

CHEMISTRY

'Soapless Soaps' Do Many Jobs

Advantages of synthetic detergents over soap are that they save time and energy in cleaning and are effective cleaners in all kinds of water.

By ANN E. EWING

➤ "SOAPLESS soaps," the cleaning agents which often look like soap, act like soap, but aren't really soap at all, are making household chores easier and less time consuming:

Rings no longer appear on the bathtub and washbowl.

Dishes and glasses are rinsed dry and sparkling clean.

Woolens are washed in one-fifth the time formerly required, in cool water with no matting.

Rugs, upholstery and woodwork are quickly and easily shampooed.

Saving time and elbow grease, the soapless soaps are also known as synthetic detergents. Biggest advantage of these competitors to soap is that they clean effectively in all kinds of water—hot or cold, hard or soft, fresh or sea.

Soap, somewhat similar to that we know today, is known to have first been made by the Romans from tallow and beech ashes. Until about 30 years ago it was undisputed champion for a cleaner world.

Drawbacks of Soap

But there are many disadvantages to using soap: It is practically insoluble in cold water. It is decomposed in acid solutions. It forms a soft, gummy residue by combining with the lime or magnesium salts found in hard water.

Many of these disadvantages are not too objectionable in the home. In industry, however, there are certain operations which are preferably carried out in acid solution, in the presence of metallic salts, or in cold water. These special problems spurred the search for substitutes, synthetic detergents.

The word detergent is not new—it's just one which for a long time went unused. Actually, a detergent is any agent which assists in cleaning. Soap was the most familiar example until the shortage of fats during the war gave the synthetic detergents their big chance.

Soaps and synthetic detergents are cleansing agents because they have the ability to "wet" a surface, to remove foreign material from that surface and to keep the removed material from resettling on the surface.

Dirt or soil is the most usual foreign material found in the home. It is a combination of substances which are soluble in water, and hence offer no problem, and substances which are insoluble in water, mostly particles which are more or less

oily. Removing these particles from a surface, then, is the cleaning problem.

In order for a soap or synthetic detergent solution to remove these oily particles, it must first wet them. Water alone will not do the trick, because of its high surface tension. Floating a needle on water, or examining the shape of a drop of water on a polished surface demonstrates the fact that the surface of water acts like an extremely thin elastic covering.

"Wetter Water"

Certain materials will reduce the surface tension of water. These are known as surface active agents, and both soap and synthetic detergents are examples. Their ability to make water "wetter" has been startlingly demonstrated by the duck which sinks in water to which a detergent has been added. The thin coating of oil which traps air beneath the feathers to keep the duck afloat is wetted and the duck sinks in water.

Getting something clean depends not only on getting it wet, but also on removing the particles from the surface, known as

emulsifying. An emulsion is a fine suspension of one liquid in another, such as the butter fat in fresh milk. Dirty dishwater is also an emulsion—of fine dirt and oil particles in sudsy water.

The third requirement for cleaning, keeping the removed particles in suspension, is known as dispersion. These three properties, wetting, emulsifying and dispersing, are dependent upon surface activity.

The molecules of the surface active agents, soap and synthetic detergents, can be thought of as similar to minute tadpoles. Odd little tadpoles, to be sure, with a tail which hates water and a head which loves water!

When a detergent, either soap or synthetic, dissolves in water the molecules at the surface have their heads, water-loving, pointed toward the water. This leaves the tails pointing away from it, where they are in an excellent position to attach themselves to oily dirt.

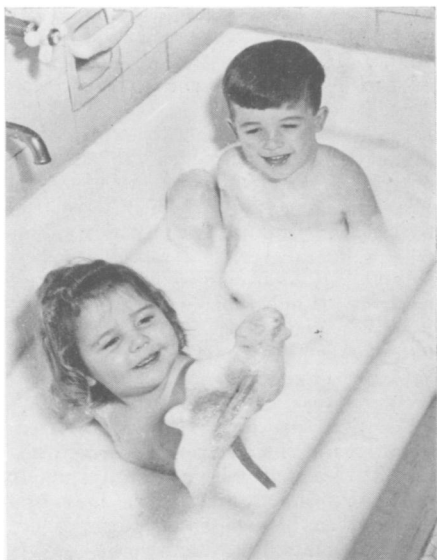
Water-Dirt Link

Thus the detergent molecules are the link between dirt and the water which is used to rinse it away. They allow a thin wedge of water to come between the dirt and its adhering surface, preventing them from sticking to each other.

By varying the materials from which the



ADVANTAGE OF SYNTHETIC DETERGENTS—Soapless soaps in the left beaker give plenty of suds, even in hard water, while soap forms gummy curds in the right beaker.



SUDSY BATH—Children play with happy smiles in billowy suds when synthetic detergent is added to their bath water.

synthetic detergents are made, they can be tailored to do a specific job. They are used in toothpastes because they taste better than soap; for bubble baths because some types will foam in any kind of water; in automatic laundries because other types give maximum cleanliness with a minimum of suds; in mouth washes because still other types have antiseptic properties; and for food preparations because yet another variety is tasteless and odorless.

Street cleaners are finding the new products helpful for their jobs. Grease and oil which remains untouched by ordinary water is out of harm's way when as little as five pounds of synthetic detergent is added to the water tank.

Addition to the synthetic detergents of certain materials, known as builders, makes it possible for the product to compete on a price basis with soap. A builder is a substance which has little cleaning action itself, but which improves the cleansing action of the detergent. Most of the synthetic detergents available today in stores contain these builders.

The dry cleaning industry uses synthetic detergents in solvents and in mixtures for spotting. In painting, surface active agents help to produce a better bond between the coating and the surface.

Synthetic detergents can be used in smaller quantities than soap. If a certain amount will do the job, twice that amount will NOT do it twice as well. Doubling the effective quantity may actually decrease the washing efficiency.

Before the war, soapless soaps represented only about one percent of American washing materials. Today, they represent 15%, an even more significant gain than these figures would indicate because the use of

all types of cleaning compounds has increased greatly in the last ten years.

The fats from which soaps and some synthetic detergents are made are an essential part of our diet. In many parts of the world there is a shortage of fats so serious as to be a famine. The increased use of synthetic detergents from petroleum releases some of the fats for use as food

which would otherwise be used to make soap.

Samples of these soapless soaps, with experiments you can do yourself, are available from Science Service. Write Science Service, 1719 N St., N.W., Washington 6, D. C., for one of these kits, enclosing only 50 cents.

Science News Letter, September 10, 1949

MEDICINE

A-Bomb Can Speed Cancer

► A SHORTER life and earlier appearance of cancer are likely to be the fate of atom bomb survivors, Dr. Egon Lorenz of the U. S. National Cancer Institute declared at the Gordon Research Cancer Conference held in New London, N. H., sponsored by the American Association for the Advancement of Science.

He referred to "extensive animal research at the National Cancer Institute and elsewhere" as basis for his statement.

Dr. Lorenz disagrees with "people in responsible positions" who have recently been quoted as saying that the hazards of an atomic bomb explosion are comparable to other hazards of war and therefore there is no need to be alarmed over them.

"There is a vast difference as far as effects later in life are concerned," he stated. "Usually the survivors of an explosion by ordinary bombs or incendiaries may, in the vast majority, not expect any special ill-effects later in life. True, some may be crippled by loss of limb but they will adjust and they will be able to live their full life expectancy.

"In other words, the body will forget the injury received and the individual will live on as though the injury had never happened. This, unfortunately, is not true in an atomic bomb explosion in which the body is exposed to penetrating radiation. The body will remember the injury received."

A definite correlation between total dose of radiation and life span was shown in experiments in which the whole bodies of animals were exposed to radiation, as they would be in case of an atomic bomb explosion, for a short time. The time of exposure was a matter of minutes. No experiments were done with exposure time comparable to that of an atomic bomb which is of the order of a millionth of a second, Dr. Lorenz explained.

"The greater the exposure at a given age, the more the life span is shortened," Dr. Lorenz reported.

"This, in severe cases, may mean a loss of many years of life. Furthermore, in the species of animals used, cancer occurred at an earlier age than in non-irradiated control animals. Again, like the shortening of life span, this shifting of the cancer age to a younger age is also dependent on the amount of radiation received, which in

some animals is quite small—so small, in fact, that probably very little immediate effect is noticed."

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PSYCHOLOGY

Prejudiced People Have Distorted Memory of Events

► CHILDREN who are highly prejudiced against foreigners or minority groups have a biased or distorted memory of things that happen to them and of stories read to them, the American Psychological Association in Denver Colo., learned from a report by Dr. Else Frenkel-Brunswik, of the University of California.

After listening to a story dealing with school children's attitudes toward newcomers and stressing aggressiveness versus friendliness and protectiveness, the prejudiced children remembered the aggressive characters in the story; the unprejudiced children recalled the friendly characters.

A fight was, in fact, the only incident remembered from the story by 42% of the prejudiced children. Only 8% of the unprejudiced children were so exclusively impressed by the fight.

The prejudiced are inclined to lose sight of the overall picture of what the story was about and remember only isolated phrases or details. Once they have formed an idea of the story, they tend to ignore any part of it that does not fit in with the fixed idea.

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