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METHOD OF PRESERVING AND PRESENTING A BLOOD SAMPLE FOR ANALYSIS THEREOF

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9 Claims. (Cl. 23—230)

This invention relates in general to methods of chemical analysis of biologic material.

This application is a divisional of my co-pending application, Serial No. 80,762, filed March 10, 1949, now Patent No. 2,652,314, for Methods of Qualitative and Quantitative Analysis.

In the everyday practice of medicine there is a constant need to analyze biologic materials for diagnostic and therapeutic purposes. Among the more routine of such analyses is the determination of the concentration of the fermentable sugar in human blood. Such determinations are of critical importance with respect to the patient's metabolism, and especially in connection with diagnosis and treatment of diabetes mellitus. In many circumstances where the patient is removed from laboratory facilities, the transmittal of the sample of the biologic material to a laboratory presents very serious problems. Such circumstances arise primarily where a patient is too sick to be removed or with less acute conditions, distant travel might work an economic hardship or, in the case of individuals suffering from a chronic ailment such as diabetic mellitus wherein blood specimens must be shipped with great frequency so that the sugar content thereof can be constantly checked in order to maintain a properly calculated diet.

Therefore, a primary object of the present invention is to provide a method for the purpose stated which permits of preserving a blood specimen by absorbent means for indefinite periods and under varying climatic conditions with the sugar content thereof remaining constant so that accurate determination thereof may be effected at a period long subsequent to the collection of the specimen.

A further object of the present invention is to provide a method for analyzing blood sugar in which minute quantities of blood may be effectively used.

It is an additional object of the present invention to provide a method for the purpose stated which coordinates with standard analytical procedures.

The method of the present invention comprises the depositing of a measured quantity of the blood to be tested upon an absorbent body. The specimen may, if desired, be deposited upon the absorbent body while said body is encased within a suitable container or outer housing which may then be closed for purposes of transmittal to a laboratory or for storage. The absorbent body and container therefore might, but not necessarily be of the type fully described and set forth in my co-pending application Serial No. 80,761, filed March 10, 1949, now Patent No. 2,710,688, for Shipping Containers. At a laboratory the absorbent body is placed in a suitable analytical flask or vessel for extraction in accordance with conventional laboratory procedure. The resultant solution or extract is then subjected to standard procedures for sugar analysis. The absorbent body should be preliminarily impregnated with a suitable preservative to prevent sugar in the absorbent blood specimen from chemical breakdown during transmittal and long periods of storage.

In detail, the present method is performed in the following manner: The absorbent body is preliminarily treated with a suitable preservative for suppressing bacterial growth in order that sugar present in the specimen to be analyzed will not be broken down chemically, such as in the formation of various acids, alcohols, and the like. Impregnation of the absorbent member by a solution of 2½% to 4% sodium fluoride (NaF) has been found satisfactory for inhibiting bacterial development. Other preservatives which have been found equally effective for this purpose have been mercuric chloride, merthiolate, or any other organic mercurial. One tenth (1/10) cc. of the blood specimen is deposited upon the pretreated absorbent member. The blood so absorbed will be inert under all atmospheric conditions for indefinite periods of time and the accurate analysis of the sugar therein will not in any way be affected by accumulations of dirt, soot, and the like. When the specimen is to be tested, as at the laboratory, the blood-containing absorbent body is placed in a suitable vessel and treated with standard sodium hydroxide (NaOH) or barium hydroxide (BaOH) in measured amount for extraction of the blood therefrom; said solutions being of a concentration recognized as standard of this procedure. When the extraction is complete, as may be determined by removal of all trace of the blood from the absorbent body, the blood-containing solution is then treated with a measured quantity of zinc sulphate ($ZnSO_4$) to provide a precipitation whereby the proteins are removed from the specimen. Said precipitation is filtered off and the filtrate is ready for quantitative testing for sugar by any standard analytical procedure, such as Somogyi's micro method and the like. It is to be particularly noted that the precise amounts of the measured quantities of hydroxide solution and zinc sulphate as utilized in this analysis are determined by normal clinical techniques.

As set forth hereinabove, a very minute amount of blood is sufficient for providing an accurate sugar quantitative analysis. Additionally, due to the preservation of the sugar present in the blood specimen, against chemical breakdown through enzymatic or bacterical action, the determination of the sugar may be made at any time subsequent to the collection of the specimen without danger of obtaining inaccurate results.

If desired, the blood specimen may be deposited upon the absorbent body while the same is within a suitable impervious flexible container, which container may then be closed and transmitted or stored, with the specimen being in a moist state. Thus, the present method provides economical means for transmitting minute quantities of a blood specimen which may be effectively analyzed by any standard analytical procedure.

It should be understood that changes in the methods, compositions, percentages, and combinations set forth may be made without departing from the nature and principle of my invention.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. The method of collecting, preserving, and presenting for ultimate analysis a blood specimen for determination of sugar content thereof, which comprises providing a section of absorbent material, impregnating said absorbent material with an agent for inhibiting the decomposition by enzymatic or bacterial action of sugar contained in blood collected on said absorbent material, depositing a quantity of a liquid blood specimen on said material under atmospheric conditions, preserving the thus treated absorbent material for any selected period

of time under atmospheric conditions, and ultimately subjecting the thus treated absorbent material to the indicated reagent for determining the sugar present in the absorbed specimen.

2. The method of collecting, preserving and presenting for ultimate analysis a blood specimen for determination of sugar content thereof, which comprises providing a section of absorbent material, impregnating said absorbent material with a bacteriostatic agent for preventing chemical decomposition by bacteria of sugar contained in blood collected on said absorbent material, depositing a quantity of a liquid blood specimen on said material under atmospheric conditions, preserving the thus treated absorbent material for any selected period of time under atmospheric conditions, ultimately extracting the blood specimen from the absorbent material in a quantity of a compatible liquid agent, and subjecting the extract solution to the indicated treatment for determining the sugar present in the specimen.

3. The method of collecting, preserving, and presenting for ultimate analysis a blood specimen for determination of sugar content thereof, which comprises providing a section of absorbent material, impregnating said absorbent material with a preservative agent for stabilizing as to its original characteristics blood collected on said absorbent material, depositing a quantity of a liquid blood specimen on said material under atmospheric conditions, preserving the thus treated absorbent material for any selected period of time under atmospheric conditions, treating the absorbent material with a hydroxide solution for extraction of the blood specimen therefrom, and then subjecting the extract solution to the indicated treatment for determining the sugar present in the specimen.

4. The method of collecting, preserving, and presenting for ultimate analysis a blood specimen for determination of sugar content thereof, which comprises providing a section of absorbent material, impregnating said absorbent material with a preservative agent for stabilizing as to its original characteristics blood collected on said absorbent material, depositing a quantity of a liquid blood specimen on said material under atmospheric conditions, preserving the thus treated absorbent material for any selected period of time under atmospheric conditions, treating the absorbent material with a hydroxide solution for extraction of the blood therefrom, treating the extract solution with zinc sulphate, filtering the thus treated solution, and then subjecting the filtrate to the indicated treatment for determining the sugar present in the specimen.

5. The method set forth in claim 4 wherein the specimen-containing absorbent material is treated with sodium hydroxide solution.

6. The method as set forth in claim 4 wherein the specimen-containing absorbent material is treated with barium hydroxide.

7. The method of collecting, preserving, and presenting for ultimate analysis a blood specimen for determination of sugar content thereof, which comprises providing a section of absorbent cellulosic material, impregnating said absorbent material with sodium fluoride for stabilizing as to its original characteristics blood collected on said absorbent material, depositing a quantity of a liquid blood specimen on said material under atmospheric conditions, preserving the thus treated absorbent material for any selected period of time under atmospheric conditions, and ultimately subjecting the thus treated absorbent material to the indicated reagent for extracting the blood specimen therefrom, and then treating the extract for determining the sugar present therein.

8. The method of collecting, preserving, and presenting for ultimate analysis a blood specimen for determination of sugar content thereof, which comprises providing a section of absorbent material, impregnating said absorbent material with an agent for inhibiting the decomposition by enzymatic or bacterial action of sugar contained in blood collected on said absorbent material, depositing a quantity of a liquid blood specimen on said material under atmospheric conditions, permitting the blood specimen to dry upon said absorbent material, preserving the thus treated absorbent material for any selected period of time under atmospheric conditions, and ultimately subjecting the thus treated absorbent material to the indicated reagent for determining the sugar present in the absorbed specimen.

9. The method of collecting, preserving, and presenting for ultimate analysis a blood specimen for determination of sugar content thereof, which comprises providing a section of absorbent cellulosic material, impregnating said absorbent material with sodium fluoride for stabilizing as to its original characteristics blood collected on said absorbent material, depositing a quantity of a liquid blood specimen on said material under atmospheric conditions, permitting the blood specimen to dry upon the absorbent material under atmospheric conditions, preserving the thus treated absorbent material for any selected period of time under atmospheric conditions, and ultimately subjecting the thus treated absorbent material to the indicated reagent for extracting the blood specimen therefrom, and then treating the extract for determining the sugar present therein.

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