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October 1, 1947

Memorandum to: William F. Bale

From: Samuel H. Bassett

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Subject: Quarterly Report - July 1 to September 30, 1947

Except for follow-up studies, all work using radioactive isotopes as tracers was discontinued prior to July 1 at the request of the Director of the Project. The personnel of the section, except for the Section Head, chose the month of July for vacations. As a result, all activities involving the care of patients had to be suspended until August 1. Those who remained on duty during July were engaged in the preparation of reports on work previously completed.

The unit was reactivated on August 1st and a patient was admitted so that the technical staff could be kept together and their time adequately occupied. This has enabled us to perform the following experiment:

Object of Experiment

To determine the fate of a solution of human serum albumin when injected intravenously into a mal nourished subject.

Subject of Experiment

Male aged 21 years convalescent from acute rheumatic fever and exhibiting the signs of rheumatic heart disease and malnutrition.

Procedure

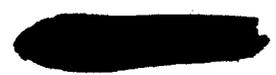
The patient was (1) placed on a low protein diet, 16 gm protein and 2670 calories a day for ten days. (2) The rate of recovery of protein lost on regime (1) was measured after the low protein diet had been supplemented by meat 71 gm protein and 3035 calories a day. (3) The subject was again placed on the low protein diet for five days. (4) The low protein intake was next supplemented by injection of a solution of human albumin in the amount of 60 gm a day giving a total intake of protein nearly the same as for the meat supplement. (5) Protein supplements were withheld for five days of low protein diet. (6) The protein intake was increased in two stages to 130 gm a day. Experimental periods were five days in length except for period V which was six days. Balances were kept by analyzing the experimental diets, their supplements and the patient's excreta for nitrogen, calcium and phosphorus. The excretion of protein in the urine was determined quantitatively. Analyses of the serum were made from time to time to establish the level of total protein, albumin, globulin and non-protein nitrogen. Electrophoretic analyses of the plasma proteins was obtained also through the courtesy of Dr. Eric Alling.

Results

While the complete data are not available as yet, most of the pertinent information dealing with the nitrogen balance and the plasma proteins is at hand. This has been assembled in Tables I and II.

Nitrogen loss was encountered as was to be expected whenever the low protein

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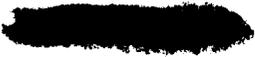
REPOSITORY: OFFICE OF HUMAN RADIATION
EXPERIMENTS (OHRE)

COLLECTION: PLUTONIUM INJECTION INVESTIGATION
FILES (OHRE 1)

BOX: 2

FOLDER: PLUTONIUM INJECTIONS - ROCHESTER -
GEN INFORMATION

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Samuel H. Bassett

diet was given. Supplementing the low protein diet with sufficient meat to the intake to an average normal level produced temporary nitrogen retention; the losses on ten days of low protein intake were greater than the recovery on ten days of "normal intake". When the low protein diet was supplemented with intravenous serum albumin the immediate retention of nitrogen (protein) was large but at the end of ten days on this regimen, the subject was in nitrogen equilibrium again. An extremely interesting feature of this phase of the experiment was the steady rise in protein of the urine. While the patient had consistently shown a mild proteinuria, careful tests of renal function including glomerular filtration rate, renal plasma flow and capacity for the tubular cells to excrete para aminohippuric acid were all normal or above normal. At the end of ten days about half of the protein solution given during the day appeared in the urine within the next twenty-four hours. Heavy proteinuria persisted for several days after the albumin injections ceased so that the maximum is found in period VIII which is a control period on the low protein diet. The administration of albumin increased the plasma volume about 25 per cent and increased the concentration of total protein in the serum by increasing the albumin. Both the concentration of total globulin and gamma globulin were depressed however. The concentration of albumin appears to have remained above normal for at least a week after the injections ceased. Further investigation is required to determine whether the reaction of this subject to large doses of intravenous albumin is unique or whether other subjects will give similar response.

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Serum albumin is probably deficient in the amino acids (~~valine~~) and tryptophan. It is possible that the course of events is as follows: Parenteral albumin is converted readily to a more "complete" protein by addition of the missing amino acids and may then be taken up and utilized by many body cells to satisfy their requirements for protein. When available sources of these amino acids have been exhausted, the rising concentration of albumin in the serum on injection leads to greater and greater passage of protein through the glomerular filter. The ability of the tubular epithelium to recover albumin is exceeded and it escapes in large quantity in the urine. That the protein requirement of the tissues is by no means satisfied when this happened, may be inferred from the avidity with which nitrogen was retained when the patient was allowed to take a high protein diet of good quality.

SHB:mm

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