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Assessment of the Effects of Household Chemicals Upon Individual Septic Tank Performances

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Fayetteville, Arkansas 72701

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ABSTRACT

ASSESSMENT OF THE EFFECTS OF HOUSEHOLD CHEMICALS UPON INDIVIDUAL SEPTIC TANK PERFORMANCES

A laboratory study and a field study were performed to determine the amounts of specific household chemicals required to destroy bacteria populations in individual domestic septic tanks. The particular chemicals evaluated include liquid chlorine bleach, High Test Hypochlorite (HTH), Lysol disinfectant and Drano crystal. The laboratory study was performed to determine the approximate chemical concentrations to destroy the bacteria in the septic tank, and the field study showed the actual effect of the chemicals upon the bacteria in terms of reduction of the number of bacteria in the septic tank as well as the time required for the bacterial population to recover. A liquid bleach concentration of 1.85 ml/l destroyed the bacteria in the septic tanks. This corresponds to 7 liters (1.85 gallons) of liquid bleach in a 3780 liter (1000 gallon) septic tank. After addition of chlorine bleach, and within approximately 30 hours of normal septic system usage, the bacterial population had recovered to its original concentration. A Lysol concentration of 5.0 ml/l destroyed the bacteria in the domestic tanks. This corresponds to 19 liters (5.0 gallons) of Lysol in a 3780 (1000 gallon) septic tank. Following the addition of Lysol, the bacteria population recovered to its original concentration within approximately 60 hours (2.5 days). A Drano concentration of 3.0 mg/l destroys the bacteria in a septic tank. This corresponds to 11.3 grams (0.4 ounces) in a 3780 liter (1000 gallon) septic tank. The bacterial population recovers to its original concentration within 48 hours following the addition of the Drano.

M. A. Gross

Completion Report to the U. S. Department of the Interior, Reston, VA, June 1987

Keywords -- Septic Tanks/Bacteria/Household Chemicals

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INTRODUCTION

Approximately one-third of the households in the United States use onsite wastewater treatment and disposal as the treatment mechanism for domestic sewage. In Arkansas, approximately forty-two percent of the homes use onsite wastewater treatment (Arkansas Statistical Abstract, 1986). Generally, the individual household onsite wastewater treatment and disposal takes the form of a septic tank followed by a soil absorption system. Through the course of using a septic tank, pumping of the solids that accumulate in the tank is necessary, and the recommended pumping schedule is every three to five years (U.S. Public Health Service, 1972).

Homeowners with septic tanks are continually confronted with advertisements and solicitation by manufacturers of products claimed to be capable of enhancing septic tank functions. The claims range from rejuvenating the bacteria to eliminating the need for pumping solids from the septic tank. Although these claims are made, some states have published statements forewarning homeowners of these claims. Tennessee states, "There are no known chemicals, yeasts, or other substances capable of eliminating or reducing solids in a septic tank so that cleaning is unnecessary" (State of Tennessee Department of Public Health). The Agricultural Extension Service of the University of Minnesota states, "A 'starter' is not needed for bacterial action to begin in a septic tank. Many bacteria are present in the materials deposited into the tank and will thrive under the growth conditions present. Additives should not be used, since they are of no benefit and some may do great harm. Additives that cause the accumulated sludge in the tank bottom to increase in volume will result in the sludge being flushed out into the drainfield, plugging soil pores. Other additives, particularly degreasers, may be carcinogens (cancer-causing) or suspected carcinogens that will flow directly into the ground water along with the treated sewage" (Machmeier, 1983).

The claims of the advertisements for septic tank additives are sometimes based upon the success of using acclimated bacteria, sometimes called "superbugs", to clean grease from sanitary sewers (Grease-Eaters Clear Sewers, 1982). Specialized bacterial cultures have also been used to reduce sludge volumes associated with aerobic biodegradation of domestic and industrial wastes (Grubbs, 1983; Chambers, 1981). Based upon industrial and municipal applications such as these, manufacturers market septic tank additives to reduce or eliminate the need for pumping the tank, increase bacterial action, reduce scum accumulations, unclog leach fields, clean and deodorize the system and dissolve grease, proteins, fat and starch.

The reason given for the improper functioning of domestic septic tanks is the addition of household chemicals to the septic system. The claims are made that household chemicals and disinfectants destroy the bacterial population in individual household septic tanks and, therefore, bacterial "starters", or enzymes, or dried cultures are needed to resupply the septic tank with bacteria. The bacteria responsible for the anaerobic digestion in the septic tank are the common bacteria in the various species of Pseudomonas, Flavobacterium, Alcaligenes, Escherichia, Aerobacter and possibly Methanobacterium, Methanosarcina and Methanococcus (McKinney, 1962). These bacteria are those commonly found in the biochemical degradation of domestic wastewater and, in fact, are so common that microbiologists generally refer to them as "soil bacteria" since they (the bacteria) are found in the soil.

Although household cleansers and disinfectants may perform well in destroying bacteria in home usage of the disinfectants, their toxic effects were not expected to destroy the numbers of bacteria found in septic tanks at the level of chemical introduced into the domestic septic tank under normal usage. In fact, the University of Minnesota Agricultural Extension Service states, "Normal amounts of household detergents, bleaches, drain cleaners, toilet bowl deodorizers, and other household chemicals can be used and won't harm the bacterial action in the septic tank. Do not use excessive amounts of any household chemicals" (Machmeier, 1983). The U.S. EPA recommends a higher dosage of chlorine to disinfect septic tank effluent than is used to disinfect raw fresh wastewater, package biological treatment plant effluent or sand-filtered effluent (Onsite Wastewater Treatment and Disposal Systems Design Manual, 1980). This disinfection is, of course, for destroying all bacteria prior to surface discharge and would be conservatively higher than the minimum amount required to destroy the bacteria in a domestic septic tank.

A. Purpose and Objectives

The purpose of this study was to determine the amounts of household chemicals required to decrease or destroy the bacterial population in a domestic septic tank. The specific chemicals studied were chlorine bleach, Lysol and Drano. These chemicals represent commonly-used cleansers, disinfectants and drain-openers.

B. Related Research and Activities

Studies have been performed to characterize typical septic tank effluent (Onsite Wastewater Treatment and Disposal Systems Design Manual, 1980; Scherer, 1980). Normal septic tank effluent five-day Biochemical Oxygen Demand (BOD_5) ranges from 7 mg/l to 480 mg/l with a mean of 154 mg/l reported by Scherer (1980). Suspended solids' concentrations range from 8 mg/l to 695 mg/l with an average of 154 mg/l being reported by Scherer. Scherer's study included only household septic tanks as a data base.

A comprehensive study of household sewage disposal systems was conducted in the early 1950's at the Robert A. Taft Sanitary Engineering Center (Weibel et al., 1954). This study included examination of synthetic detergent effects upon the septic tank-soil absorption system as well as effects of ground garbage and zeolite softener salts. This study considered anionic detergents and regarded slug doses of chemicals as being more harmful to a biological process than the same quantity applied in gradual doses. The results of this study showed that the synthetic detergents caused little change in the biological activity of the sludge layer at the bottom of the tank. However, biological activity in the upper layers of the septic tank was inhibited by the addition of synthetic detergents in a slug load. A result of the slowed biological activity was the decrease of suspended solids in the septic tank effluent, indicating better settling due to decreased biological activity. At average-use quantities of seven brand-name synthetic detergents, none of the detergents interfered seriously with normal digestion of wastewater in the septic tanks.

METHODS AND PROCEDURES

The study of household chemicals effect on septic tank effluents was conducted in two stages. The first stage was a laboratory scale study of the effect of household chemicals on septic tank effluent. Once sufficient data were obtained, a field study on domestic septic tanks was performed which comprised the second stage of the study.

A. Laboratory Study

The laboratory study of the effect of household chemicals on septic tank effluent was conducted to determine the quantities of chemicals required to kill the bacteria in the effluent. The chemicals that were used in this study were liquid chlorine bleach, Lysol and Drano.

Since 1880, the criterion for determination of the microbiological quality of water used for drinking has been its coliform content. The coliforms are used as indicator organisms, i.e., evidence of fecal pollution of water. In this study, this criteria has been taken into consideration. A concentration of each of the chemicals was established that was enough to kill all the coliform bacteria in the sample.

While performing the laboratory study, the following parameters were analyzed:

1. Five-Day Biochemical Oxygen Demand (BOD_5)
2. Suspended solids
3. Coliform concentration

4. pH

The lab study consisted of spiking one liter of raw septic tank sewage with various concentrations of each one of the chemicals mentioned. The procedure followed for each is as follows.

About 5 gallons of septic tank effluent (STE) were obtained from one of the domestic septic tank users. BOD analysis was performed on the raw sample. The BOD analysis was performed as per Standard Methods for the Examination of Water and Wastewater Method #507 (American Public Health Association 16th Edition, 1985). BOD dilution was prepared. 5.0 ml of raw STE was innoculated into four BOD bottles and filled with BOD dilution water. Dilution water only was placed into four BOD bottles. Initial dissolved oxygen was measured in one of the bottles with STE and on the blank. The other bottles were incubated at 20°C for five days. After five days, each of the bottles was analyzed for dissolved oxygen. Once the data were obtained, the BOD_5 was calculated in the following manner:

$$BOD5\ (mg/l) = \left(\frac{300}{5}\right)(D_1-D_2)-(B_1-B_2)$$

where D_1 and D_2 = initial and final D.O in the STE bottles, respectively, mg/l

B_1 and B_2 = initial and final D.O in the blank bottles, respectively, mg/l

Suspended solids analysis was performed according to Standard methods, by method #209C (American Public Health Association 16th Edition, 1985). The suspended solids were determined by weighing three fresh 'Whatman' glass microfibre filters in aluminum pans. About 100 ml of well mixed STE was filtered through each one of the filters, and the filters were allowed to dry in a dessicator. After the drying was completed, the filters, along with the aluminum pan, were weighed. The average of the difference in the initial and final weights gave the amount of suspended solids in 100 ml of sample.

To test for the effect of chemicals on STE, one liter samples of STE were subjected to interaction with various concentrations of the chemicals. They were allowed to interact for about one hour and then analyzed for total coliform. The procedure used for testing for coliforms was as per Standard Methods for the Examination of Water and Wastewater Method #909A which is the total coliform membrane filter technique. The procedure for testing the total coliforms is as follows.

A culture media for the coliform bacteria was first prepared. This media was prepared from the M-endo medium which is available commercially. To prepare a 200 ml of this media, 9.6 gms of this media was taken and hydrated in 200 ml of distilled water and 4 ml of 95 percent ethanol. It was then heated to boiling and cooled to below 45^{o}C.

In a sterile petri dish with a flat bottom and a cover, an absorbent pad which had been sterilized was placed. Approximately 2 ml of the M-endo broth was placed on the absorbent pad.

A gridded membrane filter with a pore diameter of 0.45 µm was used to filter the sample. Care was taken not to contaminate the filter. A known amount of sample with proper dilution was then passed through the filter. The filter was placed flat on the absorbent pad and the lid closed on the petri dish. The petri dish was placed in an incubator kept at 35^{o}C $\pm$ 0.5^{o}C for a period of 24 hours.

After 24 hours of incubation, the petri dish was removed from the incubator, and the number of coliform colonies on the plate was determined. All organisms that produce a colony with a golden-green metallic sheen within a 24-hour incubation period on a suitable medium are considered members of the coliform group.

Coliforms are reported as colonies/100 ml. Since the coliforms were indicator organisms, the concentration of the individual chemicals required to kill all the coliform bacteria was determined as discussed in the above manner.

While the raw STE was being contacted with chemicals, the pH of each individual experiment was closely monitored by use of a calibrated pH meter.

The concentrations required of each chemical to kill the coliform bacteria were reported as mg/l Drano, ml/l Lysol and ml/l chlorine bleach.

B. Field Study

Once the required concentrations of chemicals were established in the laboratory, these concentrations were used as beginning points to apply chemicals to individual household septic tanks in the field. Four septic tanks were used during the field study. The following tanks were used:

TABLE 1
Tank Volumes

Tank Name	Volume of Tank
A	1000 gal
B	1000 gal
C	400 gal
D	375 gal

Before any field study was done each tank was fitted with risers on the effluent access ports. The risers were made of concrete and were 2 ft. square by 1 ft. high. On the risers was a lid which had a tongue and groove closure in order to keep the lid tightly closed. The contents of the tanks were then completely pumped out. The risers also provided easy access to obtain samples for further analysis. Figure 1 is a sketch of a typical domestic septic tank with the riser installed.

After the pumping, the tanks were allowed about two weeks time to return to their normal mode of operation. Once the tanks were back to normal operation, a field study on the effect of household chemicals on septic tank performance was performed.

The dosages required of each chemical were calculated for each tank based on the experimental results. The required dosage was then injected into the septic tank through the water closets inside the homes to ensure as much mixing of the chemical with the septic tank contents as possible, while still modeling normal dosing of household septic tanks with chemical slug loadings. Before injecting the chemicals, a raw sample of the effluent was obtained to analyze for coliform, pH and BOD_5. After the chemicals were injected, the tanks were monitored every few hours. Samples were obtained every 4-8 hours and analyzed for coliform. The expected reaction was that all the coliforms would be killed some time after the required dosage of chemicals was added. The monitoring was continued until the coliform concentration in the septic tank returned to the concentration before addition of the chemical. This

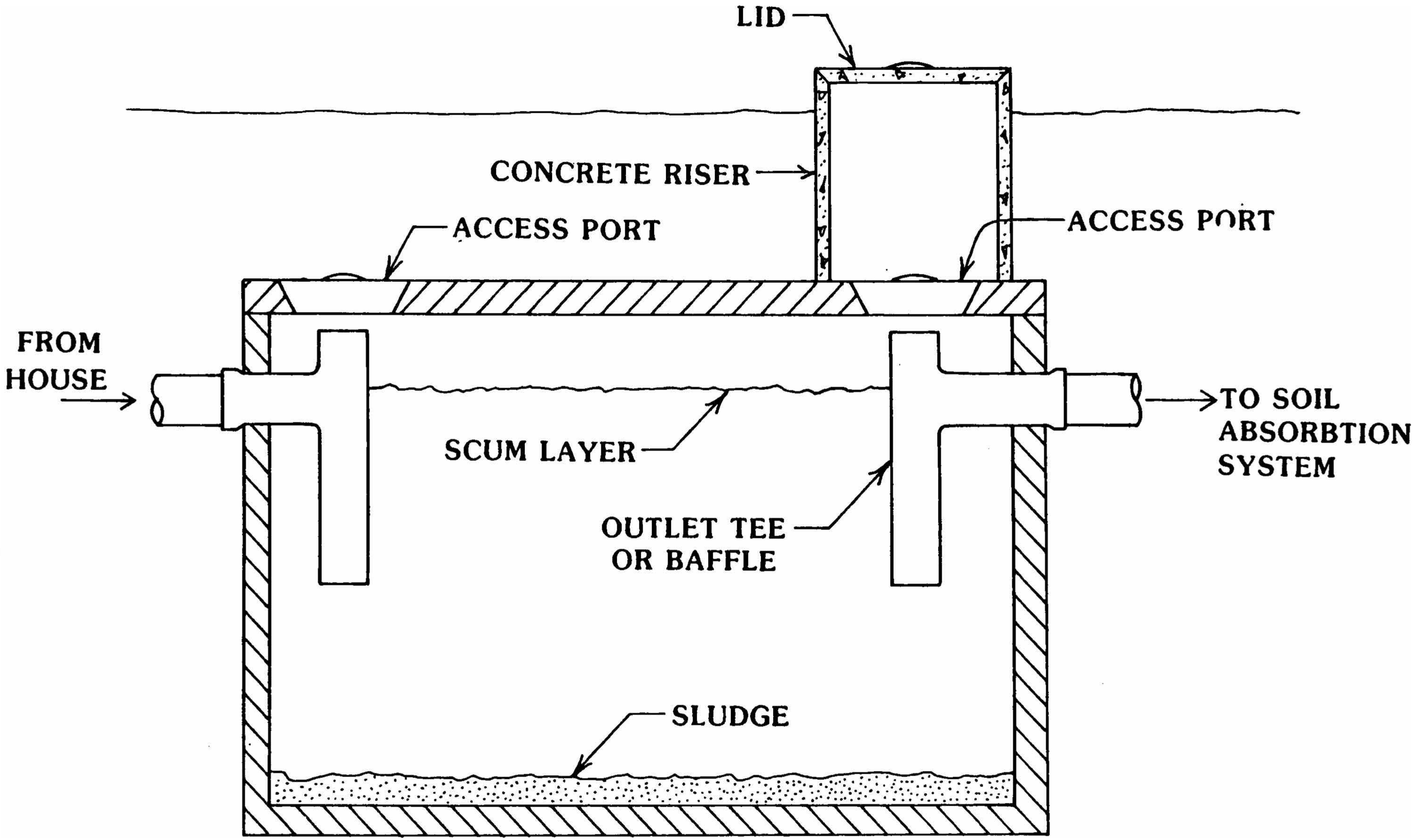

FIG. 1 TYPICAL DOMESTIC SEPTIC TANK

gives the regeneration rate of the bacteria after they have been completely destroyed.

PRINCIPAL FINDINGS AND SIGNIFICANCE

In this section, the principal findings on the effect of household chemicals, specifically liquid bleach, Lysol and Drano, on the septic tank, both in the laboratory and field study, are discussed.

A. Liquid Bleach Study

One liter samples of raw STE were used in ten-fold serial dilutions of liquid bleach in the laboratory. Initial studies showed that there was a gradual decrease in the bacteria concentration with an increase in the concentration of liquid bleach. Serial dilutions of the liquid bleach were made ranging from concentrations of 1 mg/l to 100mg/l of active chlorine. As the concentrations of the liquid bleach increased in the raw STE, the color that was originally dark gray turned light gray. The study showed that when 1 liter of STE was treated with 1.85 ml of liquid bleach, all the coliforms in the STE were destroyed. This corresponded to 100 mg/l of active chlorine. BOD was typically between 180 and 210 mg/l, and the suspended solids varied between 60 and 80 mg/l.

Table II shows the effect of liquid bleach on raw STE at varying concentrations. It is observed that the pH did not vary much except at higher concentrations where the media became slightly acidic. The coliform concentration gradually decreased until the liquid bleach concentration was raised to 100 mg/l active chlorine, wherein the coliforms were completely destroyed.

TABLE II

Experimental Study on the Effect of Liquid Bleach on STE

Vol. of Solution liters	Vol. of Bleach ml	Concentration of OCL^{-1}	Coliform Concentration Coliform/100 ml	pH
1	0	0	1.5E6	7.0
1	0.05	1	1.08E6	7.0
1	0.185	10	1.6E5	7.0
1	0.9255	50	0.93E5	7.0
1	1.11	60	1.2E5	7.0
1	1.48	80	0.8E5	7.0
1	1.66	90	0.5E5	6.9
1	1.85	100	0	6.9

These experimental data were used to calculate the amount of liquid bleach required to destroy the coliform bacteria in various tanks shown Table 1. According to the experimental data, a 1000 gallon septic tank required 7 lbs of bleach, or approximately 2-6 gallons of liquid bleach, for all the bacteria to be killed. This corresponded to about 600 gms of HTH powder which contained 65 percent chlorine.

As shown in Table III, when a 1000 gallon tank was injected with 600 gms of HTH, all the bacteria were not killed. A higher amount of HTH than predicted by the laboratory experiments was used. For a 400 gallon tank, 300 gms of HTH was required to kill the bacteria. This is possibly because the laboratory work is a batch process, whereas the field study was performed on a semicontinuous system.

The septic tanks were also injected with appropriate amounts of liquid bleach as determined by experimental studies. As indicated by the studies, 2 gallons of liquid bleach were enough to kill all the bacteria in a 375-400 gallon tank. One would expect better results using liquid bleach compared to using HTH, as liquid bleach is already

TABLE III

Field Study on the Effect of Liquid Bleach on Septic Tank Performance

Tank	Dosage	Hrs	Coliform Colonies/100 ml
A	600 gms HTH	0	3.4 E5
		1.5	3.0 E5
		7.5	0.5 E5
		2.5	1.5 E5
A	600 gms HTH	0	5.0 E5
		1.5	3.3 E5
		6.5	0.7 E5
		24.5	2.1 E5
		30.5	4.0 E5
B	600 gms HTH	0	3.7 E5
		2.5	1.6 E5
		8	0.7 E5
		26	2.3 E5
C	300 gms HTH	0	7.7 E5
		2	<10,000 colonies/100 ml
		6.5	<10,000 colonies/100 ml
		24	0.4 E5
		26	8.7 E5
C	300 gms HTH	0	4.3 E5
		1	<10,000 colonies/100 ml
		6	<10,000 colonies/100 ml
		24	0.3 E5
		32	1.9 E5
D	400 gms HTH	0	7.1 E5
		4.5	<10,000 colonies/100 ml
		23	<10,000 colonies/100 ml
		28.5	0.4 E5
		47	1.8 E5
		52	3.5 E5
C	2 gallons	0	68E5
		4	0
		8	0
		11	19E0
		22	32E2
		26	86E2
		31	29E3
		43	99E4
		48	26E5
		52	42E5

TABLE III continued

Tank	Dosage	Hrs	Coliform Colonies/100 ml
D	2 gallons	0	48E5
		4	0
		8	0
		11	06E1
		22	43E2
		26	92E2
		31	18E3
		43	19E5
		48	31E5
		52	42E5
C	175 gallons	0	59E5
		5	40E0
		9	12E1
		20	23E2
		24	86E2
		28	31E3
		40	41E5
		44	48E5
		48	52E5
D	175 gallons	0	48E5
		5	0
		9	31E1
		20	48E2
		24	92E2
		28	18E3
		40	89E4
		44	11E5
		48	18E

in solution and therefore undergoes proper mixing as opposed to HTH.

A notable observation when the liquid bleach or HTH was added was that the scum layer in the tank broke up and was thinned. A typical recovery for the bacteria when using laboratory concentration of liquid bleach in the form of HTH on septic tanks ranged between 25 and 30 hours. When using higher concentrations, the recovery time was between 30 and 55 hours. Using liquid bleach, the typical recovery times ranged between 45-60 hours. This was expected, as a better contacting was attained as compared to HTH. This shows that any damage the liquid bleach might do to the performance of the septic tank does not require a long time for the damage to be undone.

B. Lysol Study

One liter of raw STE sample was used to perform a laboratory scale study to determine the effect of various concentrations of Lysol. This showed that at very low concentrations, Lysol had little effect on the coliform concentration. Considerable change in the concentration of coliforms was observed when the concentration of Lysol was raised to 1 ml per liter of STE. Then there was a gradual decrease in the concentration of coliforms with a gradual increase in the concentration of Lysol. Table IV shows the effect of Lysol at different concentrations in 1 liter of STE.

Again using the raw STE, the BOD ranged between 180 and 210 mg/l, and the suspended solids varied between 60 and 80 mg/l.

It was observed that about 5 ml of Lysol per liter of STE was enough to destroy the bacteria. The solution at concentrations of greater than 4.5 ml Lysol per liter of STE tended to be slightly acidic with a pH of about 6.9.

TABLE IV

Experimental Study on the Effect of Lysol on STE

Vol. of Solution Liters	Vol. of Lysol ml	ml Lysol / ml total volume	Coliform Colonies/ml	pH
1	0	0	1.5E6	7.0
1	0.1	1.0E-4	4.8E5	7.0
1	0.2	2.0E-4	4.0E5	7.0
1	0.4	4.0E-4	3.6E5	7.0
1	0.5	5.0E-5	2.1E5	7.0
1	1.0	1.0E-3	1.8E5	7.0
1	2.0	2.0E-3	1.2E5	7.0
1	3.5	3.5E-3	0.9E5	7.0
1	4.0	4.0E-3	0.8E5	7.0
1	4.5	4.52E-3	0.5E5	6.9
1	5.0	5.02E-3	0	6.9
1	15	0.015	0	6.9
1	15	0.031	0	6.8

The experimentally observed concentration of 5 ml Lysol per liter of STE was taken to study the effect of Lysol on domestic septic tanks. A 1000 gallon tank required approximately 19 liters of Lysol for all the bacteria to be killed.

Table V shows the amount of Lysol used on different size tanks and the time rate of change of the coliform concentration. Contrary to what was observed in the case of liquid bleach, the experimentally determined concentration was enough to kill all the bacteria. There was some foaming action observed after placing Lysol into the septic tanks.

Typical recovery times for the bacteria after being poisoned by Lysol ranged from 30 to 65 hours. This again shows that the damage that may be done to the septic tank by excessive use of Lysol can be quickly undone and therefore has very little effect on the septic tank.

C. Drano Study

One liter samples of raw STE were treated with varying amounts of Drano to study the effect of Drano on STE. This showed that a marked decrease in concentrations of coliforms was observed at very low Drano concentrations. 0.1 mg of Drano per liter of STE reduced the concentration of coliforms ten-fold. Table VI shows the effect of Drano on the septic tank effluent. It was observed that 3 mg/l of Drano were sufficient to kill the bacteria. The BOD of the raw STE was between 180 and 210 mg/l, and the suspended solids varied between 60 and 80 mg/l. As was typical with the other chemical, there was a slight decrease in pH at higher concentrations of Drano. Three mg of Drano per liter of raw STE corresponded to 11.34 gms of Drano per 1000 gallon septic tank.

Initial studies proved that experimentally observed dosages of Drano were not detrimental to the bacterial activity. A higher concentration of 10 gms per 400 liters of solution was first applied, killing all the bacteria. The concentration of Drano was gradually decreased to determine the exact amounts of Drano required for a 400 gallon tank. Eight gms of Drano were the net amount required for a 400 gallon tank, corresponding to 20 gms of Drano for a 1000 gallon tank.

Recovery times for Drano were found to be in the range of 30-55 days. This shows that low concentrations of Drano kill all the bacteria, but a long recovery time for the bacteria is not required.

TABLE V

Field Study on the Effect of Lysol on Septic Tank Performance

Tank	Dosage	Hrs	Coliform Colonies/100 ml
C	1.75 gallons	0	5.5 E5
		2	2.0 E5
		7	<10,000
		12	<10,000
		25	0.7 E5
		31	2.8 E5
C	2 gallons	0	6.7 E5
		4	0
		12	1E2
		26	1.6E3
		32	2.9E3
		39	2.1E4
		50	2.3E5
		56	3.8E5
D	2 gallons	0	3.8 E5
		5	<10,000
		24	<10,000
		29	0.8 E5
		48	3.2 E5
D	2 gallons	0	5.1 E5
		1.5	1.4 E5
		6	<10,000
		24	0.9 E5
		30	3.1 E5
D	2 gallons	0	5.5 E5
		2	0
		5.5	0
		24.5	3 E2
		28	1.8 E2
		31	2.0 E4
		60	2.6 E4
		65	3.6 E5
C	2 gallons	0	64E5
		5	0
		9	10E0
		21	98E3
		24	23E4
		30	79E4
		42	21E5
		46	39E5

TABLE V continued

Tank	Dosage	Hrs	Coliform Colonies/100 ml
D	2 gallons	0	57E5
		5	0
		9	0
		21	63E3
		24	82E3
		30	18E4
		42	23E5
		46	29E5

TABLE VI

Experimental Study on the Effect of Drano on STE

Vol. of Solution Liters	Mgs. of Drano	Concentration mg/l	Coliform Colonies/100 ml	pH
1	0	0	1.5E6	7.0
1	0.1	0.1	6.6E5	7.0
1	0.2	0.2	4.2E5	7.0
1	0.3	0.3	2.9E5	7.0
1	0.5	0.5	2.4E5	7.0
1	2.0	2.0	1.0E5	7.0
1	2.5	2.5	0.5E5	7.0
1	3.0	3.0	0	6.9
1	5.0	5.0	0	6.8

TABLE VII

Field Study on the Effect of Drano on Septic Tank Performance

Tank	Dosage	Hrs	Coliform Colonies/100 ml
C	10 gms	0	4.2 E5
		1	7 E2
		5	0
		12	3 E2
		23	2.1 E5
		26	2.7 E3
		29	2.4 E4
		47	3.2 E5
D	10 gms	0	5.8 E5
		2	9 E2
		5	0
		8	6 E2
		24	2.2 E3
		27	1.1 E4
		30	2.0 E5

CONCLUSIONS

Although the confirming field study is still in progess, data gathered as of this date indicate that the slug loads indicated in Table VIII of household chemicals will destroy the bacteria population in a 3780 liter (1000 gallon) septic tank. Also, the recovery times required for the bacteria population to return to normal concentrations are shown.

TABLE VIII

Chemical Dosage to Destroy Bacteria in a 3780 Liter Domestic Septic Tank

Chemical	Volume	Recovery Time, Hours
Liquid Bleach	9.9 liters (2.62 gallons)	30
Lysol Liquid	1.9 liters (5.0 gallons)	60
Drano Crystal	37.8 grams (1.3 ounces)	48

Once-per-week slug loads at the concentration shown in Table VIII would cause little harm to the septic tank's bacteriologic action since the longest recovery time is 60 hours (2.5 days). However, to be conservative, half of these volumes should be used as maximum slug loads to the 3780 liter (1000 gallon) septic tank. Table IX can be used as maximum recommended volumes of slug chemical dosages to a 3780 liter (1000 gallon) septic tank.

TABLE IX

Maximum Recommended Chemical Dosages for a 3780 Liter Domestic Septic Tank

Chemical	Volume
Liquid Bleach	4.9 liters (1.3 gallons)
Lysol Liquid	9.5 liters (2.5 gallons)
Drano Crystal	18.9 grams (0.65 ounces)

The likelihood of an individual homeowner using 1.3 gallons of liquid bleach or 2.5 gallons of Lysol liquid in one day is remote. However, 0.65 ounces of Drano crystal could possibly be used in a short time period during the course of unclogging a drain. The use of large amounts of Drano crystals is not recommended for septic systems.

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