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# METHYL ALCOHOL POISONING\*

(A Clinical and Pathological Study of 11 Fatal  
Cases)

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Prohibition has painted many lurid scenes upon the Canopy of Time. Legislative enactment changed men's rights but not their appe-

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ites. In this region illicit liquor flowed freely. The grip of the Law was tightened. Demand exceeded supply. Every source of intoxicating liquor was tapped. A drum of methyl alcohol disappeared. Scores of drinkers became sick and blind. Then the Grim Reaper took his toll and eleven husky men fell before his onslaught in this city in four days, and many others in the outlying villages and hamlets.

Methyl alcohol is produced by destructive distillation of hard wood or peat. The crude product is refined producing a colorless, mobile liquid having a vinous odor and a burning taste. The refined product is used as a denaturant. Radiator alcohol until recently contained ten per cent. methyl alcohol. This has been reduced to two per cent. because there were so many deaths following the use of the ten per cent. product as a beverage. Some people have a tolerance to methyl alcohol. Benetal<sup>1</sup> reports the case of a man who drank one pint of the ten per cent. mixture daily without any ill effects. Usually methyl alcohol if taken in large quantities results in death or in permanent blindness. In smaller repeated quantities it exerts an accumulative effect eventually leading to death or blindness. Small repeated doses of ethyl alcohol give no such effect because the alcohol is completely oxidized to carbonic acid and water. Oxidation of methyl alcohol results in the formation of still more poisonous products, formic acid and formaldehyde. The action of methyl alcohol on the living organism is due to the formation of these incomplete oxidation products.

Clinically large doses may have no serious effect for twenty-four to forty-eight hours. One of the cases under discussion suffered his first symptoms twelve hours after a drinking bout. He died before the next twelve hours had passed. A companion attended the first man's autopsy and spoke of his own good health at that time. Twenty-four hours later he laid on the autopsy table. Another companion recovered.

Briefly the symptoms and signs that were evidenced by the poison cases were:

1. Weakness. A feeling of general lassitude and loss of strength.
2. Headache.
3. Dimmed vision progressing to blindness. These eye changes are always present in some degree.

4. Abdominal pain and vomiting—the vomiting is persistent. Bloody mucus and shreds may be expelled.

5. Dyspnea and cyanosis. There is a severe acidosis. The respirations are slower and deeper than normal. The cyanosis is very marked, the individual becoming almost indigo blue.

6. Convulsions and coma. Barbash<sup>2</sup> reports a case in which there was severe meningeal irritation. An arachacentesis relieved the intracranial pressure and the meningeal irritation subsided. Two of our cases were treated with spinal puncture. One showed some increased intraspinal pressure. Both died.

The coma is somewhat delayed when compared to that of ethyl alcohol but continues for a longer period of time.

7. Death. From cardiac paralysis in our cases. Other authors report deaths due to respiratory paralysis.

#### 8. Laboratory Examination:

Urine: In the acute cases there is a severe acidosis giving an increase in the amount of titratable organic acids, especially lactic and formic. In the chronic cases there is a marked albuminuria and the presence of granular, cellular and hyaline casts in large numbers.

Blood: In the acute cases there are no characteristic blood changes. In the chronic cases there is a marked anemia.

The autopsy findings were of interest. Norris<sup>3</sup> states that most cases when autopsied are negative except for a general visceral congestion. Our findings were so consistent in these eleven cases that we are prepared to state that wood alcohol poisoning does produce characteristic changes in addition to a general visceral congestion.

External examination revealed two types of bodies, the flaccid of which there were nine— and the spastic of which there were two. The former evidenced a normal amount of rigor mortis. The cyanosis was marked, the color being almost an indigo blue. The spastic type were abnormally rigid. The bodies were hyperextended, the arms flexed at the elbows, the thighs flexed on the abdomen and the legs on the thighs. The bladder and rectum had emptied. The skin was a mottled pink as in cyanide poisoning.

Only the brain showed any gross pathological change. There was an increased amount of cerebrospinal fluid and a mild degree of edema

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 of the brain. The optic nerves all showed edema and those of the individual who had been sick for four days had undergone cloudy swelling and marked degeneration. No eyes were removed for examination. In experimental animals dying of methanol poisoning there is always a degeneration of the retinal ganglion cells as well as degeneration of the optic nerve.

Gross examination of the heart and lungs were characterized in the spastic cases by a contraction of the heart until it was one-half the normal size. The lungs were completely filled with air, the individual dying at the end of an inspiratory breath. In the flaccid cases the heart, particularly the right side, was dilated. The lungs were congested and edematous, the dependent portions being full of fluid. When the abdomens were opened no free fluid was found. In the spastic type extreme contracture of the muscle of the stomach and intestine had occurred reducing the lumen of these organs to a minimum and expelling their contents. Strassman<sup>4</sup> autopsied one case years ago with similar intestinal contractures. In the flaccid type the intestines were in a state of muscular relaxation and were full of their normal content.

The mucosa of the esophagus and stomach showed varying degrees of pathology. The mucosa of the stomach of the individual who died twelve hours after drinking the methyl alcohol was only mildly congested. In one individual who had been sick three days the esophageal mucosa and mucosa of the stomach at the esophageal opening and in the prepyloric area was ulcerated and eroded. The characteristic change in the other cases was a hemorrhagic gastritis of a mild degree.

Every liver was congested. Microscopically there was a degeneration of the liver cells. In the individual who lived four days there was an acute yellow atrophy.

The pancreas in every case was the site of a hemorrhagic pancreatitis. The most profound pancreatitis occurred in the individual who died in the first twelve hours. His pancreas was three times the size of the normal. It was swollen, red, edematous and filled with multiple hemorrhagic areas.

The kidneys all showed a distinct congestion. In the individual who lived four days, there was

a cloudy swelling and degeneration of the glomeruli and tubules. All the kidneys evidenced a degeneration to a lesser degree. The kidney pathology accounts for the albuminuria and casts found in the prolonged cases of alcohol poisoning.

Characteristic of methyl alcohol poisoning are the following changes:

1. Degeneration of the retinal cells and optic nerve.
2. Hemorrhagic pancreatitis.
3. Degeneration of the liver.
4. Degeneration of the kidneys.
5. General visceral congestion.

Treatment is supportive and eliminative. The acidosis is combated by large intravenous infusions of 5 per cent. sodium bicarbonate solution. Stomach lavage is imperative, and must continue three or four days. Bongers recovered three times as much methyl alcohol in the gastric lavages of the second and third day, as he was able to obtain the first day. This indicates that methyl alcohol is excreted into the intestinal tract, and long gastric lavages are necessary. An inlying duodenal tube of the Ewald type or a nasal tube is advantageous. The individual may drink fluid freely and the inlying tube allows for a continuous drainage, making the stomach lavage an automatic procedure. Hot packs are used to remove the burden from the kidneys and promote elimination. Heat should be applied to the body between hot packs. Cardiac stimulants such as digifolin and caffeine are given hypodermically. Morphine is indicated for pain. Meningeal irritation is to be relieved by arachnoiditis.

The prognosis must always be a guarded one. Energetic, persistent, and intelligent treatment will be rewarded by a fair percentage of recoveries. In dealing with so fatal a poison that is the best to which even the most ambitious can aspire.

In summation there are four points to be observed:

1. Methyl alcohol when taken in poisonous quantities produces a definite clinical picture.
2. The treatment is supportive and eliminative.
3. The prognosis must be guarded.

4. The autopsy findings are characteristic.

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