in 0·1 *N* sulphuric acid. Our experience with this method has been that in practice it fails because filtration of urine is a slow process, and also the asbestos mat invariably becomes clogged before 100 ml. of urine have passed through. Swiftness and simplicity of operation and an absolute minimum of handling are essential when dealing with highly radioactive solutions, and these considerations led us to evolve the following method, which is a practical improvement on that of Purves.

Silver chloride prepared by precipitation from silver nitrate was washed carefully with distilled water containing 1 per cent of nitric acid to free it from soluble salts. After drying in the dark at 100–110° C., it was fused in a silica dish at 465° C. The melt was allowed to solidify into a cake, removed from the dish by breaking the latter, and grated down with a coarse rasp. Silver chloride so prepared is effective in removing iodide from solutions. Varieties of silver chloride globules and sponges were also made by pouring the melt into cold water, but none of them was effective.

A glass tube of internal diameter 1 cm. and length 25 cm., wrapped in black paper, was filled with granules of silver chloride sieved free of dust. The packing was maintained in position by a plug of glass wool at each end. The urine, contained in the bottles used for collection, is drawn through the column by means of a water pump and discharged into a 2-lit. reservoir from which, after checking that the radioactivity has been removed by the column, it is disposed of down the sink. The extracted radioiodide is found almost completely within the first 2 cm. of the column.

The *p*H of the urine is adjusted to 2·8 with nitric acid using brom-phenol blue as indicator. If this is done as soon as possible after collection, neither boiling nor filtration of the urine is necessary and the extraction of iodide may be postponed, if desired, for 24–72 hr. The rate of flow through the column is limited only by the necessity of avoiding disturbance of the packing and of preventing channelling by gas bubbles produced by reduced pressure. Flow-rates of 100 ml./min. or more may be easily maintained.

The silver chloride preparation appears to be very stable. We have treated as much as 8 litres at a time without reducing the efficiency of the column, and there seems no reason why this figure should not be exceeded. In practice, however, the accumulation of dangerous quantities of radioactivity renders it advisable to decontaminate the column periodically as outlined above. This process also regenerates the silver chloride. We have so far passed more than 30 litres through the column without noticing any falling-off in its performance, as is indicated in the accompanying table. The column was decontaminated following passage of the volumes marked with asterisks.

Volume of urine treated (ml.)	Flow-rate (ml./min.)	Delay before treatment (hr.)	Radioiodide extracted (per cent)
1,500*	100	24	97·8
800*	100	48	78·4
1,000*	25	72	83·9
1,600*	30	72	82·9
3,000	20	48	89·8
1,400	70	48	73·8
3,000	10	48	88·9
750*	100	24	73·9
1,600*	100	24	73·9
3,000*	125	48	97·1

It will be seen that the percentage extraction is considerably lower in some cases than others. Recirculating such urine through the column to remove the unextracted fraction is ineffective. This cannot at present be entirely explained, but is at least partially due to the presence of a variable quantity of protein-bound iodine which occurs in radioiodide–therapy urine, and which the column does not extract. This fraction is insignificant during the early hours of treatment, when the urinary output of radioactivity is at its greatest; and the column is, in fact, at its most efficient with such urine. We consider, therefore, that notwithstanding this limitation, the technique is of value as a practical expedient.

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[1] Purves, H. D., *Nature*, **169**, 111 (1952).

Spontaneous and Induced Mutation

In his book "Bacterial Physiology" (New York, 1951), Dr. J. Lederberg writes, on page 94: "Not all workers have accepted the duality of adaptation mechanisms. Hinshelwood (1946), for example, has disregarded the selection of spontaneous mutants as an element of bacterial adaptations, apparently in order to bolster the applicability of his system of chemical kinetics to problems of bacterial growth".

The reference is to my short book, "The Chemical Kinetics of the Bacterial Cell" (which is described in its own preface as an "essay" and is not a reference work in any event). Nevertheless, it contains one chapter entitled "Variants" (that is, mutants) and another entitled "Selection" (one section of which is entitled "Superposition of Adaptation and Selection"). On page 193, in connexion with spontaneous and induced changes, it is stated: "It should be emphasized at the outset that one has not necessarily to do here with two competing or mutually exclusive hypotheses. Both types of mechanism may in fact operate in nature". On page 202 it is stated: "From this point of view the question would no longer be: what is the mechanism of variation and adaptation, but, which of the various mechanisms plays the more important part in any given example". On page 203 (in connexion with the same problem) it is stated: "Probably the correct interpretation varies from case to case". Ten pages later, still in the same connexion, it is stated: ". . . one is inclined to feel that a complete gradation of behaviour is probably to be detected, by the proper methods, among bacteria, just as it is known to exist in ordinary chemical reactions, where the relative importance of nucleation and growth of nuclei varies widely".

Experiments in this laboratory have led us to conclude that the induced adaptation mechanism operates in various particular cases. But we have never denied possible or even probable duality of mechanism in general.

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