sions of 0.001 cc. (while rapidly stirred) using an electrometric method for indicating the end-point. Burette readings are plotted against voltage, the curve showing a sharp angle at the end-point. Blanks are run on all the reagents and subtracted from the results. Human blood gave 0.1-0.7γ in 5 cc. On adding iodine, the following was recovered (Table I):

TABLE I.
Micrograms of Iodine in 5 cc.

Original content	Amount added	Amount recovered	% recovered
.5	5	4.81	88
.5	5	4.91	89
.5	5	5.33	97
.5	5	5.51	100

9672 P

A Simple Inexpensive Method for Concentrating Serum Under Sterile Conditions.

WILLIAM THALHIMER.

From Manhattan Convalescent Serum Laboratory, New York City.

Cellophane in sheets has been used for some time as a dializing membrane, and bags made of these sheets have been used as dializing bags.

Seamless tubes of cellophane, known commercially as sausage casings, also have been used for similar purposes.

Schwartzman[1] has made use of cellophane bags in the "preparation and preservation of immunologically active bacterial products."

Kendall[2] has used cellophane tubes for concentrating antiserums and antibody solutions with the aid of a very interesting, simple negative pressure dialysis apparatus which he has devised. Undoubtedly others have used cellophane for similar purposes.

Apparently it is not well known that cellophane can be sterilized in an autoclave at 15 pounds pressure for 30 minutes without changing any of its important characteristics.

It is very simple to make up cellophane bags out of cellophane tubing*—simply tied off with heavy twine at one end and with a

1 Morell, Sam, and Schwartzman, Gregory, *Science*, 1937, **86**, 130.

2 Kendall, Forrest E., *J. Exp. Med.*, 1930, **51**, 319.

*Cellophane sausage casings were generously furnished by Visking Casing Corp.

one-hole rubber stopper tied in at the other end. Through the hole in the stopper a piece of glass tubing is inserted and its end covered with filter paper. The completed bag is sterilized in the autoclave. After it has cooled, sterile, filtered serum is introduced and the bag suspended in front of an electric fan in a room or in a mechanical refrigerator. It has been found that moisture will evaporate from a large cellophane tube filled with serum (about 1,000 cc.) in front of the fan at room temperature at the rate of 20-25 cc. an hour, and almost this fast in the refrigerator. In small amounts, 1-20 cc., in small bags, the serum will concentrate or dry even more quickly.

The serum can be concentrated to any desired degree or can be completely dried. Since the cellophane is impervious to bacteria the serum will remain sterile. When the desired concentration has been reached the serum either can be used or put into sterile bottles and kept. During the process of evaporation, because of the cooling effect of this process, this serum is kept at a temperature about 8°C. below a room temperature of about 25°C.

Serum concentrated to one-fourth the original volume is quite viscous, but can be drawn through a large bore needle for subcutaneous or intravenous injection.

My interest is in concentrating human serums, such as immune measles serum obtained from adults who some years previously had an attack of measles. This concentrated serum is needed to amplify the supply of measles convalescent serum for the prevention or attenuation of measles in children exposed to this disease.

Apparently there also is a growing field of usefulness for concentrated normal human serum for intravenous administration to counteract shock, for the alleviation of edema of individuals with the nephritic syndrome, etc.

The cost of the cellophane tubes is very small and no additional apparatus is needed, so that the additional expense of concentrating serum is very small. However, for concentrating large volumes of serum, instead of rubber stoppers, we are now using duraluminum metal parts, made for us by a machinist.†

If desired, the serum can be evaporated to complete dryness and when dry has the appearance of amber or resin. This method, because of its simplicity and low cost, should be of use in research laboratories for drying and preserving small amounts of serums.

The keeping quality of several standardized serums, dried by this method is now being investigated.

The dried serum can be restored to its fluid condition by merely

† Mr. Paul Leo, 119 West 63rd Street, New York City.

immersing the cellophane bag containing the serum in a vessel of distilled water or physiological saline solution, water dializing into the bag. Since bacteria will not pass through the intact cellophane membrane the redissolved serum will remain sterile even though the water in which the bag is immersed is not sterile. The residue of a small amount of serum, 10-20 cc., will redissolve under these conditions in from 1-2 hours.

9673 P

Experimental Exchange Transfusions for Reducing Azotemia. Use of Artificial Kidney for This Purpose.

WILLIAM THALHIMER.

From the Manhattan Convalescent Serum Laboratory, New York City.

Howell[1] first isolated heparin, which retards the coagulation of blood whether added *in vitro* or *in vivo*. Purified, non-toxic heparin was prepared by Charles and Scott.[2, 3, 4] This preparation has been demonstrated by Best[5, 6, 7] and his co-workers to be non-toxic when injected intravenously into humans.

A new type of transfusion, called for the time being, an "exchange transfusion," has been carried out experimentally by using heparin* as a non-coagulant.

After removing both kidneys from a dog the animal's blood urea increases rapidly. The morning after bilateral nephrectomy this animal and a donor animal are anesthetized by nembutal† injected intravenously. Cannulae are inserted into the femoral artery and vein of one leg of each animal. At this time a small amount of heparin was injected intravenously into each animal. With a 50 cc. all-glass syringe 200 cc. of blood is transferred from the donor

1 Howell, W. H., and Holt, E., *Am. J. Physiol.*, 1918, **47**, 328.

2 Charles, A. F., and Scott, D. A., *J. Biol. Chem.*, 1933, **102**, 425.

3 Charles, A. F., and Scott, D. A., *J. Biol. Chem.*, 1933, **102**, 431.

4 Scott, D. A., and Charles, A. F., *J. Biol. Chem.*, 1933, **102**, 431.

5 Murray, D. W. G., Jaques, L. B., Perrett, T. S., and Best, C. H., *Canad. M. A. J.*, 1936, **35**, 621.

6 Best, C. H., Cowan, Campbell, and MacLean, D. L., *Science*, 1937, **85**, 338.

7 Murray, D. W. G., Jaques, L. B., Perrett, T. S., and Best, C. H., *Surgery*, 1937, **2**, 163.

* Heparin was generously furnished by Dr. C. H. Best, University of Toronto.

† Nembutal was generously furnished by Dr. J. F. Biehn, Abbott Laboratories.