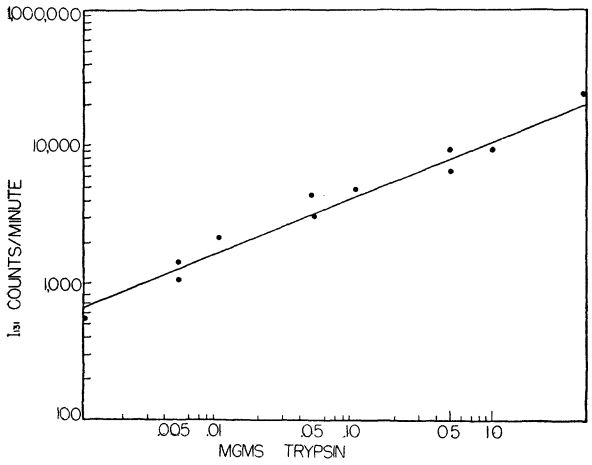

FIG. 1.

formation of unbound radioiodine that, though not necessarily in inorganic form, is no longer attached to the whole protein and may be separated from the latter by selective precipitation of the albumin. The radioactivity contained in the supernatant should then be proportional to the proteolytic activity of the enzyme.

Radioactive iodinated albumin is dialyzed against cold running water for 72 hr to free it of any unbound inorganic I^{131}. The proteolytic solution is then added to the labeled albumin. After 20 min, 1 cc of β-naphthalene sulfonic acid and 1 cc of human serum albumin as a carrier are added to precipitate the proteins. The mixture is centrifuged and the supernatant plated and counted with a thin end-window Geiger-Müller tube.

The results using varying concentrations of trypsin (Tryptar-Armour) in 1 cc of solution are shown in Fig. 1.

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Various Absorption Coefficients for 23.5-Mev X-Rays

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In choosing the material for a window through which one can view patients receiving betatron x-ray therapy, it was necessary to measure the half-value layers of glass,[1] lead glass, water, and zinc bromide.[2] It was found necessary to have a protective window-thickness providing about 8–9 half-value layers of absorbing material to protect the betatron personnel in the control room satisfactorily.

TABLE 1

23.5 MEV X-RAYS

Material	Half-value layer	Absorption coefficient
Water	29.6 cm	0.023 cm^{-1}
Glass	11.9 cm	0.058 cm^{-1}
Zinc bromide	9.4 cm	0.074 cm^{-1}
Lead glass	3.6 cm	0.19 cm^{-1}
Lead	1.4 cm	0.48 cm^{-1}

K. R. Ferguson (*1*) and others have discussed various liquid and solid absorbers for window constructions that can be used for high energy radiation protection. In order to select the best material in respect to lowest space consumption and cost as well as chemical stability, the following absorption coefficients were measured with a 23.5-Mev x-ray beam.

The absorption coefficients of glass, lead glass, and

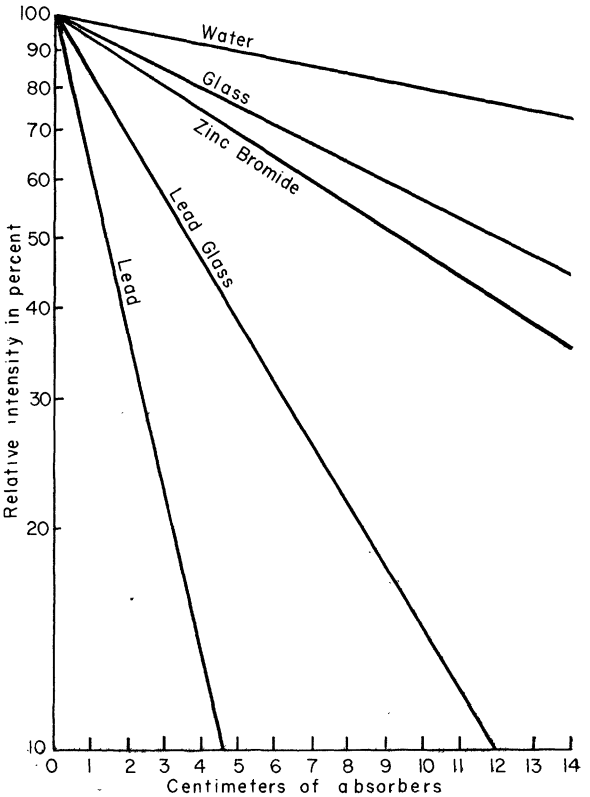

FIG. 1. Absorption qualities of various materials for protective windows against 23.5 Mev x-rays are shown. The lead curve is given for comparison.

[1] Samples of plate glass and lead plate glass were furnished by the Pittsburgh Plate Glass Company.

[2] Zinc bromide solution containing hydroxylamine hydrochloride to prevent coloring due to oxidation products was supplied by the Dow Chemical Company.

lead metal were determined by placing absorbers of these materials in front of a Victoreen thimble ionization chamber (25 r) situated within an 8-cm square lucite block (*2*) at a distance of approximately 100 cm from the betatron target. A well-collimated and uniform 6-cm-diameter beam of 23.5-Mev maximum x-ray energy was employed.

The values for water and zinc bromide were measured in a lucite tank. A small ion chamber was moved along the axis of the beam by remote control (*3*). The instantaneous ionization current at any point was amplified and recorded. The field size was 10×12 cm at 100 cm from the target. Inverse square correction was applied to all readings. The characteristics of the different materials are shown in Table 1 and Fig. 1. Measured values for lead are given for comparison.

It should be noted that the data show only the rate of absorption due to ionization after the electronic equilibrium has been reached, which is at approximately a depth of 4 cm for water.

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The Dynamic Equilibrium between Circulating and Extravascular Plasma Proteins[1]

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It has been demonstrated that after intravenous administration of native (*1*) and labeled heterologous (*1, 2*) and homologous (*3–6*) plasma proteins to animals and labeled (*6*) and native (*7, 8*) homologous plasma proteins to humans, approximately half of the administered plasma protein, exclusive of that amount catabolized, leaves the circulation within the first few days. The importance of the nature of the label, the manner in which labeling has been performed, and, in the case of heterologous proteins, the activity of the reticuloendothelial system and the influence of antibody production in these experiments has been discussed (*1, 6*).

The extravascular distribution of native heterologous plasma proteins in animals (*9, 10*) and native homologous plasma proteins in humans (*7, 11*) has also been investigated; specific plasma proteins were found in the connective tissues and in the cells of many organs. In instances of a marked deficiency of a specific circulating plasma protein in humans, γ-globulin in agammaglobulinemia (*8*) and fibrinogen in congenital afibrinogenemia (*7*), it has been found that extravascular sites in these patients are also depleted of the specific plasma protein (*7, 11*). Extravascular deficits of the given plasma protein in these patients could be quickly rectified by intravenous administration of the protein (*7, 11*).

Although it has been demonstrated that an excess of a given plasma protein in the circulation will shift extravascularly, for a true equilibrium to exist between the intravascular and extravascular pools of plasma protein, it must also be shown that an excess in the extravascular compartment will result in movement of the protein into the circulation. It was the purpose of this investigation to demonstrate, if possible, the reversible nature of the shift of protein between the intravascular and extravascular compartments.

Rabbit antisera vs. pneumococcus type III polysaccharide were employed in this study since the antibody could be detected by its immunochemical reactivity with specific antigen without additional labeling. The antisera were passively transferred to normal rabbits, thus avoiding the question of synthesis by the host animal of the protein being measured. The levels of antibody in the circulation were determined by the method of Heidelberger *et al.* (*12*), the specific precipitates were measured spectrophotometrically (*13*). The antisera used were pooled, fractionated with ammonium sulfate at half (0.5) saturation, and the precipitate was dialyzed exhaustively against saline buffer ($\Gamma/2$ NaCl = 0.1, $\Gamma/2$ phosphate = 0.05) and then against 0.15 *M* NaCl. The filtered concentrated solution contained 16.9 mg antibody/ml and represented a 10% solution of protein. Prior to intravenous administration, a volume of blood equal to the amount of antiserum to be injected was removed from an ear vein. The following experiments were performed and the results are recorded in Fig. 1.

Expt. 1. Effect of exchange transfusion. Four rabbits were given 20 ml antiserum intravenously. At the end of the 4th day of equilibration, the right femoral vein in each of the rabbits was exposed, and a No. 19 polyethylene catheter was inserted through an incision in the vein wall.

A. Two of the rabbits were then given exchange transfusions of 300 ml of normal rabbit blood, with removal of blood and its replacement in 10-ml aliquots over a period of an hour. The exchanged rabbits demonstrated the expected fall in circulating antibody immediately following the procedure; a rapid rise in circulating antibody soon occurred.

B. The 2 control rabbits were not treated and they showed no significant alteration of circulating antibody other than a continued logarithmic decay over this same period.

Expt. 2. Effect of injection of specific antigen. A. Four rabbits were given 18 ml of antiserum intravenously, and at the end of the 2nd day were given 2.2 mg of pneumococcus polysaccharide III intra-

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