METHYL (WOOD) ALCOHOL.[1]

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WHEN wood is subjected to the process of decomposition, known as "dry distillation," there result a number of compounds, some of which are gaseous, some liquid at ordinary temperature and some solid.

Among the liquid compounds is methyl or wood alcohol. Methyl alcohol distills over in the first groups of compounds between the temperature of 150° C. and 280° C. together with acetone and acetic acid. Boyle discovered (1661) in this liquid portion, which he obtained by dry distillation of wood, two constituents—an acid and a neutral spirit. It was not until 1834 that Dumas and Péligot determined the character of this neutral spirit, though Phillips Taylor, in 1812, recognized it as alcohol different from ethyl alcohol. Dumas and Péligot named this alcohol methyl alcohol from the Greek, μέ the wine, and ὕλη wood.

The method of manufacture from wood is, in general, as follows: Iron retorts are charged with wood, such as beech, birch and oak, and are heated slowly at first in order that the greatest amount of methyl alcohol and acetic acid may be obtained. The methyl alcohol is found by experiments on small portions of wood, to vary from 5 per cent. to 1 per cent. of the weight of the wood after the water is driven off. The yield depends upon the variety of wood and regulation of the temperature. After the methyl alcohol and acetic acid are driven off the temperature is slowly raised until the temperature of 430° C. is reached, when charcoal alone is left in the retort. The condensed distillate, on standing, separates into distinct layers—a tarry, oily, resinous lower layer, and a watery upper layer. This upper layer is drawn off, and contains, besides methyl alcohol, acetic acid, acetone and homologous ketones, acetates and other compounds The methyl alcohol may be distilled off from this "crude vinegar" after its neutralization with lime, whereby the tarry matters are left behind with the calcium acetate in the retort. To the impure methyl alcohol, which may contain some unneu-

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tralized acetic acid, as well as methyl acetate and acetone, is added milk of lime, and the mixture is allowed to stand. By this means the acetic acid is completely neutralized and the methyl acetate decomposed. By repeated distillation over lime the methyl alcohol is freed from everything but acetone. The acetone may be removed either after formation of iodoform by the addition of iodine and sodium hydroxide and distillation, or the formation of methyl oxalate, which is decomposed by water, or by converting the acetone into chloroform by distilling over chloride of lime, or by passing dry chlorine through the alcohol, which is heated in a flask with a reflux condenser. The acetone is converted into high boiling chloracetone (CH_3-CO-CH_2CL), from which the methyl alcohol can be distilled. Another source of methyl alcohol is by distilling the residue obtained by evaporation of the spent waste in the preparation of ethyl alcohol from beet sugar and molasses. A large proportion of ethyl alcohol is now prepared from molasses. The distillate contains ammonia compounds, methylamine, methyl cyanide and methyl alcohol. The ammonia and amine are removed by neutralizing with sulphuric acid and distillation. The distillate carries the methyl alcohol and methyl cyanide. The cyanide is decomposed by rectification over lime, and the methyl alcohol is distilled off and dehydiated with lime.

The strength of wood spirit varies from 35 per cent. to 95 per cent. Its usual impurities are acetone (AH_3-CO CH_3), higher ketones, aldehyde, methyl acetate (C_3H_5-OH. CH_3CH-CH_3-OH.), allyl alcohol and empyreumatic bodies. The purer the alcohol the better its solvent power. Its solvent power is about the same as ethyl alcohol, and hence is often substituted for it for burning in lamps and for varnishes. Also sometimes it is substituted by druggists for ethyl alcohol.

Animal experiments give us our most reliable data in regard to the physiological action of methyl alcohol. Methyl alcohol is a powerful poison, causing death if taken in sufficient quantities. It produces coma more slowly than ethyl alcohol, but the coma is of longer duration. It causes a drop in body temperature and hemorraghes in the stomach and bowels. I noticed this condition in the stomachs of five men supposed to have been killed by drinking whisky adulterated with methyl alcohol, and from which I recovered enough methyl alcohol to give decided reactions. It causes partial or total blindness in men.

Animals given small doses of methyl alcohol, not sufficient to kill within a few days, cannot withstand the toxic action for more than a few weeks. The fatal dose for the dog has been placed at 6.36 gms. to 7.2 gms. per kilo of body weight, whether given intravenously or injected into the muscle tissue. For the rabbit the fatal dose is placed at 7.2 gms. to 9 gms. per kilo body weight.

The M. L. D. of ethyl alcohol is about t same as that of methyl alcohol for dogs and ra bits. It seems to make little difference wheth the methyl alcohol is given by the mouth or j jected into the vein or muscle tissue; the M. L. is quite constant.

Reid Hunt (*Johns Hopkins Bulletin*, for Au ust and September, 1902) gave the result a series of experiments, comparing the toxici of ethyl and methyl alcohols.

He used, in most of his experiments, Kah baum's purest methyl alcohol, perfectly colorle and entirely free from substances, giving an iod form reaction. The ethyl alcohol used was the most part Squibbs' absolute alcohol. Th alcohols were diluted and introduced into t stomachs by means of a soft rubber cathet He used, also, Columbian spirits of a light yello color, giving the iodoform reaction, and of abo 98 per cent. strength. He used rabbits as t animals. His results indicate that ethyl alcoh is a little more toxic than methyl alcohol for rab bits. These alcoholic doses, it must be remem bered, were fatal doses. In doses termed by Hun as "subacute" methyl alcohol was always fat to the dog when used as the test animal, whil it will be noticed the ethyl alcohol failed to kill Where the rabbit was used, the animal fed wit ethyl alcohol either survived or its death w delayed, whereas each animal given methyl alco hol died promptly except the last two of th series, which Hunt does not consider "subacut poisoning cases," since much smaller doses wer given. One animal died after seventeen day the other became ill but recovered.

One may judge by these experiments that poi oning was not due to impurities in the methy alcohol but to the alcohol itself. It has been found that methyl alcohol is partially oxidized i the body, and is found in the urine as formic acid. It is possible that formaldehyde, the in termediate step in this oxidation process, is formed.

Methyl alcohol is sometimes substituted for ethyl alcohol by druggists in preparation for ex ternal use. It has been also used to adulterate whisky. A bill is now before the Legislature for bidding the use of methyl alcohol in any prepara tion for external or internal use, as a medicine or beverage, and should receive the backing of every one having any knowledge whatever of the poisonous property of methyl alcohol.

In conclusion, let me give the method of de tecting the presence of methyl alcohol. The method depends upon the fact that methyl alcohol is oxidized to formaldehyde by hot copper oxide, and the formaldehyde may then be detected if in sufficient quantities by the odor; if not in suffi cient quantities, by one of the following tests: First. Hehner's test, delicacy, 1-500-000. Second. Phloroglucin. Third. Sulphuric acid morphine test. A little of the suspected liquid in a test tube (after distillation, preferably) is oxidized