ficiency. On the basis of these findings it may be concluded that the negative results reported in the past were due to insufficient dosage.

Conclusions. Progesterone is "cortin-like" in that it will maintain life and weight gain in immature adrenalectomized male rats.

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Selective Bacteriostatic Action of Sodium Lauryl Sulfate and of "Dreft."

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The bacteriostatic action of various soaps has undergone a considerable amount of study by many investigators. Recently, a somewhat related class of substances, the sodium alkyl sulfates, has been synthesized. These substances have also been made use of as detergents in such preparations as "Dreft," "Drene" and other commercial products.

The alkyl sulfates are half-esters of sulfuric acid. In this respect they differ from soaps which are combinations of fatty acids and alkalis. In both cases, however, the alkyl chain probably determines its bactericidal effectiveness. Sodium lauryl sulfate is a sodium alkyl sulfate containing 12 carbon atoms.

The similarity of these substances to soaps suggested the possibility that similar bacteriostatic action might be exhibited by them. Accordingly, sodium lauryl sulfate as such, and "Dreft" which contains a large amount of sodium lauryl sulfate were tested for their bacteriostatic action. Twenty-one strains of Gram positive bacteria, 20 strains of Gram negative bacteria and 6 strains of common molds were used in these studies. In general, all tests were made on Difco standard nutrient agar to which the test substances had been added in varying amounts so as to make concentrations of 1.0% sodium lauryl sulfate and of 1.0, 0.5, 0.25, and 0.1% "Dreft". The plates were streaked with heavy suspensions of the organisms and then incubated at appropriate temperatures for 48 hours.

The effects of sodium lauryl sulfate and of "Dreft" on the growth of the 41 strains of bacteria and 6 strains of molds studied in this investigation are shown in Table I. It is evident that the Gram positive organisms were prevented from growing, whereas the

TABLE I.
Bacteriostatic Action of Sodium Lauryl Sulfate and of "Dreft."*

	Sodium lauryl sulfate	"Dreft"			
	Concentration in nutrient agar				
	1%	1%	.5%	.25%	.1%
Gram positive					
Sarcina lutea	—	—	—	—	—
Gaffkya tetragena	—	—	—	—	—
Staphylococcus aureus (12 different strains)	—	—	—	—	—
" *albus*	—	—	—	—	—
" *citreus*	—	—	—	—	—
Bacillus subtilis	—	—	—	—	—
" *anthracis*	—	—	—	—	—
" *mesentericus*	—	—	—	—	—
" *mycoides*	—	—	—	—	—
" *vulgatus*	—	—	—	—	—
Gram negative					
Neisseria catarrhalis	—	—	—	—	—
Klebsiella pneumoniæ	+	+	+	+	+
Serratia marcescens	+	+	+	+	+
Achromobacter liquefaciens	+	+	+	+	+
Pseudomonas aeruginosa	+	+	+	+	+
" *fluorescens*	+	+	+	+	+
Aerobacter aerogenes	+	+	+	+	+
Proteus vulgaris	+	+	+	+	+
Alcaligenes fecalis	—	—	—	—	+
Escherichia coli	+	+	+	+	+
" *communior*	+	+	+	+	+
Salmonella paratyphi	+	+	+	+	+
" *schottmülleri*	+	+	+	+	+
" *aertrycke*	+	+	+	+	+
" *enteritidis*	+	+	+	+	+
" *gallinarum*	+	+	+	+	+
" *pullorum*	+	+	+	+	+
Eberthella typhosa	+	+	+	+	+
Shigella dysenteriæ	+	+	+	+	+
Vibrio comma	—	—	—	—	—
Molds					
Aspergillus sp.	—	—	—	—	—
" *niger*	—	—	—	—	—
Mucor sp.	—	—	—	—	—
Penicillum sp.	—	—	—	—	—
Rhizopus sp. (—)	—	—	—	—	—
" " (+)	—	—	—	—	—

+ = growth; — = no growth.
*All control inoculations on nutrient agar alone resulted in luxuriant growth.

Gram negative bacteria grew as freely as on the nutrient agar controls. There were 3 exceptions to the latter statement: *Vibrio comma, Alcaligenes fecalis,* and *Neisseria catarrhalis* were definitely inhibited in their growth. It was found, however, that *A. fecalis* was able to grow in the concentration of 0.1% "Dreft".

Difficulty was encountered when an attempt was made to determine if there existed a concentration of "Dreft" greater than 1%

capable of inhibiting the growth of the Gram negative bacteria. In concentrations of 10% and above, a reaction between "Dreft" and the Difco nutrient agar often occurred which resulted in a heavy white precipitate, and such agar did not solidify properly. Determinations made by the cup-plate method showed that *Eberthella typhosa* especially, and very probably other Gram negative bacteria, were not inhibited by even 10% and 15% concentrations of "Dreft".

The selective bacteriostatic properties of sodium lauryl sulfate and "Dreft" suggest their use in selective media. This has already been proposed by Cowles[1] with respect to the presumptive test in sanitary water analysis. Perhaps even greater use of such a selective medium may be made in the study of intestinal disturbances where the presence of Gram positive organisms in the stools is frequently confusing. The fact that *A. fecalis* is inhibited almost as much as Gram positive organisms may simplify such examinations where the isolation of this bacterium is of no importance.

While our work was in progress, a paper by Cowles[2] appeared, in which are reported results essentially the same as ours. Cowles' work differed from ours, however, in several respects. For the test medium this author used nutrient broth, whereas nutrient agar was used in our work. In place of "Dreft", as used in our studies, Cowles used a liquid form of this product which is known commercially as "Drene". Work with 27 bacterial species was reported in Cowles' paper, and our work has so far dealt with 47 strains of 35 species of bacteria and molds. Cowles' additional important contribution was to point out the greater bacteriostatic action against *Staphylococcus aureus* by sodium alkyl sulfates as the number of carbon atoms in the alkyl chain is increased.

From the experiments here recounted, it is apparent that sodium alkyl sulfate and the commercial preparation "Dreft" possess a high degree of bacteriostatic selectivity. The growth of Gram positive bacteria and molds was definitely inhibited while most Gram negative bacteria grew freely in the presence of these substances in nutrient agar.

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1 Cowles, P. B., *J. Am. Water Works Assn.*, 1938, **30**, 979.

2 Cowles, P. B., *Yale J. Biol. and Med.*, 1938, **11**, 33.