in spite of the damage done to transcellular strands at the cut ends of the section.

The particles presumably travel long distances through the phloem and could therefore be involved in transporting mobile materials from the leaf to the stem, the apex or the root. Although particles move past one another in adjacent strands they have not been observed changing direction and are probably part of a two-way transport system. Two-way movement without change of direction implies either that particles originate where transcellular movement begins and are assimilated at their destination or that particles are part of a circulation system in the plant. If the first explanation is correct, particles originating in the stem or root are assimilated in the mature leaf. It is difficult to accept this possibility because leaves export the products of photosynthesis in quantity and import only traces of mobile materials[4-6]. On the other hand, if a circulation system exists in the plant, particles could move out of the leaf loaded with mobile materials and then move back to the leaf after discharging their contents. Circulation streaming seems a more plausible explanation of two-way particle movement in the phloem, and it is interesting that particle circulation is known to occur as part of protoplasm streaming in hair cells.

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MICROBIOLOGY

Effect of Ultra-Violet Radiation and Desiccation on Different Age-Cultures of *Escherichia coli K12*

DURING the course of an investigation on the effect of monochromatic ultra-violet radiation on *E. coli* some unusual observations were made concerning the sensitivity of different age-cultures to ultra-violet light and desiccation. A survey of literature[1-3] revealed conflicting reports on the subject. This work was undertaken to resolve the problem.

For investigating the effect of ultra-violet light on *E. coli* 0·04 ml. (one drop) of suitably diluted culture was spread on a clean sterile glass slide and exposed to ultra-violet radiation for 30 sec. at a distance of 45 cm. from the source. A Hanovia 215-W. quartz mercury lamp housed in an asbestos-lined metal box was used as a source. The exposed slide was then pressed on a nutrient agar Petri dish and gently removed after 15 min. The plates were incubated at 37° C. for 24 hr. This entire operation was carried out in very dim light. After the incubation period the developed colonies were counted. The controls were similarly and simultaneously prepared.

For desiccation work, the glass slides spread with a suitably diluted culture were placed in a metal box and dried at 37° C. in an incubator with the lid slightly open for 3 hr. After this period, the slides were treated as before. The control slides were similarly prepared, but immediately pressed on agar plates without allowing them to dry. These experiments were repeated several times with both glass and stainless steel slides which gave identical results. This eliminates the possibility of attributing the lethal effects to free alkali on the glass surface.

Table 1. EFFECT OF ULTRA-VIOLET RADIATION AND DESICCATION ON *E. coli*

Age of the *E. coli* culture (hr.)	Percentage viable colonies after drying	Percentage viable colonies after exposure to ultra-violet radiation
0·75	20·8	7·2
1·5	18·5	6·0
3	6·0	2·3
4·5	2·0	1·2
6	4·0	1·5
8	10·0	2·6
12	18·5	3·7
16	20·2	4·0
18	20·1	4·1
24	20·3	4·1

It will be seen from Table 1 that the 0·75-hr.-old culture (in the lag phase of growth) is most resistant to both ultra-violet radiation and desiccation, whereas the 4·5-hr.-old culture (in the logarithmic phase of growth) is least resistant to these agents. The 24-hr-old culture (in the maximum stationary phase) is fairly resistant to both the ultra-violet light and desiccation.

The resistance of *E. coli* to ultra-violet light and desiccation seems to be a maximum in the lag phase and starts diminishing during early logarithmic phase and is regained as the culture reaches the maximum stationary phase. The resistance to desiccation seems to be completely regained after 24 hr., but the resistance to ultra-violet radiation is not completely regained even after 24 hr.

It has been observed (ref. 4) that during the later part of the lag phase the nucleic acid content, protein content and the cell size are at their maximum levels and start diminishing in logarithmic phase. It is also well known that the bacterial cells are not dividing in the lag phase and their cell walls and membranes are unbroken. It therefore appears that the intact cell membranes, the large amount of nucleic acids, etc., and the large cell size may be responsible for the resistance of the cells in this phase to ultra-violet radiation and desiccation.

It is interesting to note that work conducted on the effect of X-rays, heating, cooling, freezing and freeze-drying, seems to suggest that bacteria are less resistant to these agents in the logarithmic phase than in the stationary phase. It would be extremely informative to investigate the effects of these agents on the bacteria in the lag phase.

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Spheroplasts of Marine Bacteria induced by the Action of Penicillin

SEVERAL species of marine bacteria which are characterized by osmotic dependence have been induced to form spheroplasts by the action of penicillin added to cultures growing optimally in a nutrient broth prepared with sea water. Two factors indicated the likelihood of obtaining this result. First, recent papers[1-3] have contained results indicating that the internal osmotic pressure of marine bacteria and