure in the present study is supported by earlier investigations. However, low Cd exposure through 0.105 mg Cd/m^3 in inhaled air for 30 days or 62 exposures to 0.33 mg Cd/m^3 were not found to cause neurological effects. Concentrations of Cd/m^3 air that produced tremors and decreased activity in rats ranged from 112 to 132 mg/m^3 for 2 hour exposures. The results of the present study, however, demonstrate that neurobehavioral effects occur at much lower Cd concentrations.

The reduced locomotor activity possibly represents early manifestations of more frank neurobiological alterations potentially exhibited at higher concentrations and with longer periods of exposure.

Acute inhalation exposure to a soluble Cd compound (CdCl) is highly toxic, resulting in increased tissue accumulation of Cd^2 and concentration-dependent impairments in spontaneous locomotor activites.

Source: Veterinary and Human Toxicology, Vol. 43, No. 3, May 2001.

A NEW TREATMENT FOR ANTHRAX

Although anthrax is a relatively rare disease, Bacillus anthracis, the microbe that causes it, has attracted much attention because of its potential use in biological warfare. Vaccination against anthrax is possible but impractical because of the difficulty of predicting which populations are likely to be at risk in the event of a terrorist attack.

Antibiotics are effective if given at a very early stage of infection, but the bacteria multiply rapidly, producing lethal amounts of anthrax toxin.

Anthrax is a multicomponent toxin that is assembled at the surface of host cells after infection. The lethal action of the toxin, however, occurs in the host cell cytoplasm where two of its components, edema factor (EF) and lethal factor (LF) interfere with cellular regulation, allowing the anthrax bacilli to multiply rapidly in the blood. Anthrax toxin is equipped with a sophisticated translocation device to permit EF and LF to pass across cellular membranes to reach their targets in the cytoplasm. This structure is assembled on the host cell surface from seven identical subunits of protective antigen (PA), which is a principal component of the anthrax vaccine.

Earlier research showed that several mutations in PA can prevent translocation of EF and LF into host cells. The mutant forms of PA bind to the cell surface and assemble into heptamers, but these do not form pores, apparently because they cannot be inserted into the membrane.

Now, new research has demonstrated that if normal and mutant PA molecules are mixed in a test tube, the mutant subunits behave in a dominant-negative manner i.e. they participate in the formation of the heptamer but prevent pore formation and translocation of EF and LF into cultured cells.

These findings suggest that assembly of just one molecule of mutant (dominant-negative) PA into the the heptamer can block translocation of EF and LF into the cytoplasm.

The researchers have tested the mutant PA in a rat model of anthrax intoxication and have found that while rats injected with a lethal mixture of LF and PA become moribund within 90 minutes, if mutant dominant-negative PA is included in the mixture, the rats show no evidence of intoxication and survive unscathed.

Source: Science, Vol. 292, No. 5517, April 2001.

NEW DRUGS TO COMBAT CANCER

New drugs currently being tested in animals and tested in humans hold great promise in the treatment of cancer. One such drug, oltipraz, activates the body's natural defence mechanisms by stimulating the body to produce an enzyme called glutathione S-transferase (GST). This enzyme neutralises carcinogens such as benzene, preventing them damaging DNA and allowing the body to release the by-products.

Trials of oltipraz are being carried out in China where almost 10 percent of the adult population die from liver cancer, mainly because of aflatoxin, a chemical found in moulds that grow on rice and cereal grain.

In the trial on volunteer subjects in Qidong, China, oltipraz was administered to subjects once a week for a period of two months. It was found that these subjects excreted over twice as much neutralised aflatoxin in their urine as volunteers given a placebo.

GST and related enzymes detoxify a broad range of carcinogens thus providing protection against a number of different forms of cancer.

Another new drug, combretastatin, based on the root bark of African bush willow, has the capacity to attack the blood vessels that feed tumours, but does not affect healthy tissue. In a mouse study, no trace of residual tumours could be found in the animals after nine months. Phase one trials are currently being carried out on 34 patients with bowel cancer at Mount Vernon Hospital in London. The drug is used in combination with a form of radiotherapy which uses antibodies to target radiation on the cancer cells.

Source: New Scientist, Vol. 170, No. 2285, April 2001 and Cancer Research, Vol.61, June 15, 2001.

New support for a link between dioxins and leukemia

A new report issued by the US National Academy of Sciences' Institute of Medicine (IOM), Veterans and Agent Orange : update 2000, now finds some evidence of a link between exposure to Agent Orange, a herbicide used by US forces during the Vietnam war, and the genetic transmission of acute myelogenous leukemia (AML). Previous IOM reports had found insufficient evidence to support the link.

Over the past 10 years, much has been learned about the mechanisms by which the dioxins exert their toxic effects. Most information published to date is consistent with the hypothesis that 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) produces its biological and toxic effects by binding to a protein that regulates gene expression, the aryl hydrocarbon receptor (AhR). The binding of TCDD to the AhR triggers a sequence of cellular events that involve interactions with numerous other cellular components. The actual biochemical and cellular events that follow the initial binding of these chemicals to the AhR and lead to particular toxic end–points, however, have yet to be defined. Thus, although the presence of the AhR appears to be necessary for toxicity to occur, it alone is not sufficient. The findings that many AhR-modulated genes and responses are regulated in a cell-, tissue-, developmental stage-, and species-specific pattern suggest that the molecular and cellular pathways leading to any particular toxic event are extremely complex and probably involve multiple events, genes, and signal transduction pathways. Further definition of the pathways regulated by the AhR in a tissue-specific fashion will help to clarify the understanding of the relationships between the dose of TCDD that reaches the tissue and the events leading to specific toxic end points.

In *update 1998,* the committee found limited/suggestive evidence of an association for three cancers–respiratory (larynx, lung or bronchus, and trachea) cancer, prostate cancer, and multiple myeloma–and three other health outcomes–spina bifida in the children of veterans, acute and subacute (transient) peripheral neuropathy, and porphyria cutanea tarda. The recent scientific literature continues to support the classification of these diseases in the limited/suggestive category of evidence.

In 2000, the committee responsible for *Type 2 Diabetes* found that there was limited suggestive evidence of an association between exposure to the herbicides used in Vietnam or the contaminant dioxin and that health outcome. Evidence reviewed in this report continues to support that finding.

The committee also found that one additional condition satisfies the criteria necessary for inclusion in this category: AML in the children of veterans. Two studies, in particular, support this conclusion. One is a case-control study of AML in which self-reported service in Vietnam or Cambodia was associated with an elevated risk after adjustment for numerous potentially confounding life-style and sociodemographic factors. The second, a study of the children of Australian Vietnam veterans, found a greater than fourfold risk, although confounding factors other than age and gender were not controlled. While direct measures of exposure are lacking, the committee found the following characteristics of these studies to be particularly persuasive: (1) both were conducted in Vietnam veteran populations; (2) the association was specific for AML, with no excess risk found for other forms of leukemia; (3) one study was adjusted for numerous confounders, while the other had an association of sufficiently large magnitude to reduce the likelihood of being completely due to confounding; and (4) the strongest association was seen in children diagnosed at the youngest ages–cases that are considered the strongest candidates for an etiology of parental origin. These characteristics diminish the likelihood that the outcomes were unrelated to service in Vietnam. A third study, which reported a 2.7-fold increased risk of AML in the children of fathers with self-reported exposure of more than 1,000 days to pesticides or weed killers, adds to the plausibility that herbicide exposure could be related to the higher risk observed among those who served in Vietnam.

Source: Chemistry in Britain, Vol. 37, No. 6, June 2001 and Veterans and Agent Orange: up date 2000 on internet at www.nap.edu.

The Belgian Dioxin Incident

Dioxins, a group of chemical compounds released by processes such as waste incineration and the burning of household fuel, have been linked to health effects ranging from skin disease to cancer. Polychlorinated biphenyls (PCBs) are mixtures of synthetic organic chemicals. Like dioxins, PCBs have been linked to cancer; they have also been associated with neurotoxicity, reproductive and developmental toxicity, immune suppression, liver damage, skin irritation, and endocrine disruption.

In January 1999, animal feedlots in Belgium were contaminated with PCBs and dioxins including polychlorinated dibenzo-*p*-dioxins and polychlorinated dibenzofurans. The dioxins, probably originating from oil left at a waste recycling center, entered the food supply via animal feed made with recycled animal fat. (In Belgium, waste fat from recycling centers is commonly mixed with fat from slaughterhouses to make animal feed.) Five hundred tons of the contaminated feed was distributed to farms, mostly poultry operations, throughout Belgium.

Researchers from four Flemish universities have made a study which indicates that the incident may have

(Continued on page 8)

SETTING AN EXPOSURE STANDARD FOR BERYLLIUM

In spite of its relatively high cost, beryllium is widely used in industry because for certain critical applications it performs better than alternative metals. In 1999, the United States produced over 30 metric tons of beryllium, mostly as alloys with copper.

Some of beryllium's advantages are that it is light (one-third lighter than the next lightest metal, aluminum), strong (six times stronger than steel), less prone to expand and shrink, magnetically more transparent, and a better electrical and thermal conductor than alternative materials. Some beryllium is used as an unadulterated metal in components for satellites, aircraft, space optical systems, and guidance systems. Its nuclear characteristics (it produces neutrons when bombarded with alpha particles) allow it to serve critical roles in nuclear reactors and weapons. Because beryllium is transparent to X rays, it is used in X-ray tube windows. Some beryllium goes toward producing beryllium oxide, which is hard, strong, and an outstanding conductor of heat. Beryllium oxide is most often used in lasers and radar systems and as a substrate for electronic circuits that drive high-speed computers.

However, by far the greatest amount of manufactured beryllium (about 75%) ends up in alloys, about 95% of which is copper alloy. Adding 0.5-2.0% beryllium to copper forms an alloy that is exceptionally strong and hard, an excellent electrical and thermal conductor, nonmagnetic, and resistant to corrosion and fatigue. Beryllium-copper springs, connectors, and switches are used in goods ranging from cars to computers, from satellites to home appliances.

This widespread use of beryllium has raised the problem of how to protect workers from the dangers of exposure to the toxic substance.

An estimated 30,000 workers in the United States alone come into contact with beryllium daily, according to the National Institute for Occupational Safety and Health (NIOSH).

Scientists know that the current exposure limit for beryllium set by the Occupational Safety and Health Administration (OSHA) of 2 micrograms of airborne beryllium per cubic meter of air (μg/m^3) per 8-hour day leaves a significant percentage of workers at risk. But finding a safer limit presents numerous challenges. Simply reducing current exposure limits may not reduce the number of workers stricken with chronic beryllium disease (CBD), which results in death in about 30% of sufferers. Instead, researchers say, an entirely new type of exposure standard must be created that would take into account factors that until recently have not been considered, including dust particle size, particle number, low dosage, chemical form, and possibly genetic predisposition of workers.

To address the concerns about the current beryllium standard, officials at OSHA are in the process of setting new rules for workplace exposure to beryllium. In parallel, scientists at NIOSH are working with industry representatives and scientific consultants on a suite of research projects that they will use to develop a new NIOSH-recommended exposure limit (the current NIOSH recommended limit is 0.5 μg/m^3 per 8 hours).

These results will contribute data which will be used in setting the new OSHA standard to be proposed in 2001.

Source: Environmental Health Perspectives, Vol. 109, No. 2, February 2001.

Removal of radium from drinking water

A research project conducted by a team of researchers at Pennsylvania State University in the United States has developed a form of clay that absorbs radium and immobilises it at room temperature so that it can be disposed of without risk.

In the research project, a study was made of a range of natural and synthetic clays, and measurements were taken of the amounts of radium they absorbed from solutions of NaCl containing RaCl2.

The researchers found that the best type of clay for radium absorption was Na-4-mica, which removed 95 per cent of the radium present. They attributed this to the way in which the layers in the composition of the clay are offset with an interlayer spacing which is too small to capture ions of hydrated sodium or barium, but large enough to trap the less hydrated radium ions. Once trapped, the radium does not leave the mica.

Since the Na-4-mica is cheap to produce, it could be used in conventional ion exchange columns to remove radium from water

---

Source: Nature, No. 410, April 2001.

Sensitisation to Natural Rubber Latex

A study carried out by the Community Medicine Department of the Faculty of Medicine at Khon Kaen University in Thailand in collaboration with three research institutes in UK estimated the prevalence of sensitisation to natural rubber latex in latex tappers and in workers in latex glove factories.

With the increased use of rubber gloves in recent years, it has become apparent that they, and other rubber products, can induce contact dermatitis as well as delayed-type allergy to accelerators in the thiuram group. The prevalence of latex sensitisation amongst healthcare workers ranges from 3% to 22%. There are no reports of sensitisation to natural rubber latex in tappers.

The population of the study comprised 500 workers in three latex glove factories, 314 tappers and a control group of 144 college students.

The workers in the glove factories were classified into three exposure groups; high, moderate, and low. Personal exposures to natural rubber latex aeroallergens were measured by immunoassay. Symptom questionnaires and skin prick tests with latex allergens (Stallergenes 1:200 w/v) and other common environmental allergens were performed. The criterion for positivity was a wheal reaction at least 3 mm in diameter greater than that to a diluent control.

It was found that the geometric mean (GM) concentration of latex in air was 15.4 $\mu g/m^3$ for those employed in glove stripping, glove inspections, and packing of powdered gloves. The moderate exposure glove manufacturing group and the tappers had GM concentrations of 2.3 and 2.4 $\mu g/m^3$ respectively, compared with United Kingdom users of latex powdered gloves, who had GM concentrations of 0.5 $\mu g/m^3$. The prevalence of sensitisation to latex in the tappers and latex glove factory workers was 1.3% and 1.7% respectively. No positive cases were found among the college students. Workers who showed a positive skin prick test to latex were more likely to be atopic. Work-related respiratory and dermatological symptoms were found in about 20% of each population studied, but were not related to the presence of positive latex prick tests.

This study suggests that in the Thai latex industries, latex sensitisation is rare despite high concentrations of airborne exposure, and is less prevalent than in the healthcare sector in Europe where skin exposure is greater.

Source: Occupational Environmental Medicine, No.6, June 2001.

INSECTICIDE PROPERTIES OF INERT DUSTS

An ancient technology originally used by Chinese farmers in earlier millenia is now being redeveloped by researchers at Greenwich University in UK.

The technology is based on the natural ability of diatomaceous earth (DE) to kill insects that invade grain stores. The major constituent of DE is amorphous silicon dioxide (SiO2) with minor amounts of other minerals. Its insecticidal properties can vary by 20 times according to the geological origin.

Depending upon the source and processing procedures, DE can contain from 0.1 to 60% crystalline silica. The varieties registered as insecticides generally have less than 7% crystaline silica.

Trials have shown that DE is as effective as organophosphate pesticides at killing insects in stored grain.

Once mixed with the grain, it absorbs the waxes on the skin of any insects present in the grain and causes them to die from desiccation.

DE is non-toxic and, therefore, safer for animals and humans than the currently used organophosphate pesticides. Because DE is locally available in many developing countries it could be used to reduce storage losses. It also offers a cheaper and more environmentally safe alternative to organophosphate pesticides.

Source: Chemistry & Industry, No. 12, June 2001 and Beyond 2000 May 2001.

MONITORING ACID RAIN

In recent years, alarm has been expressed about the increase in acid rain in many countries in Asia.

The rapid growth of industrial and agricultural production, especially in China, India, Thailand, and Indonesia, has resulted in a remarkable increase in SO_2 and NO_x emissions during the past decade, and these emissions look set to grow further. Although emissions of these pollutants are lower than in Europe and the US on a per capita basis, experts predict that total emissions in East Asia will surpass the combined emissions of Europe and the US by the year 2020.

The main reasons for the increasing pollution are the low quality of fuel in most of East Asia (the sulphur content can be as high as 7 per cent in Thai lignite and up to 5 per cent in Chinese brown coal) and the absence of control technologies in many countries. There is concern that these increasing emissions will cause enormous environmental damage, with some impacts already apparent. Governments throughout the region are starting to treat the problem with growing urgency, and in China abatement of acid rain is now considered a top government priority.

Acid rain monitoring networks provide information required by policy-makers to make sound abatement decisions. Although networks are well established in Europe and the US, rainwater monitoring in East Asia is still in its infancy and the few existing national networks do not yet give a clear picture of acid deposition in the region.

While some rainwater monitoring stations in East Asia participate in the Global Atmosphere Watch (GAW) of the World Meteorological Organisation (WMO), these are few and far between. A recent review of acid rain monitoring networks in East Asia indicates that these vary considerably between countries.

In view of the volatile economic situation in the region it is difficult to make reliable predictions regarding the extent of acid rain and associated air pollution problems in the future. If sufficient funds are made available to implement the required pollution control technologies and policies, then we may expect the problem to be effectively controlled, if not eliminated.

Economic growth, accompanied by increasing prosperity, would ensure that sufficient funds are available for pollution control. Economic downturn may not necessarily result in reduced emissions; it may lead to fewer, but more polluting, industries as less financial resources are available for implementing pollution control measures. In any case, international co-operation between industrialised nations which have a longer history of successful air pollution management, and developing countries in East Asia on all aspects of the acid rain problem is to be encouraged. Technology transfer, sharing of information, collaborative research, and financial assistance by industrialised nations would greatly speed up the process of environmental recovery in East Asia.

Source: Chemistry in Britain, Vol. 37, No. 6, June 2001.

The Belgian Dioxin Incident

(Continued from page 5)

doubled or tripled the PCB/dioxin body burden of some Belgians.

The study suggests that in terms of added cancer risk, the incident could result in 32 – 1,540 additional cancer deaths over the projected lifetime of the total Belgian population of 10 million, and PCB exposure could add between 22 and 6,545 cancer deaths. These ranges are based on applying two different risk estimates for lifetime exposure to the amount of contaminants in the incident exposure.

Depending on a person's diet and the chance occurrence of high levels of contamination, however, the effects could be much more serious. The potential impacts of three common dietary patterns typical of the average Belgian citizen were assessed. One pattern assumed the ingestion of 15 grams of heavily contaminated animal fat per day and resulted in a 75% increase in dioxin body burden. Another assumed the ingestion of three portions of heavily contaminated chicken meat per week and resulted in a 42% increase in dioxin body burden. A third common dietary pattern resulted in a 48% increase in dioxin body burden. Some people may have incurred even higher exposures because consumption of products such as milk and derived food items such as sauces and pastries were not factored in to the estimations.

The researchers warn that significant numbers of Belgians who consumed contaminated products temporarily increased their intake of dioxins to a level up to 100 times greater than that recommended by the World Health Organization.

Source: Environmental Health Perspectives, Vol. 109, No. 3, March 2001.

The ICEIT NEWSLETTER is published quarterly by the International Centre for Environmental and Industrial Toxicology of the Chulabhorn Research Institute. It is intended to be a source of information to create awareness of the problems caused by chemicals. However, the contents and views expressed in this newsletter do not necessarily represent the policies of ICEIT.

Correspondence should be addressed to:

ICEIT NEWSLETTER
Chulabhorn Research Institute
Office of Academic Affairs
Vibhavadee-Rangsit Highway
Bangkok 10210, Thailand
Tel: (66-2) 574-0622 to 33 ext. 1610
Fax: (66-2) 574-0616 or (66-2) 247-1222
CRI Homepage: <http://www.cri.or.th>