Federal Environmental and Occupational Toxicology Regulations and Reporting Requirements: A Practical Approach to What the Medical Toxicologist Needs to Know, Part 1

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Abstract Toxicologists are often called upon to assist in environmental, industrial, occupational and public health assessments. Accordingly, medical toxicologists may find it prudent to be aware of applicable federal toxicological regulations and reporting requirements and of the roles of relevant federal agencies. These regulations are numerous, complex, and have evolved and expanded over time, making it difficult for toxicologists to sustain a current knowledge base. This article reviews the pertinent federal toxicological reporting requirements with regard to the Toxic Substances Control Act (TSCA), the Atomic Energy Act (AEA), the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), the

Resource Conservation and Recovery Act (RCRA), the Clean Air Act, the Clean Water Act, the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the Emergency Planning and Community Right to Know Act (EPCRA), the Occupational Safety and Health Act, the Department of Transportation, and information about the National Response Center. We reference internet-based government resources and offer direct links to applicable websites in an attempt to offer rapid and current sources of practical information. The format of the article is a series of hypothetical scenarios followed by commentary. Discussions of the Safe Drinking Water Act, the Food, Drug, and Cosmetic Act, and the Dietary Supplement Health and Education Act are beyond the scope of this paper. For those desiring a more in-depth discussion of the relevant federal environmental laws and statutes and applicable case law, the reader is directed to resources such as the Environmental Law Handbook, the websites of individual laws found at www.epa.gov and the decisions of individual courts of appeal. It is our hope that this article provides not only useful practical information for the practicing toxicologist but also serves as a key reference for medical toxicology core content on environmental laws and regulations.

Keywords Environmental toxicology · Occupational toxicology · Federal regulations · Reporting requirements

This is part 1 of a two part series. Part 2 will appear in the next issue of JMT. The Journal of Medical Toxicology is grateful for the contribution that this paper makes to medical toxicology education and practice. This article was peer-reviewed.

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Background

Scenario You are on call at night as the medical consultant to your regional poison center (PC), and you are notified that there has been a local release of hydrogen cyanide. Several important questions immediately come to mind: Where was the spill? How many people could be affected? What resources are available to aid the injured? Is there a need for

evacuation, and, if so, how many need to be evacuated, how far away, and for how long?

These are all important questions that will shape the response and inform the poison center's recommendations. Some answers clearly fall outside the purview of the PC, including the decision to evacuate, the distance to evacuate, on-scene hazard containment and mitigation strategies, and on-scene incident management utilizing an Incident Command System (ICS). Decisions between implementing evacuation or shelter-in-place strategies are made in the field based on the real-time assessment of the release, weather, quality of structures in the plume, and characteristics of the population at risk. Guidance on evacuation radii, responder staging, and hazard containment is available in criterion standard references such as the Department of Transportation (DOT) Emergency Response Guidebook and through airborne hazardous material release ("plume") modeling platforms such as area locations of hazardous atmospheres (ALOHA) and HPAC. If the release occurred at a facility covered by the Toxic Release Inventory (Emergency Planning and Community Right-to-Know Act; EPCRA), then an annually submitted Risk Management Plan (RMP) may describe the chemicals, quantities, engineering processes, and "worst case scenario" potentially involved in the incident. It is likely that the most important contribution the medical toxicologist or PC can make to the resolution of an incident is to provide the best possible information on exposure, toxicity, human health effects, diagnosis, and treatment of the presumptive agent. The PC has the capability to communicate medical guidance to receiving facilities and to track those hospitalized patients for the need for additional intervention and to follow outcome. Additionally, the health communication role of the PC can be extremely important in a large incident which may affect an entire community. PCs routinely practice crisis communication, perform community outreach, and provide public health education.

One potentially less urgent but equally important question is as follows: what are the potential legal and regulatory reporting requirements for responsible parties, and who actually makes these reports? Over the last several decades, the number of federal and state hazardous substance regulations—and agencies responsible for administering these regulations—has grown. The original purpose of any one particular regulation may be environmental protection or protection of public health; however, all have implications for medical and clinical toxicologists in practice. In some cases, such as nuclear regulatory reporting, the requirements may date to the 1950s. More recently, the Department of Homeland Security has contributed several reporting requirements and response plans and frameworks, often in the form of Homeland Security Presidential Directives (HSPDs). HSPD-8 specifically singles out Poison Control Centers as a response resource. Reporting requirements, including the type of report and the

agency to which a report is directed, often vary depending on the type and amount of a hazardous substance involved, where the substance is located, in what capacity the substance was in use when the release occurred, and whether or not any human health effects resulted from the accident. Many clinician toxicologists are not fully aware of what regulations exist regarding the manufacture, storage, transportation, use, and disposal of hazardous chemicals. Additionally, toxicologists may not be aware of which federal or state agencies are responsible for regulating these materials and overseeing the consequences of their possession or unintended release. Although seldom required to make environmental or occupational hazardous materials reports themselves, nevertheless specialists in medical toxicology are often called upon by industry and the public for direction and consultation in emergency situations. Accordingly, they may be better able to assist in a response (for example, where to find sources of information on the hazards involved) if they have knowledge of applicable regulations and reporting requirements.

It is impossible to describe comprehensively all environmental, commercial, and occupational toxicology laws and regulations that might apply to every conceivable scenario encountered in a medical toxicologist's clinical practice. In addition, the many state and local regulations and agencies responsible for them magnify the complexity of this subject and are beyond the scope of this paper. Indeed, the myriad federal and state regulations, the agencies governing environmental permitting, regulation, and enforcement, the agencies concerned with occupational toxicology rulemaking, and the substantial body of case law that has grown around the environmental statutes, preclude an exhaustive review of this material. The reporting requirements for hazardous material releases, spills, and the laws which govern occupational exposure are largely unchanged since the 1970s. In addition, changes to chemical-specific standards and action levels based on changing science may be a lengthy process: for example, the original arsenic water standard of 50 ppb (established by the US Public Health Service in 1942 and set by the EPA in 1975) was ultimately lowered to 10 ppb by the EPA in 2001. Finally, the actual chemical agents or classes of chemical agents covered by these regulations are frequently reviewed and updated, so staying current on the regulatory status of a particular chemical or chemical class of interest requires frequent review.

The literature contains numerous articles describing federal environmental and occupational toxicology regulations, either as they relate to risk assessment and hazardous waste management or as they relate to environmental public health [1–7]. In addition, several medical and environmental toxicology textbooks have basic overviews of the principle federal environmental laws, relevant agencies, and chemical classes regulated, although these texts are seldom current and they offer little practical information concerning actual reporting requirements, such as to whom, when, where, and by what means [8, 9]?

The primary goal of this paper is not to provide an exhaustive review of all federal environmental and occupational toxicological statutes but rather to provide a practical guide for clinicians who desire a better understanding of the relevant federal statutes and reporting requirements which may apply in a case or incident in which they are consulted. In this article, references contain links to agency websites which in turn contain lists of covered chemicals, relevant quantities and thresholds, and report forms, rather than referencing actual federal code or other paper documentation. It is hoped that web links will provide information that is more easily accessible and current.

Federal Regulations and Reporting Requirements

Scenario 1 You are a medical toxicologist and work for a small environmental and industrial toxicology consulting firm. This firm has been hired by a housing developer that intends to build homes near a facility that dismantles and recycles industrial electrical equipment, such as oil-powered generators, electric motors, and transformers. During your research of this facility, you learn that part of this process involves draining lubricants and insulating fluids from these devices and then transferring these substances to a hazardous waste disposal service. Your client wants to know if there are any risks of potential long-term health effects for future residents living near such a facility. Before you can answer questions about possible health risk in terms of potentially exposed populations or completed exposure pathways, it is critical to determine exactly what industrial substances were present at the facility and in what quantity. To access this information, you want to know which agencies might be responsible for inspecting the facility, what types of reports are filed regarding the industrial toxic substances present at the facility, what is included in these reports, to which agency these reports are to be sent, and if there is a publicly available list of toxic substances present at the facility.

Toxic Substances Control Act

Most industrial chemicals potentially harmful to human health or the environment are regulated by the Toxic Substances Control Act (TSCA, 15 USC 2601–2629), a federal law and regulations governing the manufacture, importation, storage, use, disposal, and degradation of chemicals in commercial use. The first title of this act (Title I—The Control of Toxic Substances), passed on October 11, 1976 and allows the US Environmental Protection Agency (EPA) to substantially regulate the use of such chemicals. TSCA requires any organizations involved in any of the above activities to register the identity and amount of the chemicals with the EPA. The EPA is authorized to require the following:

1. Premanufacture testing of chemicals to determine health or environmental risk
2. Review of chemicals for significant risk prior to the start of commercial production
3. Restriction or prohibition on the production or disposal of certain chemicals
4. Import and export control of chemicals prior to their entering or leaving the USA

Any use of TSCA chemicals or mixtures of these chemicals exceeding 25,000 lbs/year must be registered with the EPA. However, organizations with less than \$40 million/year in cumulative sales or a total import or manufacturing volume of less than 10,000 lbs/year are exempt from this reporting requirement [10].

The information concerning chemicals used by the facility which you've been asked to research is available because of the EPA's authority to require record keeping and reporting of chemicals in the TSCA Chemical Substance Inventory, a continuously updated compendium on existing and new chemical substances used commercially in the USA (TSCA, 15 USC 2601–2629). The purpose of the TSCA Inventory is to identify existing and new chemicals for purposes of inventory reporting (existing chemicals) and those which may require testing, research, and reporting prior to commercial production, importation, and use. The public version of the Inventory is found at the US EPA's Substance Registry Service website [11].

There are two steps to listing of a chemical on the TSCA Inventory. First, if a chemical is not currently listed and is not exempt, then a manufacturer or importer must file a "premarketing notification (PMN)" (TSCA Section 5) and the chemical undergoes EPA review (listed chemicals intended for an entirely new use must also undergo review). Of specific interest to the medical toxicologist is the requirement that manufacturers/importers must supply any test data on health or environmental effects. However, there is no specified set of tests or requirement that specific environmental or human health data be generated for the review [12]. TSCA Section 5(e) requires the EPA to rule on the PMN within 90 days; it may delay an additional 90 days, limit or prohibit manufacture if premarket review information is lacking, or the EPA may ban a chemical altogether if there is evidence of substantial human health or environmental risk. If manufacture or import begins, the responsible party must file a "notice of commencement (NOC)" within 30 days [13]. In a sense, the two-step process is similar to that required by FDA for new drugs, to wit: filing of an Investigational New Drug (IND) which allows clinical trials to commence is similar to the PMN and review, while a NOC is analogous to filing of a New Drug Application (NDA) and FDA approval. Seeking a new indication for an FDA-approved drug also requires another IND; in the same vein, proposed new use of a TSCA listed (approved) chemical requires a new PMN.

There are a number of exemptions to the PMN/review/NOC process for test marketing, for R&D purposes, for low volumes used (less than 10,000 lbs/year), for polymers, and for substances imported as part of an article which are not intended to be removed from the article, and for impurities, by-products of reactions, and chemicals for which their final use in the market is related to a product formed of the chemical rather than the chemical itself. For example, a PVC pipe used in plumbing is considered an object and the chemical from which the pipe was molded is, in this instance, exempt. An additional type of exemption is allowed for so-called “low-volume release/low exposure” (LoREX) chemicals. A low-volume exemption for production/import of <10,000 lbs/year is combined with the following stringent exposure restrictions to qualify for LoREX:

1. No dermal exposures
2. No inhalational exposures
3. No exposure in drinking water over 1 mg/year
4. When applicable, ambient surface water limit of 1 ppb and less than 1 g/m³ released as a result of the chemical's incineration [14]

The definition of a “chemical” (TSCA Section 3(2)b) is comprehensive and includes both “organic or inorganic substance of a particular molecular entity...occurring in whole or in part as a result of a chemical reaction or occurring in nature...” TSCA contains notable exemptions to these definitions, including tobacco, any chemical mixture, any commercial pesticide, any nuclear material, and specifically any commercial food, food additive, drug, cosmetic, or device (40 CFR 710.2(p)).

The nature of EPA requirements for hazard data during a PMN or “significant new use review” (SNUR) is tiered: Human or environmental toxicity data is considered best. However, exposure data (such as physical properties of a new chemical that would be expected to contribute to exposure) or production volume/intended use/expected types of releases to occur, may be used as a surrogate for evaluating human and environmental risk. The manufacturer/importer is responsible for conducting a risk assessment based on exposure potential, chemical-specific properties, and volume/use/release data.

Testing and Studies

When a chemical presents a substantial risk either based on exposure potential OR volume in production/volume released, the EPA may require testing. Testing may be based on “risk” in which a chemical poses an unreasonable risk to human health or the environment, or where data are insufficient to make the determination (TSCA Section 4(a)(1)(A)) or when the risk of exposure is so high—based on production/use/

release volume—that human exposure is a foregone conclusion (TSCA Section 4(a)(1)(B)). The thresholds for testing based on likelihood of exposure were established on May 14, 1993:

1. Production of >1 million lbs/year
2. Release of >1 million lbs/year
3. Exposure of >100,000 of the general population per year
4. Exposure of >10,000 consumers per year
5. Exposure of >1,000 workers per year [15]

While there is no absolute set of test requirements, TSCA Section 4 allows EPA to require a range of studies, usually incorporating acute/subacute/chronic toxicity, neurotoxicity, teratogenicity, oncogenicity, and mutagenicity. Testing recommendations are established by the EPA Office of Chemical Safety and Pollution Prevention (OCSPP) as the Harmonized Test Guidelines (Series 870—Human Health Effects) [16]. The actual test methods are described for numerous tests under each of the following sections (a representative example of a toxicity study is included for illustrative purposes):

Group A—Acute Toxicity Test Guidelines

870.2400—Acute Eye Irritation (August 1998)

Group B—Subchronic Toxicity Test Guidelines

870.3150—90-Day Oral Toxicity in Nonrodents (August 1998)

Group C—Chronic Toxicity Test Guidelines

870.4300—Combined Chronic Toxicity/Carcinogenicity (August 1998)

Group D—Genetic Toxicity Test Guidelines

870.5100—Bacterial Reverse Mutation Test (August 1998)

870.5385—Mammalian Bone Marrow Chromosomal Aberration Test (August 1998)

Group E—Neurotoxicity Test Guidelines

870.6200—Neurotoxicity Screening Battery (August 1998)

870.6500—Schedule-Controlled Operant Behavior (August 1998)

Group F—Special Studies Test Guidelines

870.7800—Immunotoxicity (August 1998)

Group G—Health Effects Chemical-Specific Test Guidelines

870.8355—Combined Chronic Toxicity/Carcinogenicity Testing of Respirable Fibrous Particles (July 2001)

TSCA Section 6 gives the EPA the authority to regulate any chemical that poses an unreasonable risk to human health, including restrictions on manufacture and import, use, production volume, transport, disposal, up to and including bans for all use. EPA has regulated asbestos, CFCs, dioxins,

hexavalent chromium, metalworking fluids, and polychlorinated biphenyls (PCBs) under this authority.

TSCA Section 7 is an important authority which permits the EPA to conduct imminent hazard seizures of chemicals or inventory to protect human health. Imminent hazards are not necessarily related to a particular chemical, nor even a TSCA violation, but used instead when a situation or circumstance, not amenable to routine TSCA enforcement (penalties, fines) is an “imminent hazard” to human health or the environment.

Finally, TSCA Sections 11 and 16 codify the authorities to conduct inspections, assess fines (up to \$32,000 per day per violation) and penalties, subpoena records, and conduct negotiations and settlements with violators. Egregious or knowing violations of TSCA can result in criminal liability (\$25,000 per day and up to 1-year imprisonment) [17].

Ongoing Reporting

The EPA changed reporting requirements in 2003 with the Inventory Update Rule (IUR) which took effect in 2006. Entities must file an IUR report every 5 years for the manufacture (or import) of 25,000 lbs or more of an Inventory chemical in the year preceding the reporting year. Additionally, manufacture/import of greater than 300,000 lbs invokes additional reporting requirements of intended use and any human exposures resulting from manufacture, import, transport, or use of the chemical in the year prior to the report (40 CFR 710, Subpart C).

Reporting required by applicable organizations includes a listing of the identity of involved chemicals, their intended commercial use, the quantity of these chemicals in use, any by-products, any known health or environmental effects of these chemicals, a quality control plan to ensure safety and quality in chemical processes, a description of how many of the company’s workers may be exposed to the reported chemicals, disposal and pollution prevention activities, and the physical form and maximum concentration of the involved chemicals as those chemicals are released or transported from that company. Currently, reporting is required by involved organizations to be renewed every 5 years [18]. The Inventory can be accessed through the EPA’s website in the Chemical Registry System [19]. Non-proprietary and non-confidential chemical information is available publicly. Information to be kept confidential is still reported to the EPA though it is not publicly available, and substantiation of the need for confidentiality is required in such cases [19].

While TSCA itself is over 35 years old, subsequent TSCA amendments, or Titles, TSCA have been added to address specific public health protection regulations regarding the following: asbestos exposure (Title II—The Asbestos Hazard Emergency Response Act), indoor radon (Title III—The Indoor Radon Abatement Act), home lead exposure (Title IV—The Lead-Based Paint Exposure Reduction Act), and a ban on

PCB manufacture, importation, and commercial distribution with severe restrictions of PCB use and disposal [18].

TSCA does not preempt state regulation of chemicals covered under its scheme. For example, under TSCA Section 18, states are not prevented from also regulating chemicals specified in TSCA. However, if an EPA testing rule exists for a chemical (TSCA Section 4 rule), states are prohibited from establishing testing requirements for that chemical. Similarly, state or local regulations on a chemical with a specific EPA rule limiting, prohibiting, or restricting either production/import, use, transport, or disposal of a chemical, then the state regulation must be either identical to the federal rule or the state’s rule must ban the chemical entirely. For example, with regard to PCBs, states can regulate any substance with fewer than 50 ppm of PCBs, while anything containing more than 50 ppm PCBs falls under federal authority [20].

Some toxic or potentially toxic substances, such as radioactive materials regulated under the Atomic Energy Act, pesticides (regulated under FIFRA), food, food additives and cosmetics regulated under the 1994 Federal Food, Drug, and Cosmetic Act, and any tobacco product(s) have specific (and generally more stringent) federal laws and regulations governing their production, commercial use, and disposal, and are thus exempt under TSCA. In addition, regulatory agencies and reporting requirements may depend upon the setting in which TSCA Inventory substances are found and whether or not a chemical release has occurred. As an example, in instances where a state agency has substantial competence and resources, federal responsibilities may be carried out by the state.

In the above vignette, since no specific release has occurred, it would be reasonable for the toxicologist to check with the company as to which chemicals they may manufacture (or import), use, transport, inventory, or dispose of on-site; some of this reporting, such as the possession of an extremely hazardous substance (EHS) or a hazardous substance (HS) may be available as a result of Resource Conservation and Recovery Act (RCRA) reporting requirements which will be covered in Scenario 4. The chemicals can be checked against the TSCA Inventory, the most current print version of which is the 1985 edition (five volumes) and 1990 supplement. Human health or environmental toxicity data should be available from the company’s PMN filing and the subsequent EPA review. The nature of EPA’s decision under TSCA Section 5 (or Section 4 if a test rule was invoked, or Section 6 if an unreasonable risk to human health or the environment was found) should be available. If a chemical is under review, or is so old that it is in the process of being delisted from the Inventory, the EPA quarterly “Chemicals in Progress Bulletin” may be useful. In addition, any chemical with which the company deals in substantial quantities and which appears in the inventory, would have required an IUR

report every 5 years. Additional reporting requirements under the CAA, CWA, RCRA, and CERCLA will be covered in Scenario 5.

Scenario 2 You are on-call as your regional poison center's medical toxicologist and are notified by a Radiation Safety Officer that one of your state's nuclear power plants has just experienced an on-site reactor shutdown. There have not been any reports of injuries or fatalities, but the local emergency response plan has been activated. Besides offering medical toxicological expertise and consultation to local officials, emergency responders, and health care providers, you may wonder whether such an event needs to be reported to an agency of the federal government, how to make such a report, and to which agencies the report should be made. Are any of your actions during the incident reportable? What if there had been injuries requiring your or the PC's direct involvement in diagnosis, medical management, or patient tracking?

Atomic Energy Act

Radioactive and nuclear materials and substances containing radioactive materials are regulated by the US Nuclear Regulatory Commission (NRC) or through state enforcement of NRC standards. The Atomic Energy Act of 1954, under which the NRC functions, is a preemptive act which nonetheless allows for individual state involvement: A state nuclear regulatory agency may not set their own standards but may enforce compliance with federal standards. Materials regulated by the NRC include source materials such as uranium and thorium, special nuclear material such as enriched uranium and plutonium, and by-product materials such as nuclear reactor and enrichment mill wastes and residues. The NRC also regulates radiation dose limits for workers, posts radiation areas, and is the agency to which loss or theft of nuclear materials is reported. Other radioactive materials, such as radioactive materials used by industry, scientists, or in medicine, are regulated by individual states that have an agreement with the NRC to enforce the federal standards; there are 34 such states [21]. In states without an NRC agreement, the NRC itself regulates these "other" radiological materials' production, use, and disposal. Thus, one of your first questions will likely be: What is the NRC status of the state in which you practice? This will define the reporting agency (state or federal) if you are ever involved in an incident. The NRC also regulates the use of all radioactive and nuclear materials in areas not under state jurisdiction, such as at federal facilities (DOE) and tribal territories [22].

NRC nuclear facility adverse event reporting requirements are dependent on the circumstances of the event, with more serious and potentially life-threatening events requiring more immediate reporting. For example, criticality events, loss of material greater than normal operating loss, theft of material,

and area site emergencies require immediate reporting by the license holder to the NRC Operations Center at (301) 816-5100 whether or not there is a state-specific agreement, whereas less serious incidents such as an equipment failure or an unplanned contamination event requiring restricted access to that affected area for greater than 24 h (but not leading to an area site emergency plan activation) can be reported to the NRC within 24 h of the event. Reports can be made electronically, by telephone, and by written documentation. Such reports must include the date and time of the event, the location of the event, a description of the isotopes involved, the quantity and physical characteristics of the involved materials, a description of the event and its causes and contributing factors, and—if known—any known personnel exposures, and corrective actions taken [23]. Details of NRC contact information for radiation exposure reporting can be found at the Radiation Exposure Information and Reporting System (REIRS) for Radiation Workers website [24] as can contacts for report of safety concerns [25].

In the above vignette, even though no human exposures are thought to have occurred, nonetheless, since the facilities' site emergency plan was activated, the reporting requirement to the NRC is immediate, although the PC will not likely contribute significantly to the report. Alternately, if the incident on which your PC was consulted had involved exposures, injuries, or casualties, the report would also need to be immediate and you may be asked to make a contribution to the report of your center's role in medical management or victim tracking.

Scenario 3 You are a medical toxicologist working as a private consultant and have been hired by a local insecticide manufacturer. About 2 years ago, the manufacturer began marketing a new insecticide, but over the last several months, several farmers and insecticide applicators began to report odd skin lesions and respiratory complaints despite following the manufacturer's instructions for use. To your knowledge, no premarketing evaluation of this chemical has shown any skin or respiratory effects. The manufacturer wants you to evaluate the affected people to determine if there is indeed some as yet unknown adverse health effect linked to the use of this agent. If new adverse health effects resulting from the use of the insecticide are discovered, you would likely want to know if they need to be reported to any government agencies, and, if so, how must the report be made and to which agencies, and which party has the responsibility of making the report.

Federal Insecticide, Fungicide, and Rodenticide Act

The use of all pesticides in the USA, including all insecticides, herbicides, rodenticides, and fungicides, is regulated by the EPA under the authority of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). This act, passed in 1947 by Congress, required that all pesticides distributed in interstate

commerce, be registered with the US Department of Agriculture before any commercial use and that all pesticide use comply with the labeled instructions. In 1964, Congress made it possible for the USDA to refuse registration of a pesticide if there were concerns for safety or product effectiveness. In 1972, Congress amended this statute allowing EPA to oversee the registration of pesticide, labeling of product and legal remedies if they were mislabeled, dangerous, ineffective, or misused.

With the creation of the EPA by Presidential Reorganization Order No. 3 on December 2, 1970, the responsibilities of FIFRA were transferred from the USDA to the EPA in 1972 [26]. FIFRA was amended in 1972 as the Federal Environmental Pesticide Control Act (FEPCA) which created legal authorities for pesticide regulation, some of which include suspension (an immediate ban on use) and cancellation (the legal proceedings aimed at deregistering a pesticide). The EPA has the authority to suspend the use of any pesticide if it finds sufficient evidence of unwarranted risks to public health or the environment. Manufacturers of pesticides must submit a report to the EPA prior to commercial production and marketing that includes a proposed label describing application directions, indications for use of the pesticide, the chemical formula of the pesticide (generally kept confidential by the EPA for patent protection), and a description of all product testing related to the pesticide's efficacy and safety (medical toxicologists may have access to the formula and formulation of a pesticide through PoisIndex, which is distributed to poison centers under a confidentiality agreement regarding the protection of proprietary information). Many pesticides may be applied legally only by licensed pesticide applicators who receive their certification by means of a formal training and examination process [27].

Adverse events resulting from exposure to already registered pesticides used properly must be reported by the organization that has previously registered that pesticide with the EPA [28, 29]. Such events are defined under FIFRA as “any unreasonable risk to man or the environment, taking into account the economic, social, and environmental costs and benefits of the use of any pesticide” [29]. This requirement allows the EPA to reconsider allowing the use of such pesticides if post-registration information demonstrating undue human health or environmental risk becomes available.

A prime example of this type of post-registration action involved the pesticide DDT. Rachel Carson's book, *Silent Spring*, drew attention to the potential environmental consequences and human health effects associated with DDT use in the 1950s [30]. Upon its publication in 1962, the US Department of Agriculture (then responsible for FIFRA activities) initiated deregistration of DDT; this process was not completed until June 14, 1972, by the EPA, which inherited FIFRA duties in 1970. In July 1975, EPA report EPA 540/1-75-022 describing all of the criteria and scientific and economic evidence which informed the decision to ban DDT [31].

Adverse events information that must be reported to the EPA includes listing exactly who or which organization discovered the adverse event information, all written documentation including published articles, public hearing records, or previously submitted documentation to the EPA regarding the pesticide in question, (reports of) any human fatalities or hospitalizations, and any domestic animal or wildlife fatalities thought to be due to the direct result of exposure to the pesticide [32]. Adverse Event Reporting under FIFRA is made on a 26-page collection of guidance documents and templates known as an Industry Voluntary 6(a)(2) Incident Reporting Form which must be submitted to the EPA within thirty calendar days of the registrant's (or surrogate reporting party's) knowledge of the adverse effects [33]. Thus, your role in discovering or documenting the new adverse health effect information will be part of the report made to the EPA, even if the pesticide registering entity is the one actually making the report. Alternately, a toxicologist may be the reporting party (on behalf of the manufacturer) if the original registering entity is not known. Details of EPA contact information necessary for adverse events reporting can be found at the EPA's website “Adverse Effects Reporting: FIFRA 6(a)(2)” [28]. Responding to a FIFRA report will usually be a state agricultural department or state environmental agency responsibility since the EPA typically takes the reporting party's notification, and passes it to the state for enforcement or action. A list of state agriculture agencies can be found on the USDA website [34]. Thus, if a medical toxicologist is responsible for making the FIFRA notification (either on behalf of the manufacturer, or if the original registering entity is no longer available) on the new human health effect of this pesticide—as is the case in this scenario—the toxicologist may ultimately be dealing with a state agriculture, state environmental, or state public health point of contact.

Scenario 4 You are a medical toxicologist working for your state environmental protection agency and you have just been notified that a hazardous waste transportation company will be transferring and temporarily storing hazardous material within your jurisdiction before finally shipping the material to a treatment and disposal location in another state. You have been asked by your supervisor whether there are any public health concerns that may be associated with this plan. To answer this question, you would need to know, among other things, exactly what type and quantity of material will be transported, what type of temporary storage and containment will be used, and particular risks associated with handling the material. To find this information, you need to know what specific data regarding the hazardous waste needs to be reported under federal law and is thus available to you for review.

Resource Conservation and Recovery Act

Regulation of the generation, management, handling, transport, and disposal of hazardous solid wastes at active and

anticipated sites within the USA is detailed by the RCRA of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. RCRA is an all-encompassing statute aimed at changing the practice of solid hazardous waste disposal in the USA with the aim of environmental protection and natural resource preservation. The act was responsible for the essential ban on the practice of land disposal (“dumping”) of hazardous wastes; the 1984 Amendment also strictly regulated the use of underground storage tanks (USTs). Together, RCRA/HSWA is an attempt to protect the future environment and human health from the unregulated, improper use and disposal of hazardous wastes in the USA.

Definition of “Hazardous” Wastes

The definition of hazardous waste is a difficult one and requires definition for purposes of the RCRA statute. “Hazardous” wastes are defined in terms of wastes which pose a health or environmental hazard based on amount or physical, chemical, or infectious characteristics (Section 1004(27), 42 USC 6903(27)). The first class is called the “characteristic” or “D-list” substances, because a chemical whose hazardous waste identification number starts with D must exhibit any of four hazardous “characteristics” (40 CFR Part 261, Subpart C): (a) liquid with a flashpoint of less than 60 °C, (b) non-liquids that can ignite spontaneously or by friction or exposure to moisture, (c) an ignitable compressed gas defined by DOT (49 CFR 173.300), or (d) an oxidizer defined by DOT (49 CFR 173.151). There are 43 D-list wastes currently listed at the EPA Office of Solid Waste [35].

For reporting, manifesting, and regulatory purposes, the EPA maintains several lists of hazardous wastes. Unsourced wastes such as waste solvents and ketones are F-list substances (those with hazardous waste ID numbers beginning with F). K-list wastes have a source, such as wood-preserved waste sludge and petroleum waste sludge. P-list substances (P for “poisonous”) are acutely hazardous because of their toxicity (HCN is a P-list chemical); these chemical wastes are more stringently regulated. Finally, U-list substances are considered toxic for purposes of disposal. Current listing at Office of Solid Waste (OSW) based on HazWaste numbers includes the following:

- U-list—359 wastes
- P-list—123 wastes
- K-list—151 wastes
- F-list—39 wastes

As mentioned above, the characteristic wastes or D-list substances are listed based on one of four particularly hazardous chemical properties (flammability, ignitability, corrosivity, toxicity). It does not matter what the waste is, if it meets certain characteristics or possesses certain chemical properties

(such as a flashpoint of <60 °C), the substance is considered a hazardous waste when it comes time to dispose of it.

There are notable exceptions to the hazardous waste lists, such as household garbage, sewage, industrial wastewater discharge covered by the Clean Water Act, nuclear materials covered by the Atomic Energy Act, scrap metal, as well as coal combustion, mine tailings, and oil and gas drilling wastes. Some universal wastes, such as nickel-cadmium batteries, mercury-containing thermometers, and fluorescent light bulbs, are exempt from HazWaste listing but still must be transported and disposed of using an abbreviated set of regulations, reporting requirements, and record keeping [36].

The EPA and, in some cases, state environmental protection agencies acting under the authority of the EPA, enforce RCRA law. Thus, through a comprehensive system of self-identification, permitting, reporting, tracking, record keeping, and civil and criminal penalties, a producer or handler of a hazardous waste is responsible for every step of substance management, in other words from “cradle to grave” [37]. Abandoned hazardous wastes and inactive waste sites fall under the jurisdiction of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA—also known as “Superfund”) which creates remedies for those material and sites in which “ownership” or linkage to a responsible party no longer applies.

RCRA Program

The most important of the 10 RCRA subsections is Subtitle C (42 U.S.C. 6921–6939e), Sections 3001–3023, which describe this all-encompassing US hazardous waste management program. Section 3001 defines hazardous wastes as described above. RCRA Subtitle C, Sections 3002, 3003, and 3004 are sets of standards governing waste handling, labeling, tracking, transporting, and delivery of wastes to appropriate treatment and disposal facilities [38]. Section 3005 governs the permitting and operation of, and the air- and water-monitoring plan, corrective actions, and process controls at, disposal facilities. Section 3006 allows for state authority in carrying out administration and enforcement of an “equivalent” waste management program to that of RCRA. Thus, section 3006 is a non-preemptive allowance in that it does not prevent states from adopting more stringent standards than those in 3002–3005. Additional RCRA Subtitle C sections include provisions for record keeping retention by hazardous waste organizations, training of personnel in appropriate waste management and handling (Hazardous Waste Operators/HazWOPER training 29 CFR1910.120(a-p)), waste minimization efforts, waste packaging and labeling, and designates and provides permits to facilities based on the volume of hazardous waste managed [39].

Not all entities are covered by RCRA. Certain exceptions are in place for small (<1,000 kg) and “very small” (<100 kg)

generators of waste—they may store wastes for extended periods of time and may only need to manifest their waste and insure it is disposed of at a proper transport-storage-disposal (TSD) facility (40 CFR 261.5) [40]. Other entities may not be subject to RCRA unless they have a spill or accident, such as a chemical supply company which spills a pure listed substance; if such an event occurs, the company must go through the Section 3002 process of becoming a RCRA compliant generator of hazardous waste.

The process of RCRA enforcement begins with an entities' notification to EPA that it is commencing hazardous waste activities. RCRA Section 3010(a) requires a generator, transporter, or disposal facility to file Form 8700-12 within 90 days of the start of HazWaste operations [41]. Information includes identifying data, and the EPA hazardous waste identification numbers of the material. Once a generator of hazardous waste obtains their EPA identification numbers, they must produce a Uniform Hazardous Waste Manifest which will accompany the waste from generation, through transport, storage, treatment, and disposal (i.e., “cradle to grave”) [42]. All hazardous wastes regulated under RCRA require an accompanying manifest which must include the generator's name, the transporter's name and EPA identification number, the HazWaste number, and the listed disposal destination or other designated site EPA identification numbers. Details regarding the waste material itself, including the shippers name, product identification, DOT hazard class, any special handling instructions, number of containers, unit weights and volumes, and the materials' EPA waste codes must also be specified on the manifest. The manifests must be available with the wastes from the time it is generated (the “cradle”) until it reaches final disposition (the “grave”), and the manifest must be shared with each state that the waste travels through when shipped.

Implied in this tracking and surety program are regulations insuring proper packaging and labeling of the waste at all times and adherence to DOT Hazardous Materials Transport Act requirements such as placarding and manifesting. Examples of record keeping, covering every step of the process include receiving the final documentation of disposal of the waste by the TSD facility and maintaining it for 3 years. If the generator of the waste does not receive the final receipt that their waste has indeed reached “the grave” they must file an exception notice with the EPA and begin the process of investigating and accounting for the missing waste. Generators of wastes are permitted to maintain small amounts of waste on-site prior to transport and disposal; however, if they treat their own wastes, they must also file for permitting as a TSD facility. Waste generators file biannual reports (Form 8700-13A) to the EPA (or state if authorized to administer the RCRA program) describing their activities, types and amounts of waste generated, and a plan to minimize waste amount and toxicity [43].

While most transporters of HazWaste must obtain an EPA identification number and storage permit and comply with

DOT Hazardous Materials Transport Act (HMTA) requirements (container standards, labeling, placards), comply with RCRA Subtitle C, Section 3003 governing transports, and maintain the manifest and all relevant documentation until final delivery of the waste to the TSD facility, there is an exception for transporters who hold HazWaste for less than 10 days. These transporters are not required to obtain storage permits and comply with RCRA (40 CFR 263.12) [44]. Transporters are responsible for cleanup of waste spilled in transport; however, reporting is required under the DOT HMTA to the National Response Center, whereas a permitted generator or TSD facility which has a spill is required to report to EPA in compliance with the applicable Subtitle C section: 3002 for waste generators and 3004 for TSD facilities.

Hazardous and Solid Waste Amendment

The HSWA to RCRA, enacted in 1984, is perhaps one of the most restrictive of the federal environmental laws ever passed. While not severe in terms of penalties or fines, the numerous statutes and restriction were born out of the recent experience and sentiment over headline-making, abandoned hazardous waste sites in which long buried and forgotten toxins exposed communities resulting in human health effects (Love Canal, NY). HSWA severely restricted land-filling of hazardous wastes in favor of treatment, recycling, or more permanent options like incineration. New regulations and restrictions on facilities that treat and dispose of hazardous wastes were a key element of the HSWA.

Under HSWA Subtitle I, underground storage tanks which were used to hold hazardous wastes and petroleum products were subjected to new regulations governing their registration, maintenance, and improved leak detection [45]. EPA requires notification of tank installation/status/location using Form 7530-1, sets standards for the types of tanks which can be installed, determines the minimum technical standards of tanks (Section 3004(o)) such as having a leak detection system (3004(o)(4)), and allows for federal inspection [46]. In addition, new solid waste management strategies were explored. “Land farming” is encouraged under HSWA, and most commonly, land farming is used for solid wastes like sewage treatment plant sludge or for relatively low-toxicity VOCs like many ketones. In addition, HSWA specifically regulated management of underground storage tanks containing petroleum products [37]. HSWA broadened the mandate of EPA under RCRA and authorized the EPA to regulate companies that only produce or handle small quantities (less than 1,000 kg) of hazardous waste each month [47]. This greatly expanded the number of industries and sites subject to RCRA statutes.

There is no single report to the EPA required by RCRA; rather there are multiple types of reports that must be made

depending on the circumstance: start-up of waste operations, overproduction of wastes, spills, human exposures, facility type, location of wastes within facility, containment, etc. A brief summary of the circumstances requiring reporting, who is required to make the report (waste generator, transporter, TSD facility), and references to the appropriate citations within the federal code can be found in the following EPA web link [48].

In certain states, many of the regulations and reporting under RCRA are managed by state environmental agencies under the authority of the EPA (Subtitle C, Section 3006), while in other, non-authorized states, RCRA regulations are managed by the EPA itself. If a state's program is consistent with RCRA, then a state may administer its own waste management plan, including Subtitle C functions such as facility permitting, inspection, enforcement, and required reporting. Thus, RCRA is not strictly speaking preemptive. A state may not be able to prohibit a hazardous waste activity from occurring at a facility, but they can still regulate it. In essence, any facility has to be allowed to operate, but through zoning codes and other permitting mechanism, where and how it operates may be tightly controlled by authorized state agencies. In certain circumstances, a state might restrict a facility from handling certain wastes that it may technically be capable of handling—for example, if it is near a populated area.

As a federal law that is not preemptive, a great deal of leeway is afforded to states to carry out the same responsibilities as RCRA. States can enforce requirements that are at least as stringent as the federal rules and may be more stringent. So, in one state, used oil that might come from an auto lubrication facility (e.g., a quick oil change shop) is considered a hazardous waste subject to these same or similar reporting requirements. In another states, such oil might only be a “special waste” with less stringent requirements (after passage of the HSWA in 1984, EPA decided *not* to list used motor oil as a hazardous waste unless it contained >1,000 ppm total halogens and thus represented a mixture of chlorinated hydrocarbons which *are* listed hazardous wastes) [49].

Thus, for the Scenario above, you must have some idea of the scope of your state's assumption of RCRA responsibilities (or not), and if so, how your state may regulate specific types of hazardous waste facilities (producers, transporters, licensed disposers), and perhaps more importantly, how your state classifies certain types of waste. There are several possible pitfalls in this scenario. First, if your state assumes waste management responsibilities under RCRA or its own program, then the temporary storage site is likely permitted and complies with both RCRA Section 3003 and the DOT Hazardous Materials Transport Act requirements, as well as maintaining a Universal Reporting manifest. In this case, information on the waste entering your area will be well documented and have a management program to insure its proper handling,

storage, and ultimate disposal. However, if your state does not have its own waste management program and the site plans to hold the waste for less than 10 days—and thus be exempt from RCRA—then you may find there is a dearth of information on what is entering your area. If the waste originated out-of-state and that state has its own waste management plan, but no jurisdiction or enforcement in your state, a spill at the “temporary” holding site in your state could result in a gap in the “cradle to grave” provision and no responsible party. While there may not be any immediate public health concern unless an accident occurs, there may nonetheless be concerns about proper hazardous waste handling responsibilities. Contacting the producer of the waste before it arrives, and asking for documentation such as their hazardous waste permit (8700-12) and any biennial reports (8700-13A)—which will detail what wastes they generate—as well as the Universal Reporting Manifest which will detail exactly what is headed your way in this shipment could be helpful. Checking the RCRA status of the transport company and any permits they have will quickly demonstrate if they are subject to RCRA or the originating state's RCRA program. If a spill occurs while the shipment is actually being moved, then notification would be to the National Response Center and thus fall under federal authority. If a spill occurs at the actual holding facility and it is “exempt” based on a planned storage of 10 days or less, there could be no responsible party. Information for state program status and regional EPA offices can be found at the RCRA State Authorization website [50].

Conflict of Interest The findings and conclusions in this report are those of the authors and do not necessarily represent the views of the Centers for Disease Control and Prevention, the Agency for Toxic Substances and Disease Registry, or the National Institute for Occupational Safety and Health.

References

1. Dime RA, Sadat MM, Berkowitz J (1983) Approach towards establishing interim hazardous waste cleanup criteria. National Conference on Management of Uncontrolled Hazardous Waste Sites; 1983 October 31–November 2. Hazardous Materials Control Research Institute Consultants, Washington, DC, pp 301–303
2. Klees AA (1996) The interface of environmental regulation and public health. *Occup Med* 11:173–192
3. Kamrin MA (1997) Environmental risk harmonization: federal/state approaches to risk assessment and management. *Regul Toxicol Pharmacol* 25:158–165
4. Schweitzer GE. Proceedings of the Fourth Annual Conference on Environmental Toxicology, 16, 17, and 18 October 1973, 1973 Aerospace Medical Research Laboratory, Wright-Patterson Air Force Base, Ohio; Report Number AMRL-TR-73-125, pp 11–18
5. Lynn FM, Kartez JD (1994) Environmental democracy in action: the toxics release inventory. *Environ Manag* 18:511–521

6. Garrett TL (1979) The law of toxic substances. *Environ Health Perspect* 32:279–284
7. Walker B (1985) The present role of the local health department in environmental toxicology. *J Environ Health* 48:133–137
8. Wald PH (2006) Industrial poisoning: information and control. In: Flomenbaum NE, Goldfrank LR, Hoffman RS, Howland MA, Lewin NA, Nelson LS (eds) *Goldfrank's toxicologic emergencies*, 8th edn. McGraw-Hill Companies Inc, New York, pp 1663–1672
9. Micale LM, Phillips PD (1999) Laws and regulations regarding hazardous materials. In: Sullivan JB, Krieger GR (eds) *Clinical environmental health and toxic exposures*, 2nd edn. Lippincott, Williams, and Wilkins, Philadelphia, pp 93–107
10. U.S. Environmental Protection Agency: Toxic Substance Control Act (TSCA) Section 8(e) Notices, December 1, 2006. (Accessed January 14, 2007 at <http://www.epa.gov/oppt/tscas8e/pubs/reportingrequirements.htm>)
11. U.S. Environmental Protection Agency: Substance Registry Service. (Accessed May 31, 2014 at http://iaspub.epa.gov/sor_internet/registry/substreg/searchandretrieve/searchbylist/search.do)
12. Landfair SL (2007) Toxic Substances Control Act. In: Sullivan TFP (ed) *Environmental Law Handbook*, 19th edn. Government Institutes, Lanham, p 617
13. Landfair SL (2007) Toxic Substances Control Act. In: Sullivan TFP (ed) *Environmental Law Handbook*, 19th edn. Government Institutes, Lanham, p 618
14. U.S. Environmental Protection Agency: new chemical—low volume exemptions/modifications, April 3, 2013. (Accessed May 31, 2014 at <http://www.epa.gov/oppt/newchemicals/pubs/backlvem.htm>)
15. Landfair SL (2007) Toxic Substances Control Act. In: Sullivan TFP (ed) *Environmental Law Handbook*, 19th edn. Government Institutes, Lanham, p 646
16. U.S. Environmental Protection Agency: Chemical Safety and Pollution Prevention - Harmonized Test Guidelines, June 11, 2013. (Accessed May 31, 2014 at http://www.epa.gov/ocspp/pubs/frs/publications/Test_Guidelines/series870.htm)
17. Landfair SL (2007) Toxic Substances Control Act. In: Sullivan TFP (ed) *Environmental Law Handbook*, 19th edn. Government Institutes, Lanham, pp 669, 678
18. U.S. Environmental Protection Agency: Civil Enforcement - TSCA Enforcement Programs and Priorities, March 23, 2006. (Accessed January 14, 2007 at <http://www.epa.gov/compliance/civil/tscat/enfprog.html>)
19. U.S. Environmental Protection Agency: TSCA Chemical Substance Inventory, January 8, 2014. (Accessed January 14, 2014 at <http://www.epa.gov/oppt/existingchemicals/pubs/tscainventory/>)
20. U.S. Environmental Protection Agency: polychlorinated biphenyls (PCBs), March 25, 2014. (Accessed May 31, 2014 at <http://www.epa.gov/epawaste/hazard/tsd/pcbs/index.htm>)
21. U.S. Nuclear Regulatory Commission: NRC:FSME - State Regulations and Legislation, May 28, 2014. (Accessed May 31, 2014 at <http://nrc-stp.ornl.gov/rulemaking.html>)
22. U.S. Nuclear Regulatory Commission: state and tribal programs, March 5, 2007. (Accessed April 27, 2007 at <http://www.nrc.gov/about-nrc/state-tribal.html>)
23. U.S. Nuclear Regulatory Commission: NRC Regulations: Subpart F—reports and inspections, April 20, 2007. (Accessed April 27, 2007 at <http://www.nrc.gov/reading-rm/doc-collections/cfr/part076/part076-0120.html>)
24. U.S. Nuclear Regulatory Commission: reporting radiation exposure information to the NRC, January 27, 2014. (Accessed May 31, 2014 at <http://www.reirs.com>)
25. U.S. Nuclear Regulatory Commission: Report a safety or security concern, October 17, 2013. (Accessed May 31, 2014 at <http://www.nrc.gov/about-nrc/regulatory/allegations/safety-concern.html>)
26. Miller ML (2007) Pesticides. In: Sullivan TFP (ed) *Environmental Law Handbook*, 19th edn. Government Institutes, Lanham, p 690
27. U.S. Environmental Protection Agency: pesticides —regulating pesticides: laws and regulations, February 4, 2014. (Accessed May 31, 2014 at <http://www.epa.gov/pesticides/regulating/laws.htm>)
28. U.S. Environmental Protection Agency: pesticides—regulating pesticides—Adverse Effects Reporting—FIFRA 6(a)(2), February 4, 2014. (Accessed May 31, 2014 at <http://www.epa.gov/pesticides/fifra6a2/>)
29. U.S. Environmental Protection Agency: Federal Register Environmental Documents—reporting requirements for risk/benefit information, October 30, 2009. (Accessed February 2, 2014 at <http://www.epa.gov/fedrstr/EPA-PEST/1997/September/Day-19/p24937.htm>.)
30. Carson R (1962/2002) *Silent spring*. Houghton Mifflin Harcourt, New York
31. U.S. Environmental Protection Agency: EPA-540/1-75-022: DDT, A review of scientific and economic aspects of the decision to ban its use as a pesticide, July, 1975. (Accessed October 10, 2013 at <http://www2.epa.gov/sites/production/files/documents/DDT.pdf>)
32. U.S. National Archives and Records Administration: Government Printing Office: Code of Federal Regulations: Title 40, Protection of Environment, Chapter 1, Part 159, December 17, 2004. (Accessed April 17, 2007 at http://www.access.gpo.gov/nara/cfr/waisidx_02/40cfr159_02.html)
33. U.S. Environmental Protection Agency: Industry's Voluntary 6(a)(2) Incident Reporting Forms & Guidance Documents, February 2, 2014 (Accessed May 31, 2014 at <http://www.fifra6a2.com/guides/6a2guide.pdf>)
34. U.S. Department of Agriculture: State Departments of Agriculture (Accessed May 31, 2014 at <http://www.rma.usda.gov/other/stateag.html>)
35. U.S. Environmental Protection Agency: Office of Solid Waste - EPA Hazardous Waste Codes (Accessed May 31, 2014 at http://www.epa.gov/waste/inforesources/data/br91/na_apb-p.pdf)
36. U.S. Environmental Protection Agency: wastes—hazardous wastes—universal wastes, December 21, 2012 (Accessed May 31, 2014 at <http://www.epa.gov/osw/hazard/wastetypes/universal/index.htm>)
37. U.S. Environmental Protection Agency: laws and regulations—summary of the Resource Conservation and Recovery Act, March 14, 2014. (Accessed May 31, 2014 at <http://www2.epa.gov/laws-regulations/summary-resource-conservation-and-recovery-act>)
38. Case DR (2007) Resource Conservation and Recovery Act. In: Sullivan TFP (ed) *Environmental Law Handbook*, 19th edn. Government Institutes, Lanham, p 134
39. Case DR (2007) Resource Conservation and Recovery Act. In: Sullivan TFP (ed) *Environmental Law Handbook*, 19th edn. Government Institutes, Lanham, p 135
40. U.S. Environmental Protection Agency: Wastes – Hazardous Wastes – Universal Wastes. (Accessed May 31, 2014 at <http://www.epa.gov/osw/hazard/wastetypes/universal/compare.htm>)
41. U.S. Environmental Protection Agency: notification of RCRA Subtitle C activity, instructions and form, December 2011. (Accessed May 31, 2014 at <http://www.epa.gov/osw/inforesources/data/form8700/8700-12.pdf>)
42. U.S. Environmental Protection Agency: Wastes: The Hazardous Waste Manifest System link to Uniform Hazardous Waste Manifest - EPA Form 8700-22 Rev 3-05 PDF, August 23, 2006. (Accessed May 31, 2014 at <http://www.epa.gov/osw/hazard/transportation/manifest/pdf/newform.pdf>)
43. U.S. Environmental Protection Agency: biennial report: reportable and non-reportable wastes (Accessed May 31, 2014 at <http://www.epa.gov/solidwaste/inforesources/data/br13/reportable12-23-13.pdf>)
44. U.S. National Archives and Records Administration: Government Printing Office: Code of Federal Regulations: Title 40, Protection of Environment, Chapter 1, Part 263.12 - Transport Facility Requirements, March 18, 2010 (Accessed May 31, 2014 at <http://www.law.cornell.edu/cfr/text/40/263.12>)

45. U.S. Environmental Protection Agency: preventing and detecting underground storage tank system releases, February 15, 2013 (Accessed May 31, 2014 at <http://www.epa.gov/OUST/prevleak.htm>)
46. U.S. Environmental Protection Agency: Form 7530–1 Notification for underground storage tanks (Rev 9–2008), (Accessed May 31, 2014 at <http://www.epa.gov/oust/fedlaws/notify2011.pdf>)
47. U.S. Environmental Protection Agency: regulations governing hazardous waste generators. (Accessed May 31, 2014 at <http://www.epa.gov/osw/inforesources/pubs/orientation/orom33.pdf>)
48. U.S. Environmental Protection Agency: RCRA burden reduction initiative RCRA hazardous waste reporting requirements, May 27, 1999. (Accessed May 9, 2007 at <http://www.epa.gov/waste/inforesources/data/burdenreduction/rpt-req.pdf>)
49. Case DR (2007) Resource Conservation and Recovery Act. In: Sullivan TFP (ed) Environmental Law Handbook, 19th edn. Government Institutes, Lanham, pp 166–167
50. U.S. Environmental Protection Agency: wastes—laws and regulations—RCRA state authorization, January 23, 2014. (Accessed May 31, 2014 at <http://epa.gov/osw/laws-regs/state/index.htm>)