

HAZARDOUS WASTES IN ZAMBIAN HOUSEHOLDS: A PILOT STUDY

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Prepared for:
Wildlife and Environmental Conservation Society of Zambia



USAID, Africa Bureau, Office of Sustainable Development, Division of Human Resources and Democracy, Education Team



Through:
The GreenCom Project

GreenCOM
Environmental Education and Communication Project

Academy for Educational Development

September 1999

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Acknowledgments

This study would not have been possible without the advice, guidance, and assistance of Brad Strickland, Ph.D., of USAID's Africa Bureau, and Mwape Sichilongo, Ernest Chingaibe, and Boyd Pinyolo of the Chongololo Clubs, Lusaka. I am particularly indebted to the last three people for organizing the focus groups and facilitating the bilingual meetings.

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INTRODUCTION

In 1998, the Environmental Council of Zambia (ECZ), as part of its activities for the Basel Convention on Transborder Handling of Hazardous Wastes, asked the Wildlife and Environmental Conservation Society of Zambia (Wildlife Society) to begin thinking about how it would conduct an education campaign about toxic wastes and hazardous substances for young children through their primary school-based Chongololo clubs. Also in 1998, USAID's Africa Bureau's Education Team was working with the GreenCom project and the Wildlife Society on a study of the success of Chongololo clubs in delivery of school-based environmental education and its impact on communities. The Africa Bureau and the Wildlife Society then began exploring ideas for integrating education on toxic substances into Chongololo club activities. The areas for further exploration were narrowed to: (1) hazardous substances in the home environment; (2) substances that especially affect the health and cognitive development of children; and (3) substances that families and children could easily do something about.

The Africa Bureau arranged for the GreenCom project to provide a specialist in toxic substances and child health in Africa to provide technical assistance to the Wildlife Society. (The specialist was identified in conjunction with USAID Global Bureau's Environmental Health unit). In August 1999, the specialist conducted a pilot study with Chongololo clubs that would serve as the basis for production of their educational materials, i.e., magazines, posters, and a radio program. Chongololo clubs also planned to make the report and subsequent materials available to other environmental education programs in Africa via the Internet.

This report is the result of that pilot study on hazardous household products (HHPs) in Zambia.

RATIONALE FOR THE PILOT STUDY AND CHONGOLOLO CLUB EDUCATIONAL ACTIVITIES ON HHPs

Why should anybody be concerned about hazardous household products (HHPs) in Zambia, considering the more serious public health problems in the country, including high infant mortality, malnutrition, AIDS, malaria, and kindred communicable diseases? What priority should be given and how much of the very limited resources should be devoted to health risks from HHPs? Do the risks represent more than a ripple in an ocean of life-threatening diseases? These are important questions for government agencies involved in health care delivery in most African countries. All too often, funding agencies put their money exclusively on endemic killer diseases and ignore the so-called chronic environmental health problems.

There are cogent reasons why some attention needs to be given to HHPs in any national public health program that advocates disease prevention. First, exposure to HHPs is a readily controllable health risk—it is by far easier to control the poisoning of young women with mercury in soap than to find a local cure for AIDS. Moreover, any toxic substances in HHPs tend to exacerbate the severity of the endemic communicable diseases and vice versa. For instance, both lead poisoning and malaria affect the immune system, which can lead to synergism when the two diseases co-occur. Third, the health effects of exposure to HHPs are very insidious (including teratogenesis, mutagenesis, neurotoxicosis, and carcinogenesis), may take a long time to manifest, and thus may jeopardize the future wellbeing of a population. Recent studies have linked exposure to HHPs to endocrine disruption and decreased fertility, a serious threat to the health of both unborn and future generations. For these reasons, this report advocates a comprehensive approach to primary health care that includes all risk factors, including those due to HHPs. While high priority must still be given to the endemic killer diseases, an all-out effort to beat the endemic diseases before tackling the HHPs appears short-sighted. Experience from the developed countries shows that programs that protect people from exposure to carcinogens, neurotoxins, and teratogens in household products often result in significant improvements in citizens' health and a reduction in health care costs (Steinman and Epstein 1995).

Zambia is not the only African country confronting problems with toxic wastes and HHPs. As African economies are increasingly integrated into the global economy, local markets and homes are often flooded with dangerous imported household goods as well as industrial wastes. While data is difficult to obtain on rates of child exposure to toxins in any country, it is especially difficult to obtain in Africa, where meager health resources are focused on prevention and treatment of infectious diseases. However, what little information we have strongly supports the need to undertake pilot studies to assess local patterns of consumption and handling of these products in the home. The more we learn about the health and developmental risks to African children from common toxins, the more clear it is that we need to take steps to educate children, adolescents, and parents on careful handling and disposal of dangerous substances.

Some people would say that many African countries cannot afford a national program on HHPs. I contend, however, that in Zambia the costs of household products should not be affected significantly by a meaningful program to minimize their exposure risks. Most HHPs are imported from countries where there are requirements for consumer right-to-know labeling, and importers should be encouraged to insist on appropriate labels on goods they bring into the country. Products with the most toxic ingredients are often made exclusively for African markets, and manufacturers should be required to make their products conform to the safety regulations in their home countries. If Zambian businesses are not exposing people to toxic chemicals, complying with the right-to-know labeling or similar warning will not cost anything, as they will not need to put any warning on their products. Studies in other countries show that the cost of adding health warnings to a product label is often small. After all, companies often change their product labels whenever they create a new advertising slogan. (However, studies in other countries do allow that consumers are likely to shun toxic products if they are made aware of the risks to themselves and their children.)

It needs to be stressed that there will always be differences in scientific opinion regarding the risks and health effects of exposure to common household hazardous products. In this report, I have leaned on the side of caution—especially since history shows that what scientists do not know can harm you, and we have little or no information on human toxicity for many of the chemicals in our household products. It is indeed wise advice that prevention is better than cure. In the current global economy, products with known and unknown toxic substances are flooding the Zambian market from foreign countries. As the Zambian economy and technology grow, a wider variety of toxic chemicals will be employed in commercial production of goods, and more people will be able to afford to buy HHPs. As HHPs must be regarded as a threat to the health of the Zambian population, and this risk will likely get worse unless some form of intervention program is implemented, this project conceived by ECZ and the Wildlife Society is a forward-looking step in the right direction.

PUBLIC HEALTH PERSPECTIVES

That food and consumer products contain ingredients and contaminants that pose hidden long term health hazards is a worldwide public health problem. Since 1965, more than 4 million new chemicals have been reported in the scientific literature and 70,000 of these are now in commercial production. Many are found in the myriad household products including cleaners, polishers, glues, paints, cosmetics, pesticides, deodorizers, and personal care products. Most of the chemicals in household products pose little or no hazard to the consumer. Others, however, are not so benign. Recent studies leave no doubt that toxic ingredients in common household products present a real and immediate danger, especially to children. In 1990, more than 4,000 infants under age 4 were admitted to hospital emergency rooms in the United States due to poisoning by household cleaners. In that same year, nearly 18,000 pesticide-related hospital emergency room admissions were reported, 74 percent of which were children under age 14 (Steinman and Epstein 1995). A four- to seven-fold increase in risk of leukemia has been reported among children whose parents use pesticides in the home. About 4 percent of leukemia and non-Hodgkin's lymphoma cases in the U.S. general population may be associated with exposure to hair color products. Other experts put the proportion of non-Hodgkin's lymphoma cases among women, in particular, attributable to use of hair dyes at about 20 percent. A recent survey suggests that 15 percent of the American population suffers from multiple chemical sensitivity due to increased proliferation of synthetic chemicals in HHPs (Steinman and Epstein 1995). One would expect the prevalence rates for these health effects to be much higher in the developing countries where the use of toxic substances in household products is less regulated.

Cosmetic and beauty products are poorly regulated in most countries and are among the most hazardous household products on the market. In 1990, there were over 38,000 cosmetics-related injuries in the United States that required medical treatment (CPSC 1990). This number does not include the many cases of allergic reactions and irritation that most people consider to be normal cost of grooming. About 20 percent of all non-Hodgkin's lymphoma cases in U.S. women have been attributed to the use of hair-coloring products (Zahm et al. 1992). Other health effects of cosmetic and personal care products range from acute toxicity to allergic reactions, sensitization, irritation, and cancer (Adams and Mailbach 1985). It is estimated that up to 2 million people in the United States suffer cosmetic-related contact dermatitis of various natures (Nader 1974). This figure probably is a gross underestimate, since many consumers often fail to link adverse reactions to topical applications of cosmetics or beauty products.

Most countries have consumer protection laws that include the consumers' right to know what ingredients are in the products they use daily, and to be assured that chemicals posing the highest health risks are phased out as alternatives become available. There is apparently no law in Zambia requiring local manufacturers or producers to disclose the toxic ingredients in their products. Zambians, therefore, receive little information or guidance about the toxic ingredients in their household products, and are, essentially, shopping in the dark. For many imported goods, the label disclosure is often misleading and not an objective source of information. Although there is a registry program for

production and importation of toxic chemicals in Zambia, companies are not required to disclose how much of the toxic materials are used for household products, or the concentration of the toxic ingredient in their products. In most developed countries, consumer products or foods that contain ingredients or contaminants that increase the risk of cancer, nervous system damage, or birth defects are labeled as such and removed from the marketplace when safer alternatives become available. By contrast, many governments and companies in Africa have yet to accept that there exists a basic and essential consumer right to be informed by full label disclosure of toxic chemicals contained in consumer products or applied to foods, nor the need for proper legislative mandate to limit the use of such substances. This inaction has left consumers uninformed and at-risk.

HOW THE INFORMATION WAS OBTAINED

Gathering information on household products in Zambia is not easy under normal circumstances, and was extremely so in this case, because the survey had to be completed in a short period of time. The strategy I adopted was to prepare a list of chemicals commonly used in HHPs and known to be hazardous (Appendix). The intention was to visit as many stores in Lusaka (and surrounding areas) as possible to identify these chemicals in products sold locally. Whether the HHPs were sold in markets in the city and/or in the supermarkets was also of interest. During the process, chemicals that were not on the original list were also identified as much as possible.

I linked up with Dr. Brad Strickland of USAID's Africa Bureau's Office of Sustainable Development (AFR/SD) in Lusaka, and we met with the executive director (Mwape Sichilongo) and education director (Ernest Mwembe) of Chongololo club in August 1999 to develop an action plan. We met with ECZ staff, who briefed us on current restrictions on toxic substances, labeling laws in Zambia, and various aspects of enforcement. The research plan consisted of visits to major nonformal markets and shops to inventory the most widely available HHPs to which children and families might be regularly exposed. We worked out the logistics for focus groups with parents and children in three different environments to assess current knowledge of HHPs and obtain feedback as to what they are exposed to. The three environments for the focus groups were an urban low-income compound, a semirural village, and a group of school teachers who were Chongololo club leaders in schools around Lusaka. The team also interviewed a variety of individual civil servants, shopkeepers and nonformal marketers, parents, and children to further assess levels of awareness and interest.

Focus Groups

Focus groups were used to (1) explore current knowledge about HHPs in urban and periurban areas; (2) gather information about the use or misuse of HHPs; and (3) ascertain whether the community was aware of health effects associated with exposure to HHPs. Three focus groups were held: in Bauleni Compound (ten women, five men, and four adolescents), Chipapa Village Women's Group (thirteen women) and Matero Boys School (sixteen male and female teachers). The first two meetings were conducted in Chinyanja using a local facilitator and the third, with teachers, was conducted in English.

Each session began with a general discussion of what is a "toxic" substance, since there is no equivalent word in the local language. The group was then shown different brands of mercury-containing soaps and asked whether they knew what the soap was used for, whether they had used the product, and if so, how often, whether they had family members who used such soaps, whether they knew of people outside their immediate family who used the soaps, and whether they were aware of people who were made sick by the soap, etc. The group was then told that the soap contained mercury as the active ingredient, that mercury could be absorbed through the skin, and what were some of the possible health effects of using the soap over a long period of time. Similar questions and discussions were then extended to other products including skin lightening creams and potions, hair colorants, insecticide spray cans, rat poison, flypaper, dry cell batteries,

brake fluid, moth balls, etc. At the end, the group was asked to describe other toxic products in their homes. Meetings lasted about two hours, and each participant was rewarded with a bottle of soft drink and some cookies.

This study's methodology has a number of shortcomings. Most products made in Zambia do not disclose the active ingredients on labels, which makes it impossible to assess their health hazard. Thus, we had to assume that the basic ingredients in Zambian products are similar to those imported from neighboring South Africa and Zimbabwe, especially when they are made by the same multinational company. Even where the active ingredients are shown on the label, the industry provides no information on their health hazard. In some cases, the active ingredient is given as a trade name and no attempt is made to include its chemical name. It is conceivable that the products displayed in the stores and markets that I visited are not representative of what is sold throughout the country. It should, however, be pointed out that most of the HHPs are made by relatively few companies under brand names that are pervasive throughout Lusaka. Irrespective of these shortcomings, the study does show that HHPs are rampant in the Zambian marketplace and that the risk of exposure to these toxic ingredients is relatively high.

KEY FINDINGS

A *toxic* or *poisonous* compound is capable of causing injury or death through ingestion, inhalation, or skin adsorption. *Corrosive compounds* can eat away materials and living tissue by chemical action. *Reactive compounds* react with air, water, and other substances resulting in explosions or generation of toxic fumes. According to internationally accepted protocols, a *hazardous product* carries one or more of the following signs:

- *Poison*: means highly toxic; toxicity is primary hazard
- *Danger*: means extremely corrosive, flammable, reactive or highly toxic
- *Warning* or *Caution*: appears on all other hazardous substances

During the study, it was possible in many cases to identify a hazardous product by reading its label. In some cases, especially with locally made products, the active ingredients were not indicated on the label.

A synoptic survey of labels on consumer goods clearly shows that Zambians are exposed to a wide variety of substances that fall within each hazard category. Examples of toxic or poisonous household products in Zambia include brake fluid, brass polish, fungicides, insecticides, fertilizers, rat and mouse poisons, cleaning fluids and medicines, medicated and skin lightening soaps, and bleaching creams. Examples of corrosive compounds on the local market included oven cleaners, drain and toilet cleaners, chlorine bleach cleaners, scouring powders, car batteries, and silver polish. Common local examples include chlorine-containing products (bleaches and oven cleaners) that can produce toxic products in reaction with ammonia. Examples of flammable household products are paint, solvents, oil, grease, gasoline, while examples of explosive products include aerosol spray cans and propane cylinders.

We were able to identify with minimum effort well over 100 toxic compounds in common household products sold in the country (see Appendix). The total number of toxic compounds to which local consumers are exposed could be many times higher, and the human toxicity of some of the compounds is still unknown. A list of the most toxic ingredients in antiseptic soaps (Table 1), bleaching creams and skin toners (Table 2), hair products (Table 3), common pesticides (Table 4) and cleansers (Table 5) are provided in this report.

Table 1: Common antiseptic soaps sold in Zambia showing the active (toxic) ingredients

Brand	Maker/Importer	Active
Top germicidal soap	Le Savon, Spain	2% Mercuric iodide; 75 g
Round Top germicidal soap	Le Savon, Spain	2% mercuric iodide; 100 g
Mekako rond antiseptic	Anglo Fabrics (Bolton) Ltd	2% mercuric iodide; 100 g
Princess antiseptic soap	Not indicated	2% mercuric iodide; 100 g
Rico germicidal soap	Rico Skin Care Ltd, Egham, U.K.	Mercuric iodide (amount not indicated); 75 g
Jaribu Gold Kwanza	Anglo Fabrics (Bolton) Ltd	2% mercuric iodide; 70.9 g
Movate germicidal soap	Esapharma, Melzo (Milan), Italy	2% mercuric iodide; 100 g
Dermo germicidal soap	Not indicated	2% mercuric iodide; 75 g
Miki germicidal soap	C&C International Ltd, U.K.	2% mercuric iodide; 75 g

Table 2: Widely used bleaching creams and skin toners showing the most active (toxic) ingredients

Brand	Maker/Importer	Active Ingredients/Composition
Movate	Esapharma, Melzo (Milan), Italy	Globetasol proprionate; 30g
Diproskin	Verdhman Exports, Ghatkopar (W), Mumbai, India	Betamethasone dipropionate (0.05%), chlorocresol
Diprosone	Verdhman Exports, Mumbai, India	Betamethasone dipropionate
Peau Riche bleaching body lotion	GDK-CI, Abidjan	Stearic acid, dihydroxy-1-4-benzene (2%)
Princess medicated beauty cream	Not indicated	Hydroquinone
Clear Riche	GDK-CI, Abidjan	Hydroquinone
Clear Essence medicated fade cream	Bluefield Associates Inc., Ontario, California	Hydroquinone (2%)
Skin Light Cream	Rodis, Abidjan	Hydroquinone (0.1%)
Betnovate skin cream	Glaxo, India	Betamethasone (0.1%), chlorocresol
Topsone gel	Milan	Betamethasone dipropionate (0.05%)
Superlemon complexion cream	Italy	Hydroquinone
Yesako dermatological crème de beauté	U.K.	Hydroquinone (2%)
Rico Complexion Cream	U.K.	Hydroquinone (2%)
Clere Lemon Fresh	U.K.	Hydroquinone (2%)
IKB	U.K.	Hydroquinone (2%)
Malaika crème de beauté	Not shown	Hydroquinone (2%)
Amira skin lightener cream	U.K.	Hydroquinone (2%)
Jaribu dermal cream	U.K.	Hydroquinone (2%)
Tura-Gel		Fluocinonide (0.05g)
Amira C	U.K.	Clobetasol proprionate (0.05%)
Kiss medicated dermal cream	U.K.	Hydroquinone (2%)
Miki skin lightening cream	U.K.	Hydroquinone (2%)
Dear Heart beauty cream	South Africa	Hydroquinone
Mekako skin lightener	U.K.	Hydroquinone (2%)
Movate Cream	Isapharma, Italy	Clobetasol proprionate (0.05%)
Extra Clair	Not shown	Hydroquinone (2%)

Table 3: Hair products showing active ingredients

Brand	Maker/Importer	Active Ingredients /Composition
Elite hair shampoo	International Chemicals, Lusaka, Zambia	No ingredients on label
Choice Egg Shampoo	Colgate Palmolive, Zambia	
Inecto super black	Rapidol Ltd, Pinetown, S. Africa	Paraphenylene diamine
ZPII treatment shampoo	Revlon	Zinc pyrithione

Table 4: Active ingredients in common pesticides sold in Zambia

Brand	Maker/Importer	Active Ingredients/Composition
Target flying insect killer	Richett & Coleman	Tetramethrin (pyrethroid), 3.15 g/kg; d'Allethrin (pyrethroid), 1.35 g/kg; phenothrin (pyrethroid) 0.9 g/kg
Target Odourless	Richett & Coleman	Bioallethrin 2.4 g/kg; bioresmethrin, 0.46 g/kg
Baygon	Bayer, Germany	Piperonyl butoxide (1%); dichlorvos (1%), tetramethrin (0.2%)
Doom multi-purpose spray	CGP Holdings Ltd, S. Africa	Propoxur (1%), d'phenithrin (0.065%); tetramethrin (0.15%); piperonyl butoxide (0.6%)
Teepool	Universal Household Liquid Detergents, Cutline Ltd, Zambia	No ingredients indicated
Power spray	Mac Med, Zambia	D.D.V.P. (1%), neopynamin (0.1%), piperonyl butoxide (0.25%)
Dyant ant killer		Pyrethrins (0.15%), D-phenothrin (0.1%)
Rattex (rat poison)	Robertson Homecare Ltd, Durban, S. Africa	Difethiolone (0.0025%)

The finding of such a wide array of HHPs was startling, as were some of the unexpected uses for highly toxic substances (such as the black powder in batteries that contains cadmium and nickel salts). Availability and household use of hazardous substances was common and includes such things as cadmium-nickel battery powder, automotive brake fluid, mercury based skin-bleaching soaps, hydroquinone skin-bleaching creams, benzene-based creams, household insecticide sprays, auto batteries, diesel fuel, and lead-based petrol. Many of these substances are an integral part of daily subsistence life of Zambians, and are hazardous to the population. Exposure to most of these HHPs can be reduced with public education and minor changes in behavior. Focus group and individual interviews, however, found that awareness of the health effects associated with

exposure to these substances was very poor. And awareness of ways to handle or dispose of these substances was even lower.

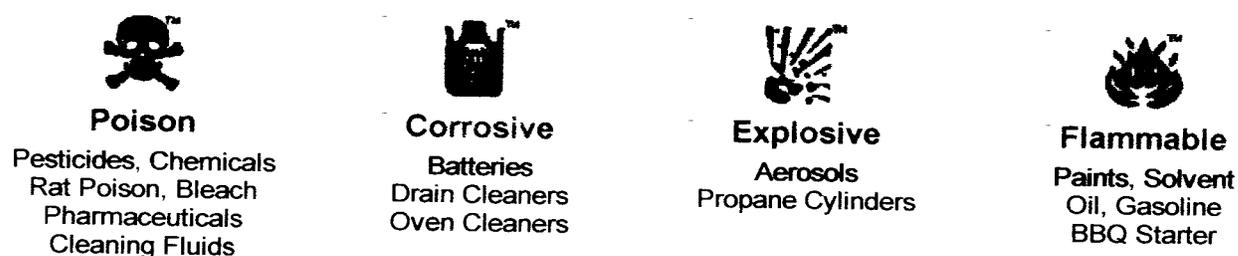
Some of the hazardous substances, such as the mercurial soaps and hydroquinone creams, are illegal in Europe, but manufacturers continue to produce them for African markets. Low level mercury exposure results in neurological damage. Children are even more sensitive than adults, and exposure can lead to nonreversible learning disabilities or worse (see vignette below). In fact, Zambia's Food and Drug Authority of the Ministry of Health banned the sale of mercury-containing soaps in the 1980s when they were seldom available. Now that importation of goods has reached new heights in Zambia, the soaps and creams have become widely available, but no one is reminding shopkeepers or buyers of the products that they are illegal, pose a threat to human health, and contaminate the local environment.

An inadvertent and rather usual pathway for exposure to cadmium and nickel is a game nearly universally known to Zambian children which is called *Kila*, which involves smashing one dry-cell battery at another stationary battery. Children explain that the objective is to knock the stationary battery with force. The child who breaks the stationary battery open is crowned the champion. In their enterprising ways, some people purposefully break the batteries open to obtain the black powder that they put to such uses as shoe polish, a coloring for floor finishing, and sometimes to polish black boards at school. The number of people exposed to cadmium and nickel from such enterprising uses of battery contents is unknown.

At every one of our focus groups someone knew of a child who had either gone into a coma or died from ingesting the cadmium-nickel powder. Information about the cause of these incidents, however, did not reach beyond immediate family members to the rest of the participants of the focus group. In spite of knowing the dangers of cadmium poisoning, few focus group participants knew of effective ways to dispose of batteries to prevent inadvertent contact with children. In every focus group, parents were extremely interested and excited to have access to information on the toxicity of these substances. All indications were that a simple education campaign on the handling of these common HHPs will be well received and used effectively by parents and communities.

FOCUS GROUP OBSERVATIONS

The transliteration of the words, *toxic*, *hazardous* and *poisonous* into Chinyanja and other local languages within the context of household products represents a barrier in communicating the potential risks to many people. This observation raises the issue of appropriate disclosure labeling that can best serve the interest of the Zambian consumer. Currently, most of the labels give the ingredients in English with occasional recommendation that the product may be dangerous. These labels are probably meaningless to most people in the country, and in fact most focus group participants professed that they had never read the labels on household products. One way to overcome the language barrier would be to use simple signs to indicate danger. The following signs are used internationally and can be modified for the Zambia public.



It would be easier to educate the consumer to recognize these signs rather than read fine-printed hazardous ingredients on the product label.

Most focus group participants showed a high level of awareness of the HHPs that were discussed—they had either used the products themselves or knew someone who had used them. The high price (since most of the products were imported) was a factor that was limiting even more widespread use of the HHPs. Knowledge of how to handle or dispose of the HHPs was very limited among all focus groups, however.

There were numerous anecdotal reports of people who had been made sick by the various HHPs—including cancerous skins from use of bleaching soaps and creams, dizziness after insecticide spraying, acid burns from lead acid batteries and infant death from swallowing of the contents of dry cell battery. The numerous reports point to the fact a substantial fraction of the Zambian public is well aware that household products represent an important health hazard in the country.

Specific comments and observations from the focus groups are summarized below.

Medicated Soaps and Bleaching Creams

- Some female participants had used the products because they were freely and widely available
- Every participant knew of somebody (including relatives) that use these products
- Young women use them most commonly; the number of young men supposed to have used them was believed to be small

- Many women use mixtures of soaps and creams to increase the skin bleaching potency
- Some women make pastes of the soaps that they apply and leave on their faces overnight to increase penetration into the skin
- Some women were encouraged to use them because they were imported from Europe and, therefore, believed them to be safe
- Some people believed that the toxicity of the products could be reduced with lemon juice
- Some women claimed that the use of bleaching creams was being popularized in the country by glamorous and powerful women who were said to use such products (I could not validate this claim)
- Some women claimed that they were advised by medical doctors to use them on children for treating their skin rashes
- To get the best result, the common practice was to use the mercurial soap first and to apply the bleaching cream afterward
- To maintain the “look,” the creams especially and the soap have to be used every day
- Several cases of young women with “sick looking” skin were mentioned that were thought to be related to the used of these products

Vignette 1: Mercury Poisoning

Mercury poisoning can cause serious and permanent nerve and kidney damage. Mild cases of mercury poisoning show nonspecific symptoms such as general malaise, blurred vision and pins-and-needles tingling. Symptoms of acute mercury poisoning include diminished hearing, speech disorders, rapid heartbeat, sweating, irritability or hostility, withdrawal or shyness, memory loss, pains in hand and feet, slight hand tremors, difficulty with fine motor control (such as handwriting), sleeplessness, and headaches. Young children and children born to women exposed to mercury are especially affected. Mild exposure of a pregnant woman may result in modest neurological abnormalities in the baby. More severe exposure can lead to dramatic effects on development, including abnormal placement of brain structures and gross impairment of mental development. A study at the Kenyatta National Hospital in Nairobi found that 70 percent of student nurses who used mercurial skin toners had nephrotic syndrome (Barr et al. 1973).

Pesticides

- Most participants had used these products and knew that they were poisonous (pesticides were the most cited HHP)
- Most could not tell how to apply or use them safely
- Many were not sure how long after spraying before the room can be occupied (10–20 minutes were mentioned)
- Most did not recognize the necessity for frequent washing of bed linens and wet mopping of floors as a means of reducing exposure and were apparently not practicing these protective measures
- Most did not know what to do with empty spray cans and were not aware that they represented an explosive hazard
- Some reported various symptoms after spraying rooms for mosquito control.

Vignette II: Hydroquinone Poisoning

Ingestion of moderate amounts of hydroquinone can cause headache, breathing difficulty, blue fingers, ringing in the ears, nausea, dizziness, a sense of suffocation, increased respiratory rate, pallor, muscle twitching, and dark urine. Prolonged application to the skin can result in dermatitis, loss of skin pigmentation, and anemia. Introduction into the eye can cause immediate irritation, and may lead to ulceration of the cornea. Repeated exposure can lead to discoloration of eyelids, clouded eye lenses and eye color changes. Hydroquinone is an active allergen (about 5 percent of people exposed to it can develop allergic skin rashes after repeated contacts), and has been shown to cause bladder cancer in mice. Short-term tests show that it is a mutagen and offspring of rats exposed to hydroquinone exhibit birth defects. The health effects of this compound are additive with other phenolic compounds.

Rat Poison (Rattex)

- Some people preferred these toxic compounds because the rats had become “too smart” to be caught by traps
- People who used these products were generally aware of their toxicity and took necessary precautions to put them outside the reach of children
- How to dispose of the poisoned rats was not clear to some people
- Cases of cats and dogs (but no known incidence of a child) being killed by a dead (poisoned) rat were reported

Batteries (Dry Cell and Lead Acid)

- There was general lack of knowledge about the hazards of these products or how to dispose of them
- Dead dry cell batteries were often given to children for the so-called *kila* game, which involves trying to smash the cells on another stationary battery. The black powder in the cell (cadmium and nickel salts) are scattered in the play area where the children can become exposed
- Some participants reported that they had broken open the batteries and used the black powder as shoe polish, hair dye, or on black boards
- Cases were reported of children dying, going into a coma, or being made sick by swallowing the black powder in dry cell batteries
- Lead acid batteries were finding alternative uses in powering television sets, radios, and even in providing lighting—these applications were known to most people in the focus groups
- To prevent overvoltage, these batteries are often altered to reduce the voltage output, for instance, by inserting metal plates and nails into battery plates. Inadequate re-sealing of the battery was reported to result in acid leakage and occasional acid burning of people
- Since there is no battery recycling program in the country, some people try to repair or recover the lead from dead batteries, which can result in extensive contamination of the home environment and exposure of children to lead

Vignette 3: Cadmium Poisoning

Clinical symptoms of cadmium poisoning (*itai-itai* disease) include deformities of the spine and chest, increased excretion of total protein, glucose, amino acids, and low molecular weight proteins, changes in blood chemistry (low levels of serum, total protein, uric acid, inorganic phosphorus, and high levels of chloride, alkaline phosphatase, and creatinine), decreased lymphocyte counts, anemia, renal dysfunction, and peripheral nerve disturbance.

Petroleum Distillates

Gasoline/Petrol

- Most participants were aware of gasoline sniffing among the young people
- Use of gasoline for treatment of skin rashes and sores was reported by some participants
- Gargling of petrol for sore throat was reported
- Mouth rinsing with petrol for toothache was reported

Brake Fluid

- The general impression from the focus groups was that brake fluid was an effective remedy for skin rashes and was widely used, especially in the more rural areas
- There were occasional reports of brake fluid use for hair/head lice as well as for ring worm

Diesel Fuel

- Reported to be widely used for lighting purposes, primarily in rural areas where the supply is from truck drivers who siphon it from their vehicles. Small lamps used in burning the diesel fuel are reported to emit a dense smoke said to hurt the eyes.

Vignette 4: Lead Poisoning

Lead affects the human nervous system, the production of blood cells, kidney, reproductive system, and behavior. Long term exposure to low levels of lead primarily affect the blood and nervous systems. The symptoms of lead poisoning tend to be vague and nonspecific and often mimic the conditions of many communicable diseases. Children are at most risk of lead poisoning. Pregnant women are also at particular risk, because lead can cross the placenta to damage the fetus or lead to miscarriage.

Shoe Polish

- Several people reported its use on rashes

Paint

- Little concern was expressed about paint hazard; probably of less an issue in the rural areas

Asbestos

- Concern for widespread use of asbestos as roofing material was raised in the third focus group. Although the product is approved by the government, participants said that more information on the health hazard of asbestos should be made available.

- They wondered why a product that has been banned in many countries is considered safe in Zambia.

Mothballs

- The majority of people in focus groups reported using this product and were surprised to learn that it is hazardous

Vignette 4: Naphthalene Poisoning

(Mothballs contain naphthalene, a neurotoxin that can cause blood damage to the fetus. Naphthalene is highly volatile (responsible for its odoriferous characteristic) and is readily absorbed through the skin. Baby clothes should never be exposed to naphthalene).

Availability of HHPs in Rural Areas

Dr. Strickland followed up with market and household inventories and focus group discussions in rural settings during his work in the rural Mfuwe area of Eastern Province. He observed that contrary to the expectation that many of the creams and soaps containing mercury and hydroquinone would not be present due to lack of income in rural areas, that there was a small local demand. Rural shops were stocking nearly all the HHPs that were sold in different more specialized shops in Lusaka. While mercury soaps did not sell very fast, according to rural shop keepers, they felt compelled to stock them along with other soaps and detergents along with the wide array of rural necessities such as bicycle spare parts, salt, sugar, cadmium-nickel batteries, brake fluid, insecticides, and cleaning agents for toilets and ovens, cloth, chloroquine, and panadol.

ENVIRONMENTAL IMPLICATIONS

In view of the widespread and common use of HHPs, one suspects that consumer goods probably represent a principal way for bringing many toxic chemicals into country. Most of the hazardous substances in household products ultimately get released into the Zambian environment. Toxic chemicals in soaps and creams get washed into the sewer and subsequently get into local rivers and lakes and become bioaccumulated in the food chain. Other products (such batteries and fertilizers) are discarded on land where the toxic elements can be taken up by crops. Some (pesticides) are sprayed in the air and become dispersed and deposited into local water, soil and crops. Table 5 shows some of the hazardous wastes that can be generated from household products. It is apparent that HHPs represent a major source of toxic wastes in the country.

Table 5: Hazardous Wastes Generated by Everyday Household Products

Product	Hazardous wastes
Plastic	Organic chlorine compounds and solvents
Pesticides	Organic chlorine and organic phosphate compounds
Paints	Heavy metals, pigments, solvents, and organic residues
Oil and gasoline	Phenol, benzene, other organic compounds, ammonia, acids, and caustic liquids
Metals	Lead, mercury, zinc, fluoride, cyanide, acid and alkaline cleaners, solvents, pigments, plating salts, and oils
Leather	Chromium and organic solvents
Textiles	Heavy metals, dyes, organic chlorine compounds, and solvents

In terms of environmental impact, the use of large quantities of mercury in soaps and creams must be viewed with particular concern. The mercury released from these products is converted by bacteria in water and sediments to organic methylmercury, which is rapidly taken up by fish and stored in the muscle. Through the process of biomagnification, methylmercury concentrations can become highly elevated in fish tissue. When people eat the fish, they then become exposed to the mercury that was in the soaps and creams. A recent survey of fish from several lakes in East Africa (J.O. Nriagu unpublished) found elevated levels of mercury in a number of fish samples. Since there are no known industrial sources of mercury in the lakes, it was concluded that most of the mercury in the fish came from soaps and creams (Nriagu 1992).

Pesticides exert their toxic effects not only on pests but also on untargeted species, including humans, cows, fish, birds, plants, soil microorganisms, and beneficial insects. Recent studies point to the fact that effects of chronic long term exposure to pesticides may be more pernicious than has generally been realized. The disruption of the function of endocrine glands is particularly worrisome. Hormones are given off by endocrine glands and act as “messengers” from one part of the body to another. As such, they start and stop a number of body functions including the production of male and female sex

hormones. As disrupters of the endocrine function, pesticides are increasingly being linked to negative reproductive outcomes in human and wildlife populations.

POSSIBLE MATERIAL FOR SCHOOL-BASED ACTIVITIES

The following section is based on discussions with Mr. Mwape Sichilongo, and derives from the need for Chongololo club for material to be used in their school-based educational activities. The ideas in this section will require further development and modification to meet the needs of Zambian schoolchildren. It is presented in the form of twenty questions around which various activities can be developed.

1. How can your family reduce the risk of exposure to toxic household products?
 - Read labels and follow directions
 - Wear protective clothing and gloves
 - Stop using the product if you become dizzy, sick to your stomach, or develop headache
 - For proper ventilation, it best to use the chemicals outdoors
 - Do not smoke when using flammable products
 - Never mix household products—toxic fumes or explosion can result
 - Store (hide) toxic products where children cannot find them
 - Keep hazardous products in a cool dry place away from lamps and cooking and heating fires
 - Store corrosive, flammable, reactive, and poisonous products away from each other
 - Ensure that all containers have secure lids/caps
 - Always return products to their proper places after use
 - Regularly inspect the home for toxic products and discard items you no longer use
2. Name two hazardous products that can be found in your home
3. Name one popular cosmetic that is toxic
4. Name one brand of medicated soap or cream that is toxic
5. What are some of the words or pictures on a product label that tell you that it is hazardous?
6. Why are so many people in this country uncertain about toxic ingredients in the products they buy?
7. What does word “toxic” mean to you?
8. How long does it take a toxic product to produce adverse health effects: immediately, about one week, one year, many years?
9. Name three ways that toxic substances enter the body
10. What should you do when your child swallows a toxic product?
11. Why is petrol, motor oil, and brake fluid bad medicine?
12. When is a product hazardous?
13. Should a child be allowed to play with dry cell batteries?
14. After applying medicated soap, how many times should you wash your face to avoid adverse effects?
15. True or false: People in rural areas do not have hazardous products in their homes
16. True or False: Lemon juice can reduce the toxicity of mercury in soaps and creams

17. True or false: Soaps and creams are responsible for some of the mercury in fish caught in streams and lakes of Zambia
18. What is in the black powder found in batteries and why should children never be allowed to play with it?
19. Why is *kila* game dangerous to your child's health?
20. What makes the motorcar batteries very dangerous?

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APPENDIX

List of toxic substances in common household products in Lusaka, Zambia (adapted from the compilations by Harte et al. 1991 and Steinman and Epstein 1995).

1. **Acetone:** Eye and skin irritant. Neurotoxic. Used in paint removers and strippers and solvent for other organic compounds
2. **Alcohol, Denatured:** Dangerous fire hazard. Irritant. Acutely poisonous.
3. **Aliphatic hydrocarbons:** Prolonged exposure and inhalation may irritate skin, digestive system, throat, and lungs. Neurotoxic. Used in some car waxes.
4. **Aliphatic naphtha:** Eye irritant. Neurotoxic. Used in some furniture polishes.
5. **Aliphatic petroleum distillate:** Flammable. Eye and skin irritant. Neurotoxic. Used in some car cleaning products.
6. **Aliphatic petroleum solvent:** Moderately irritating to skin on prolonged contact. Neurotoxic. Used in some carpet cleaners.
7. **Alkaline bacillus:** Allergen. Used in some laundry soil and stain removers.
8. **Alkylphenol:** Eye irritant. May cause skin sensitization. May act on the body with weak estrogenic effects. Used in some adhesives.
9. **Allethrin:** Eye and skin irritant. Can cause sudden swelling of face, eyelids, lips, mouth, and throat tissues, as well as produce hay fever-like symptoms. Neurotoxic. Damaging to the immune system. Highly toxic. Used in some pet flea-control products.
10. **Aluminum:** Inhalation of powder has been reported as a cause of lung disease. May be implicated as one of the factors in the onset or exacerbation of Alzheimer's disease. Used in some drain openers and in pots, pans and utensils.
11. **Aluminum silicate:** Suggestive evidence of carcinogenicity; its hazard is in the dry state (e.g., when sanding or scraping). Used in some paints.
12. **Ammonia:** Undiluted, a powerful eye and systemic irritant that may cause severe burning pain and corrosive damage, including chemical burns, cataracts, and corneal damage. Mild exposure to vapors may cause respiratory irritation. Repeated or prolonged exposure to vapors may cause irritation, bronchitis, and pneumonia. Used in a wide range of household cleaning and auto products.
13. **Ammonium chloride:** Corrosive to eyes; can cause permanent damage. Used in some toilet bowl cleaners and deodorizers.
14. **Ammonium hydroxide:** Eye irritant. Safe when highly diluted as in most household products. Used in some air fresheners.
15. **Aromatic hydrocarbon:** Highly flammable. Heating may cause pressure buildup and possible rupture of the container. Eye and skin irritant. May contain traces of benzene, a carcinogen. Neurotoxic. Used in some adhesives.
16. **Bendiocarb:** Eye and skin irritant. Allergenic. Sensitizer. Neurotoxic. Used in some home and garden pesticides.
17. **Brake fluid:** see petroleum distillates; used as home remedy.
18. **Butane:** Flammable. Neurotoxic at very high concentrations. Used as a propellant in a wide range of consumer aerosol products and lighter fluids.
19. **Butyl acetate:** Flammable. Skin and eye irritant. Mild allergen. Neurotoxic. Used in shoe products.

- 20. Butyl cellosolve (also known as 2-butoxy-1-ethanol or ethylene glycol monobutyl ether):** Mild skin and eye irritant. Damages blood and body's ability to make blood, central nervous system, kidneys, and liver. Readily absorbed through skin. Neurotoxic. Used in some all-purpose cleaners, window cleaners, and a wide range of other household cleaning products.
- 21. Cadmium:** Inhalation affects respiratory system and kidneys. Carcinogenic. Teratogenic. Used in dry cell batteries.
- 22. Calcium carbonate:** Moderate to severe eye irritant. Used in some all purpose cleaners.
- 23. Calcium oxide:** Characterized as a powerful caustic to living tissue. Used in some home and garden pesticides.
- 24. Carbaryl (Sevin):** Eye and skin irritant. Allergenic. Sensitizer. Highly neurotoxic; symptoms include increased salivation, coughing, difficult breathing, and phlegm. Associated with birth defects. Used in a wide range of pesticides.
- 25. Chlorpyrifos (Dursban):** Severe eye, skin, and respiratory irritant. Allergenic. Sensitizer. Highly neurotoxic. Significant reproductive effects. Commonly used in pesticide products sold in stores. Poses acute and chronic hazards to both pets and owners.
- 26. Concentrated perfume oil:** Mild eye irritant. Used in some air fresheners and body lotions.
- 27. Crystalline silica:** Eye, skin, and lung irritant. Carcinogenic. Its hazard occurs when it is in the dry, not liquid, state. Used in some highly popular brands of cleanser, paints, and some powdered pest control products.
- 28. Cyanoacrylate ester.** Combustible. Vapors can irritate the skin and eyes, as well as mucous membranes. Used in some adhesives.
- 29. Cyclohexane:** Flammable. Moderate eye, skin, respiratory irritant. Used in some adhesives.
- 30. D-cis trans allethrin:** Eye and skin irritant. Can cause sudden swelling of face, eyelids, lips, mouth, and throat tissues as well as hay fever-like symptoms. Neurotoxic. Used in some home and garden pesticides.
- 31. DEET:** Eye and skin irritant. Sensitizer. Neurotoxic. Readily absorbed into skin. Used in some mosquito and insect repellents, as well as pet flea control products.
- 32. Detergents and soaps (uncharacterized):** Can cause temporary respiratory tract irritation when in powder form (as in the case of laundry detergents) and mild to severe irritation of the eyes in both powder and liquid form (as with dishwashing liquids or other, harsher liquid cleaning products). Symptoms of respiratory distress include coughing, sore throat, wheezing, and temporary shortness of breath. Eye-related symptoms include stinging, tearing, itching, swelling, or redness. Used, in some carpet cleaners, dishwashing products, laundry detergents, and a wide range of other household cleaning products.
- 33. Diazinon:** Combustible. Corrosive to eyes. Severe eye and skin irritant. Allergenic. Sensitizer. Highly neurotoxic. Toxic to the fetus. Toxic to birds. Used in lawn pesticides and flea collars, as well as by home exterminators and lawn care companies.
- 34. 1,4-Dichlorobenzene (para-dichlorobenzene):** Carcinogenic. Highly volatile. Causes liver and kidney damage. Used in moth repellents and deodorizers.

- 35. Dichlorvos (DDVP):** Eye and skin irritant. Allergenic. Sensitizer. Carcinogenic. Highly neurotoxic. Teratogenic: causes sperm and other reproductive abnormalities. Used in some no-pest strips and insect repellents.
- 36. Diethanolamine (DEA):** Mild skin and severe eye irritant. Reacts with nitrites (added as undisclosed preservatives to some products or their raw materials or present as contaminants) to form highly potent carcinogenic nitrosamines. Nitrosamines have been shown to readily penetrate the skin. Used in a wide range of household cleaning products.
- 37. D-limonene:** Eye and skin irritant. Sensitizer. Suggestive evidence of carcinogenicity. Neurotoxic. Teratogenic. Used in some paints and pest control products.
- 38. Dimethylbenzyl ammonium chloride:** Severe eye and skin irritants. Used in some bathroom cleaners and toilet bowl cleaners and deodorizers.
- 39. Dimethyl ethylbenzyl ammonium chloride:** Severe eye and skin irritants. Used in some bathroom cleaners.
- 40. Dioctyl phthalate (di [2-ethylhexyl] phthalate):** Skin and severe eye irritant. Carcinogenic. Reproductive toxin. Used in adhesives and correction fluid.
- 41. Dipropylene glycol methyl ether.** Eye and skin irritant. Used in some laundry soil and stain removers, car interior and exterior cleaners and protectants, and shoe products.
- 42. D-trans allethrin:** Eye and skin irritant. Can cause sudden swelling of face, eyelids, lips, mouth, and throat tissues, as well as hay fever-like symptoms. Neurotoxic. Used in some pest control products.
- 43. Ethoxylated alcohols:** May be contaminated with 1,4-dioxane, which is carcinogenic and rapidly penetrates the skin.
- 44. Ethoxylated nonyl phenol:** Eye and skin irritant. Used in some car bug, insect, and tar removers.
- 45. Ethyl alcohol:** Mild eye, skin, and respiratory tract irritant. Used in air fresheners, pest control products, and a wide range of household cleaning products.
- 46. Ethylene glycol:** Flammable. Eye, skin, and respiratory irritant. Excessive exposure may cause kidney, blood, and possibly liver damage. Neurotoxic. Reproductive toxin. Absorbed through the skin. Used in metal polishes, stain remover, car waxes, and shoe products.
- 47. Ethylene glycol propyl ether:** Eye and skin irritant. Neurotoxic. Used in some paints.
- 48. Feldspar:** Mild respiratory irritant. Used in some all-purpose cleaners.
- 49. Fenvalerate:** Highly neurotoxic to humans and pets. Can cause tingling and burning sensation of the hands and face. Used in some home and garden pesticides, as well as other pest control products.
- 50. Formaldehyde:** Poisonous irritant to the skin, eyes, and mucous membranes. A sensitizer. Carcinogenic. Neurotoxic. Used in some furniture polishes, car cleaners and waxes, and a wide range of other consumer items, especially paints and related products.
- 51. Glycol ether:** Eye irritant. Used in some household cleaning products.
- 52. Heptane:** Flammable. Neurotoxic. Used in some shoe products.

53. **Hexachlorobenzene (HCB):** Eye and skin irritant. Sensitizer. Carcinogenic. Neurotoxic. Teratogenic. Used in some nail polish.
54. **Hexane:** Flammable. Eye, skin, and respiratory tract irritant. Neurotoxin. Used in some adhesives and beauty aids.
55. **Hydramethyion:** Carcinogenic. Used in some home and garden pesticides.
56. **Hydrocarbon solvent:** Slight to moderate skin irritant. Neurotoxic. Used in some furniture polishes and a wide range of other consumer products.
57. **Hydrochloric acid:** Corrosive. Severe eye, skin, and mucous membrane irritant; highly toxic if inhaled with unknown systemic effects. Inhalation of vapors may cause severe irritation of the respiratory system, coughing, and difficulty breathing. Used in some toilet bowl cleaners and deodorizers.
58. **Iodine:** Can cause stinging and burning of eyes and conjunctivitis. Skin irritant. Used in some antiseptic soaps, toilet bowl cleaners, and deodorizers.
59. **Isobutane:** Flammable. Neurotoxic at very high concentrations. Used as a propellant in some spray cans.
60. **Isobutyl acetate:** Flammable. Skin and eye irritant. Used in some adhesives.
61. **Isoparaffinic hydrocarbon:** Moderate eye and skin irritant. Used in a wide range of household cleaning products, including air fresheners and car waxes.
62. **Isopropyl alcohol:** Combustible. Can be a moderate eye irritant. Neurotoxic at high concentrations. Used in some floor cleaners and car waxes.
63. **Kerosene:** Flammable. Slight to moderate eye and skin irritant. May contain traces of benzene, which is carcinogenic. Neurotoxic. Used in some furniture polishes and car waxes.
64. **Lead:** Carcinogenic. Neurotoxic. Reproductive effects. Used in lead acid battery, pigment, and solder.
65. **Light petroleum distillates:** Eye, skin, and respiratory irritant. Can cause rashes. Neurotoxic. Repeated exposure has caused kidney disorders and damage in experimental animals. Used in some spot (including nail polish) removers.
66. **Limonene fraction terpenes:** Eye, skin, and respiratory irritant. Used in some spot (nail polish) removers.
67. **Medium aliphatic solvent naphtha:** Eye and skin irritant. Neurotoxic. Used in some auto products.
68. **Mercury:** Neurotoxic. Reproductive effects. Used in soaps and creams and small dry cell batteries.
69. **Methanol (methyl alcohol):** Severe eye and skin irritant. Can cause permanent blindness. Neurotoxic. Used in some paint removers and strippers and art products.
70. **Methoxychlor:** Eye and skin irritant. Sensitizer. Limited evidence of carcinogenicity. Reproductive toxin. Weak estrogen-like effects. Used in some pest control products.
71. **Methyl ethyl ketone:** Eye, skin, and respiratory irritant. Neurotoxic. Reproductive toxin. Used in some thinners and adhesives.
72. **Methylene chloride (dichloromethane):** Severe skin and moderate eye irritant. Can cause irregular heartbeat, even heart attack, when inhaled. Carcinogenic. Neurotoxic. Used in some paint strippers and spray paints.
73. **Mineral spirits:** Severe eye and skin irritant. Neurotoxic. Used in some floor cleaners, waxes, polishes, and many paints and related products.

74. **Monethanolamine:** Moderate skin, severe eye irritant. Used in some paint removers and strippers.
75. **Morpholine:** Moderate to severe eye, skin, and mucous membrane irritant. Reacts with nitrites (added as undisclosed preservatives to some products or their raw materials or present as contaminants) to form carcinogenic nitrosamines. Can cause kidney damage. Used in some furniture polishes and car waxes.
76. **Naled:** Eye and skin irritant. Neurotoxic. Transformation product includes dichlorvos, which is carcinogenic and a reproductive toxin. Used in some pest control products.
77. **Naphthalene:** Combustible. Eye and skin irritant. Can cause corneal damage and cataracts. Neurotoxic. Reproductive toxin: transported across the placenta and can cause blood damage. Used in some moth repellents and car waxes.
78. **N-octyl bicycloheptene dicarboximide:** Eye and respiratory tract irritant. Used in some household and garden pesticides, as well as other pest control products.
79. **Nonionic surfactants:** Eye irritant. Used in some toilet bowl cleaners and deodorizers.
80. **Nonoxynol 4:** Eye and skin irritant. Used in some laundry soil and stain removers.
81. **Nonylphenol ethoxylate:** Mild eye irritant. Used in some air fresheners.
82. **Nonylphenol polyethylene oxide:** Eye, skin, and respiratory tract irritant. Used in some spot removers.
83. **Oil of orange:** Skin irritant. Carcinogenic. Used in some all-purpose cleaners, furniture polishes, and spot removers.
84. **Oleic diethanol amide:** Eye and skin irritant. Used in some waxes.
85. **Ortho phenylphenol:** Severe eye and skin irritant. Possibly carcinogenic. Used in some air fresheners and disinfectants.
86. **Oxalic acid dihydrate:** Moderate eye and skin irritant. Can be allergenic. Used in some cleansers.
87. **Parabens (methyl, propyl):** Allergenic. Used as preservatives in some household products.
88. **Permethrin:** Eye and skin irritant. Can cause sudden swelling of face, eyelids, lips, mouth, and throat tissues, as well as hay fever-like symptoms. Carcinogenic. Neurotoxic. Used in some household and garden pesticides, and other pest control products.
89. **Petroleum distillates:** Fire hazard. Eye, skin, and respiratory irritant. Can cause conjunctivitis and dermatitis. May contain traces of benzene, a carcinogen. Mild to significant neurotoxic effects leading to organic brain damage, depending on concentration and duration of exposure. Used in a wide range of products, including heavy-duty cleaners, laundry stain removers, home and garden pesticides, pest control products, and waxes.
90. **Petroleum hydrocarbons:** Eye, skin, and respiratory irritant. May contain traces of benzene, a carcinogen. Neurotoxic. Used in some furniture polishes.
91. **Petroleum process oil:** Eye, skin, and respiratory tract irritant. May contain traces of benzene, a carcinogen. Neurotoxic. Used in some furniture polishes.
92. **Petroleum solvents:** Severe eye, skin, and respiratory irritant. May contain traces of benzene, a carcinogen. Significant neurotoxic effects. Used in some floor cleaners, waxes, and polishes.

- 93. Petroleum spirits:** Eye, skin, and respiratory irritant. May contain traces of benzene, a carcinogen. Neurotoxic. Used in some spot removers.
- 94. Phenothrin (sumithrin):** Eye and skin irritant. Can cause sudden swelling of face, eyelids, lips, mouth, and throat tissues, as well as hay fever-like symptoms. Neurotoxic. Used in some pest control products.
- 95. Phosphoric acid:** Corrosive. Severe eye, skin, respiratory irritant. Breathing vapors can make lungs ache. Used in some bathroom cleaning products, especially those that remove lime and mildew, metal polishes.
- 96. Pine oil:** Weak allergen. Very large doses cause central nervous system depression. Used in a wide range of household cleaning products.
- 97. Polychlorinated biphenyls (PCBs):** Cause dermatitis. Carcinogenic. Neurotoxic. Teratogenic. Used in some lubricants and some artist's oil paints.
- 98. Polyoxyethylene oleyl ether:** Moderate eye and skin irritant. Used in some air fresheners.
- 99. Propane:** Flammable. Neurotoxic at high concentrations. An aerosol propellant used in a wide range of consumer products.
- 100. Propoxur:** Carcinogenic. Neurotoxic. Used in some home and garden pesticides.
- 101. Propylene glycol methyl ether.** Mild to moderate eye, skin, and respiratory irritant. Used in some carpet and car cleaning products.
- 102. Propylene oxide:** Flammable. Skin and eye irritant. Carcinogenic. Neurotoxic. Used in some adhesives.
- 103. Proteinase:** Allergenic. Used in laundry soil and stain removers.
- 104. Proteolytic enzymes:** Mild eye irritant. May cause sensitization with symptoms ranging from mild hay fever and asthma to dermatitis. Used in some laundry soil and stain removers.
- 105. Pyrethrins:** Allergenic. Neurotoxic. Used in some household and garden pesticides, as well as pest control products.
- 106. Quaternary ammonium compound:** Eye and skin irritant. Used in some all-purpose cleaners and laundry fabric softeners.
- 107. Quaternary Dicco:** Slight fire hazard. Moderate to severe skin and eye irritant; in some cases may cause skin burns and corneal damage to the eye. Used in some car interior and exterior cleaners and protectants.
- 108. Quaternium 15:** Eye and skin irritant. Allergen. Can release formaldehyde. Used in some detergents.
- 109. Resmethrin:** Can cause sudden swelling of face, eyelids, lips, mouth, and throat tissues, as well as hay fever-like symptoms. Neurotoxic. Used in some pest control products.
- 110. Rotenone:** Skin irritant. Carcinogenic. Neurotoxic. Tetrogenic. Used in some pest control products.
- 111. Silicon dioxide:** Eye and skin irritant. Used in some auto products.
- 112. Silicone emulsion:** Slight fire risk. Used in some cleaners and protectants.
- 113. Sodium bisulfate:** Corrosive and damaging to the eyes, skin, and internal tissues if ingested. Can cause asthma attacks. Used in some toilet bowl cleaners and deodorizers.
- 114. Sodium dichloroisocyanurate dihydrate:** Corrosive. Severe eye, skin, and respiratory irritant. Can form chlorine gas that can cause burning and watering of the

eyes, as well as burning of the nose and mouth. Used in some toilet bowl cleaners and deodorizers.

115. **Sodium 2,4-dichlorophenoxyacetate (2,4-D):** Irritant. Sensitizer. Carcinogenic. Neurotoxic. Teratogenic. Used as a herbicide in lawn care products and golf courses.
116. **Sodium dithionate:** Eye, skin, and respiratory irritant. Used in some spot removers.
117. **Sodium dodecylbenzene sulfonate:** Eye and skin irritant. Used in some laundry soil and stain removers.
118. **Sodium hydroxide:** Corrosive. Eye, skin, and respiratory irritant. When highly concentrated as used in some drain openers and oven cleaners, it can burn eyes, skin, and internal organs. Can be fatal if swallowed. Used in a wide range of household cleaners.
119. **Sodium hypochlorite (bleach):** Corrosive. Eye, skin, and respiratory irritant. Sensitizer. Can be fatal if swallowed. Especially hazardous to people with heart conditions or asthma. Used in a wide range of household cleaners.
120. **Sodium metasilicate:** Corrosive. Severe eye, skin, and respiratory irritant. Inhalation of dust can cause throat and lung damage. Used in some floor cleaners.
121. **Sodium ortho-phenylphenol:** Eye and skin irritant. Carcinogenic. Used in some bathroom cleaners.
122. **Sodium silicate:** Can be corrosive. Can cause burns to the eyes and tissue damage to the skin, as well as cause burns to mouth, throat, and stomach if swallowed. Used in some detergents and car interior and exterior cleaners and protectants.
123. **Sodium sulfate:** Corrosive. Severe eye, skin, and respiratory irritant. Can cause asthma attacks. Used in some toilet bowl cleaners and deodorizers.
124. **Solvents (uncharacterized):** Eye, skin, and respiratory irritant. Neurotoxic. Used in some paint removers and strippers.
125. **Solvent orange 3 dye/solvent red 49 dye:** Carcinogenic. Used in some shoe polishes.
126. **Starch:** Allergenic. Used in some laundry starches.
127. **Stoddard solvent:** Slight fire hazard. Eye and mucous membrane irritant. Neurotoxic. Used in some auto, floor wax, and shoe products.
128. **Sulfite:** Poses minimal risk for eye, skin, and respiratory irritation, as well as nausea and allergic sensitization. Frequently used in least-toxic pesticides, especially for organic gardening. Sulfur products are some of the safest chemicals available for use-for both people and the environment.
129. **Surfactants (uncharacterized):** Eye irritant. Used in a wide range of household cleaning products.
130. **Talc:** Carcinogenic when inhaled. Used in some face powders.
131. **Tetrachloroethylene (perchloroethylene):** Eye, skin, and respiratory irritant. Carcinogenic. Neurotoxic. Used in some spot removers.
132. **Tetrachlorvinphos:** Eye and skin irritant. Carcinogenic. Used in some pest control products.
133. **Tetramethrin:** Eye and skin irritant. Can cause sudden swelling of face, eyelids, lips, mouth, and throat tissues, as well as hay fever-like symptoms. Neurotoxic. Used in some pest control products.
134. **Tetrasodium EDTA:** Eye irritant. Used in some bathroom cleaners.

- 135. Titanium dioxide:** Limited evidence of carcinogenicity: Hazardous as a dust (as when paint containing titanium dioxide is being sanded or scraped). Used in some paints and shoe polishes.
- 136. Toluene:** Eye and skin irritant. Can cause cardiac sensitization. Neurotoxic. Reproductive effects. Used in some spot removers and art products.
- 137. 1,1,1-trichloroethane:** Moderate skin and severe eye irritant. Can sensitize the heart, cause cardiac arrest. Inadequate evidence to determine its carcinogenicity. Significant neurotoxic effects. Used in some metal polishes, spot removers, household pesticides, and a wide range of other products.
- 138. Triethanolamine (TEA,):** Eye and skin irritant. Can react with nitrites (added as undisclosed preservatives to some products or their raw materials or present as contaminants) to form carcinogenic nitrosamines. Nitrosamines have been shown to readily penetrate the skin. Used in hair coloring shampoos, some liquid all-purpose cleaning products, metal polishes, spot removers, and other household cleaning products.
- 139. Tripropylene glycol monomethyl ether:** Prolonged and repeated skin exposure to large doses can result in narcosis and kidney injury. Used in some floor cleaners, waxes, and polishes.
- 140. Trisoditim. nitrilotriacetate:** Carcinogenic. Used in some bathroom cleaning products.
- 141. Turpentine:** Flammable. Eye irritant. Can cause allergenic sensitization. Neurotoxic. Can cause serious irritation of the kidneys. Used in some furniture polishes, auto, art, and shoe products.
- 142. Urea:** Skin irritant. Allergen. Used in some laundry soil and stain removers.
- 143. VM&P naphtha:** Eye and skin irritant. Neurotoxic. Used in some furniture polishes.
- 144. Washing soda:** Caustic. Can cause eye burns with potential injury on prolonged contact. Used in some laundry detergents.
- 145. Xylene:** Severe eye and moderate skin irritant. Significant neurotoxic effects. Reproductive effects. Used in some spot removers, car cleaners, paints, and other consumer products.