and human material. The disappearance of the glutamic acid N-terminal residues from bovine fibrinogen during clotting foreshadowed the cleavage of fibrinopeptide from the protein. Similarly, the disappearance of the alanine N-terminal residues from human fibrinogen upon clotting with homologous thrombin suggests the existence of human fibrino-peptide. Moreover, the postulated human fibrino-peptide would have to differ from the demonstrated bovine one, at least in its N-terminal residues.

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The Growth and Shrinkage of Aerosols

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When a nonvolatile aerosol, e.g., one composed of minute droplets of dioctyl phthalate (DOP) suspended in air, is introduced into a flask whose bottom and side walls are wetted with a master solution containing DOP and a miscible volatile solvent such as toluene, the aerosol droplets grow with extreme rapidity by absorbing the ambient vapor of the volatile solvent. Equilibrium is reached in a few seconds or less and persists for a considerable period of time as judged by the constant positions of the red bands in the Higher Order Tyndall Spectra produced when a beam of white light is directed through the aerosol.

The extent of growth is determined by the fixed partial pressure of toluene from the master solution; for the smaller droplets there is the additional effect of curvature of the droplet upon the vapor pressure of the volatile component (Kelvin effect) to be taken into account. When correction is made for the curvature effect, La Mer and Gruen (*1*) have shown that this procedure furnishes a very rapid, simple, and exceedingly accurate method of determining particle radii that are too small to measure without growth.

The present investigation involves the reverse process; namely, the shrinkage of aerosols. Monodisperse aerosols of DOP of the order of 0.10 μ in radius were first produced in a La Mer-Sinclair homogeneous generator (*2–5*) and grown over master solutions of DOP and toluene. By observations of the Higher Order Tyndall Spectra, the particle radius was then obtained. The grown aerosol was then passed into a second vessel containing a master solution with a lower proportion of the volatile component toluene. From the angles of the Higher Order Tyndall Spectra, it was observed that the aerosol diminished in size, and attained equilibrium with the second master solution almost immediately. Shrinkage experiments were carried out using master solutions of various compositions, and similar phenomena were observed in all cases.

Some typical results are given below. The radius of the grown aerosol for each of the two master solutions (r_g) is followed by the radius of the initial aerosol (r_i) calculated as shown in the La Mer-Gruen paper, allowing for the Kelvin effect and assuming that equilibrium has been set up between the aerosol and the master solution. The compositions of the master solutions are indicated by numbers, $K = 2$, 3, 4; these K values signify that a 2-, 3- or 4-fold increase in the radius of the aerosol droplets would be expected if the Kelvin effect was ignored; i.e., the solution for which $K = 2$ has the composition $[(2)^3 - 1]$ parts by volume of toluene to 1 part of DOP. In practice of course, because of the Kelvin correction, the grown aerosol does not attain the size suggested by the K value.

Experiment		r_g (microns) exptl.	r_i (microns) calcd.
(a)	$K = 3$	0.520	0.194
	$K = 2$	0.365	0.190
(b)	$K = 4$	0.590	0.187
	$K = 3$	0.510	0.192
(c)	$K = 4$	0.605	0.191
	$K = 2$	0.355	0.186

The agreement within the limits of experimental error between the values of r_i for the two master solutions in each set of results indicates then that the growth and shrinkage of the aerosol under these experimental conditions is an equilibrium process.

Attempts have also been made to ascertain whether or not the presence of a surface film on the aerosol had any effect in reducing the rate of shrinkage when it was placed over the second master solution. If the surface of the droplet became contaminated, the contamination should remain on the periphery if the contaminant lowers the surface tension. With decreasing size, the skin of the contaminant would shrink and might impede the rate of evaporation of the volatile component by forming a complete surface. It was hoped that experiments of this type might furnish an explanation for the frequently reported failure of smogs to evaporate when the relative humidity became lower than the equilibrium value. Since it is difficult to find a suitable surface contaminant that is not soluble in toluene, growth and shrinkage experiments were made with pure sulfuric acid aerosols over master solutions of H_2SO_4-H_2O. Oxidized hydrocarbon oils could be

used here as surface contaminants. It was not found possible, however, to prepare H_2SO_4 aerosols that were as monodisperse as those prepared from DOP. Consequently, when these aerosols were grown over the master solutions, the resulting aerosols became too polydisperse to exhibit reasonably distinct orders in the Higher Order Tyndall Spectra. This increase in polydispersity on growth may be attributed to the Kelvin effect; i.e., the growth of the smaller droplets in the initially moderately polydisperse pure H_2SO_4 aerosol is inhibited with respect to the growth of the larger droplets, thus broadening the range of the size distribution. Reasonable results in growth or shrinkage experiments using the light scattering technique may therefore only be obtained when the initial aerosol is very monodisperse as in the case of DOP. The increase in polydispersity on growth has been discussed theoretically in detail elsewhere (*6*).

Quite similar results to those obtained in the case of sulfuric acid were obtained when attempts were made to grow glycerol aerosols over glycerol-water solutions.

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Evidence for X-Ray Induced Recessive Lethal Mutations in Yeast[1]

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The difference in radiosensitivity of haploid and diploid yeast cells, as shown by earlier investigations (*1–3*), indicates that the site of the radiation-induced damage is in the nucleus. This difference in sensitivity of the two ploidies has been accounted for quantitatively (*3*) by assuming that the damage to the cells is principally in the form of recessive lethal mutations, the haploid cell being killed by one such mutation while the diploid cell would be killed only when an allelic pair of such mutations has been induced. On the basis of these assumptions, one would expect many of the diploid cells which survive a dose of x-rays to carry one or more recessive lethal mutations in heterozygous state. These cells should exhibit an inheritable increase in radiosensitivity because of the increased probability of producing an allelic pair of recessive lethal mutations with a second dose of x-rays. This postulate has been verified experimentally by Tobias and Stepka (*4*).

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TABLE 1

Number of Asci Showing Different Fractional Germinations from Control and Irradiated Diploid Cells

Fraction of the spores germinating per ascus	Control	2500 r	7500 r
4/4	11	2	4
3/4	0	0	2
2/4	1	4	4
1/4	0	0	0
0/4	0	1	6
Total no. of asci dissected	12	7	16
% viable spores	96	57	47

The present experiment was undertaken in an attempt to exhibit by another procedure the presence of x-ray-induced recessive lethal mutations in irradiated yeast. This was carried out by demonstrating a reduction in the percentage of germination of spores produced by diploid cells previously exposed to a small dose of x-rays. Sporulation of a diploid cell carrying recessive lethal mutations would bring about segregation of these mutations to the nuclei of the 4 haploid ascospores. Those spores receiving recessive lethal mutations would fail to germinate, and would thus provide a direct means of detecting this form of radiation-induced damage.

Cells of a diploid culture of *Saccharomyces cerevisiae* were grown on presporulation medium (*5*) for 72 hr, at which time a large loopful of cells was removed from the slant and suspended in sterile water. Half the suspension was placed directly on a gypsum slant, the other half was irradiated and then placed on another gypsum slant. This procedure was carried out for 2 doses of x-rays, 2500 r and 7500 r, both of which kill relatively few of the diploid cells; the lower dose kills only 3% of the cells whereas the higher dose kills about 10% of the cells. After 48 hr, a number of 4-spore linear asci were present in the cells which were sampled from both control and irradiated diploid slants, the frequency of sporulation being unaltered by the low doses of x-rays. A number of these asci, selected at random, were dissected using the procedure described by Lindegren (*5*), and the individual haploid spores were placed on separate drops of yeast extract-dextrose agar medium. The slide on which the spores were inoculated was placed on a Van Tieghem cell and incubated at 30° C. The number of spores germinating from each ascus was observed after 72 hr incubation. The results of this experiment are presented in Table 1.

The data presented in Table 1 clearly indicate that exposure of yeast cells to x-rays results in the induction of recessive lethal mutations. In nearly every case,