

Energy Saving Bulbs: An Emerging Threat to Public Health, from Mercury Contamination of the Environment.

Type of Article: Review

Best Ordinioha

Department of Preventive and Social Medicine, Faculty of Clinical Sciences College of Health Sciences, University of Port Harcourt, Port Harcourt, Rivers State, Nigeria.

SUMMARY

Energy saving bulbs are promoted for their efficiency and capacity to reduce the emission of greenhouse gases, the acknowledged cause of global warming and climate change. They however contain varying quantity of mercury that can easily contaminate the environment. Mercury is a neuro-toxin, but damages have also been reported in the kidney, skin and the cardiovascular system. There is therefore an urgent need to emphasize the safe disposal of the energy-saving bulbs as their use increase in Nigeria. Recycling programme should be institutionalized, with the active participation of the manufacturers and importers of the bulbs; while education programme should be mounted on the handling and safe disposal of broken bulbs.

INTRODUCTION

Energy saving bulbs are being promoted the world over, for their efficiency and capacity to reduce the emission of greenhouse gases, the acknowledged cause of global warming and climate change¹. It is estimated that the change from the conventional incandescent light bulbs, to the energy saving fluorescent bulbs would result in a reduction of 376kw/hr of electricity during the lifetime of each bulb, and a 75% decrease in the emission of greenhouse gases¹. In Nigeria, the use of the energy saving bulbs is further promoted, as one of the ways of solving the country's energy deficit, as the electricity consumed by the usual 60watts incandescent bulb is enough to light up at least four energy saving bulbs, of the same illumination¹. This is significant, considering that most of the

electricity consumed in Nigerian households is for illumination.

But, energy saving bulbs and all fluorescent bulbs contain varying quantity of mercury that can easily contaminate the environment, when the bulbs are not recycled. Each energy saving bulb contains at least 4mg of mercury in the glass tube, while the older fluorescent tubes contain significantly higher quantity of about 50mg of mercury².

The contamination of the environment with mercury

The mercury content of these light bulbs is in powdered form, and is easily dispersed in the environment, when the glass tubes are broken. The mercury from the bulbs easily changes into various forms, circulating endlessly in the biosphere, without losing its toxicity. It can dissolve in water, assume a gaseous state, or become methylated in a living organism, to be converted to methylmercury that is almost completely absorbed when ingested; but does not decompose, or become less harmful in its various forms, because it is a natural element³. Burnout and broken light bulbs are commonly disposed in the various unofficial dumpsites in Nigeria, where they can easily contaminate the ground water⁴. These unofficial dumpsites have been found to cause the contamination of ground water, with heavy metals, several times higher than the regulatory limits⁵. This is likely to happen with mercury, if the use of energy saving bulbs increase, and their indiscriminate disposal persists.

The disposal of the bulbs in the riverine communities of Nigeria is into the surface water bodies that often serve as a source of drinking water, to members of the communities. This

exposes members of these communities to mercury, and provides the opportunity for the bio-accumulation of mercury in fish and other aquatic organisms in the surface water. Fish and shell fish are known to bio-accumulate mercury, to several times the concentration of the water, in which they live, and is often enough to cause widespread poisoning, as was noted in the Minamata bay in Japan⁶. Big, carnivorous fish like shark and sword fish, preferred by affluent Nigerians are known to contain particularly high levels of mercury, such that the United States Food and Drug Administration had to advise that pregnant women and women of childbearing age who may become pregnant, should limit their consumption of these fish to no more than one meal per month, to protect the foetus³.

The health hazard of mercury

Mercury is a neuro-toxin, but damages have also been reported in the kidney, skin and the cardiovascular system. The Minamata disease presented mostly with neurological symptoms that include prickling, tingling sensation in the extremities (paresthesia); impaired peripheral vision, hearing, taste, and smell; slurred speech; unsteadiness of gait and limbs; muscle weakness; irritability; memory loss; depression; and sleeping difficulties^{3,6}. Renal damage occurs because mercury bio-accumulates in the kidneys, and often manifests as frank proteinuria, hematuria, and/or oliguria; and could result in acute renal failure, with degeneration or necrosis of the proximal convoluted tubules⁷. Dermal manifestations include erythematous and pruritic skin rashes, heavy perspiration and reddened and/or the peeling of the skin on the palms of the hands and soles of the feet; while the effects on the cardiovascular system include increase in heart rate, characterized by sinus tachycardia, and increased blood pressure³. Children and the unborn child are at special risk, because of the ease with which methylmercury crosses into the developing brain, the tendency of the foetus to bio-accumulate mercury, and the effects of mercury on the developing nervous system. Blood levels of mercury in the foetus have been found to be several times those of the maternal blood, and have been associated with small

decrease in IQ, in low exposures; and delayed developmental milestones, brain damage with mental retardation, incoordination, and inability to move, in higher exposures³.

Recommendations for action

The contamination of the environment with mercury, by the energy saving bulbs can be prevented with proper disposal, especially the recycling of burnout bulbs, and the proper handling of broken bulbs^{1, 2}. Recycling programme is well institutionalized in the developed countries, with the active participation of the manufacturers and importers of the bulbs^{1, 2}. Under the Extended Producer Responsibility policy, manufacturers and/or importers are charged advance fees to fund the safe disposal of the product, or required by law to run their own safe disposal or recycling programme². This means that the responsibility of the manufacturers and importers of the bulbs, do not end with the sale, but extends to the safe disposal of the bulbs. Nigerian government should therefore ensure that manufacturers and importers of the bulbs have a recycling programme, before they are given the license to sell the bulbs, to the general public. This same regulation should also be extended to products such as mercury thermometers and sphygmomanometers that are known to contain significant quantities of mercury.

Broken bulbs should not just be gathered and dumped into a refuse bin; it is a hazardous waste that requires special handling, to prevent direct inhalation, and the contamination of the environment. The United States Environmental Protection Agency advises that the room in which the bulb was broken, should be evacuated of persons and pet, and air out for at least five minutes; and then, no effort should be spared in collecting all the pieces of the broken glass tube and every visible powder, using stiff paper or cardboard, sticky tape and damp paper towels or disposable wet wipes. It is also advised that all the bulb debris and the materials used in the cleanup should be placed in a sealable plastic bag, and deposited in a special refuse bin, for collection and final disposal in designated sanitary landfill⁸. This reflects the care taken to

avoid the contamination of the environment with mercury, in developed countries.

REFERENCES

1. Energy Star. Frequently Asked Questions Information on Compact Fluorescent Light Bulbs (CFLs) and Mercury. November, 2010. Accessed from the website: <http://www.energystar.gov/cfls>, on 15th August, 2012.
2. United Nations Environment Programme. Mercury in products and wastes. Geneva. UNEP.2008
3. Agency for Toxic Substances and Disease Registry (ATSDR). Toxicological profile for mercury. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service. 1999.
4. Ordinioha B, Sawyer W. Solid waste management in some oil bearing communities in Rivers State, south-south Nigeria: Implications to community health. Port Harcourt Medical Journal 2012; 6: 251-25
5. Leton TG, Omotosho O. Landfill operations in the Niger delta region of Nigeria. Engineering Geology 2004; 73: 171-177.
6. Kutsuna M, ed. Minamata disease: Study group of Minamata disease. Japan: