appeared as rapidly as in leukemic mice similarly treated. Daily doses of 0.2 mg. or less/gram of body weight given for three weeks proved to be nontoxic for normal mice. Doses of urethane which affected leukemic marrows produced no striking cytologic alterations in the bone marrow of normal mice.

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The Role of Arsenic in the Production of Alcoholic Polyneuritis

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In view of the experimental work which led to the discovery of BAL (British anti-lewisite) it might be worth while to mention some unpublished results obtained on the urinary excretion of arsenic in patients suffering from alcoholic polyneuritis. The signs and symptoms of arsenic polyneuritis are so similar to those seen in alcoholic polyneuritis that it seemed possible that arsenic as well as alcohol with its concomitant avitaminosis played a role in the latter. Twenty-four patients on the wards and 5 from the Outpatient Department of the Boston City Hospital were studied for urinary arsenic excretion. Fourteen of these suffered from alcoholic polyneuritis, while 15 patients were utilized as a control group.

Six of the 14 patients had paralysis and loss of sensation of all four extremities; 5 had a moderate, and 3 a mild, type of polyneuritis. (The additional diagnosis of Korsakoff's psychosis was made in 5, delirium tremens in 1, and signs of pellagra were present in 2.)

The 15 patients utilized as a control group fell into four groups: (1) those suffering from acute infective polyneuritis; (2) patients suffering from chronic alcoholism without signs of neuritis; (3) a group chosen at random on the ward; and (4) some outpatients who had had alcoholic polyneuritis in the past but who denied the use of alcohol at the time tested.

An attempt was made to collect at least three 24-hour urine specimens from the 24 hospitalized patients. Several had more than 3 specimens tested; the maximum was 11. Only one or more single specimens were collected from the 5 outpatients. The Reinsch test was used on all specimens, and those from 2 patients containing the largest amounts of arsenic were checked by the Gutzeit quantitative test. One patient was excreting as much as .227 mg. of arsenic/1,000 cc. of urine.

The more severe the paralysis, the more positive were these tests for arsenic. Arsenic is not a normal constituent of the body but is present due to ingestion with food. It is possible that alcohol affects the storage of arsenic, which in turn contributes to the interference with enzyme action already present in these malnourished patients.

The 14 patients suffering from alcoholic polyneuritis were consistently excreting significant amounts of arsenic in the urine, while the 15 in the control group showed only an occasional trace of this element.

Mass Mortality of Marine Animals on the Lower West Coast of Florida, November 1946–January 1947

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Catastrophic mass death involving millions of fish recently occurred on the south Florida Gulf Coast. In the latter part of November 1946, mackerel fishermen noted dead and dying fish and turtles in streaks of discolored water 10–14 miles offshore from Naples. The mortality moved northward and reached Boca Grande by January 10. Fish continued dying in the bays behind Captiva and Sanibel Islands as late as January 29. Investigations carried out since January 15 have resulted in the following observations.

Dead fish, in association with discolored water, were reported from Dry Tortugas to Boca Grande, a distance of 130 miles. At Fort Myers on January 19 the beach was littered with fish in excess of 170/foot of shore line, in addition to those floating on the water in bays and sounds and to a distance of 10 miles offshore. One homeowner on Captiva Island reported burying 60,000 fish from 200 feet of bay beach. The same area had to be cleaned on three other occasions. The total number of dead fish over the whole area was estimated to be over 50,000,000. Oysters, clams, crabs, shrimp, barnacles, and coquinas were also killed. The clam industry at Marco, 50 miles south of Fort Myers, and the sponge industry north of Tampa Bay do not appear to have been involved, nor, in spite of an isolated report of dead fish from a vessel passing Dry Tortugas, does the mortality appear to have reached the Florida Keys. All kinds of fish succumbed. Mackerel seemed to be relatively unaffected, but many mullet were killed. Floating carcasses of black drum, tarpon, groupers, and large jewfish were the most spectacular sights.

Reports of the phenomenon were not received by the writers until the middle of January. From January 18 onward, the water was sampled chemically and with plankton nets near Sanibel Island, where dying fish were encountered; at Fort Myers Beach, where dead fish only were found; and at Naples, where the water was beginning to clear up and the fishermen were making mackerel catches.

Reddish-brown discoloration of the water was observed off Fort Myers Beach. Plankton examination showed this to be unusually rich, consisting predominantly of copepods and invertebrate larvae with little phytoplankton. At Clam Bay dying fish were seen in streaks of greenish-yellow water. These streaks contained large quantities of diatoms with *Coscinodiscus* sp. as the dominant organism, together with considerable detritus and smaller numbers of naked flagellates resembling species of *Gymnodinium*. The water at Naples, which was not discolored, contained copepods and a great abundance of *Rhizosolenia* sp. No one species was overwhelmingly predominant at all stations, but the organisms tentatively identified as *Gymnodinium* sp. were found in varying numbers in samples from the areas where fish were still dying.

[1] The writers are much indebted to J. N. Darling, of Captiva, Florida, for information and assistance given during the course of this investigation.

A patch of vivid yellow water, seen south of Useppa Island on January 28, consisted almost exclusively of *Gymnodinium* sp. with a mixture of numerous larval invertebrates. The water was viscid and slimy, having the consistency of diluted syrup. A fish was seen dying in this water.

Chemical determinations disclosed no unusual salinities. Water temperatures ranged from 22.5° C. to 26° C. Samples showed a pH close to 8.2. The dissolved oxygen content was not low in brownish-red water near Fort Myers Beach except in an inshore area where large numbers of dead fish littered the water. In the yellow patch of water described above the oxygen content was low, being less than 33 per cent saturated. Hydrogen sulfide was reported earlier at Naples, and the hulls of several fishing vessels were seen with the white topside paint definitely blackened. During the period of investigation no H_2S could be detected.

An odorless but acrid gas causing stinging of the nostrils and hard coughing made life miserable for the residents of Captiva Island when a northwest wind caused a heavy surf on the Gulf Beach from January 22 to 26. This gas, which could not be identified, was not present during calm weather on January 28, but could be detected by boiling samples of Gulf and bay water. It was particularly strong in a sample of the yellow water. Lund (*1*) has previously called attention to presence of this gas during a similar heavy mortality of fishes on the Texas Coast.

A report giving full details of observations on this phenomenon will be published later.

Reference

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The Glyceride Structure of Natural Fats

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Naturally occurring fats and oils consist predominantly of esters of glycerol and fatty acids, each hydroxyl group of the glycerol being esterified with a mole of fatty acid. A number of different fatty acids (usually at least four) make up any given fat. Because of the number of fatty acids and the fact that there are three positions on each glycerol molecule to which the fatty acids may be attached, a large number of isomeric glycerides is possible in a single natural fat. Thus, if n represents the number of component acids, the theoretical number of isomers possible from a maximum distribution of the acids over the three positions of glycerol is n^3. The actual number of glycerides chemically distinguishable from one another is $\frac{1}{2}(n^3 + n^2)$ (*4*).

In general, the glycerides of natural fats are highly mixed, simple triglycerides being the exception rather than the rule and occurring for the most part only in the relatively few fats in which a single fatty acid predominates. Since natural fats consist largely of isomeric glycerides, many of which differ from each other only slightly with respect to physical and chemical properties, the analysis of fats for their component glycerides has been an extremely difficult problem. For many years various investigators, especially Prof. Hilditch and his co-workers, have attempted to enlarge upon our rather meager knowledge of the glyceride structure of natural fats. The chief result of the investigations at the University of Liverpool has been the pronouncement of the so-called "rule of even distribution" (*3*). According to this hypothesis, the individual fatty acids of a fat tend to be apportioned evenly among the different glyceride molecules. In seed fats, for example, it is pointed out that trisaturated glycerides do not usually appear until the proportion of fatty acids reaches approximately 60 per cent. Numerous exceptions to this rule have been discussed by Hilditch, and a rough classification of fats has been made on the basis of their conformity to this rule.

An analysis of the "rule of even distribution," however, reveals the fact that truly "even" distribution is not proposed. Rather, it is maintained that, at fatty acid molar concentrations of approximately 60 per cent, homogeneous triglycerides of that fatty acid first appear—something less than "even" distribution. Frequently an association ratio (molar ratio of saturated to unsaturated fatty acids) of 1.4:1.0 is used, which is equivalent to a 58 per cent molar concentration of saturated fatty acids. On the basis of a truly "even" distribution, however, no homogeneous triglyceride should be formed until the molar concentration of the fatty acid in question is 66.7 per cent—that is, until more than two-thirds of the fatty acid molecules are the same. This is illustrated in Fig. 1, in which 10

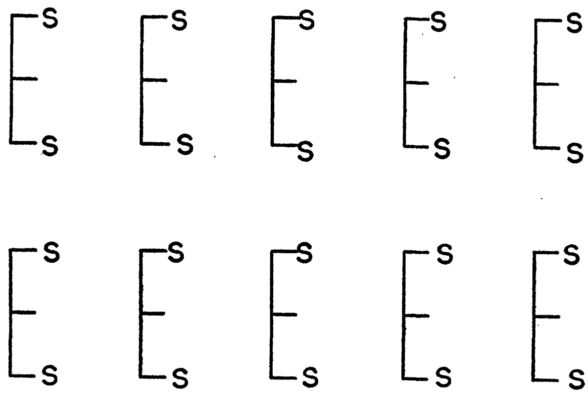

Fig. 1

glyceride molecules are shown graphically. It is apparent that 20 saturated fatty acid radicals could be attached to the glycerol molecules without any glyceride containing more than two saturated fatty acids. The 21st saturated fatty acid, however, must unite with a glyceride already containing two molecules of the same fatty acid, consequently producing a molecule of trisaturated glyceride. An extension of this reasoning to a greater number of glycerol molecules leads to the obvious conclusion that only when the molar concentration of the saturated fatty acids exceeds two-thirds would saturated triglycerides be formed under a truly "even" distribution. Thus, the molar concentration of trisaturated glycerides, $[S_3]$, can be related to the molar concentration of saturated fatty acids, [S], as follows:

$$[S_3] = 3\,([S] - 66.7).$$

In general terms, if S_3 represents the triglycerides of any fatty acid, S, then the above equation defines "even" distribution as the term is employed in this paper.

Prof. Hilditch (*3*) has noted that fruit coat fats do not ad-