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Effect of Sodium Pyruvate on the Rate of Metabolism of Ethyl Alcohol.

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Westerfeld, Stotz and Berg[1,2] reported an average increase of 260% in the rate of ethyl alcohol metabolism following the oral administration of two 5 g doses of sodium pyruvate to dogs which had received 2 to 3 cc of absolute alcohol per kilogram by stomach tube 4 to 6 hours earlier. They stated also that feeding 5 g of sodium pyruvate to a dog which had not received alcohol previously resulted in an increase of venous blood pyruvate from 1.5 mg % to 4.5 mg %. When given to a dog that had received alcohol, pyruvate was utilized so rapidly, according to their claim, that it produced only a slight increase in blood pyruvate.

Since this reported effect on alcohol metabolism is so striking, it was decided to ascertain whether these results could be duplicated in dogs that received alcohol intravenously in the control experiment to establish the normal rate of metabolism of alcohol as well as for the experimental group which received sodium pyruvate.

We believe that the above reported experiments are open to criticism because of the short duration, the control and experimental observations were made during a single administration of alcohol, and the alcohol was given by mouth. Accordingly, we made control observations of the rate of alcohol metabolism over about 12 hours and experimental observations with pyruvate several days later over the same period of time. In all of our experiments, the alcohol was given intravenously to prevent any discrepancy due to a possible variable rate of absorption of alcohol from the gastrointestinal tract. Pyruvate was administered intravenously in some animals to insure its reaching the blood stream.

Methods. Twenty experiments were done on 6 dogs by determining the rate of disappearance from the blood of alcohol given intravenously in amounts of 2 cc of absolute alcohol per kilogram, diluted to 20%. All dogs were fed Purina Dog Chow for 2 or more days and fasted for at least 15 hours before each experiment. The animals were later given the same amount of alcohol intravenously and 2 doses of 0.5 g of sodium pyruvate per kilogram by stomach tube. The pyruvate was also given intravenously to 2 dogs. Blood samples for alcohol and pyruvate estimations were drawn at approximately hourly intervals, allowing 45 to 60 minutes after administration for uniform distribution. Specimens were taken at 15-minute intervals following pyruvate administration because of the rapid disappearance of the pyruvate. Pyruvate was estimated by the method of Bueding and Wortis[3] except that the blood was drawn and precipitated immediately according to the method of Friedemann and Haugen.[4] Alcohol estimations were made by the methods of Harger,[5] Heise,[6] and Ewing.[7]

Results. Fig. 1 shows graphically the rate of disappearance of ethyl alcohol alone and following 2 doses of 0.5 g per kilo of sodium pyruvate as a 5% solution by stomach tube. The pyruvate levels in the blood rose only slightly and transiently. It will be noted that administration of pyruvate had no influence on the rate of disappearance of ethyl alcohol from the blood.

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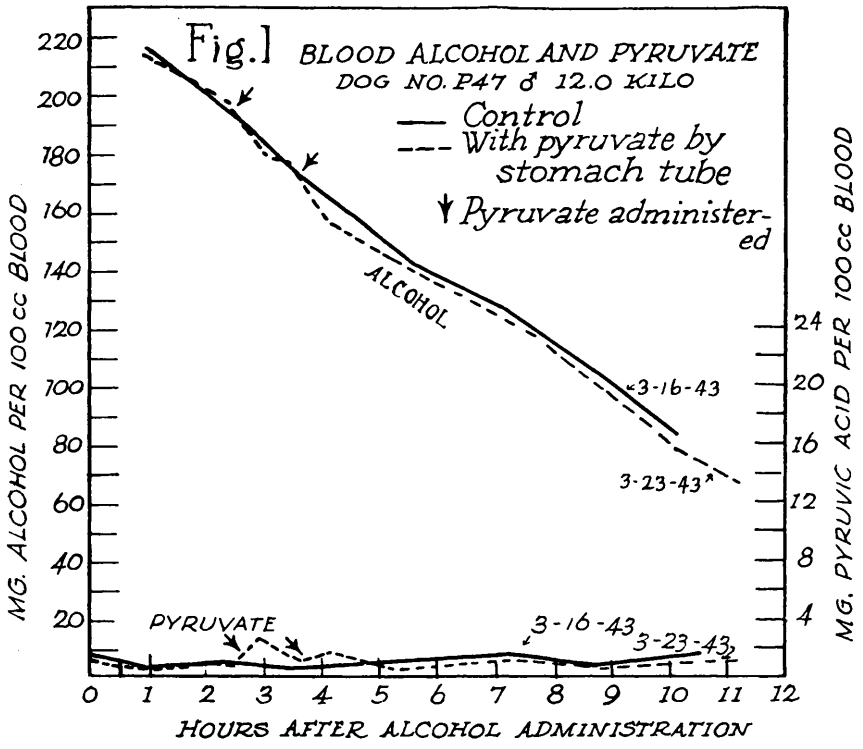
Fig. I
BLOOD ALCOHOL AND PYRUVATE
DOG NO. P47 ♂ 12.0 KILO
Control
With pyruvate by stomach tube
Pyruvate administered
ALCOHOL
3-16-43
3-23-43
PYRUVATE
3-16-43
3-23-43
MG. ALCOHOL PER 100 cc BLOOD
MG. PYRUVIC ACID PER 100 cc BLOOD
HOURS AFTER ALCOHOL ADMINISTRATION

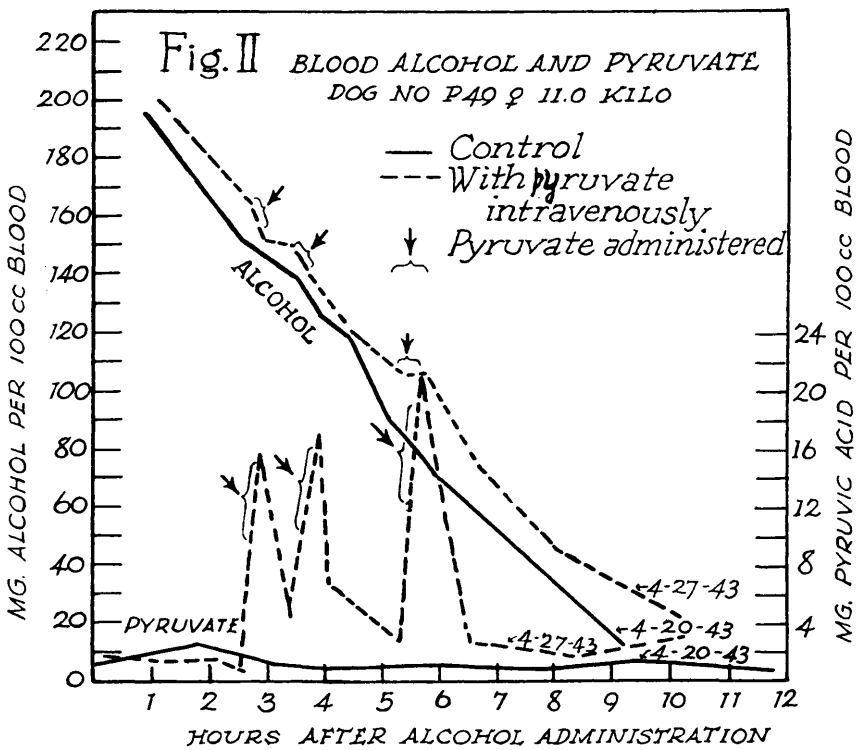
Fig. II
BLOOD ALCOHOL AND PYRUVATE
DOG NO P49 ♀ 11.0 KILO
Control
With pyruvate intravenously
Pyruvate administered
ALCOHOL
4-27-43
4-29-43
4-27-43
4-20-43
PYRUVATE
MG. ALCOHOL PER 100 cc BLOOD
MG. PYRUVIC ACID PER 100 cc BLOOD
HOURS AFTER ALCOHOL ADMINISTRATION

Fig. II presents graphically the data obtained from following the rate of disappearance of alcohol alone and following the administration of a 10% solution of sodium pyruvate intravenously in 0.5 g per kilogram doses. It will be noted that 3 doses of sodium pyruvate intravenously over a period of 4 to 5 hours had no influence on the rate of metabolism of ethyl alcohol. The results shown in these two graphs are typical of those obtained with similar studies on 4 other dogs.

It is suggested that the results of Westerfeld, Stotz and Berg, which appear to indicate that pyruvate increases the rate of metabolism of ethyl alcohol, are due to the fact that absorption of alcohol from the stomach was not complete during the control period as was evidenced by the unusually low values for blood alcohol; and that following pyruvate administration, which may have retarded further absorption of alcohol by its hypertonicity, the true normal rate of alcohol disappearance was obtained. This is supported by the fact that the rate of disappearance of alcohol reported by these authors following pyruvate is almost identical with the rate of disappearance we have observed in our controls—*i.e.*, about 20 mg % per hour.

It is believed from our experience that the high levels of blood pyruvate reported by Westerfeld, Stotz, and Berg following sodium pyruvate by stomach tube may have been due to the struggling and other activity of the dogs. The low levels of blood pyruvate which they reported after ingestion of alcohol may, therefore, have been due to the decreased activity of the dogs as a result of the sedative action of alcohol and not to the increased utilization of the pyruvate in the metabolism of the alcohol as is thought by these workers.

Conclusions. Studies on 6 dogs show that the administration of sodium pyruvate by stomach tube or intravenously has no influence on the rate of metabolism of ethyl alcohol.

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The Action of Antibiotics on Organisms Producing Gas Gangrene.

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The bacteriostatic action of penicillin on the gas gangrene anaerobes and its efficacy in the treatment of experimental gas gangrene have been reported.[1-7] The present paper compares aspergillic acid[8-10] with other antibiotic agents and sulfonamides *in vitro* on *Cl. perfringens, Cl. septicum, Cl. oedematiens*, and a strain of *Cl. perfringens* made fast to sulfonamides by repeated transfer in broth containing sulfathiazole, and *in vivo* on *Cl. perfringens* infection in mice.

The medium used for the antibiotic tests *in vitro* contained 2% bacto tryptose, 0.2% glucose, 0.5% sodium chloride, 0.1% disodium phosphate, and 0.1% sodium thioglycollate; pH 7.4 to 7.6. Paraffin-vaseline seals were used on all cultures and

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