

# Pesticide regulation, utilization, and retailers' selling practices in Trinidad and Tobago, West Indies: current situation and needed changes

Lexley M. Pinto Pereira,<sup>1</sup> Kim Boysielal,<sup>1</sup> and Avril Siung-Chang<sup>2</sup>

**Suggested citation** Pinto Pereira LM, Boysielal K, Siung-Chang A. Pesticide regulation, utilization, and retailers' selling practices in Trinidad and Tobago, West Indies: current situation and needed changes. *Rev Panam Salud Publica.* 2007;22(2):83-90.

**ABSTRACT**

**Objective.** To explore pesticide regulation in Trinidad and Tobago, and to ascertain pesticide utilization and retailers' selling practices on Trinidad, which is the larger of twin islands that constitute the republic of Trinidad and Tobago.

**Methods.** Between February and June 2005, agrochemical retailers in Trinidad were surveyed about the most frequently sold pesticides and their knowledge and practices of pesticide sale. The Poisons and Toxic Chemicals Control Board of the Ministry of Health informed on legislature.

**Results.** Of 107 actively trading licensed pesticide outlets, 97 participated (91% response rate) in the survey. Currently only 2.9% (21) of 720 registered products from four chemical classes are frequently utilized. Paraquat, methomyl, and alpha-cypermethrin (respective trade names are Gramoxone, Lannate, and Fastac) from World Health Organization (WHO) Hazard Classes I and II, and glyphosate isopropylamine (Swiper, Class U) are the most frequently purchased pesticides. Pet shops constitute 39.2% (38) of retail shops selling pesticides. No regulations guide pesticide sale to agriculturists, and children may purchase them. Inadequate human and technical resources render legislative controls ineffective and disciplinary action against offenders is weak. Extensive governmental resources are employed in legislative procedures and product approval for the very low, 2.9% utilization rate, negatively impacting on monitoring pesticide sales. The Poisons Information Centre (PIC) does not liaise with the Poisons and Toxic Chemicals Control Board or provide educational interventions for the community. As a result of this survey, it was possible to develop the first database to include the chemical, brand, and colloquial names of pesticides used in Trinidad and Tobago; WHO classification of approved pesticides; manufacturers; packaging; and antidotes and their availability for use by the Board and health professionals in Trinidad.

**Conclusions.** Urgent critical evaluation of legislation regarding pesticide imports and use, and partnership with the Rotterdam Convention are recommended for Trinidad and Tobago. A strengthened Poisons Information Centre can provide educational initiatives and information on early management of pesticide exposure.

**Key words** Agriculture, commerce, government regulation, pesticides, poisoning, Trinidad and Tobago.

<sup>1</sup> Faculty of Medical Sciences, University of the West Indies, St Augustine, Trinidad, West Indies. Send correspondence and reprint requests to: Lexley M. Pinto Pereira, Faculty of Medical Sciences, Uni-

versity of the West Indies, St Augustine, Trinidad, West Indies. Tel/Fax 1-868-663-8613. email: lexleyp@gmail.com

<sup>2</sup> Office of the Representative of the Pan American Health Organization and World Health Organization to Trinidad and Tobago, Port-of-Spain, Trinidad.

Pesticides are a serious public health and environmental problem, particularly in developing countries, where acute pesticide poisoning is a well-recognized cause of morbidity and mortality (1–4). In Caribbean countries, agrochemicals for pesticide use are commonly involved in poisoning, largely as self-inflicted occurrences. Trinidad and Tobago, a twin-island republic, has the highest suicide rate among the Caribbean countries, and paraquat is responsible for most suicides (5).

Trinidad and Tobago has a population approaching 1.3 million. It is the southern-most Caribbean country, situated northeast of Venezuela. Trinidad, the larger of the two islands, is the Caribbean's leading producer of oil and natural gas, but until the early part of the twentieth century enjoyed an essentially agricultural economy dominated by the sugar industry and to a lesser extent by cocoa, coffee, and coconuts. Tobago's economy is driven by tourism. Agricultural growth increased until 2002, representing 11% of the country's gross domestic product (GDP) (or US\$ 143 million) (6). Subsequently, positive economic growth from the petroleum, natural gas, chemicals, and tourism industries increased GDP to US\$ 18.14 billion in 2006. The major contribution was from the petroleum industry (20.6%), and only 0.6% was derived from the agriculture sector whose weak performance came largely from a shrinking and restructured sugar industry (7).

The country's major agricultural yield comprises cocoa, sugarcane, rice, citrus, and coffee. Sugar, cocoa, coffee, citrus, and flowers are the key exports. A flourishing small-scale agriculture industry maintains the country's self-sufficiency in fruits and vegetables. Cultivation of the land employs 9.5% of the country's labor force. Of Trinidad's 4 814 sq km, 46% is forests and woodlands and 28% is built-up and developed; 9% is devoted to permanent crops and 2% to permanent pastures (there is no information about the remaining 15%). A Government plan for agricultural use of the land

**TABLE 1. Proposed land use allocation by type of agricultural activity in Trinidad and Tobago, 2004**

Type of agricultural activity	Hectares	Percentage
1. Sugarcane	3 040	14.5
2. Food crops <sup>a</sup>	2 812	13.4
3. Rice	2 984	14.3
4. Livestock	2 220	10.6
5. Vegetables and food crops <sup>b</sup>	1 112	5.3
6. Citrus	1 080	5.2
7. Tree crops	840	4.0
8. Buffalypso (water buffalo)	590	2.8
9. Forestry	710	3.4
10. Vegetables	440	2.1
11. Dairy	400	1.9
12. Small ruminants	280	1.3
13. Cocoa	72	0.3
Subtotal	16 580	79.2
14. Rental land (cane farmers) <sup>c</sup>	4 354	20.8
Total hectares subject to use re-allocation	20 934	100.0

**Note:** Total land currently in use is 251 772 hectares.

<sup>a</sup> Food crops include pulses, tubers, and roots.

<sup>b</sup> Mixture of vegetables and food crops.

<sup>c</sup> Rented by the government to sugarcane farmers for cultivation.

(Table 1), 14.6% of which is arable, allocates production for the domestic, regional, and extra-regional markets (8). The 2005–2006 budget supports food security as the major objective of agricultural policy in order to ensure self-sufficiency in strategic foods, including rice and root crops.

In Trinidad and Tobago, agriculture is essentially confined to the rural areas, providing revenue for farmers and agricultural laborers in rural households. Agrochemicals are extensively used in vegetable and fruit gardens, in the small-scale industries of coffee, cocoa, and citrus fruits, and in household gardening. To maintain or improve crop yield on both small and large farms, pest control is crucial. Farmers tend to equate pest management with pesticide use in the mistaken belief that a direct relationship exists between an efficient product yield and the amount of pesticide applied. Access to pesticides is uncontrolled, with attendant risks of accidental exposure or intentional poisoning.

The Pesticides and Toxic Chemicals Act (1979) regulates importation, storage, manufacture, sale, use, and transport of pesticides and toxic chemicals.

It provides for the establishment of the Poisons and Toxic Chemicals Control Board, which is a division of the Food and Drugs Division of the Ministry of Health. Applications to import pesticides are made to the Board by distributing agents. On receiving approval from the Board, the agents distribute the products to retailers, who are the point of sale in both the islands of Trinidad and Tobago. Approved items are re-registered every three years.

Though much of the country's economy thrives on the agricultural sector, a database of current information on the registered agrochemicals with their chemical, commercial, and colloquial names, physical forms, and the World Health Organization (WHO) classification of pesticide toxicity is not available to the Board. Information on knowledge, attitudes, and practices of vendors of agricultural pesticides is not available in any Caribbean country. We surveyed retail outlets on the island of Trinidad to determine the most frequently purchased agrochemicals, the physical form in which they are sold, retailers' selling practices, and to determine if distributing agents

or manufacturers, respectively, sell or produce agrochemicals in the country.

## MATERIALS AND METHODS

Vendors of agrochemical pesticides in Trinidad and the Poisons and Toxic Chemicals Control Board participated in the survey between February and June 2005. Nearly all (135 out of 137) pesticide retailers are located in six of the eight counties in Trinidad: St. Andrew and St. George in the north, Caroni in the west, Nariva in the east, and Victoria and St. Patrick in the south. There were no retailers in the counties of St. David and Mayaro in the northeastern and southeastern tips of the island, respectively. Two vendors are located in Tobago.

The questionnaire was personally administered to respondents throughout the island. Shop owners or store managers selling agrochemicals agreed to respond honestly and as accurately as possible. They were assured of confidentiality; neither they nor their association with any retail outlet were identified. The survey sought information on the type of shop, the pesticides sold, packaging of products, mixing of chemicals at the outlet, sale of chemicals out of the original packaging, and provision of product information to customers. Retailers reported on the colloquial terminology, if any, by which customers identified specific products, package sizes in which the products were available, and the prices of the commonly purchased pesticides. The retailers were asked to name the distributing agency or manufacturer, if any, from which they sourced products and which agrochemicals customers most frequently purchased from those that were available. These responses were used to provide the "sales rank" of products. Results from the survey were categorized by county and entered into a Microsoft Access database. Descriptive statistics were applied to the data.

Information on regulatory policies was obtained from the Poisons and Toxic Chemicals Control Board.

## RESULTS

Twenty-eight of the 135 listed shops were not in business, and 10 of the remaining 107 actively trading licensed outlets did not participate, so 97 retailers were surveyed (response rate of 91%).

Presently the Board has registered 720 pesticide product formulations for importation and sale in the country. There is no local manufacture of pesticides in Trinidad. Retailers sell just 21 (2.9%) of the 720 listed pesticide formulations, several of which contain the same chemicals. For example, the products Chemquat, Herbiquat, and Gramoxone all contain paraquat, and both Agrinate and Lannate contain methomyl (Table 2). Basically, from the registered pesticide formulations only four chemical entities are sold. Based on the number of retailers selling the item, pesticide sales were highest for paraquat, which was sold by 83 retailers (85.6%). Gramoxone was reported as the most popular brand of paraquat by 80 retailers (82.5%). Seventy-two retailers (74.2%) sold products containing glyphosate; 60 retailers (61.9%) sold products containing alphacypermethrin/cypermethrin; and 57 retailers (58.8%) sold products containing methomyl. Diazinon was ranked as the sixth most frequently sold item by 36 retailers (37.1%). Based on the survey response retailers ranked the five most frequently purchased brands as Gramoxone, Swiper, Fastac, Lannate, and Diazinon.

All the branded liquid formulations range in price from \$1.63 to \$21.21 per bottle of 125 mL to 1 gallon, respectively. Pesticide products were commercially available as small (125 mL to 250 mL), inexpensively priced packages from a low of \$0.81 per 125 mL to just \$1.88 for the larger 500 mL packages, which retailers indicated were popular with customers. Retailers believed that the small packages were affordable for average consumers.

Repeatedly mispronounced names of some products had become colloquial parlance in the community (e.g., "Grommazone" for Gramoxone). Cus-

tomers referred to Swiper as Trounce (10 g/kg metsulfuron + 835 g/kg glyphosate). Retailers could not explain why; they were not themselves aware of this inaccuracy, even though Trounce itself is not sold in the country (Table 2).

There are a total of seven distributing agents in the country which are all located in Trinidad, but who service the 137 retailers in both islands of Trinidad and Tobago. Five of the agents are located in Caroni County in central Trinidad, and there is one each in the counties of St. George (north) and Victoria (south). The majority of sales to the retailers are made by two of the agencies, both of which are in Caroni County; however the interview was directed only to the 135 retailers in Trinidad, who were listed on the records of the Poisons and Toxic Chemicals Control Board.

The greatest concentration of retailers (37) was in St. George County in the north, where the capital, Port-of-Spain, is located. St. George boasts the highest concentration of commercial areas and upper middle-class, high-rise residential communities. Extensive ornamental and kitchen plant horticulture in these populations explains the high number of housewives who purchase pesticides. A considerable number of self-employed individuals cultivate herbs and seasonings on the hilly slopes in this county.

Fewer retailers were located in the counties of Victoria (21 retailers) and St. Patrick (14 retailers) in the south, and Caroni (14 retailers) in central Trinidad. There were just 8 retailers in St. Andrew County (northeast Trinidad) and 3 in Nariva County (eastern Trinidad). Seventy-nine retail establishments (81.4%) were located in major towns, and 59 (60.8%) were devoted solely to the sale of agrochemicals (Table 3). The remaining 38 (39.2%) were pet shops that were licensed to sell agents only for animal protection against fleas, ticks, and mites. Nevertheless, the pet shops sold practically all the chemicals that were also available at the agrochemical retailers, but in smaller packages. Pet

**TABLE 2. Hazard class, colloquial name, and sales rank of agrochemicals as recorded by retailers in Trinidad, 2005**

Commercial brand name	Active ingredient	WHO hazard <sup>a</sup> and chemical class <sup>b</sup>	Colloquial name	Sales rank <sup>c</sup>	Retailers selling product	
					No.	%
Herbiquat, Chemquat	Paraquat	2; BP	<i>Pahaquaat</i>	2	3	3.1
Gramoxone	Paraquat	2; BP	<i>Grommazoner/ Pahaquaat</i>	1	80	82.5
Round up	Glyphosate isopropylamine	U <sup>d</sup>	NA <sup>e</sup>	12	13	13.4
Swiper	Glyphosate isopropylamine	U	<i>Trounce</i>	3	57	58.8
Atila	Glyphosate	U	NA	11	2	2.1
Pestac 5EC	Cypermethrin	2; PY	<i>Pest-tack</i>	15	1	1.0
Fendona SC	Alpha-cypermethrin	2; PY	<i>Fen-donnah</i>	21	9	9.3
Fastac	Alpha-cypermethrin	2; PY	<i>Fasttuc</i>	8	50	51.5
Lannate	Methomyl	1b; C	NA	4	53	54.6
Agrinate	Methomyl	1b; C	<i>Lannate L</i>	5	4	4.1
Diazinon	Diazinon	2; OP	<i>Deea-zee-non</i>	6	36	37.1
Vydate	Oxamyl	1b; C	NA	17	6	6.2
Kocide 101/DF	Copper hydroxide	3; CU	<i>Kooside</i>	19	14	14.4
Malathion	Malathion	1a; OP	<i>Mala-th-on</i>	9	8	8.2
Banrot	Etridiazol/Thiophanate-methyl	U	<i>Band-rot</i>	14	6	6.2
Actellic	Pirimiphos-methyl	3; OP	NA	13	4	4.1
Karmex	Diuron	U	<i>Dur-ron</i>	7	4	4.1
Diuron	Diuron	U	<i>Dur-ron</i>	18	2	2.1
Pestban E/5C	Chlorpyrifos	2; OP	<i>Pest- band</i>	20	1	1.0
Furore	Fenoxaprop-P-ethyl	O <sup>f</sup>	NA	16	1	1.0
Rizolex	Tolclofos methyl	U	NA	10	1	1.0

<sup>a</sup> Based on LD<sub>50</sub> for the rat: 1a = extremely hazardous; 1b = highly hazardous; 2 = moderately hazardous; 3 = slightly hazardous.

<sup>b</sup> OP = organophosphate, C = carbamate, PY = pyrethroid, CU =copper, BP = bipyridilium.

<sup>c</sup> Based on product sale as indicated from the retailers' records.

<sup>d</sup> U = unlikely to present hazard in normal use.

<sup>e</sup> NA = not applicable.

<sup>f</sup> O = obsolete.

shops displayed signs indicating the products as "chemicals for animal protection, agricultural supplies, garden supplies, and pet supplies."

Respondents stated that customers were mainly farmers (99.0%) or housewives (81.4%) who purchased pesticides for outdoor use. To the specific question, "Do you sell these agents to children at your shop?", 45.4% (44) of respondents would not comment (Table 3). All respondents said products were always sold in the original packaging, but on direct questioning ("Do you repackage products?"), 47.4% contradicted themselves and said they repackage fertilizer and salt. No retailers admitted to mixing chemicals for sale, but five (5.2%) volunteered that their peers indulge in the practice.

Eighty-seven retailers (89.7%) said customers requested their advice on precautions for use and storage of pesticides, and 80 (82.5%) reported that

customers asked about management of accidental exposure or ingestion of these agents. The Emergency Health Services (EHS) had sought information on antidotes and handling cases of exposure from nearly all retailers (95, or 97.9%) at least once. One-third of retailers (31) volunteered that distributors set very high prices for chemicals. About a quarter of respondents (23) were concerned that active ingredients were not stated on product labels, that most products were of WHO Hazard Classes I and II, and that small package sizes made purchase for self-intoxication easier. Some retailers (18) commented on the strong odors of some agrochemicals.

Only one respondent asked for stricter governmental controls on pesticide sales. Retailers said distributors should be responsible for providing product safety information, and were noticeably concerned at this deficit. Three respondents wanted educa-

tional interventions for the community, retailers, and distributors that would focus on safety, handling, and storage. They also wanted to see user-friendly labels.

The interviews gave no indication of intended or demonstrated illegal activity at the point of sale. Nonetheless, the Poisons and Toxic Chemicals Control Board had reports of illegal repackaging of chemicals and had seized such items on inspection visits. The Board subsequently sent warning letters to those involved and levied a nominal monetary penalty, which officials considered had no effect.

The Poisons and Toxic Chemicals Control Board files documentation on brand and chemical names, package sizes, manufacturers, and selling agencies, but the access and maintenance of these files are extremely labor- and time-intensive. The Board has no information on specific antidotes for the products commonly used (such as

**TABLE 3. Selling practices of agrochemical retailers (97) as reported in survey in Trinidad; 2005<sup>a</sup>**

Variable	Number and percentage of retailers answering "Yes" to survey question		Number and percentage of retailers answering "No" to survey question	
	No.	%	No.	%
Type of retail shop				
Agrochemical/agricultural supplies	59	60.8	38 <sup>b</sup>	39.2
Location/District				
Major towns	79	81.4	18	18.6
Person interviewed				
Owner	28	28.9	NA <sup>c</sup>	NA
Manager	22	22.7	NA	NA
Sales person	47	48.5	NA	NA
Five agrochemicals most frequently bought				
Gramoxone	80	82.5	NA	NA
Swiper	57	58.8	NA	NA
Fastac	50	51.5	NA	NA
Lannate	53	54.6	NA	NA
Diazinon	36	37.1	NA	NA
Product used indoors/outdoors (stated by customer)				
Indoor	0	0.0	NA	NA
Outdoor	97	100.0	NA	NA
Frequent purchaser of products				
Farmer	96	99.0	NA	NA
Housewife	79	81.4	NA	NA
Worker	67	69.1	NA	NA
Others	5	5.2	NA	NA
Sells products to children				
Yes	6	6.2	NA	NA
No	43	44.3	NA	NA
Maybe/Not sure	4	4.1	NA	NA
Did not comment	44	45.5	NA	NA
Always sells products sold in original packaging	97	100.0	NA	NA
Are products repackaged at the outlet?				
"No"	NA	NA	38 <sup>d</sup>	39.2
If "yes", which?				
Fertilizer and salt	46	47.4	NA	NA
Did not comment	13	13.4	NA	NA
Customers request mixtures of product	97	100.0	NA	NA
Advice sought by customer				
On precautions for storage and use	87	89.7	10	10.3
On accidental exposure/ingestion	80	82.5	17	17.5
Contacted by the Emergency Health Service agency	95	97.9	2	23.1

<sup>a</sup> Questions may have more than one response.

<sup>b</sup> Pet shops licensed to sell animal supplies; these retailers were also interviewed.

<sup>c</sup> NA = not applicable.

<sup>d</sup> Responses include retailers at agrochemical and pet shops.

pralidoxime, the antidote for organophosphates) or decontamination procedures. In addition, the Board does not interface with the country's Poisons Information Centre (PIC).

## DISCUSSION

Government resources spent on bureaucratic approvals for imported pesticide formulations in Trinidad are dif-

ficult to justify when a mere 2.9% of registered products are regularly sold by retailers. Over 50% of retailers on the island reported that paraquat was sold most frequently, followed by glyphosate, alpha-cypermethrin, and methomyl. Of 720 registered agrochemical formulations, only five brand name products are commonly sold, with a preference for Gramoxone.

Weak enforcement of the existing regulatory approval guidelines in Tri-

nidad calls for re-examination of policy. Contributions from the agricultural, health, and educational sectors can ensure that only those pesticides essential for the country are imported, which will facilitate subsequent monitoring. Eddleston et al. (9) recommend a minimum pesticide list analogous to the WHO Essential Drugs List in the developing world to contain pesticide poisoning and its harmful effects. Konradsen et al. (10) propose a restricted

pesticide list, enforced by national policies, in order to phase out WHO Class I and Class II pesticides, thereby controlling access to hazardous pesticides.

Trinidad and Tobago is encouraged to become a party to the Rotterdam Convention to enforce the Prior Informed Consent procedure of the United Nations Environment Programme (UNEP) and Food and Agriculture Organization (FAO) (11). Such empowerment will guarantee that only those pesticides that can be safely managed will enter the country and that importation of hazardous pesticides or their formulations will be controlled. Members of the Caribbean Community and Common Market (CARICOM) would also be encouraged to be parties to the Convention.

Encouraging fewer pesticide applications as part of the Integrated Pest Management system of FAO (12) allows health authorities to limit harm from pesticides. WHO and FAO encourage countries to introduce legislation restricting availability of problem pesticides (13, 14). Such an initiative would benefit Trinidad and Tobago in reducing easy access to and use of pesticides.

In the Caribbean, paraquat is most frequently used for poisoning by pesticide in Trinidad and Tobago (5) and Jamaica (15). In 1999, the incidence of paraquat poisoning in Trinidad was 8 per 100 000 population (5). Of 105 fatalities following acute exposure in south Trinidad, paraquat was involved in 80 deaths and organophosphates in 10 (16). Organophosphates and paraquat are also among the main causative agents of poisoning in Central America (17). Because there is no antidote and there are only limited treatment options, paraquat poisoning is life-threatening. A strategy of prevention should be adopted wherever paraquat is the favored pesticide.

Easy availability and ineffective regulatory control of pesticides make them a popular method of self-harm and a common cause of occupational exposure in the developing world. Like many countries, Trinidad and Tobago is complacent about the public health problem of pesticide poisoning, and

there is insufficient interest in giving priority to the reduction of associated morbidity and mortality (18). Enforcing pesticide regulations in developing countries has demonstrated decreased fatality from poisoning (19).

Yet to be defined in Trinidad are the extent of pesticide residue on produce and plants, the quantification and assessment of occupational exposure, and potential long-term adverse effects on health following such exposure. Vegetables in Trinidad may be presenting a health hazard to consumers and farmers. A survey conducted in 1996–1997 showed that 10% of produce exceeded the maximum residue limits for organophosphates (20). Acute poisoning from organophosphate exposure has not been reported, but occupational pesticide intoxication from organophosphate spraying has been described in Bolivian farmers (21).

Guidelines for preventive measures and therapeutic interventions following organophosphate exposure or poisoning can emerge from collaborative research in developing countries, where organophosphates are commonly used (22). Despite high usage of organophosphate compounds and sales by 47.4% of registered retailers, the Ministry of Health in Trinidad and Tobago does not ensure that a regular supply of the antidote pralidoxime is available from its health providers. Considering that organophosphates are easily available, the lack of oxime antidotes would increase the chances of fatal poisoning with these agents, though such data are not available for Trinidad and Tobago.

Pet shops, which constitute 39.2% of outlets for agrochemical pesticides, are licensed to sell veterinary items. However, they illegally sell pesticides for other than veterinary uses.

About half of respondents (45.4%) did not reply about selling pesticides to children, inviting speculation that children constitute a significant buyer population. Only authorized adults, namely farmers and/or landowners, should be permitted to purchase pesticides in order to protect children from accidental exposure or misuse.

A smaller, less expensive pesticide package size facilitates purchase for intentional self-poisoning. However, the opposite argument is that small package sizes discourage repackaging of larger quantities into unlabelled or inappropriate containers, a practice frequently associated with accidental poisoning. No retailer in the survey admitted to mixing or repackaging the imported agrochemical pesticides, even though the Board confirmed this activity on inspection visits. Obstacles in monitoring the trade, and fewer inspection visits than recommended, make detection of illicit activity difficult. The Board relies only on warning letters to vendors and a nominal cash penalty to enforce regulations. Licensed establishments for pesticide sale should be mandated to display the license prominently and maintain a ledger book for the Board's scrutiny.

The Board is inundated with unnecessary legislation and has insufficient resources to control a negligible utilization of agrochemicals. It is worth asking whether a country as small as Trinidad and Tobago needs so many formulations and "me-too" products. The inspectorate has acquired a culture of extensive investigation and report writing that becomes an end in itself (23). For example, surveillance by field inspection visits is below optimum (approximately every two months) and sacrificed for administrative responsibilities and tasks. Despite the paucity of officers, new supervisory staff and "foot soldiers" have not been recruited, placing the Board in a difficult situation when current staff retires.

Casual legislative control, inadequately trained personnel to monitor sale and use, and an oblivious community indicate that Trinidad and Tobago, like other developing countries, has no clear philosophy on pesticide safety (24). It is recommended that the 26-year-old Pesticides and Toxic Chemicals Act be reviewed, the workforce enhanced, the Board given adequate authority, and new staff trained as soon as possible. The creation of an expert committee to (a) register products that are relevant for the country and (b) build the local capacity to reg-

ulate storage, trade, and application will lighten the Board's administrative burden.

The Board does not have adequate resources to guide the management and treatment of pesticide poisoning. It is alarming that the EHS has depended on retailers as a source of information on antidotes and management of pesticide poisoning. The Board should put an end to this practice and ensure that this information is provided by toxicology specialists or the Poisons Information Centre. Therefore, it is a matter of urgency for the Board to initiate cooperation with the country's PIC. The PIC was established in 2001 as an academic initiative but has been unable to meet its mandate because of lack of funds and resources. Active partnership with the Ministry of Health can strengthen the Centre, making it possible for it to provide information on early supportive measures to manage the poisoned patient. This is where the EHS should be getting its information rather than from retailers of pesticides. With adequate support, the PIC would be in a position to initiate educational activities in the community, to stock specific antidotes, and to advise on decontamination procedures. This would benefit not only Trinidad and Tobago but other Caribbean countries and territories, the majority of which do not have a PIC.

The study was limited in not reporting on illegal imports of pesticides and the numerous unlicensed shops on the island, which could not be accessed. Nonetheless, the study has enabled production of a current database of

registered pesticides which can be reviewed annually. The repository of the database is the Registrar of the Pesticides and Toxic Chemicals Control Board, and a copy is also available at the local office of the Pan American Health Organization/World Health Organization in Trinidad and Tobago. The database categorizes agents by the chemical names of the active ingredients, the WHO Hazard classes, commercial and colloquial nomenclature, physical forms, exposure management, and specific antidotes and their availability in the country. For example, a product commercially called "Fish Mosquito Coils," of the pyrethroid chemical class, is available in solid form, contains the active ingredient allethrin, belongs to Hazard Class IV, has no specific antidote, and requires supportive care following exposure. The data provided in Table 2 illustrate the type of information in the database (excluding the antidotes and treatment recommendations). Such a country-specific database disseminated to health care institutes allows quick product identification and proficient diagnosis, treatment, and management. Ministries of Health, Labor, Industry, and Agriculture; providers of toxicological/health information; hospitals and primary care treatment facilities; suppliers of pesticides; and the community as a whole would benefit from this information.

The PIC can use this resource for educational interventions to prevent accidental or self-inflicted poisoning, decrease pesticide exposure, and facilitate early detection of poisoning. Es-

tablishing health surveillance programs for workers with occupational pesticide exposure, and promoting poisoning management by health providers, particularly in primary care facilities, can follow. The information and activities of the PIC should be shared and exchanged with other CARICOM countries.

We have highlighted excessive pesticide approval with poor regulatory control in Trinidad and Tobago. Health authorities must heed the lack of a functional PIC as a warning signal, and provide the existing structure with adequate resources for early management of poisoning prior to hospital admission.

**Acknowledgments.** This project was funded by a PAHO/WHO grant to Lexley M. Pinto Pereira and supported by the PAHO/WHO Representative in Trinidad and Tobago, Lilian Reneau-Vernon. Participating retailers cooperated without reservation. Joanna Tempowski and Nida Besbelli, International Programme on Chemical Safety, WHO, Geneva, made valuable comments, and Gerard Hutchinson, Professor of Psychiatry, University of the West Indies, critiqued the initial manuscript. Deoraj Ramcharan, Secretary of the Food and Drugs Division, and Imtiaz Ali, Senior Inspector of the Poisons and Toxic Chemicals Control Board, Ministry of Health of Trinidad and Tobago, provided the information requested. Nicholas George, Senior Pharmacist, Central Government Stores, Trinidad, informed on antidotes available in the country.

## REFERENCES

1. Tagwireyi D, Ball DE, Nhachi CF. Toxicoepidemiology in Zimbabwe: pesticide poisoning admissions to major hospitals. *Clin Toxicol (Phila)*. 2006;44(1):59-66.
2. Xue SZ. Health effects of pesticides: a review of epidemiologic research from the perspective of developing nations. *Am J Ind Med*. 1987;12:269-79.
3. Jeyaratnam J. Acute pesticide poisoning: a major global health problem. *World Health Stat Q*. 1990;43(3):139-44.
4. Wesseling C, McConnell R, Partanen T, Hogstedt C. Agricultural pesticide use in developing countries: health effects and research needs. *Int J Health Serv*. 1997;273-308.
5. Hutchinson G, Daisley H, Simeon D, Simmonds V, Shetty M, Lynn D. High rates of paraquat-induced suicide in southern Trinidad. *Suicide Life Threat Behav*. 1999; 29(2): 186-91.
6. Industry Canada. Country commercial guide-Trinidad and Tobago. Economics trends and outlook [Internet site]. Available from: <http://strategis.ic.gc.ca/epic/internet/inimr-rinsf/en/gr120483e.html>. Accessed 5 May 2006.
7. USA, Bureau of Western Hemisphere Affairs 2007 [Internet site]. Available from: <http://www.state.gov/r/pa/ei/bgn/35638.htm>. Accessed 21 August 2007.
8. Bryce R. Caribbean Land and Water Resources Network (CLAWRENET) [Internet site]. Ministry of Agriculture, Land and Marine Resources (MALMR), Trinidad and Tobago.

Available from: [http://www.procaribe.org/networks/clawrenet/reports/z\\_tt/tt.htm](http://www.procaribe.org/networks/clawrenet/reports/z_tt/tt.htm) Accessed 8 May 2006.

9. Eddleston M, Karalliedde L, Buckley N, Fernando R, Hutchinson G, Isbister G, et al. Pesticide poisoning in the developing world—a minimum pesticides list. *Lancet*. 2002;360(9340):1163–7.
10. Konradsen F, van der Hoek W, Cole DC, Hutchinson G, Daisley H, Singh S, et al. Reducing acute poisoning in developing countries—options for restricting the availability of pesticides. *Toxicology*. 2003;192(2–3):249–61.
11. United Nations Environmental Programme. Conference of plenipotentiaries on the Stockholm convention on persistent organic pollutants. UNEP/POPS/Conf/2. 2001. Available from: <http://www.pops.int/> Accessed 12 May 2006.
12. Food and Agriculture Organization of the United Nations. FAO pesticide management—FAO/OECD pesticide risk reduction survey, an analysis of government responses to the second questionnaire on the state of implementation of the international Code of Conduct on the Distribution and Use of Pesticides: Rome: FAO; 1996.
13. World Health Organization. Primary prevention of mental, neurological and psychosocial disorders. Geneva: WHO; 1998. Pp. 75–90.
14. World Health Organization. World health report 2001. Mental health: new understanding, new hope. Geneva: WHO; 2001.
15. Escoffery CT, Shirley SE. Fatal poisoning in Jamaica: a coroner's autopsy study from the University Hospital of the West Indies. *Med Sci Law*. 2004;44(2):116–20.
16. Daisley H Jr, Simmons V. Forensic analysis of acute fatal poisonings in the southern districts of Trinidad. *Vet Hum Toxicol*. 1999;41(1):23–5.
17. Wesseling C, Corriols M, Bravo V. Acute pesticide poisoning and pesticide registration in Central America. *Toxicol Appl Pharmacol*. 2005;207(2 Suppl):697–705.
18. Buckley NA, Roberts D, Eddleston M. Overcoming apathy in research on organophosphate poisoning. *BMJ*. 2004;329(7476):1231–3.
19. Roberts DM, Karunarathna A, Buckley NA, Manuweera G, Sheriff MH, Eddleston M. Influence of pesticide regulation on acute poisoning deaths in Sri Lanka. *Bull World Health Organ*. 2003;81(11):789–98.
20. Yen IC, Bekele I, Kalloo C. Use patterns and residual levels of organophosphate pesticides on vegetables in Trinidad, West Indies. *J AOAC Int*. 1999;82(4):991–5.
21. Jors E, Morant RC, Aguilar GC, Huici O, Lander F, Baelum J, et al. Occupational pesticide intoxications among farmers in Bolivia: a cross-sectional study. *Environ Health*. 2006 Apr 21;5(1):10.
22. Kamanyire R, Karalliedde L. Organophosphate toxicity and occupational exposure. *Occup Med (Lond)*. 2004;54(2):69–75.
23. London L, Bailie R. Challenges for improving surveillance for pesticide poisoning: policy implications for developing countries. *Int J Epidemiol*. 2001;30(3):564–70.
24. Ecobichon DJ. Pesticide use in developing countries. *Toxicology*. 2001;160(1–3):27–33.

Manuscript received on 24 May 2006. Revised version accepted for publication on 26 May 2007.

## RESUMEN

### Regulación, utilización y prácticas de venta minorista de los pesticidas en Trinidad y Tobago, Indias Occidentales: situación actual y cambios necesarios

**Objetivo.** Analizar la regulación de los pesticidas en Trinidad y Tobago y verificar la utilización y las prácticas de venta minorista de pesticidas en Trinidad, la mayor de las dos islas que componen la República de Trinidad y Tobago.

**Métodos.** Entre febrero y junio de 2005 se realizó una encuesta a los vendedores minoristas de sustancias químicas de Trinidad sobre los pesticidas más frecuentemente vendidos, así como sobre sus conocimientos y las prácticas de venta de pesticidas. La Junta de Control de Venenos y Sustancias Tóxicas (JCVST) del Ministerio de Salud informó sobre la legislación vigente.

**Resultados.** De 107 tiendas autorizadas que comerciaban activamente con pesticidas, 97 participaron en este estudio (tasa de respuesta de 91%). Solo 21 (2,9%) de los 720 productos registrados de cuatro clases de sustancias se utilizan con frecuencia. Los productos paraquat, metomil y alfacipermetrina (cuyos nombres comerciales respectivos son Gramoxone, Lannate y Fastac) pertenecientes a las clases de riesgo I y II de la Organización Mundial de la Salud (OMS) y la isopropilamina de glifosato (*Swiper*, Clase U) son los pesticidas más frecuentemente adquiridos. Las tiendas de mascotas constituyen 39,2% (38 unidades) de las tiendas minoristas que participaron en el estudio. No hay regulaciones que normen la venta de pesticidas a los agricultores y los niños pueden comprarlos. Los recursos humanos y técnicos inadecuados hacen inefectivos los controles legislativos y las medidas disciplinarias contra los infractores son débiles. Se emplean considerables recursos gubernamentales en procedimientos legislativos y en la aprobación de productos de muy baja (2,9%) tasa de utilización, lo que afecta negativamente en el monitoreo de las ventas de pesticidas. El Centro de Información sobre Venenos no coordina sus acciones con la JCVST ni ofrece intervenciones educativas para la comunidad. Como resultado de este estudio, se pudo elaborar la primera base de datos con los nombres químicos, de marcas y vernáculos de los pesticidas utilizados en Trinidad y Tobago; la clasificación de la OMS de los pesticidas aprobados; los productores; los empaques; y los antidotos y su disponibilidad, tanto para el uso de la Junta como de los profesionales sanitarios de Trinidad.

**Conclusiones.** Se recomienda realizar una urgente evaluación crítica de la legislación relacionada con la importación y el uso de los pesticidas en Trinidad y Tobago, así como la asociación con la Convención de Rotterdam. Un fortalecido Centro de Información sobre Venenos podría promover iniciativas educativas y ofrecer información sobre el tratamiento temprano de las personas expuestas a pesticidas.

## Palabras clave

Agricultura, comercio, regulación gubernamental, pesticidas, envenenamiento, Trinidad y Tobago.