Synthetic Detergents in Well Water

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THE presence of synthetic detergents, or "syndets," in ground water is being reported with increasing frequency, and the number of incidents may be expected to rise still more as housing developments are constructed in areas not served by either public water supplies or public sewers. A study in Suffolk County, N.Y., for example, found that many wells contained detergents (*1*). A committee has been formed by the Research Steering Committee of the Association of American Soap & Glycerine Producers, Inc., to investigate factors associated with such pollution (*2*).

In Rhode Island, the department of health has since January 1959 found synthetic detergents in samples from 72 wells in various localities in the State. These detergents were first noticed by the formation of a soapy foam in the bottle upon shaking, and their presence was confirmed by laboratory analysis. The presence of syndets in all these wells was believed to have resulted from their leaching through the ground into the ground water. Unlike soaps, which are precipitated by the calcium and magnesium in the water and left behind, synthetic detergents are only partly removed by a septic tank and absorption field. They are very stable chemicals and will travel appreciable distances through the ground into the water table and move with it.

The health department's analysis of well water, performed on application to the department, consists of physical examination, sanitary chemical analysis, and bacteriological examination. Specific tests include turbidity, sediment, odor, color, nitrogen as free ammonia and albuminoid ammonia, nitrite and nitrate nitrogen, chloride, 20° C. and 35° C. plate counts, and coliform tests. Since January chemical tests for synthetic detergents have been performed routinely if the water appears soapy. A survey form, filled out by the collector of the sample, must accompany each sample. This form tells the type of well, its construction, and its location with respect to sources of pollution.

The following statistics pertain to the wells we have found to contain syndets:

- 47 percent were analyzed because of taste and odor complaints; 7 percent, because of foaming.
- 56 percent were positive for coliform group bacteria; 89 percent were considered grossly polluted on the basis of a sanitary chemical analysis.
- 21 percent were located in the cellar of the house.
- 44 percent were dug wells; 23 percent were driven wells; and 31 percent were drilled wells.
- 73 percent were within 50 feet of the sewage disposal unit; and 94 percent were within 100 feet of the sewage disposal unit.

Almost all these wells would be considered polluted on the basis of the chemical or bacteriological examination. If a well is so constructed and located that it is possible for it to be contaminated by the sewage disposal units, it is likely that syndets will be recovered from the well.

In certain areas, detergent contamination has been found to extend into most of the wells of a locality. One such area is the Quaker Hill Subdivision in Portsmouth, R.I., which consists of about 50 homes with no public sewers and no public water supply. This subdivision was developed during the period 1953 to 1958. The

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Analysis of 25 wells, Quaker Hill subdivision, Portsmouth, R.I.

Well No.	Depth (feet)	Turbidity	Sediment	Color	Free ammonia (ppm N)	Albuminoid ammonia (ppm N)
1	130	0	0	0	0.000	0.016
2	125	0	Soapy	0	.000	.016
3	140	0	Soapy	0	.000	.008
4	150	0	Soapy	0	.000	.016
5	200	0	Soapy	0	.008	.032
6	227	0	Soapy	0	.000	.024
7	300	0	Soapy	0	.400	.032
8	250	0	Soapy	5	.000	.032
9	145	0	Soapy	0	.000	.016
10	145	0	Soapy	0	.000	.016
11	135	0	Soapy	0	.008	.040
12	----------	0	Soapy	0	.000	.000
13	60	0	Soapy	0	.160	.024
14	135	0	Soapy	5	.016	.024
15	160	0	0	0	.000	.016
16	225	0	Soapy	0	.000	.056
17	175	0	Soapy	0	.024	.056
18	----------	0	Soapy	0	.000	.024
19	150	0	0	0	.000	.016
20	100	0	0	0	.000	.032
21	140	0	Soapy	0	1.000	.024
22	140	0	0	0	.000	.000
23	100	0	0	0	.000	.000
24	300	0	0	0	.000	.000
25	275	0	Soapy	0	.000	.008

Well No.	Nitrate (ppm N)	Nitrite (ppm N)	Chloride (ppm Cl)	Detergent (ppm A.B.S.[1])	Coliform	Distance from disposal field (feet)
1	4.0	0.002	33	0.0	+	70
2	10.0	.007	25	.59	0	30
3	6.0	.004	22	.55	0	50
4	15.0	.002	23	.52	0	30
5	.5	.140	38	2.4	0	----------
6	7.0	.000	43	2.5	0	50
7	3.0	.200	32	2.75	0	65
8	5.0	.006	28	5.0	0	35
9	7.0	.007	39	2.65	0	63
10	10.0	.000	25	3.75	+	50
11	20.0	.017	42	4.00	0	50
12	10.0	.004	33	.57	0	60
13	15.0	.070	37	2.5	+	85
14	15.0	.001	28	.57	+	115
15	10.0	.002	21	.26	0	30
16	10.0	.002	46	2.60	0	62
17	10.0	.004	33	3.75	+	75
18	6.0	.002	30	1.75	+	----------
19	7.0	.000	25	.65	0	150
20	10.0	.001	25	.25	0	45
21	7.0	.002	37	2.00	0	50
22	7.0	.001	26	.15	0	50
23	6.0	.001	27	.27	0	40
24	10.0	.001	21	.25	0	80
25	10.0	.002	23	1.10	0	75

[1]Determined by methylene blue, given as parts per million alkyl benzene sulfonate.

NOTE: All drilled wells located in rock. Bedrock is 8–10 ft. below surface of ground.

house lots vary in size from 7,000 sq. ft. to 15,000 sq. ft., with the average lot being approximately 8,850 sq. ft. The individual wells are drilled through the overburden into Pennsylvania sandstone, shales, and conglomerates. Water is furnished through openings along bedding plains and openings in the zone of fractures. These homes have septic tanks and absorption fields for sewage and waste disposal, but as the lot sizes are fairly small, most of the wells are within 75 feet of the disposal unit.

A total of 25 wells in this area were analyzed, and all but 1 contained detergents. The amount ranged from 0.15 to 5.0 ppm (see table). Upon shaking, most of the samples showed a soapy foam, but several did not. The detergent level of those that did not appear soapy was in the range of 0.15 to 0.4 ppm. We have found that generally a syndet concentration of at least 0.50 to 0.60 ppm is necessary to cause a soapy foam; the higher the concentration, the more abundant and more persistent the foam.

Only 6 of the 25 wells showed any laboratory evidence of bacteriological contamination, and few exhibited high nitrogen values. The only form of nitrogen that tended to be abnormally high for this area was the nitrate nitrogen.

Many of the wells in this subdivision would be considered safe on the basis of routine bacteriological and chemical examination. Because of the presence of detergents, however, we have considered them polluted or potentially polluted. Presence of detergents, if their concentration is high enough, is evidence that seepage from the sewage disposal field is finding its way into the wells. Under these conditions, the wells must be viewed with suspicion and considered polluted if the sanitary survey so suggests. For example, there would be no reason to question the safety of wells Nos. 2 and 3 on the basis of the bacteriological and chemical examinations. However, since these wells contain detergents and are located near the sewage disposal system, we feel they are unsafe and we recommend their abandonment.

The Rhode Island Department of Health, in its subdivision recommendations, has recognized the difficulties of maintaining safe drinking water and safe sewage disposal facilities in close proximity to each other. The department recommends lot sizes of at least 2 acres in areas where there are no public water facilities and a distance of at least 100 feet between any well and any sewage disposal unit.

REFERENCES

(1) Flynn, J. M., Andreoli, A., and Guerrera, A. A.: Study of synthetic detergents in ground water. J. Am. Water Works A. 50: 1551–1562, December 1958.

(2) Moss, H. V.: Review of 1958 A.A.S. & G.P. research investigations related to detergents in water and sewage treatment. Presented at the annual meeting of the Association of American Soap & Glycerine Producers, Jan. 21, 1959, New York City.

Compilation of Air Pollution Research Projects

An inventory of air pollution projects active during 1959 is under preparation by the American Society of Mechanical Engineers Task Group on Research in Air Pollution. Researchers as well as organizations will be included.

Organizations and research personnel desiring to be listed may communicate with Austin Heller, Chairman, Task Group-Air Pollution Research, American Society of Mechanical Engineers, 29 West 39th Street, New York 18, N.Y.

Signs and Symptoms

of trends in public health

How do temperature, humidity, and barometric pressure affect morbidity, crime, accidents, and mental health? The Health Department of New York City, in cooperation with the Public Health Service, is compiling data in the search for an answer.

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For the first time in medical history, a comprehensive picture of sickness and health in a single community will be created eventually at Tecumseh, Mich. A complete health survey of more than 8,000 residents is scheduled under a 2-year grant to the School of Public Health of the University of Michigan by the National Heart Institute, Public Health Service. Each person will be told the results of the examination and family physicians will receive detailed medical reports. Special details on heart disease and related disorders will be sought.

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The end of the era of plentiful and cheap water in the United States has been reached, states a pamphlet prepared by Princeton University for a conference on ground water last spring. Dr. J. M. Roger De Wiest of Stanford University, a specialist in ground water flow, has joined the Princeton faculty to assist in developing a 5-year plan of teaching and research on water supply.

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Ten million people in the United States are rheumatic patients, one-half suffering from arthritis and 200,000 permanently crippled, estimates Dr. Philip S. Hench of the Mayo Clinic.

Conversion of salt water to fresh by a process known as long-tube vertical multiple-effect distillation gives promise of a remarkable breakthrough, according to Secretary of the Interior Fred A. Seaton. The process will be tested at Freeport, Tex., in a demonstration plant designed to produce 1 million gallons of water per day at an estimated cost of about $1 per 1,000 gallons. This is 50 percent cheaper than the cost of converting sea water to fresh in the most efficient commercial plant in operation in the world today.

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Four fallacies concerning mental illness were listed recently by Dr. Mathew Ross, medical director of the American Psychiatric Association: (1) The mentally ill could "snap out of it" with a little effort. (2) It's stylish to go to the psychiatrist; mentally ill persons can be recognized because they are violent. (3) Anyone who is not mentally ill is mentally healthy. (4) Tranquilizers are wonder drugs that cure mental illness.

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Under certain conditions, epilepsy is not a barrier to Federal employment. A policy followed by the Civil Service Commission for a number of years was explained in a pamphlet issued by the Commission in August 1958, "Employment of Epileptics in the Federal Service." Although the policy is not a new development, the issuance of the pamphlet and ensuing correspondence with the National Epilepsy League resulted in considerable publicity at the time of the meeting of that organization in Chicago in August 1959. The Commission continues to hold, as stated by its medical director, Dr. Eugene R. Chapin, that epileptics are employable if their seizures are adequately controlled and job placement is selective.

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Today's retirement policies and practices and their impact on the Nation's economy will be examined at Cornell University for the next 3 years under a Ford Foundation grant. Sponsored by the New York State School of Industrial and Labor Relations at Cornell, the study group will evaluate retirement policies of both industrial and nonprofit organizations, as well as community attitudes.

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Thirty countries are now participating in the Public Health Service's international fellowships program since 17 countries of Central and South America and the Australasian area were added. Started in 1958, the program gives postdoctoral medical research training in this country to scientists from abroad. Applicants, nominated by their country's panel of scientists and approved by a fellowship board of the National Institutes of Health, receive from the Public Health Service a basic annual stipend of $4,500, allowances for wives and children, and limited travel funds.

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Accidents in pleasure and instructional flying will be the subject of nationwide study through a recent grant by the Public Health Service. The grant of $77,600 to Flight Safety Foundation will permit development of a long-range research plan for experiments in prevention by specialists in biostatistics, physiology, psychology, mathematics, education, and public health.

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A comprehensive community plan for meeting the problems of chronic illness, the result of 15 years of exhaustive study and experience in the Chicago area, is given in volume 22 of *The Proceedings of The Institute of Medicine* of Chicago, dated May 15, 1959.