DOWNLOAD PDF HALOGENATED HYDROCARBONS AND HALOGENATED AROMATIC HYDROCARBONS

Chapter 1 : Chlorinated polycyclic aromatic hydrocarbon - Wikipedia

In a previous review (Journal of Industrial Hygiene and Toxicology,), the author covered the general field of the halogenated aliphatic hydrocarbons with respect to their toxicity and potential dangers.

Chapter 12 Organic Chemistry: Alkanes and Halogenated Hydrocarbons Opening Essay Hydrocarbons are the simplest organic compounds, but they have interesting physiological effects. These effects depend on the size of the hydrocarbon molecules and where on or in the body they are applied. Alkanes of low molar massâ€"those with from 1 to approximately 10 or so carbon atomsâ€"are gases or light liquids that act as anesthetics. Swallowed, liquid alkanes do little harm while in the stomach. The lungs become unable to expel fluids, just as in pneumonia caused by bacteria or viruses. People who swallow gasoline or other liquid alkane mixtures should not be made to vomit, as this would increase the chance of getting alkanes into the lungs. There is no home-treatment antidote for gasoline poisoning; call a poison control center. Liquid alkanes with approximately 5â€"16 carbon atoms per molecule wash away natural skin oils and cause drying and chapping of the skin, while heavier liquid alkanes those with approximately 17 or more carbon atoms per molecule act as emollients skin softeners. Such alkane mixtures as mineral oil and petroleum jelly can be applied as a protective film. We begin our study of organic chemistry with the alkanes, compounds containing only two elements, carbon and hydrogen, and having only single bonds. There are several other kinds of hydrocarbons, distinguished by the types of bonding between carbon atoms and by the properties that result from that bonding. In Chapter 13 "Unsaturated and Aromatic Hydrocarbons" we will examine hydrocarbons with double bonds, with triple bonds, and with a special kind of bonding called aromaticity. Then in Chapter 14 "Organic Compounds of Oxygen" we will study some compounds considered to be derived from hydrocarbons by replacing one or more hydrogen atoms with an oxygen-containing group. Chapter 15 "Organic Acids and Bases and Some of Their Derivatives" focuses on organic acids and bases, after which we will be ready to look at the chemistry of life itselfâ€"biochemistryâ€"in the remaining five chapters. Compounds isolated from nonliving systems, such as rocks and ores, the atmosphere, and the oceans, were labeled inorganic. For many years, scientists thought organic compounds could be made by only living organisms because they possessed a vital force found only in living systems. What he expected is described by the following equation. This result led to a series of experiments in which a wide variety of organic compounds were made from inorganic starting materials. The vital force theory gradually went away as chemists learned that they could make many organic compounds in the laboratory. Today organic chemistry The study of the chemistry of carbon compounds. It may seem strange that we divide chemistry into two branchesâ€"one that considers compounds of only one element and one that covers the plus remaining elements. However, this division seems more reasonable when we consider that of tens of millions of compounds that have been characterized, the overwhelming majority are carbon compounds. Note The word organic has different meanings. Organic fertilizer, such as cow manure, is organic in the original sense; it is derived from living organisms. Organic foods generally are foods grown without synthetic pesticides or fertilizers. Organic chemistry is the chemistry of compounds of carbon. Carbon is unique among the other elements in that its atoms can form stable covalent bonds with each other and with atoms of other elements in a multitude of variations. The resulting molecules can contain from one to millions of carbon atoms. In Chapter 12 "Organic Chemistry: Alkanes and Halogenated Hydrocarbons" through Chapter 15 "Organic Acids and Bases and Some of Their Derivatives" , we survey organic chemistry by dividing its compounds into families based on functional groups. We begin with the simplest members of a family and then move on to molecules that are organic in the original senseâ€"that is, they are made by and found in living organisms. These complex molecules all containing carbon determine the forms and functions of living systems and are the subject of biochemistry, a topic presented in Chapter 16 "Carbohydrates" through Chapter 20 "Energy Metabolism". Organic compounds, like inorganic compounds, obey all the natural laws. Often there is no clear distinction in the chemical or physical properties among organic and inorganic molecules. Nevertheless, it is useful to compare typical members of each class, as in Table Keep in mind, however, that there are exceptions to every category in this table. To further illustrate typical differences among organic and inorganic compounds, Table Many compounds can be classified as organic or inorganic by the presence or absence of certain typical properties, as illustrated in Table

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Chapter 2 : Mechanism of action of toxic halogenated aromatics.

Organics, which include polycylic aromatic hydrocarbons (PAHs), chlorinated aromatic hydrocarbons, chlorinated aliphatic hydrocarbons, halogenated hydrocarbons, biphenyls, phenols, aniline derivatives, phenol ethoxylates, and benzoic acid derivatives, are ubiquitous in our environment. Both anthropogenic and natural causes are known for their.

Halogenated Hydrocarbons Once widely used in consumer products, many chlorinated hydrocarbons are suspected carcinogens cancer-causing substances and also are known to cause severe liver damage. An example is carbon tetrachloride CCl_4 , once used as a dry-cleaning solvent and in fire extinguishers but no longer recommended for either use. Even in small amounts, its vapor can cause serious illness if exposure is prolonged. Moreover, it reacts with water at high temperatures to form deadly phosgene $COCl_2$ gas, which makes the use of CCl_4 in fire extinguishers particularly dangerous. Ethyl chloride, in contrast, is used as an external local anesthetic. When sprayed on the skin, it evaporates quickly, cooling the area enough to make it insensitive to pain. It can also be used as an emergency general anesthetic. Bromine-containing compounds are widely used in fire extinguishers and as fire retardants on clothing and other materials. Because they too are toxic and have adverse effects on the environment, scientists are engaged in designing safer substitutes for them, as for many other halogenated compounds. Chlorofluorocarbons and the Ozone Layer Alkanes substituted with both fluorine F and chlorine Cl atoms have been used as the dispersing gases in aerosol cans, as foaming agents for plastics, and as refrigerants. Two of the best known of these chlorofluorocarbons CFCs are listed in Table Chlorofluorocarbons contribute to the greenhouse effect in the lower atmosphere. They also diffuse into the stratosphere, where they are broken down by ultraviolet UV radiation to release Cl atoms. These in turn break down the ozone O_3 molecules that protect Earth from harmful UV radiation. Worldwide action has reduced the use of CFCs and related compounds. The CFCs and other Cl- or bromine Br -containing ozone-destroying compounds are being replaced with more benign substances. HCFC molecules break down more readily in the troposphere, and fewer ozone-destroying molecules reach the stratosphere. They occur mainly over Antarctica from late August through early October and fill in about mid-November. Ozone depletion has also been noted over the Arctic regions. The largest ozone hole ever observed occurred on 24 September Image courtesy of NASA, http: Answers 1,1,1-trifluoro-2,2-dichloroethane Key Takeaway The replacement of an hydrogen atom on an alkane by a halogen atomâ€”F, Cl, Br, or Iâ€”forms a halogenated compound. Exercises Write the condensed structural formula for each compound. Write the condensed structural formulas for the four isomers that have the molecular formula C_4H_9Br. What is a CFC? How are CFCs involved in the destruction of the ozone layer? Explain why each compound is less destructive to the ozone layer than are CFCs.

Chapter 3 : Organic Chemistry: Alkanes and Halogenated Hydrocarbons

Halogenated hydrocarbons may be sub-classified based on the nature of the hydrocarbon fragment to which they are attached (alkane, alkene, alkyne, aromatic), and on the basis of the number of halogen atoms present (mono-, di- tri- tetra-, etc. halogenated compounds).

Nordt, MD Spring Introduction Hydrocarbons HC are organic compounds containing primarily hydrogen and carbon atoms, although they may contain other molecules such as halogens or alcohols. Generally speaking there are two types of HC, aliphatic or straight chained and cyclic, aromatic, or other ringed structures. Hydrocarbons are derived from many different sources including: Hydrocarbons are widely used in daily life and industrial applications as fuel, lubricants, solvents, degreasers, etc. Some HC are used medicinally such as chloral hydrate, chlorobutanol, and alcohols. Case presentation A 16 year old male was being chased by a police officer when he suddenly collapsed and was found to be pulseless and unresponsive. The police officer had found the child behind a school with a spray paint can and a rag in his hand. When the police officer told the child to drop the paint can and rag, the child ran. The child collapsed within yards of running. The police officer immediately called for paramedics and began CPR. When the paramedics arrived three minutes later, an automatic external defibrillator was applied and found the patient to be in ventricular fibrillation. The patient became responsive and was transported to the emergency department ED. In the ED he was awake but somnolent. On physical examination a small amount of gold colored paint was seen below each nostril with local erythema. No signs of trauma were seen on exam. In addition, there was protein in his urine. Once awake, the patient admitted to abusing metallic spray paint several times a day for the past several months. He stated he now notices that he is having some difficulty walking and some slurring of his words. He was admitted to the intensive care unit for observation. A computerized tomography scan of his brain showed some early diffuse white matter changes. He was noted to have a slightly wide based gait during admission but otherwise a normal neurologic examination. The patient did not have any subsequent episodes of ventricular dysrhythmias. He was discharged the following day in the care of his parents with outpatient referral to a neurologist and also a support group for teenagers that abuse inhalants. Questions What is the name of the syndrome that is described in the case above? Based on the laboratory analysis, which hydrocarbon do you suspect the patient has been abusing? Can brain white matter changes be seen following chronic hydrocarbon abuse? Epidemiology The majority of HC exposures are unintentional and result in minimal or no toxicity. However, both intentional and occupational exposures can result in severe morbidity and mortality. On average there are 13 deaths per year resulting from HC exposures reported to poison control centers in the US. Pathophysiology Depending upon the physicochemical properties of an individual HC, the toxicokinetics can vary greatly. HC that are highly volatile exert their toxicity primarily through the inhalation route. Hydrocarbon absorption following dermal exposure is generally low. Prolonged contact, abraded skin, and repeated exposure all may increase dermal absorption. As many HC are quite lipophilic, distribution into fat can be substantial. Hydrocarbons may be eliminated unchanged as parent compounds or metabolized to various metabolites, some of which may be toxic. There are two well known HC that get converted in vivo to toxic metabolites. The first is carbon tetrachloride, a compound that was once used extensively in the dry cleaning industry and in fire extinguishers. Hepatic metabolism of carbon tetrachloride produces a free radical that can be hepatotoxic, leading to fulminent hepatic necrosis. The second is methylene chloride, a chemical and gas that is converted in the body to carbon monoxide. The elimination half life varies greatly amongst different HC and can be on the order of several hours to several days. The most common organ affected by HC aspiration is obviously the lungs. Besides directly damaging lung parenchyma, HC dissolve lung surfactant, leading to alveolar collapse and extensive pneumonitis. Clinical presentation Although pulmonary toxicity from these agents was once believed to be caused by GI absorption and subsequent delivery to the lungs, it is now thought to be a direct toxic effect of the HC from aspiration into the pulmonary system. Agents with a much higher viscosity like motor oil are less frequently aspirated and therefore considered less toxic. Vomiting after HC ingestion greatly increases the risk of aspiration and should be prevented if at all possible. The larger the volume of HC ingested the increased risk of vomiting and possible aspiration. A ventilation perfusion mismatch can be seen from local destruction of lung parenchyma and alveolar collapse. However, the majority of chest radiograph abnormalities are seen within 4 to 6 hours. Many HC are rapidly and extensively delivered to the brain based on the high degree of lipophilicity, particularly following the inhalational route. Due to the high lipid content in myelin in CNS white matter, chronic abuse can result in a leukoencephalopathy and permanent neurologic sequelae. CNS depression and coma may be seen with large exposures, although these may be preceded by an initial period of agitation. Clues on physical examination of inhaled HC abuse include paint or redness around the nose and mouth and defatting dermatitis of the hands. Ataxia, dementia, and dysarthria may occur with prolonged, chronic abuse. Certain HC are notorious for causing peripheral nervous system effects, primarily an axonopathy. Probably the most well known of these are n-hexane and methyl-n-butyl ketone, both metabolized to a common toxic metabolite. It can occur following any HC exposure, but primarily after inhalation exposures. SSDS was once thought to be only seen in halogenated HC exposure, but it has now been reported with exposures to many non-halogenated HC. The sequence of events begins when a person being exposed to a HC is startled or frightened e. Hydrocarbons are irritants to skin and can cause erythema and dryness, in addition to their defatting properties resulting in loss of normal dermal adipose. Defatted as well as abraded skin can increase systemic absorption of the HC. This is a true orthopedic emergency requiring immediate referral and surgical debridement. Several HC, particularly those with halogenated components, have been shown to be hepatoxic. The best described of these is carbon tetrachloride, which as noted above is converted in vivo to a toxic metabolite resulting in centrilobular hepatic necrosis. Other agents, such as trichloroethylene may also cause injury to the liver following excessive exposures. Hydrocarbons may also affect the renal system. The most well described of these is toluene, found in a number of different products such as paints. Many of these products are abused since toluene can lead to CNS intoxication when inhaled. Heavy toluene exposure can cause a hyperchloremic renal tubular acidosis. In addition, toluene is metabolized to benzoic acid that can further contribute to a metabolic acidosis. Diagnosis The diagnosis of HC toxicity is generally known on presentation based on exposure history. Clues in a comatose or unresponsive patient include a hydrocarbon odor on the breath. There are a limited number of laboratory tests that can be used to identify hydrocarbon exposure, and most are used predominantly in an occupational setting. These would include urine hippuric acid for toluene exposure and urine phenol for benzene exposure. Other than for methylene chloride that is metabolized to carbon monoxide, there are no other readily available tests for acute hydrocarbon poisoning. Any patient that had initial coughing or choking following HC ingestion should be referred to an emergency department for evaluation. Clinical signs and symptoms are usually manifested within 6 hours of HC exposure, particularly after aspiration. Therefore, a patient that remains asymptomatic or was initially minimally symptomatic but then asymptomatic during an observation period of at least 6 hours can be safely discharged with strict return precautions. If a chest radiograph is obtained around 6 hour after exposure, it should also be normal. Some halogenated hydrocarbons are radio opaque and may be seen on abdominal radiograph after ingestion. While this may rarely confirm exposure there is little utility in routine abdominal radiography for HC exposures. Consider hydrocarbon exposure in a young patient following ventricular tachycardia or a ventricular fibrillation arrest, particularly if hydrocarbon containers or paraphernalia are found near the patient. Treatment Dermal decontamination following topical HC exposure should include removal of all clothing and copious irrigation with soap and water. Defatting of skin may occur with prolonged contact of contaminated clothing. Ophthalmic HC exposures should immediately be irrigated with copious water for at least 15 minutes, ideally at an eye wash station if available and before transport to a health care facility. Copious irrigation should be continued or repeated if the patient is still symptomatic in the emergency department. This should be followed by thorough physical examination including visual acuity and slit lamp examination and ophthalmologist referral as indicated. There is generally no role for gastrointestinal decontamination following HC exposure as activated charcoal does not bind HC well and may increase aspiration risk. Gastric lavage and dilution are not recommended following most HC exposures. There is generally no role for extracorporeal removal methods e. For patients being observed in the emergency department an initial chest radiograph is not generally indicated unless the patient is symptomatic, but should be considered at 6 hours even if the patient remains asymptomatic before discharge to ensure subtle aspiration findings are not present. If radiographic abnormalities potentially secondary to HC exposure are found at any time this should prompt extended observation or possible admission to a monitored setting. If the patient is symptomatic at the time of arrival to the emergency department following HC exposure, immediate attention to the ABCs should be addressed. Intravenous access, supplemental oxygen, and continuous monitoring including pulse oximetry should be obtained. The mainstay of treatment is primarily aggressive supportive care. Early endotracheal intubation should be considered in patients with respiratory distress or depressed mental status, and in those at risk of vomiting with inability to protect the airway. Obtaining a twelve lead electrocardiogram should be considered in symptomatic inhalational exposures, particularly if abnormal vital signs are present or irregular cardiac rhythms suspected. An initial chest radiograph should be obtained in symptomatic individuals with subsequent daily chest radiographs as needed. Following HC aspiration, a severe chemical pneumonitis can be seen and may progress to acute respiratory distress syndrome. Corticosteroid use in this setting is controversial, however, if used the administration of empiric antibiotics should be considered.

Chapter 4 : Halogenated Hydrocarbons - Chemicals, Reactions, Environmental, and Atoms - JRank Articles

Halogenated hydrocarbons are a subgroup of aromatic hydrocarbons, in which one of the hydrogen molecules is substituted by a halogen group. The most important halogenated hydrocarbons include carbon tetrachloride, trichloroethylene, tetrachloroethylene, trichloroethane, chloroform, and methylene chloride.

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Chapter 5 : What is an aromatic hydrocarbon? + Example

Persistent halogenated hydrocarbons (PHAs) are manmade chemicals and can be products of incomplete combustion. PHAs are a complex mixture of chemicals with differing molecular composition. Some PHAs are added to consumer products to provide unique properties and have been/are used as pesticides and.

Hydrocarbon Poisoning Introduction Hydrocarbons are diverse group of organic substances that contain carbon and hydrogen. Toxic exposure to hydrocarbons primarily impacts the respiratory and central nervous system. Hydrocarbons are found in substances such as glues, nail polishes, paints, paint removers, pine oil, gasoline, kerosene, furniture polishes, lamp oil, lighter fluid. Hydrocarbons are often mixed with agents, such as camphor, aniline dyes, heavy metals, and pesticides that have systemic toxicity. In young children the ingestion typically occurs as a result of exploratory behavior. Ingestion of large quantities of hydrocarbons alone by children is unusual because hydrocarbons have a bad taste. Toxicity in adolescents often arises from intentional behaviors such as inhalant abuse. Moderate to major toxic effects are associated most commonly with ingestion of lamp oil, kerosene, lighter fluid, and or naptha. Hydrocarbon toxicity can be classified according to potential for toxicity: Low toxicity unless complicated by gross aspiration Examples include asphalt, tars, mineral oil, petroleum jelly, motor oil, and axle grease. Examples include kerosene, furniture polish, charcoal lighter fluid, mineral spirits, or outdoor torch and cigarette lighter fluids clinical effects are typically limited to direct pulmonary damage and subsequent inflammation. Determinants of pulmonary aspiration is determined by 3 properties; volatility, surface tension, viscosity. Hydrocarbons with decreased viscosity, low surface tension and high volatility are more likely to be aspirated and cause pulmonary injury. Systemic toxicity occurs after ingestion of compounds including halogenated and aromatic hydrocarbons e. Systemic effects most commonly include cardiac arrhythmias secondary to myocardial sensitization and CNS depression, hepatic and acute renal tubular necrosis has also been described. Systemic absorption is not a major contributor to pulmonary injury except in the setting of massive ingestion. Primarily impacts the respiratory and central nervous system. Respiratory system is primarily affected by direct injury. The main pathologic finding is severe necrotizing pneumonia. Other findings include direct destruction of the airway epithelium, pulmonary capillaries, and alveolar septae, as well as solubilization of the lipid surfactant layer. Secondary changes include atelectasis, interstitial inflammation, and hyaline membrane formation. The inflammatory response from chemical irritation generally causes temperature elevation, usually within hours of exposure. Volatile hydrocarbons are highly lipid soluble. They enter the circulation through the lungs and rapidly diffuse throughout the body and into the CNS. Neurons, which have a high lipid content, are particularly susceptible to severe pulmonary injury and hypoxia. Includes bronchopneumonia, salicylate overdose, and other toxins. The following clinical manifestations and ancillary studies help differentiate between the different diagnoses. Typically asymptomatic initially, with history of hydrocarbon exposure Those symptomatic at presentation e. If history of hydrocarbon exposure is lacking, diagnosis is based on clinical features. There are less rapidly available studies to confirm hydrocarbon exposure by detection of urinary metabolites or direct measurements of blood levels. Characteristic odors can help identify the type of hydrocarbon ingested. Pine oil has a pine scent. Halogenated hydrocarbons have a sweet solvent odor. Kerosene and other aliphatic hydrocarbons have a petroleum distillate odor. Physical findings after hydrocarbon exposure: Pulmonary Generally signs and symptoms occur within 30 minutes, although onset might be delayed for 12 to 24 hours. Immediate signs of aspiration include coughing, choking, vomiting and gagging. Other signs depend on degree of pulmonary injury and include tachypnea, wheezing, and dullness on percussion. Major complications include asphyxia, necrotizing chemical pneumonitis, hemorrhagic pulmonary edema, lipoid pneumonia that quickly progresses to shock and respiratory arrest. Secondary bacterial or viral infection may exacerbate the chemical pneumonitis. Central Nervous System Ingested or inhalation causes rapid effects including somnolence, dizziness, weakness, ataxia, fatigue, lethargy, seizures, and coma, depending on the amount of hydrocarbons exposure. Hypoxia secondary to hydrocarbon aspiration may have detrimental CNS effects including drowsiness, tremors or seizures. Hematologic Leukocytosis can occur early after exposure and last up to 1 week. Hemolysis, hemoglobinuria and consumptive coagulopathy rarely occurs after large ingestions. Gastrointestinal Ingestion can cause direct local injury eg. Children who show signs of pulmonary aspiration should receive a chest radiograph within hours exposure. Radiographic abnormality es usually peak between hours after aspiration. Initial findings on radiograph consist of multiple, small patchy densities with ill -defined margins. As the injury progresses, the lesions become larger and coalesce. Radiograph findings typically lag behind clinical improvement, which occurs days after aspiration. Chest radiograph of patient with hydrocarbon ingestion on presentation shows pulmonary edema and right lower lobe infiltrate arrow. It is most important to recognize pulmonary toxicity and rapidly initiate appropriate supportive care. Asymptomatic patients should be observed with serial examination and be placed on NPO status. Patients in respiratory distress should receive oxygen, serial chest radiographs and beta-2 agonists for treatment of bronchospasms. If their respiratory status continues to decline, they require endotracheal intubation. Patients with seizures should receive IV benzodiazepines. Dermal and ocular exposure can be treated with copious water irrigation. Gastric lavage, ipecac administration and activated charcoal is NOT recommended because of increased risk of vomiting and additional pulmonary aspiration. Poison control is an excellent resource for management and information for providers and families alike. Depends on amount of hydrocarbon ingested or aspirated, the type of hydrocarbon exposure and the adequacy of medical care. The typical course lasts for days on average. Most children survive without serious complications, but some may progress to respiratory failure and death. Poisoning in young children typically results from an exploratory occurrence that can be prevented through safe packaging and storage. Since , US consumer product safety commission has required child-resistant packaging for products that have low viscosity and contain greater than 10 percent hydrocarbon by weight. Pediatr Ann ; Pediatric hydrocarbon-related injuries in the United States: Hydrocarbon poisoning in children. South Med J ; Pediatr Clin North Am ; Ingestion of toxic substances by children. N Engl J Med ; Clin Toxicol Phila ;

Chapter 6 : Halogenated Hydrocarbons

Abstract. 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) and related halogenated aromatic hydrocarbons are a highly toxic class of environmental contaminants, as evidenced by numerous cases of accidental poisonings of human and animal populations and their extreme toxic potency in laboratory animals.

Chapter 7 : Hydrocarbon Poisoning | Pediatrics Clerkship | The University of Chicago

This is the definition of halogenated hydrocarbon. Dr. Helmenstine holds a Ph.D. in biomedical sciences and is a science writer, educator, and consultant.

Chapter 8 : Hydrocarbon Toxicity and Abuse | California Poison Control System | UCSF

Many halogenated hydrocarbons have moderate to high toxicity by inhalation. The brominated materials tend to be particularly toxic. Much of the toxicity is due to the fact that these substances are not metabolized, but persist and accumulate in fatty tissues (they tend to be fat-soluble).

Chapter 9 : Appendix I - Hazards

Let's find out! Let me google that for you Examples include: Chloroform, Dichloromethane, 1,2-Dichloroethane, and Carbon tetrachloride, among others.