tides. Only a heavy storm would produce wave action strong enough to tear seedlings loose from their anchorage within the swamp.

Naturally planted seedlings were pulled up, and although the growth of lateral roots prevented accurate measurement such approximations as could be made showed that they had averaged 4.0 cm penetration into the mud. The major portion of a seedling is made up of the long hypocotyl with a short radicle at the lower tip. Practically all the lateral roots, which are formed long before the seedling drops, come out within 3 cm of the tip and these, accordingly, penetrate into the mud. Adventitious roots emerge later, sometimes from the hypocotyl, but usually from the upper stem, sometimes several meters above the water level.

It was observed that seedlings naturally planted in the mud show emergence of lateral roots earlier than those that fall flat on the mud, and that they remain plump and healthy, whereas those flat on the mud often appear withered and battered. After the latter develop roots and curve upward until their stem tips reach the vertical, they usually improve greatly in appearance.

It is obvious that the seedlings that plunge from the tree are by far the most effective in colonization around the parent, but that they cannot be planted beyond the outermost branches of the parent. Some extension of range will be made by these seedlings, each extending only a little beyond its parent. Those that fall flat may be floated away and are the most important means of spread to more distant sites.

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Manuscript received July 27, 1951.

Inhalation of Sulfur Hexafluoride

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In the course of some studies on breath velocity patterns (*1,2*) it was found that density changes of the inhaled air cause recognizable alterations in such patterns. It was feasible at that time only to decrease the density of inspired gases because the expedient of using compression involved the subsequent hazard of bends. In searching for a heavy diluent for oxygen it was suggested to us that sulfur hexafluoride (*3*), which was claimed to be physiologically inert in animals (*4,5*), should be an ideal agent. Its density at 0° C 760 mm Hg is 5.486 g, and that of a 80–20% mixture with oxygen is 4.24; air by comparison is 1.2929 g. Since in our experience a density decrease to about one third was effective in altering breath velocity patterns either by decompression to altitude or by dilution with helium, it was expected that the density change effected by SF_6 would be more than sufficient to cause recognizable changes in breath velocity patterns.

Purchases of SF_6 were made from two sources.[1] The first lot of gas was tested for inertness on 17 adult white rats in a 6-hr exposure to a recirculated mixture of SF_6 in oxygen, in which the latter was continuously replaced and was found to be 28.0% by repeated Haldane analysis. Forty days later 8 of the rats, chosen at random, were again exposed for 6 hr to an SF_6-oxygen mixture in which the oxygen concentration averaged 22%. No acute manifestations of toxicity were observed in either exposure. Daily weight changes were observed to be consistent and indicated a normal rate of gain. Six animals, comprising both singly and doubly exposed, were sacrificed at 77 days after the first exposure and 5 at 135 days. Gross and histopathologic examinations showed no evidence of effects attributable to the exposures, confirming the references cited.

With this background the authors subjected themselves to short bouts of breathing a similar oxygen-SF_6 mixture from the second source. Data furnished with the two lots of gases gave identical analyses. The immediate subjective effects were not unlike those of inspiring a helium-oxygen mixture in that a certain coolness and a sense of pervasion of the upper respiratory tract were experienced. The most dramatic effect noted was on the speech. The formation of sounds was definitely impaired, mainly by a marked inability to produce the higher-pitched sounds. A sensation of "speaking under water" or "gargling" was noted, and listeners reported that the effect was of a markedly "sepulchral" tone. Actually, records of the microphone impulses induced by attempting to count or pronounce the vowels and consonants were not readily differentiable from the normal. It seems, however, that the resonance of sounds is greater for low pitch than high, and undoubtedly the overtones are suppressed. The sounds enunciated have a quality somewhat like that in helium-oxygen, but not as high-pitched or harsh. Subjectively, a vibration or resonance in the chest and sinuses was felt.

After several trials, but before an experiment was set up for breath velocity studies, it was consistently found that after a bout of some 20–30 breaths at normal rate and volume a slight to marked vertigo was experienced. This sensation passed in a few minutes on breathing air, but its intensity could be considerably augmented by hyperventilation for a few breaths with air.

The possibility of the presence of small amounts of other fluorine compounds which are highly toxic caused us to suspend operations. Attempts to "detoxify" the gas by washing or by aging in a latex reservoir were not successful. W. C. Schumb[2] has been kind enough to indicate proper methods of puri-

[1] Pennsylvania Salt Manufacturing Co., 1000 Widener Building, Philadelphia 7, Pa., and Matheson Co., Inc., East Rutherford, N. J.

[2] Department of Chemistry, Massachusetts Institute of Technology, Cambridge 39, Mass.

fication, involving condensation and resublimation, as well as thermal "cracking" and alkali scrubbing.

It is possible, however, that the effect may be a physical one, affecting the exchange of CO_2 between blood and lung space. In this event it may be a temporary imbalance that might be corrected by adjustments in the tidal volume and rate of breathing in the course of a longer experiment than was carried out in this instance. It has been our experience that a temporary ventilation imbalance is also caused by breathing helium-oxygen mixtures, although without such overt symptoms. When feasible, this aspect of the administration of SF_6-oxygen mixtures will be explored further.

It is our hope that these observations will guide others about to consider the use of SF_6 in respiratory experiments. We would appreciate any comments or observations that may be helpful to our projected experiments on breath velocity patterns.

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Manuscript received July 25, 1951.

Fungistatic Potencies of Some Fluorinated *p*-Benzoquinones

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Halogenation has been shown to increase fungicidal effectiveness in the benzoquinone series (*1*) and has resulted in the recognition and commercial development of important, practical, and highly effective fungicides (*2,3*). Interest, however, has centered mainly in halogenation with bromine and chlorine, for iodine substitution products are highly unstable, and interest in the production of fluorinated benzoquinones is recent (*4*).

In March 1949, there became available from the Division of Fluorine Chemistry, Illinois State Geological Survey, several fluorinated *p*-benzoquinones having structural formulas analogous to those of certain chlorinated *p*-benzoquinones known to possess high fungicidal potencies. Preliminary tests showed that these compounds possessed fungicidal powers, and this fact was mentioned by Finger *et al.* (*4*) in 1949. With Arthur F. Kunes, Jr., as assistant, these compounds were given bioassays to determine their fungistatic potencies in relation to spores of *Macrosporium sarcinaeforme*.

Five compounds were subjected to examination: 2-fluoro-1,4-benzoquinone, 2,5-difluoro-1,4-benzoquinone, 2-fluoro-5-chloro-1,4-benzoquinone, 2-fluoro-5-bromo-1,4-benzoquinone, and 2-fluoro-5-methyl-1,4-benzoquinone. These compounds were prepared under the direction of G. C. Finger, chemist in charge of fluorine research, Illinois State Geological Survey. Their preparation and their physical characteristics were described by Finger *et al.* (*4*) in 1949.

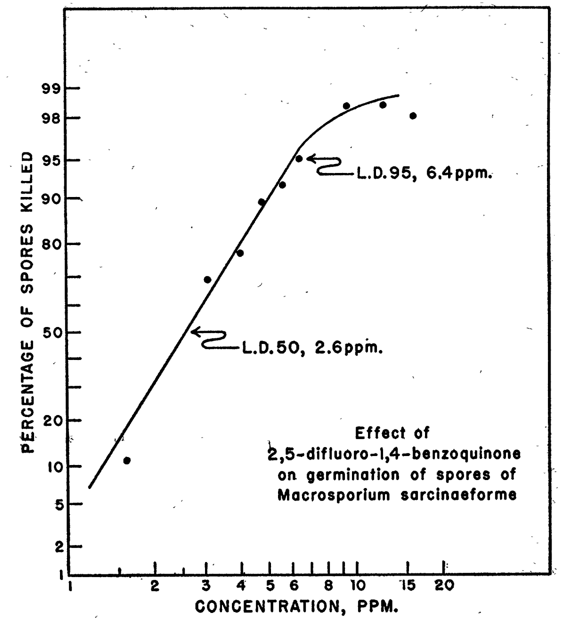

Fig. 1. Dosage-response curve obtained with 2,5-difluoro-1,4-benzoquinone and spores of *Macrosporium sarcinaeforme*, using the Peterson method of bioassay.

Bioassays were made by the Peterson (*5*) method, with minor modifications. The test fungus was obtained from Boyce Thompson Institute and presumably was a subtransplant of the strain of *M. sarcinaeforme* used by McCallan (*6*). For production of spores, the fungus was grown on thin oat agar slants for 20 or 21 days at 25° C. Mixtures consisting of a standard 50,000/ml spore suspension and of graded concentrations of the candidate compound first dissolved in 95% ethyl alcohol and then dispersed in distilled water were pipetted upon chemically clean, sterile 12-mm glass circles previously impressed in a thin coat of petrolatum on 75 × 25-mm glass microscope slides. Three circles were used per slide, and slides were arranged for incubation in groups of 4 in water-sealed, inverted 7 × 20-cm culture dishes provided with wet paper bottom pads and glass U's to support the slides above the pads, as directed by McCallan (*6*). Suitable checks were employed. Both circles and slides were so arranged as to give nonduplicating random arrangements of all concentrations in each of 4 culture dishes, thus replicating all concentrations 4 times.

Readings of spore germination were made after 20 hr of incubation, 200 spores being counted on each circle, and the readings obtained from the 4 replications were averaged.

Most effective in preventing germination of *M. sarcinaeforme* spores was 2,5-difluoro-1,4-benzoqui-