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A new and delicate biological method of detecting carbon monoxide in blood.

By DAVID I. MACHT, S. S. BLACKMAN JR., and MARGARET SWIGART.

[*From the Pharmacological Laboratory, Johns Hopkins University, Baltimore, Md.*]

In connection with a phytopharmacological study of menstrual toxin by Macht and Lubin published elsewhere, the authors had occasion to examine the effects of various specimens of pathological blood on the growth of plants and found that some of them were quite toxic for plant protoplasm. Inasmuch as carbon monoxide forms a firm compound with hemoglobin, it was thought possible that such blood might exert a poisonous effect on phytopharmacological preparations. Accordingly experiments were made with carbon monoxide blood of various animals on the growth of seedlings of *Lupinus albus* by methods described elsewhere. Series of seedlings were suspended in normal Shive solutions on the one hand and in solutions of normal blood and of monoxide blood on the other hand. It was found that carbon monoxide blood was extremely toxic for plant protoplasm and furthermore that this toxicity, biologically speaking, was propor-

tional to the concentration of carbon monoxide in the blood. The sensitiveness of *Lupinus albus* roots to carbon monoxide blood is illustrated by the following data. Some defibrinated pig's blood was saturated with pure carbon monoxide, and solutions of this blood were made in a mixture of equal parts of Shive and distilled water. It was found that a 1 per cent solution of blood produced a very marked inhibition and even 0.1 per cent solution of the blood also produced a distinct and easily measurable inhibition in the elongation of the roots. Further experiments indicated that solutions of monoxide blood as dilute as 0.01 per cent produced in sensitive preparations a definite inhibition in the growth of seedlings as compared with the growth of a similar series of seedlings immersed in a similar solution of normal pig's blood.

The authors have plotted curves showing a simple relationship between the concentrations of carbon monoxide hemoglobin and the toxicity of various solutions for plants. The greatest usefulness of the present method in studying carbon monoxide blood is for comparative purposes, such as in the studies by Macht and collaborators on the treatment of monoxide poisoning described in the following communication. Experiments with pure hemoglobin and carbon monoxide hemoglobin gave similar results as were obtained with blood. The data furnished by the plant experiments agreed well with quantitative chemical analysis, but the phytopharmacological method has been found by the authors for practical purposes to be more delicate and more convenient. Even dry blood can be studied in the same way; such blood being dissolved in distilled water and the solutions of hemoglobin thus obtained treated as above. The plant method of studying monoxide poisoning would speak for a specific toxicity of carbon monoxide aside from the asphyxia produced by it, a mooted question which cannot be satisfactorily settled by animal experiments. By the present method the presence of carbon monoxide in plasma can also be demonstrated. Poisoning with illuminating gas has also been studied by the authors. The blood obtained in such cases is even more toxic for plants than pure monoxide blood on account of the presence of ethylene gas in solution, which gas, as is well known, is very toxic for plants. This announcement is a preliminary communication and complete data of the present and further work will be published in due time.