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Toxicity is a property of a substance at which point it is injurious to someone's health. Any substance at a particular concentration can become toxic. For example, we like salt in our food. But if someone put a whole bottle of salt in our it would be too salty. If you tried to drink it, you’d probably get sick. At high concentrations, salt is toxic to us. Similarly, many natural and man-made chemicals can become toxic to human health and the environment at elevated concentrations.

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With that understanding, now we need some way to quantify the level at which something becomes toxic. Four such parameters that are critical in defining the level of toxicity of any substance are: Lethal Dose 50 or LD 50, Effective Dose 50 or ED 50, Toxic Dose 50 or TD 50, and Threshold Level.

LD 50 is a dose or concentration of a substance at which 50% of the population dies when they are subjected to it. Similarly, ED 50 is defined as the dose that causes an effect in 50% of the population of observed subjects. TD 50 is the dose that is toxic to 50% of the population. While, threshold is a level or concentration below which no effect occurs. So, generally speaking, concentration of any chemical below the threshold is considered safe.

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The Toxic Substances Control Act, or TSCA, provides the government with adequate authority to prevent unreasonable risk of injury to health or the environment, particularly in the case of imminent hazards. The act also requires that government authority must be exercised so as to not impede unduly or create unnecessary barriers to technology while fulfilling the primary purpose of the Act. As a governing condition of this act, the industry is similarly required to generate data on environmental effects of the chemicals that it is producing.

Under this law, by 1979 the EPA had compiled an inventory of all chemicals commercially used or produced in the United States prior to July 1979.

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The TSCA also addresses chemicals that were produced after 1979 and those that will be produced in the future. Under the TSCA, pre-manufacturing notice, or PMN, must be submitted 90 days in advance of the manufacture or importation of any new chemical for sale or use in commerce. A PMN contains critical information on the chemical in question, including all available test data related to the impact of the new chemical on human health and the environment.
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Another critical law or act that regulates toxic substances is the Federal Insecticide, Fungicide, and Rodenticide Act or FIFRA. This Act was passed in 1947.

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The Act requires that all pesticides must be registered and properly labeled prior to their distribution in the United States. When a pesticide is to be registered, data showing its impact on human health and the environment is submitted to the EPA, which registers the pesticide for a 5-year period if the data shows that the pesticide will not cause unreasonable risk to the environment.

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Now that we’ve gained an understanding of the key environmental laws that govern the toxic substances, let’s look at how they’re litigated when they cause harm. Common-law tort cases are often used to seek compensation for persons injured or killed because of exposure to toxic substances. The cases are typically argued upon negligence and strict product liability aspects. In order to prove negligence, the plaintiff must prove that the defendant owed a duty of care to the plaintiff, the defendant failed to meet this duty, thereby causing the injury to the plaintiff, and the plaintiff indeed incurred a compensable injury.

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Punitive damages, in such cases, are awarded to the plaintiff to punish the defendant for his or her wrongful conduct and to provide a strong deterrent to others who might consider engaging in similar activities. The amount of punitive damages awarded in tort cases is based primarily on the wrongfulness of the defendant’s act and the resources of the defendant.

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Now let’s shift our focus to waste and the laws governing waste management. Generally speaking, waste is something that has no value to its generator. Waste that is dangerous or potentially harmful to our health or the environment is called hazardous waste, which can be further classified into four major categories.

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First is listed waste, which is mentioned in Title 40 of the Code of Federal Regulations under the F-list, K-list, P-list, and U-list. Second, characteristic waste, is waste which has not been specifically listed but may still be considered hazardous, as it exhibits one of the following four characteristics: ignitability, corrosivity, reactivity, and toxicity. Third is universal waste, which includes batteries, pesticides, mercury-containing equipment, and bulbs (lamps). Finally, the fourth category is mixed wastes.

Municipal solid waste is another category of waste, and the one we deal with most on a day-to-day basis. Municipal solid waste is more commonly known as trash or garbage, and consists of everyday items that we use and then throw away.

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The Resource Conservation and Recovery Act or RCRA is our nation's primary law governing the disposal of solid and hazardous waste. The RCRA amended the Solid Waste Disposal Act of 1965.

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The RCRA’s primary goals include the following: protecting human health and the environment from the potential hazards of waste disposal; energy and natural resources conservation; waste reduction; and the management of wastes in an environmentally-sound manner. To achieve these goals, the RCRA established the Solid Waste Program, the Hazardous Waste Program, and the Underground Storage Tank or UST Program.
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Under the Solid Waste Program, the RCRA encourages states to develop comprehensive plans to manage nonhazardous industrial solid waste and municipal solid waste, sets criteria for municipal solid waste landfills and other solid waste disposal facilities, and prohibits the open dumping of solid waste. The RCRA was amended and strengthened by Congress in November 1984 with the passage of the Federal Hazardous and Solid Waste Amendments. These amendments required phasing out land disposal of hazardous waste and provided the EPA with increased enforcement authority.

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The RCRA in Subtitle C establishes a system for controlling hazardous waste from the time it’s generated until its ultimate disposal. This is famously known as the “cradle to grave” approach. The RCRA Hazardous Waste Permitting Program ensures the safe treatment, storage, and disposal of hazardous wastes by establishing specific requirements that must be followed when managing these wastes. Permits for the treatment, storage, or disposal of hazardous wastes are issued by Authorized States or by EPA Regional Offices.

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There were a large number of hazardous waste sites prior to the RCRA coming into existence. Many of these were orphan sites where no responsible party could be readily identified or the property owner had no financial means to clean up the site. To address those pre-RCRA sites, Congress passed the Comprehensive Environmental Response, Compensation, and Liability Act of 1980.

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This act is also known as CERCLA, or the Superfund Act. CERCLA brought active federal government involvement to emergency response, site remediation, and spill prevention. It established a system for compensating appropriate individuals and assigning appropriate environmental liability.

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The requirement for comprehensive community planning was established in the Emergency Planning and Community Right-to-Know Act of 1986, which was passed as Title III within the Superfund Amendments and Reauthorization Act of 1986. The Act covers emergency planning, specifies hazardous chemical reporting requirements, and describes how the public will have access to facility information. Under the act, state and local governments are required to develop emergency response and preparedness plans. Furthermore, under this law facilities are required to maintain a material safety data sheet or MSDS for any hazardous chemical used or stored in the workplace.

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The Hazardous and Solid Waste Amendments of 1984 to the RCRA provided a framework to help prevent leaks from underground storage tanks or USTs. The total number of regulated tanks were once estimated to be between 1.5 to 2 million, 10-30% of which were estimated to be leaking. Leaks from USTs can contaminate soil, soil vapor, and groundwater which then require assessment, delineation, and implementation of mitigation measures. UST-related regulations are typically implemented through state and local agencies, although federal rules serve as minimum standards.

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The Energy Policy Act of 2005 included the Underground Storage Tanks Compliance through which Congress adopted several amendments to further strengthen the control of USTs. It requires inspection of all tanks, follow up inspection of all regulated tanks every 3 years, and provides training guidelines and requirements for operators of federally regulated UST systems. The act further required that secondary containment system should be implemented for all new or replacement tanks, piping, and dispenser systems that exist within 1,000 feet of an existing community water system or an existing potable drinking water well.

This summarizes the main topics to be covered during this week.
Thank you.