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IODINE

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IODINE

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Three producers of crude iodine supplied about 28% of domestic demand in 2005 based on apparent consumption (table 1). Domestic and imported iodine was consumed in intermediate products prior to being sold to consumers (table 2). Iodine and its derivatives were used principally in animal feed, catalysts, colorants, inks, pharmaceutical and medical applications, photographic equipment, sanitation or disinfectants, and rosin stabilizers. Published prices for crude iodine in 2005 are found in table 3. Imports of crude iodine decreased by 10%, and imports of potassium iodide (KI) decreased by 32% (table 4). Exports of crude iodine increased by 109%, and exports of potassium iodide decreased by 34% during 2005 (table 5). Because some exports and imports are in product categories rather than listed as elemental iodine, net imports are not clearly distinguished. The United States is the world's third-ranked iodine producer, following Chile and Japan (table 6).

Commercial crude iodine normally has a minimum purity of 99.5% to 99.8%, depending on the supplier. Impurities, in order of quantity, are chiefly insoluble materials, iron, sulfuric acid, and water. The U.S. Pharmacopeia specifies an iodine content of not less than 99.8%. The Committee on Analytical Reagents of the American Chemical Society allows a maximum of 0.005% total bromine and chlorine and 0.010% nonvolatile matter.

Legislation and Government Programs

The revised fiscal year 2005 Annual Materials Plan authorized the disposal of 453,593 kilograms (kg) (1 million pounds) of crude iodine from the National Defense Stockpile (NDS) classified as excess to goal (U.S. Department of Defense, 2004§[1]). Stocks of iodine classified as excess to goal at the end of fiscal year 2005 (September 30, 2005) under the authority of the Ronald W. Reagan National Defense Authorization Act for Fiscal Year 2005 (Public Law 108-375, enacted October 28, 2004) were all subject to disposal limits. On February 7, 2005, the Defense National Stockpile Center (DNSC) announced the award of 113,000 kg (250,000 pounds) of crude iodine valued at $1.8 million ($15.87 per kilogram or $7.20 per pound) (Defense National Stockpile Center, 2005d). On May 5, 2005, the DNSC announced iodine basic ordering agreement (BOA) sales of 113,000 kg (250,000 pounds) for $2 million ($17.64 per kilogram or $8.00 per pound) (Defense National Stockpile Center, 2005c). On August 5, 2005, the DNSC announced iodine BOA sales for July 2005 of 113,000 kg (250,000 pounds) for $2.2 million ($19.40 per kilogram or $8.80 per pound) (Defense National Stockpile Center, 2005e). On November 9, 2005, the DNSC announced iodine BOA sales for October 2005 of 113,000 kg (250,000 pounds) for $2.3 million ($20.28 per kilogram or $9.20 per pound) (Defense National Stockpile Center, 2005f). On September 7, the DNSC announced changes in shipping instructions, payments, and solicitation notification (Defense National Stockpile Center, 2005a). On November 14, 2005, the revised Annual Materials Plan for fiscal year 2006 was released, allowing 453,000 kg (1 million pounds) to be sold (Defense National Stockpile Center, 2005b).

Iodide is an essential component of thyroid hormones. Perchlorate interferes with iodide uptake into the thyroid gland; perchlorate ingestion disrupts normal thyroid functions. In January, the National Research Council of the National Academies of Sciences published its technical review of the "Health Implication of Perchlorate Ingestion" report. From this review, the U.S. Environmental Protection Agency (EPA) established an official reference dose of 0.0007 milligram per kilogram per day of perchlorate (U.S. Environmental Protection Agency, 2005§).

The Food and Drug Administration (FDA) has approved KI in tablet form as a nonprescription drug for use as a "blocking agent" to prevent the human thyroid gland from absorbing radioactive iodine. On January 12, the FDA granted approval for ThyroShield™ (potassium iodide oral solution, USP) at a concentration of 65 milligrams per milliliter (mg/ml) for children (New York Jewish Times, 2005§).

Iodine, used with anhydrous ammonia and pseudoephedrin to make methamphetamine (meth), was first synthesized by a Japanese chemist in 1919 and used by both Axis and Allied troops in World War II to keep them alert and motivated. In the 1950s it was commonly prescribed as a weight loss aid, to fight depression, and to give housewives a boost. The Federal Government criminalized most uses of the drug in 1970. In 2005, it was still prescribed for the treatment of attention-deficit disorder and narcolepsy. More than 12 million Americans have tried methamphetamine, and 1.5 million are regular users, according to Federal estimates. Meth-making operations had been uncovered in all 50 States. Police nationwide ranked methamphetamine the No. 1 drug they battle. Many retailers have moved nonprescription cold pills behind the pharmacy counter, where meth cooks have a harder time obtaining the ingredients (Jefferson, 2005).

Some companies in the Philippines are selling and/or manufacturing water purification components, such as filters containing iodine and other iodinated resins as a disinfectant. The World Health Organization's 2003 "Background Document for Development of Drinking Water Quality" states that iodine is not recommended for long-term disinfection. Long term iodide exposure at levels exceeding the recommended energy nutrient intake may result in iodism. The symptoms resemble a sinus cold, but may also include salivary gland swelling, gastrointestinal irritation, acne, metallic or brassy taste, conjunctiva irritation, and edema of the eyelids. The recommended energy nutrient intake for iodine of Filippinos according to the Food and Nutrition

[1]References that include a section mark (§) can be found in the Internet References Cited section.

Research Institute, depending on age and sex, ranges from 80 to 120 micrograms per day for children, 120 to 150 micrograms daily for adults, and 200 micrograms per day for pregnant women (Subong, 2006).

Production

The U.S. Geological Survey derived domestic production data for iodine from a voluntary canvass of U.S. operations. The three companies to which a survey request was sent responded, representing 100% of the total production (tables 1, 6).

In 1987, IOCHEM Corp. (owned by the Kita family and Tomen Corp.) began producing iodine at a plant 1.2 kilometers east of Vici, Dewey County, OK. This was the leading U.S. iodine plant. The majority of production was shipped to Schering AG of Germany under a long-term contract. IOCHEM reported having nine production wells and four injection wells with a total production capacity of 1,400 metric tons per year (t/yr) at Vici. In 2005, a project was approved by the Oklahoma Department of Agriculture, Food, and Forestry to generate electricity from hot brine used to extract iodine. The project was expected to convert up to 10% of the estimated 30 megawatts of excess energy currently sent to cooling ponds. Current brine reaches the surface at 86º C (186º F). Also participating in the Brine Electric Inc. project are Nathaniel Energy, Denver, CO; Northwestern Electric Power Cooperative, Woodward, OK; and High Plains Resource Conservation and Development, Buffalo, NY (Carson, 2005).

North American Brine Resources began operating a miniplant located at Dover, Kingfisher County, OK, in 1983. In 2004, the miniplant continued operating at an oilfield-injection-disposal site near Dover.

Woodward Iodine Corp., Woodward County, OK, was wholly owned by Ise Chemical Corporation of Japan and began production in 1977. It produced iodine from 22 brine wells and injected waste through 10 injection wells. MIC Specialty Chemicals, Inc. (a subsidiary of Mitsubishi International Corp.) was the exclusive distributor for iodine produced by Woodward.

Consumption

Establishing an accurate end-use pattern for iodine is difficult because iodine-containing intermediates are marketed before reaching their ultimate end uses.

Biocides and Disinfectants.—Iodine is an effective germicide for a wide range of microorganisms. Iodine was used with iodophors in disinfectants for use in dairies, food processing plants, hospitals, and laboratories. Polyvinyl pyrrolidinone-iodine (PVP) complexes were used because of bactericidal, fungicidal, germicidal, and general disinfecting properties. Globaline tablets were used by the U.S. military to disinfect water supplies without boiling.

Catalyst.—Iodine is used in the production of acetic acid using the Monsanto process. The process involves methanol carbonylation with an iodide-promoted rhodium complex as the catalyst. Iodide catalysts, such as titanium tetraiodide and aluminum iodide, are used in the production of butane and butene to butadiene and in the preparation of stereoregular polymers.

Chemicals.—Iodine is used as a stabilizer in the manufacture of nylon for tire cord and carpets and for converting rosins, tall oil, and other wood products to a more stable form.

Nutrition.—Iodine is a necessary mineral in mammals for a healthy thyroid. The use of iodized salt has significantly reduced the incidence of goiter in mammals. Iodine deficiency disorder can be prevented by consuming about 150 milligrams of iodine per day for a human adult.

Pharmaceuticals.—Radiopaque agents are drugs used to help diagnose certain medical problems and may contain iodine, which absorbs x rays. Radiopaque-diagnosed medical problems include brain disorders, cardiac disease, central nervous system disorders, cerebrospinal fluid, disk disease, gastrointestinal (gall bladder) disorders, peritoneal disorders, splenic and portal vein disorders, urinary track disorders, and vascular disease. KI was used as an expectorant in cough medicines. Hydriodic acid and potassium iodide were used in the synthesis of amphetamine, ethylamphetamine, and methamphetamine stimulants controlled under 21 CFR §1308.11.

Television Panels.—Liquid crystal display (LCD) flat panel screens are replacing the cathode-ray tubes of older televisions. Merck K GaA of Germany produces 60% of the world's potassium iodide LCD material. Digital radiography screens use cesium iodide in the flat panel detectors.

Weather Modification.—Cloud seeding involves the introduction of additional nuclei (silver iodide) which causes more water drops to condense within the cloud and fall to earth. Cloud-top seeding uses generators on the ground to disperse the particle upward or by dropping flares out of planes directly into the cloud system and is performed between the temperatures of -5º C and -10º C. Cloud seeding is used internationally to increase precipitation in the form of rain or snow.

Other.—Uses included batteries, brachytherapy [a minimally invasive procedure that implants small radioactive iodine pellets (called seeds) about the size of a grain of rice into the prostate where they irradiate the cancer from inside the gland] high-purity metals, inks and colorants, laboratory reagents, lubricants, motor fuels, and photographic chemicals.

Prices

Actual prices for iodine are negotiated on long- and short-term contracts between buyers and sellers. The average declared cost, insurance, and freight (c.i.f.) value for imported crude iodine was $16.74 per kilogram. The average declared c.i.f. value for iodine imported from Chile was $17.14 per kilogram. The average declared c.i.f. value for imported crude iodine from Japan was $15.34 per kilogram. The average sale price of iodine sold by the DNSC was $17.57 per kilogram ($7.97 per pound). Published yearend U.S. prices for iodine and its primary compounds are listed in table 3 and figure 1. Because of the quarterly sales of iodine periodically since 1981, iodine prices have fluctuated.

Solicitations for NDS iodine sales are made on a quarterly basis. Since 1998, ten companies—Champa Purie-Chem Industries (India), Deepwater Chemicals Inc., Dyestuff International, Dewey Chemicals Inc., G. Amphray Lab (India), H&S Chemical Co. Inc., MIC Specialty Chemicals Inc., SQM North America, Venture Tech, and West Agro Chemical Inc.—

have purchased stockpile iodine. During the past year, the iodine market was undersupplied as increased global demand for iodine in 2005 resulted in price increases.

Foreign Trade

The U.S. Government adopted the harmonized commodity description and coding system as the basis for its export and import tariff and statistical classification systems. The system is intended for multinational use as a basis for classifying commodities in international trade for tariff, statistical, and transportation purposes. It includes unification of resublimed and crude iodine under the same code and free duty rate. Values that differ significantly could be a result of items being placed in the wrong category as a result of mistakes in reporting or to protect military items (tables 4-5). The International Trade Administration of the U.S. Department of Commerce provides monthly and annual import and export data by Harmonized Tariff Schedule of the United States classification.

World Industry Structure

Worldwide production of iodine in 2005 was estimated to be 25,400 metric tons (t), of which 15,600 t (59%) was produced in Chile, and 7,300 t (29%) was produced in Japan. Industrial uses of iodine are still increasing, and areas of applications are expanding beyond the established markets, which are as follows: catalysts, germicides and disinfectants, pharmaceuticals, various additives, x-ray contrast media, and other.

World Review

Chile.—Atacama Minerals Corp. reported that the purchase and sale agreement with ACF Minera S.A. to acquire ACF's 50% interest of the Aguas Blancas Mine located in the Atacama Desert of northern Chile was completed. An agitated-leach demonstration plant was to be built that would double the iodine production capacity to 1,500 metric tons per year (t/yr). The expansion was expected to cost $10 million and take 18 months to complete (Mining Engineering, 2005). AMEC International Chile S.A. (AMEC), an independent engineering consulting firm, prepared a resource and reserve estimate dated May 2005. The estimated reserves for the Aguas Blancas deposit estimated indicated resources of 34.8 million metric tons (Mt) of 483-part-per-million iodine (Shane, 2005).

Sociedad Química y Minera de Chile S.A. (SQM) was the world's leading producer of iodine. All production was from caliche ore. The geologic origin of the caliche ore is not clear, but it is thought to be of sedimentary origin. At the Pampa Blanca Mine located in the Sierra Gorda area the ore is leached in piles to obtain solutions of iodine, which are transported to solar evaporation ponds. In June 2004, SQM announced a 3-yea, $400 million expansion to include a 25% expansion in iodine production. In January 2005, SQM placed a 21-year unsecured bond on the Chilean market to finance the capital expenditure program (Harris, 2005).

SQM produced intermediate iodine at its five processing facilities, Mapocho—Maria Elena, Nueva Victoria, Pampa Blanca, and Pedro de Valdivia. The company planned to increase iodine production in the Nueva Victoria facility.

Japan.—Japan was the world's second-ranked producer of iodine. Iodine was manufactured in Chiba, Miyazaki, and Niigata Prefectures; Chiba Prefecture accounted for about 90% of all production in Japan. The following 8 companies operated 11 plants in Japan: Godo Shigen Sangyo Co., Ltd., Chiba Prefecture, 200 metric tons per month (t/mo); Ise Chemical Co., Ltd., two plants in Chiba Prefecture and one in Miyazaki Prefecture, 300 t/mo; Japan Energy Development Co., Ltd., Niigata Prefecture, 30 t/mo; Kanto Natural Gas Development Co., Ltd., Chiba Prefecture, 100 t/mo; Nihon Tennen Gas Co., Ltd., two plants in Chiba Prefecture, 100 t/mo; Nippoh Chemicals Co., Ltd., Chiba Prefecture, 60 t/mo; Teikoku Oil Co. Ltd., Chiba Prefecture, 50 t/mo; and Toho Earthtech, Inc., Niigata Prefecture, 60 t/mo.

Current Research and Technology

A study published in the Journal of the American Academy of Dermatology suggested that a high-dairy diet could contribute to teenage acne; however, a dermatologist suggested that the cause is the iodine levels in milk rather than the presence of hormones and bioactive molecules in milk. Several studies connected iodine consumption and acne development. The iodine enters the milk through animal feed and sanitizing solutions (Pepling, 2006).

An adhesive containing an iodide compound that secures the glass covering the charge-coupled device in digital cameras manufactured by Sony Corp. of Japan could possibly affect 10 million units. The compound reacted with water to generate a gas that corroded the bond and resulted in broken connections (Asakawa and Ootsuki, 2006).

Silver iodide nanoparticles could improve many aspects of current LCD technology by improving color, lifetime, and efficiency. Nanomaterials can diminish scattering and leveraging novel physical effects that could improve the optical, electronic, and mechanical properties. Nanotechnology has added value to flat panel displays by lowering cost and producing improvements in functionality. Organic light-emitting diode displays represent an application for quantum confinement, allowing quantum-dot color to be tuned to a particle size (Sobolev, 2005§).

Outlook

During the past decade, iodine production capacity in Chile and the United States has doubled, ensuring an adequate world supply. Most of the iodine producers were operating close to full capacity, and there may be some tightness of supply in the short term. Domestic demand was expected to remain at current levels because production of derivatives to supply the external market was expected to move overseas.

Biocides and Disinfectants.—Demand for biocides and disinfecting chemicals remained high. Growth in the water treatment market moved from South America to India and Pakistan and then into China. Expanding treatment of water supplies for municipalities will probably increase the demand for these chemicals in the future.

Catalyst.—Iodine is used as a catalyst in the making of various chemicals, including acetic acid. With the increase in

feedstock costs for natural gas and resulting increases in prices of chemicals, demand for iodine is likely to decrease.

Nutrition.—Iodine is used in animal feed to prevent goiter and regulate metabolism. People commonly receive iodine from KI added to salt. Demand for potassium iodide as a preventative of cancer of the thyroid in the event of a nuclear accident increased sales of pills to government and private individuals. More countries are providing these pills to individuals, and the demand for this compound is increasing.

Other.—Recent developments in digital imaging have produced electronic prints and overhead transparencies without the need for wet processing film. This would appear to cause a decrease in iodine usage in color film and film developing; however, 75% to 85% of all televised programs seen during prime time are recorded on 35-millimeter motion picture film and then transferred to videotape or laser disc for display. Furthermore, the majority of feature films for movie theater presentations are shot and printed on film because film provides higher image resolution. In the next decade, uses of iodine in films and processing may be limited to specialty film imaging as digital imagery technology for motion pictures improves and digital equipment and printers become more affordable.

Use of x-ray contrast media, which contain as much as 60% iodine, is expected to continue to grow between 4% and 5% per year. More medical tests on an aging population will result in increased demand for iodine-containing x-ray contrast media.

New uses of fluoroiodocarbon as halogen replacements may increase demand for iodine in fire suppression chemicals. More tests need to be completed on the iodated fluorocarbons before they are acceptable, but preliminary tests were promising. Supplementation programs designed to alleviate iodine deficiency disease (IDD) in China and India will continue to consume large amounts of iodine to prevent IDD. In Chile and Mexico, individual water purification units that use iodine are a new application of an existing purification process using iodine in camping, hiking, and military water supplies. Purification applications could become significant consumers of iodine. The use of iodine to treat wood for prevention of damage by insects was approved by the EPA to replace the use of chrome-copper-arsenates (CCAs). The potential for demand in this use is high because the PVP treatment material is not water soluble like other replacement materials for CCA treatments.

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TABLE 1
SALIENT IODINE STATISTICS[1]

(Metric tons and dollars)[*]

	2001	2002	2003	2004	2005
United States:					
Production	1,290	1,420	1,090	1,130	1,570
Imports[2]					
Quantity, for domestic consumption	5,030	6,190	5,750	5,700	6,250
Price, average[3]	13.94	12.70	11.81	13.38	16.75
Exports[2]	1,460	1,580	1,590	1,270	2,660
Consumption:					
Reported[4]	3,560	4,540	3,930	4,070	4,680
Apparent[5]	4,730	6,520	5,240	5,560	5,510
World, production[e]	20,700	21,000	22,900 [r]	24,800 [r]	25,400

[e]Estimated. [r]Revised.

[1]Data are rounded to no more than three significant digits, except prices.

[2]Source: U.S. Census Bureau information reported by Harmonized Tariff Schedule of the United States code 2801.20.0000.

[3]Cost, insurance, and freight valuation.

[4]Reported by voluntary response to the U.S. Geological Survey from a survey of domestic establishments.

[5]Calculated using domestic production plus imports minus exports plus adjustments for Government and domestic industry stock changes.

[*]Correction posted May 16, 2007.

TABLE 2
DOMESTIC CONSUMPTION OF IODINE, BY PRODUCT[1]

	2004		2005	
Product	Number of plants	Quantity (metric tons)	Number of plants	Quantity (metric tons)
Inorganic compounds:				
Crude iodine	NA	NA	8	833
Resublimed iodine	7	527	8	116
Potassium iodide	5	525	4	578
Sodium iodide	4	49	5	375
Hydriodic acid	2	46	2	131
Potassium iodate	3	66	3	33
Miscellaneous iodate, and iodides[2]	2	51	2	25
Other inorganic compounds	4	535	3	312
Total	18 [3]	1,800	22 [3]	2,470
Organic compounds:				
Ethylenediamine dihydroiodide	2	185	3	197
Povidine-iodine (idophors)	3	395	2	397
Other organic compounds[4]	5	1,690	5	1,680
Total	18 [3]	2,270	22 [3]	2,280
Grand total reported consumption[5]	XX	4,070	XX	4,680
Apparent consumption[6]	XX	5,560	XX	5,510

NA Not available. XX Not applicable.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes ammonium iodide, calcium iodate, and cuprous iodide.

[3]Nonadditive because some plants produce more than one product concurrently.

[4]Includes methyl and/or ethyl iodide.

[5]Reported by voluntary response to the U.S. Geological Survey in a survey of domestic establishments.

[6]Calculated using domestic production plus imports minus exports plus adjustments for Government and domestic industry stock changes.

TABLE 3
YEAREND 2005 PRICES OF ELEMENTAL IODINE AND SELECTED COMPOUNDS

Elemental iodine/compounds	Value[1] Dollars per kilogram	Dollars per pound
Iodine, crude, drums	23.00-25.00	10.43-11.34
Potassium iodide, U.S. Pharmacopeia, drums, 5,000-pound lots, delivered	25.76	12.27

[1]Conditions of final preparation, transportation, quantities, and qualities not stated are subject to negotiations and/or somewhat different price quotations.

Sources: Chemical Market Reporter, 2005, Current prices of chemicals and related materials, v. 267, no. 51, December 19, p. 22; U.S. Census Bureau.

TABLE 4
U.S. IMPORTS OF CRUDE IODINE AND POTASSIUM IODIDE FOR DOMESTIC CONSUMPTION, BY COUNTRY OF ORIGIN[1]

Type and country of origin[2]	2004 Quantity (metric tons)*	2004 Value[3] (thousands)*	2005 Quantity (metric tons)*	2005 Value[3] (thousands)*
Iodine, crude:				
Belgium	--	--	18	304
Canada	(4)	34	--	--
Chile	3,920	51,800	4,850	83,100
France	22	291	30	481
Germany	5	65	--	--
India	--	--	(4)	13
Japan	1,570	20,600	1,350	20,700
Mexico	71	1,000	--	--
Netherlands	--	--	(4)	2
Russia	21	282	7	102
Spain	89	1,210	--	--
United Kingdom	(4)	3	--	--
Total	5,700	75,300	6,250	105,000
Potassium iodide:[5]				
Brazil	161 r	2,690	74	1,570
Canada	287 r	4,810	233	5,170
Chile	200 r	3,570	136	2,990
Japan	5 r	19	3	21
Other[6]	25 r	440 r	11	225
Total	678	11,500	458	9,970

rRevised. -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Import information for crude iodine and potassium iodide are reported by Harmonized Tariff Schedule of the United States codes 2801.20.0000 and 2827.60.2000, respectively.

[3]Declared cost, insurance, and freight valuation.

[4]Less than ½ unit.

[5]Gross potassium iodide contains 76% crude iodine.

[6]Includes China (2004), Germany, and India (2004).

*Correction posted May 16, 2007.

Source: U.S. Census Bureau.

TABLE 5

U.S. EXPORTS OF CRUDE IODINE AND POTASSIUM IODIDE, BY COUNTRY OF ORIGIN[1]

Type and country of origin[2]	2004 Quantity (metric tons)*	2004 Value[3] (thousands)*	2005 Quantity (metric tons)*	2005 Value[3] (thousands)*
Iodine, crude/resublimed:				
Australia	--	--	20	61
Brazil	(4)	7	2	20
Canada	347	6,250	385	7,430
Dominican Republic	--	--	6	97
Germany	258	2,770	600	8,840
Jamaica	(4)	3	1	20
Japan	347	1,210	121	1,930
Korea, Republic of	(4)	14	34	168
India	18	166	371	2,970
Malaysia	6	24	6	30
Mexico	143	858	122	547
Saudi Arabia	--	--	2	3
Venezuela	12	182	29	218
United Kingdom	2	36	1	21
Other[5]	139	290 r	956	5,540
Total	1,270	11,800	2,660	27,900
Potassium iodide:[6]				
Australia	3	70	(4)	20
Colombia	(4)	11	(4)	9
France	29	591	4	134
Japan	1 r	22 r	3	41
Korea, Republic of	(4)	10 r	5	113
Mexico	5	125	6	177
Netherlands	2	56	1	38
Singapore	(4)	11	(4)	3
Taiwan	55	912 r	24	493
United Kingdom	5	120	(4)	8
Other[7]	1	50	22	515
Total	102	1,980	67	1,550

rRevised. -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Export information for iodine, crude/resublimed and potassium iodide are reported by Harmonized Tariff Schedule of the United States coders 2801.20.0000 and 2827.60.2000, respectively.

[3]Declared free alongside ship valuation.

[4]Less than ½ unit.

[5]Includes Argentina (2005), Belgium (2005), Chile (2005), Colombia (2005), Costa Rica (2004), El Salvador (2004), France, Hong Kong (2004), Italy (2004), the Netherlands (2005), New Zealand (2005), Pakistan (2005), Peru (2004), Singapore, Sri Lanka (2005), Taiwan (2004), Turkey (2005), and the United Arab Emirates (2005).

[6]Potassium iodide contains 76% crude iodine.

[7]Includes Belgium, China (2005), Germany (2005), Israel, Indonesia, Jamaica (2005), Malaysia, Peru, the Philippines (2005), Sierra Leone (2004), Switzerland (2005), Turkey (2005), and Venezuela.

*Correction posted May 16, 2007.

Source: U.S. Census Bureau.

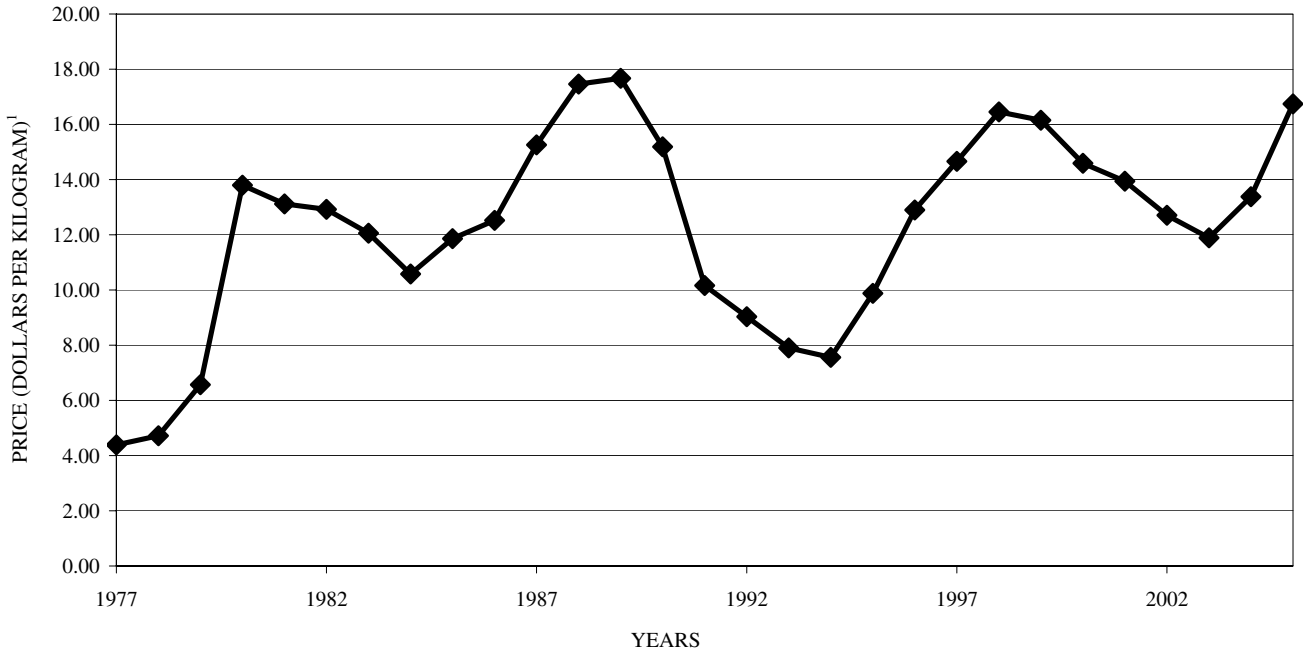
TABLE 6
CRUDE IODINE: ESTIMATED WORLD PRODUCTION, BY COUNTRY[1, 2]

(Metric tons)

Country	2001	2002	2003	2004	2005
Azerbaijan	300	300	300	300	300
Chile[3]	11,355 [4]	11,648 [4]	13,916 [r, 4]	14,931 [r, 4]	15,000
China	500	500	500	550	550
Indonesia	75	75	75	75	75
Japan	6,643 [4]	6,548 [4]	6,524 [4]	7,264 [r, 4]	7,300
Russia	300	300	300	300	300
Turkmenistan	200	200	200	250	270
United States[4, *]	1,290 [*]	1,420 [*]	1,090 [*]	1,130 [*]	1,574 [*]
Uzbekistan	2	2	2	2	2
Total	20,700	21,000	22,900 [r]	24,800 [r]	25,400

[r]Revised.
[1]World totals, U.S. data, and estimated data are rounded to no more than three significant digits; may not add to totals shown.
[2]Table includes data available through June 10, 2006.
[3]Includes iodine production reported by Servicio Nacional de Geologia y Minería.
[4]Reported figure.
[*]Correction posted May 16, 2007.

FIGURE 1
HISTORIC IODINE PRICES



[1]Cost, insurance, and freight valuation.