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Self-regulation in Environmental Management Standards

Strong public pressure, particularly in Europe and North America, has made business companies increasingly aware of the degree to which consumers care about the effect their operations have on the environment. Such is the growing concern that companies have developed their own environmental management systems (EMS). To assist in this endeavor, a new set of voluntary environmental management standards from the international organization of standardization (ISO) is being implemented by industry as a framework for redesigning the way it is regulated. The series of principles, known as ISO 14000, is intended to make it easier for businesses to track their own environmental operations and performance.

The benefits of implementing an EMS are varied, ranging from reduced production costs to enhanced public credibility. Most elements of ISO 14000 are not new to the largest corporations, and many are already assessing their EMS against the ISO draft. Meeting the EMS outlined by ISO should make it easier for importing and exporting companies and multinationals to do business in other countries, which have their own regulatory systems. It also promises to make it easier to measure environmental performance and make meaningful comparisons across borders.

ISO's vision of an EMS includes establishing a company environmental policy that reflects "the commitment of top management to compliance with applicable laws and continual improvement".

That policy forms the basis for setting objectives and targets and executing an environmental management program to achieve them through organizational structures, management controls, and accountability. It also involves measuring and monitoring progress toward the targets, addressing problems, and analyzing and revising the management system. However, specific performance goals are not part of the EMS.

The U.S. Environment Protection Agency is closely monitoring the development of the standards, but says it is officially neutral on ISO 14000 and how it will treat ISO-conforming companies. In public statements on ISO 14000, EPA officials have expressed their

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Arabidopsis Plants Hold Promise for Removal of Heavy Metal Pollutants from Soil

Heavy metals have reached toxic levels in the air, land and water in many parts of the world. Mercury pollution is a worldwide problem in aquatic environments, resulting mainly from its use in bleaching operations, as a catalyst, as a pigment in paints, and in the mining of gold. Mercury also contaminates agricultural land due to its use in seed and bulb dressings and in fungicidal sprays on fruit trees.

Although the rate of release of mercury into the environment may have slowed in recent years, previously contaminated sites continue to leach large quantities of mercury into adjacent wet lands, waterways and estuaries. The mercury that is not bound up in insoluble sulfur salts tends to accumulate in invertebrates and fish as methylmercury, dimethylmercury, or other organomercury salts. The organomercury compounds are passed on rapidly to local bird, animal, and human populations with tragic consequences.

Now, however, scientists from the University of Georgia have designed a gene that, when inserted in test plants, can remove heavy metal pollutants from soil and render them harmless. The plants show a dramatic ability to remove toxic mercury and convert it to a relatively inert form. The results in all laboratory tests carried out by the team from Georgia University have been dramatic. A bacterial gene called MerA was inserted into the commonly used test plant arabidopsis. The new transgenic plants not only grow on toxic mercury but they appear to thrive. The laboratory plants are now producing seeds that retain the ability of the parent to consume and change mercury.

Theoretically, the gene could be altered to sequester any heavy metal. Although success in the laboratory has been obvious, it may be several years before plants are available for use on contaminated sites. Different soil varieties and growing conditions may necessitate adjustments in the gene's design; and the release would need to be carefully controlled.

RETROSPECTIVE GEOCHEMICAL MONITORING

On biogenic bogs, aquatic sediments, glaciers and snowfields provide evidence that environmental pollution caused by heavy metals is not a recent phenomenon but one that began with the discovery of mining and metal-working techniques in ancient times. During the time of the Roman Empire, large quantities of heavy metals including lead, copper, zinc, mercury, and tin were mined. Although the mines were operated on a small scale, the smelting of large quantities of ores in open fires resulted in substantial emissions of trace elements into the atmosphere.

However, it was the development of large furnaces with tall stacks during the 16th century that significantly extended the capacity of smelters and industrial installations resulting in an exponential increase in the intensity of metal emissions, both in absolute masses and in the number and type of toxic metal compounds released into the environment. Records of atmospheric metal pollution dating back to ancient times have been preserved in various types of natural deposits, especially polar ice caps, ombrogenic bogs, and aquatic sediments. Ice deposits, because of their rapid rates of accumulation, provide the most detailed paleopollution records, including short-term fluctuations. Peat bogs and aquatic sediments are deposited at much slower rates and thus provide compact records that can be distorted further

by basin characteristics and postdepositional behaviour of metals. However, despite these differences, the various natural deposits have produced a coherent picture of long-term contamination of the environment by heavy metals.

The rate of metal emission into the atmosphere depends on the quantity of ore smelted and the technology used. Advances in mining technology result from the need to exploit new ore minerals and to improve efficiency of their recovery. Such factors have a major impact on metal emission rate. Retrospective geochemical monitoring is therefore a useful tool for evaluating historical developments in mining technology.

Source: Science, Vol. 272, 12 April 1996.

Source: Proc. Natl. Acad. Sci. USA, Vol. 93, April 1996.

NITRATE IN DRINKING WATER

There is growing concern in many countries over high concentrations of nitrate in drinking water. This is particularly the case in rural areas where runoff from fertilizers and animal manure often finds its way into the water supply.

In Europe and the United States, researchers are now addressing the problem by using naturally occurring enzymes to reduce the nitrate to nitrogen gas and water. Corn seeding leaves and soil bacteria are common sources for enzymes that act on nitrate. Each enzyme is specific to a particular reaction and may require non-protein cofactors in order to function. Nitrate reductase belongs to a unique class of enzymes called oxidoreductases which transport electrons and thus oxidize or reduce the substrate, in this case, nitrate.

The health hazard of nitrate in drinking water has not received the same attention as PCB or heavy metal contamination; however, it represents a larger problem since nitrate levels in residential drinking water are an immediate health concern for infants and pregnant women. For many years high levels of nitrate in drinking water have been linked to methemoglobinemia or "blue baby" syndrome, in which the oxygen-carrying capacity of an infant's blood is greatly reduced. In some cases this can lead to death.

Contamination of drinking water with nitrate is a long-term problem because once nitrate reaches groundwater, natural processes are very slow in removing it.

Currently, nitrate removal systems are based on ion exchange, reverse osmosis, or electrodialysis. However, these processes do not degrade the nitrate and thus do not entirely solve the problem, and researchers believe that an enzyme-based system will be more effective and less expensive than existing systems.

Much of the developmental work on enzyme based systems is being conducted at the Institute for Molecular Biotechnology in Jena, Germany, an establishment that was once part of the scientific conglomerate ZIMET (Central Institute for Microbiology and Experimental Therapy).

The institute uses an interdisciplinary approach to change chemical processes to biocompatible processes. In order to understand and measure the exact molecular arrangements of enzymes produced at the institute, researchers use spectroscopy, plasma resonance imaging, and atomic force microscopy. The research group is currently experimenting with several different bacteria including *Pseudomonas stutzeri* and *Alcaligenes eutrophus*, to express the enzymes and then investigate their potential for large-scale production; it plans to have the nitrate and nitrite reductases available by the end of 1996.

In the United States, a small company in Michigan, The Nitrate Elimination Company Inc. (NECi) is working on an application of this enzyme technique to remove nitrate from drinking water at or near the faucet, and hopes to make a system that is safe, inexpensive, and easy to install and use.

NECi currently uses a nitrite reductase and a nitrous oxide reductase derived from the common soil bacterium *Rhodobacter sphaeroides formadenitrificans*. All the enzymes and cofactors are immobilized on an inorganic material used in the food processing industry. It is expected that a viable commercial design will be achieved within the next two years for the development of Enzymatic Nitrate Elimination Technology (EzNET) system. This design would permit EzNET to be a stand-alone system if a high nitrate level is the only problem in a home, or to work as an add-on component to water softening or filtration systems. Existing home water systems that use reverse osmosis or distillation can remove nitrate along with other contaminants but are less efficient and more expensive to install and operate.

Source: Environmental Health Perspectives, Vol.104, No.1, January 1996.

Acid rain – an emerging problem in Asia

Acidification of the environment by what is generally termed "acid rain" was once regarded as a problem only in parts of Europe and North America. However, recent studies indicated that the problem is emerging in industrialized regions and densely populated urban areas in Asia.

The anthropogenic emission of sulfur dioxide (SO₂) is known to be the main precursor of acid rain. Total emission in a country or region comprises emissions from two sources: combustion of fuels and non-energy use of fuels in industrial processes. The emission of SO₂ from fuel combustion is estimated by taking into account sulfur content and heat values of fuels as well as the procedures for emission control and sulfur retained in ash.

Total SO₂ emission in the Asia region was estimated to be 38 million tons in 1990, almost 56% higher than that of North America. Moreover, five countries, China, India, South Korea, Japan and Thailand accounted for 91% of this regional SO₂ emission.

Coal, of different varieties, was the largest source of emission, accounting for 81% of the total emission, followed by 17% for oil. In terms of sectoral contributions to SO₂ emissions, the main sources were found to be the industrial sector in north-east Asia and the power sector in South and south-east Asian Regions. There exists a large potential for the mitigation of SO₂ emissions through efficiency improvements in the industrial and power sectors of high emission countries like China and India. However, these remain largely untapped because of the substantial level of investment needed. Additional financial investment and related pricing implications are problems which confront policy makers in most countries in the region.

Source: Journal of Environment Management, April 1996.

Allergies and asthma in inner city homes

Over the last five years a study sponsored by the US National Institute of Allergy and Infectious Diseases has been carried out in seven major US cities to determine why asthma is a severe urban health problem despite improved air quality in the last decade.

Formal reports of the study are to be published shortly. However, findings released by the National Cooperative Inner City Asthma Study indicate that cockroach antigens appear to be the most powerful asthma-provoking material encountered in urban homes.

Tests on 1,528 children under age 10 and visits to homes in the seven urban centers covered by the

study revealed that the leading antigen was not dust mite as had previously been assumed but the proteins contained in the feces and carcasses of *Blattella germanica*, the German cockroach. Some 38 percent of asthma sufferers in the age group under study were found to be allergic to cockroaches.

Moreover, levels of cockroach infestation in inner city homes were

found to be considerably higher than any previous reports had indicated. A researcher from Johns Hopkins University took a cross section of teenage asthma sufferers in Baltimore and found that the higher the level of cockroach infestation in the victims' homes, the greater their chance of being allergic to cockroaches, and the more severe their asthma.

Asthma attacks are triggered by allergic reactions resulting in the contraction of the smooth muscle bands encircling the bronchial walls which, together with the build up of mucus, inhibit breathing thus causing the sufferer to wheeze and cough.

The proportion of Americans who say they have asthma has risen 45 percent in the last decade.

News item

Long term effects of acid rain

Past research on the effects of acid rain in the United States and Europe has mainly focused on the biochemistry of sulphur, since records show that sulphuric acid has, over the last three decades, contributed up to 75% of the measurable acidity of snow and rain.

The focus on sulphur has, until recently, obscured the role of other elements in the regulation of the long-term, acid-base status of precipitation, soil, and surface waters, as well as linkages between element cycles.

Even though the United States, Canada and European countries have reduced sulphur pollution considerably, forests, lakes, and streams have not recovered from the effects of acid rain as quickly as some scientists had predicted.

Current research points to the reason for this being that acid rain has brought about profound changes in the soil to which all these ecosystems are linked. Soils take many hundreds of years to develop, and if their chemistry is changed dramatically, it will take a very long time for them to recover. In the United States, after the enactment of amendments to the Clean Air Act in 1990, enforcing reductions on sulphur emissions, many scientists thought that the pH in streams and waterways would quickly return to normal. However, this has

not proved to be the case. While sulphur emissions have fallen since the 1970s so also have the levels of calcium and magnesium in soils; one theory is that the years of acid deposition have leached away much of the pool of available calcium in the soil. In the U.S. Forest Service's Hubbard Brook Experimental Forest in New Hampshire, it has been estimated that the pool of calcium in the soil has shrunk by more than 50% in the last 45 years.

Although rock weathering can be expected to replenish the pool of available calcium over a period of time, it is unlikely that stream chemistry will return to its preindustrial state until well into the 21st century.

Source: Science, Vol. 272, 12 April 1996.

Health Hazards in the Agricultural Work Environment

Studies indicate that the risk associated with developing respiratory disease appears to be more than three times greater among those who are heavily exposed to inhalable dust in the agricultural environment.

Agricultural workers encounter a variety of airborne organic dusts commonly containing 30-40 percent of particles in the respirable range. These include molds, pollens, and dusts generated in silos, barns, and grain elevators.

Organic dusts measured in enclosed settings such as dairy, poultry, and swine buildings are particularly biologically active. Along with suspended inorganic matter (primarily silicates), they contain plant material (feed and bedding), animal-derived particles (skin, hair, feathers, droppings, urine), bacteria and fungi, mites and other arthropods, insects and insect fragments, feed additives (including antibiotics), pesticides, and microbial toxins (including glucans from molds, fungal mycotoxins, and endotoxin, the lipopolysaccharide fraction of certain bacterial cell walls).

Acute responses to isolated exposures are commonly categorized under the term organic dust toxic syndrome (ODTS). This syndrome typically occurs in the presence of large amounts of airborne, organic dust. It is characterized by fever occurring 4-12 hours after exposure and flu-like symptoms such as general weakness, headache, chills, body aches and cough. Chest tightness and shortness of breath may also occur.

Chest examination usually reveals normal breathing sounds, although lung crackles and wheezing may be present. Chest X-rays are usually normal. Pulmonary function may be impaired, and an increase in the number of white blood cells (leukocytosis) is common. Circulating blood antibodies to the specific dust are usually not present. ODTS usually disappears within 24 hours to a few days following removal from the exposure. However, repeated ODTS episodes can occur after reexposure to the organic dust. An estimated 30-40% of workers exposed to organic dusts will develop ODTS. Grain fever, pulmonary mycotoxicosis, silo unloader's syndrome, inhalation fever, and

mill fever in cotton textile workers are all included under ODTS.

In cases of chronic response, there is a history of prior exposure, presence of serious antibodies to a particular dust, and the response in the lung is lymphocytic.

Farmer's lung disease (an immunologic lung response involving antibodies to the fungi found in moldy hay), mushroom worker's lung, bark stripper's disease, and allergic alveolitis are examples of chronic responses and are synonymous with hypersensitivity pneumonitis. Symptoms often become progressively worse with increasing exposure and may lead to chronic bronchitis, shortness of breath, loss of appetite, and severe reduction in lung volume and diffusing capacity (the volume of gases that move through lung tissue membranes). Five to eight percent of workers exposed to organic dusts develop hypersensitivity pneumonitis. Although it has been studied for more than 25 years, the precise pathological mechanism of hypersensitivity pneumonitis remains unknown.

In order to minimize health risks, prevention, ventilation, and avoidance of exposures appear to be key recommendations for workers facing occupational health risks from agricultural dusts. According to some authorities, primary prevention through dust control, though more readily applicable in some agricultural industries such as cotton, is difficult elsewhere. Dust presents a challenge because of its ubiquity.

In many situations there are steps that can effectively prevent dust generation. Some of the steps outlined for specific work practices include reducing levels of microorganisms in cut grasses to be used for feed or bedding via adequate drying in the field before baling, adding fat to the diet of animals in confinement facilities and using covered feed troughs filled through enclosed spouts to reduce ambient dust levels, capping

silage materials to reduce spoilage, and pouring a quart of water on the cut surface of a hay bale prior to use in a bedding chopper, which can reduce dust levels by 85%.

In terms of ventilation, National Institute of Occupational Safety and Health (NIOSH) recommends local exhaust ventilation for barns and confinement houses. *NIOSH Alert*, an agency publication, advises agricultural workers and employers on a number of practices aimed at minimizing risk of exposure to dust, including wearing respirators with the highest assigned protection factor. In accordance with the Occupational Safety and Health Administration (OSHA) respiratory protection standard, employers must train and monitor personnel in the use of respiratory protection equipment, as well as how to maintain, inspect, store, and clean it.

Cotton dust is the only specific agricultural dust that currently has an OSHA standard, although the main regulatory requirements apply only to regulated cotton industries and processes. Growing, harvesting, ginning, classing, warehousing, and knitting of cotton are not currently regulated. Handling and processing of woven or knitted cotton fabrics are also not regulated. Several different exposure limits ranging from 200 $\mu\text{g}/\text{m}^3$ to 750 $\mu\text{g}/\text{m}^3$ apply in textile mill operations. The cotton dust standard also requires medical examinations for new employees as well as periodic monitoring for all workers exposed to cotton dust. OSHA also has a standard for non-specific dusts: 15 $\mu\text{g}/\text{m}^3$ for total dust and 5 $\mu\text{g}/\text{m}^3$ for respirable dust.

The extent of risks associated with dust exposures needs to be refined. Specific agents within agricultural dusts that are responsible for toxic and immunologic responses remain in question, as do methods for quantifying these components. Research is also needed to elucidate susceptibilities to these exposures. And more work is needed in the area of education and intervention to develop sound strategies aimed at preventing acute and chronic respiratory symptoms for a widespread and varied population of agricultural workers.

Source: Abridged from *Environmental Health Perspectives*, Vol.104, No.1 January 1996.

WHO acts to curb promotion of tobacco use

Increasingly, women are the targets of marketing campaigns which entice them into tobacco use. In countries such as the United States of America and the United Kingdom, both of which have long histories of widespread female smoking, between 80 and 90 percent of all lung cancers are caused by smoking, and have surpassed breast cancer as the most common form of cancer death among women.

Globally, there are about half a million women killed by tobacco every year, but if current smoking patterns persist, this number will increase markedly over the next thirty to forty years. As the large number of young women who are currently smoking reach middle age, one in four of them can be expected to die as a result of smoking tobacco.

Both men and women who smoke face increased risks of developing one or more of the some two dozen diseases which are caused by smoking. Most of these diseases are incurable and fatal, for example various cancers, and lung and circulatory diseases.

Cigarette smoking is not the only tobacco problem faced by women. In many areas of the Indian subcontinent, the use of various forms of chewing tobacco is widespread among women. Chewing tobacco causes oral cancer, and Indian women have the highest rate of oral cancer among the female population of the world.

Smoking by pregnant women increases the risk of complications during pregnancy, low birthweight, miscarriage, stillbirths and crib death. Children whose mothers smoke face increased risks of delayed development, respiratory infections, middle ear infection, and among asthma sufferers, increased risk of asthma attacks. If their fathers smoke as well, these risks can be even higher.

In the light of the consequences for health associated with the use of tobacco and its derivatives, the World Health Organisation (WHO) introduced a bold measure to curb the promotion of tobacco use to mark World No Tobacco Day on 31 May 1996.

The measure aimed at ending the exploitation of sport and the arts to promote tobacco products.

Organizers of sports and cultural events are urged to make a commitment to undertake not to promote the use of tobacco and its derivatives in connection with sports and/or cultural activities.

Those who make this commitment and apply it in their work are authorized to use the logo of the "Tobacco or Health" programme of the WHO. The use of the official logo commits users not to receive a financial or other contribution from tobacco manufacturers in any form whatsoever and not to undertake any promotion for tobacco.

The WHO initiative endorses the work of all those committed to banning tobacco associations with sports and the arts.

The tactics of those promoting the health agenda can vary according to the nature of the players and the nature of the opposition to public health improvement. Past successes have shown the following example of winning tactics:

- ⇒ A Minister of Health who will make this issue a very high personal priority
- ⇒ Health organizations that make detailed arguments to governmental bodies concerning the reasons for, and methods of, banning tobacco associations with sports and the arts.
- ⇒ Health advocates who vigorously counter the actions of tobacco interests through news conferences, letters and per-

sonal visits to key politicians, use of advocacy advertising, exposing of tactics by tobacco interests, and any other measures deemed necessary to protect public health.

- ⇒ Cultural and sports personalities and organizations who show leadership by making a commitment not to promote the use of tobacco, but to promote healthy lifestyles instead.

There are many lessons which have been learned from all of these actions. For example, efforts to advance public health may require political confrontations that require health advocates to get involved in directly countering those who stand to gain from a strengthened tobacco presence. In many cases, a combined effort by a coalition of interested groups has been shown to accomplish more than these groups could have accomplished working individually. It is also important that health efforts not be sidetracked by tobacco interests' claims that the association between sponsorships and tobacco consumption must be clearly delineated, with standards of proof that are often unattainable, prior to any restrictions on the marketing of tobacco products. In reality, with so many lives being at stake and there being reasonable grounds to believe that positive associations with a product will promote its consumption, it is important for countries to act as quickly and comprehensively as possible to protect the health of their citizens.

Source: WHO World No-Tobacco Day release 31 May 1996.

Arsenic Contamination in Ron Phibun District of Southern Thailand

The first case of arsenical skin cancer in Ron Phibun District, Nakhon Si Thammarat, southern Thailand was recognized in August 1987. Then 8 other people in the same family were also found to have developed skin cancer from the same cause. Arsenic concentration in well water used by the family was detected as 2.47 parts per million (ppm), far exceeding the acceptable 0.05 ppm. And tests of natural and well water in Ron Phibun showed arsenic levels of 9 ppm, that is 180 times higher than the acceptable level set by the Thai Ministry of Public Health, or 900 times higher than a normal standard level (0.01 ppm) by the World Health Organization.

Ron Phibun District is typical of much of the Main Range Tin Belt of southern Thailand with respect to geology, metallogenesis, and mining history, thus the wide occurrence of mining arsenic contamination is probable. The potential sources of arsenic contamination as waste-piles in this bedrock and alluvial-mining are typically rich in arsenopyrite and related alteration products with cumulative volume of approximately 2,000 m³.

In 1994, a collaborative program involving the Department of Mineral Resources (DMR) Thailand, and the British Geological Survey (BGS) was established to investigate the spatial distribution, geochemical form, and inherent toxicity of arsenic in surface drainage and aquifer systems, the principal sources of arsenic and the potential for contaminant mitigation. This preliminary study confirmed a serious health hazard in this area, with detected concentrations of dissolved arsenic in surface (in the range of 4.8-583 µg/l) and groundwaters (1.25-5,114 µg/l in shallow and 1.25-1,032 µg/l in deep groundwaters) exceeding WHO potable water guidelines (10 µg/l) by up to a factor of >500.

Symptoms of arsenism (principally skin lesions and cancer) were reported in many previous studies to affect >50% of exposed subjects at arsenic concentrations of 4-6 mg/l (equating to an average adult ingestion of 110-170 µg/kg/day).

A recent study indicated the contamination of shallow alluvial groundwater to be systemically more severe than the deep carbonate-hosted groundwater; therefore deep boreholes may provide the best available potable water source for the local population.

Since the recognition of health hazards related to arsenic-contaminated water supplies in Ron Phibun District, efforts have been made to reduce exposure through improving public awareness, coupled with the provision of alternative supplies. But recent surveys have confirmed that many inhabitants continue to utilize shallow wells as these tend to be most conveniently located.

Geological methods for restricting the arsenic flux into the hydrosphere are currently under development. The data acquired to date suggest that contamination cannot easily be ascribed to discrete point sources and that conventional mine-water treatment through regulation of the pH regime is inappropriate. Instead, physical removal and containment of arsenic-rich mineral processing wastes, coupled with biotic or chemical treatment of disseminated contaminant reservoirs (including catchment alluvium), is favored.

Source: Environmental Geology (1996) 27.

Studies of Possible Beneficial Effects of Nicotine and Cigarette Smoking

Cigarette smoking is an established risk factor for cancer and cardiovascular disease, and is the leading cause of avoidable disease in most industrialized countries. Less well-known are possible beneficial effects.

Preliminary data suggest that there may be inverse associations of smoking with uterine fibroids and endometriosis, and protective effects

on hypertensive disorders and vomiting of pregnancy are likely. Smoking

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Studies of Possible Beneficial Effects of Nicotine and Cigarette Smoking

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has consistently been found to be inversely related to the risk of endometrial cancer, but cancers of the breast and colon seem unrelated to smoking. Inverse associations with venous thrombosis and fatality after myocardial infarction are probably not causal, but indications of benefits with regard to recurrent aphthous ulcers, ulcerative colitis, and control of body weight may well reflect a genuine benefit. Evidence is growing that cigarette smoking and nicotine may prevent or ameliorate Parkinson's disease, and could do so in Alzheimer's dementia. A variety of mechanisms for potentially beneficial effects of smoking have been proposed, but three predominate: the "anti-estrogenic effect" of smoking; alterations in prostaglandin production; and stimulation of nicotinic cholinergic receptors in the central nervous system.

Several of the proposed beneficial effects involve disorders that are

associated with estrogen-excess (endometrial cancer, uterine fibroids, endometriosis, fibrocystic breast disease). The anti-estrogenic effect is itself unexplained, but may involve induced changes in the metabolism of estrogens, direct toxic effects on ovarian follicles, or interference with pituitary regulation of sex hormone systems. A second group of possible benefits involves the effects of smoking on central nervous system neurotransmitter systems. These effects could plausibly explain associations of smoking with Parkinson's disease, Alzheimer's dementia, and mental functioning. Third, there are clear indications that smoking can alter prostaglandin pathways, and suppress at least some aspects of immunological functioning. These effects could underlie the associations of smoking with ulcerative colitis, farmers' lung and hypertensive disorders of pregnancy.

These benefits are not without

their costs, however. The antiestrogenic effect of smoking may at least partially explain the association of smoking with an increased risk of osteoporotic fractures and the central nervous system effects of nicotine clearly underlie tobacco dependence. Inhibition of prostaglandin synthesis is thought to play a role in the effects of smoking on vascular disease.

These associations can hardly be used to justify cigarette smoking; its adverse effects are simply too overwhelming. However, these data do provide insight into the mechanisms of several diseases, and suggest avenues for treatments and preventive measures that are likely to be far safer than cigarette smoking.

Source: British Medical Bulletin 1996; 52 (No. 1).

Self-regulation in Environmental Management Standards

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interest in the standards and in the possibilities they offer in terms of tracking companies' activities more easily and streamlining some regulatory activities.

One area of concern is the certification provision: companies can simply declare to regulators and customers that they conform to the ISO 14000 standards without undergoing external review. A second option is to have a third-party or outside consultant audit a facility for ISO conformance and grant a formal certifi-

cate. The trustworthiness of third-party firms that inspect and certify facilities is a major issue in the United States. EPA is particularly concerned about the certification audit.

Before signaling how it will proceed, the agency is awaiting final results of a series of regulatory pilot projects that incorporate the standards.

Source: Environmental Science & Technology, Vol. 30, No. 7, 1996.

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