DEODORANT PROPERTIES OF NACCONOL*,†

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The use of cosmetics for the adornment of the body is very ancient; they were an appeal to the sense of sight. In modern times the science of cosmeticology has been broadened to include appeals to the sense of touch, the sense of taste, and the sense of smell. With the development of the musical powder box, the cosmetic industry now appeals to all five senses.

This discussion is concerned with the sense of smell. The cosmetic chemist is interested in smell both in a positive and a negative way; that is to say, he is concerned with enhancing pleasant odors, such as the perfumes used to improve sales appeal, and he is concerned with deodorizing unpleasant odors. At the outset it would appear to be impossible to accomplish these two contradictory objectives. Any means of destroying an offensive odor would be expected to be equally effective in destroying perfumes or other desired odors.

The problem is difficult but not impossible because odors may be eliminated in more than one way and because each method of removing odors is highly selective. Odors can be eliminated by absorbing them, by destroying them, by washing them away, or by preventing their formation. All of these methods engage the attention of the perfumer and the manufacturer of deodorants, but the perfumer is particularly concerned with products which absorb perfumes while the deodorant manufacturer is particularly concerned with products which prevent the development of unwanted odors.

Deodorizing by Absorption

It was pointed out in the article, "Synthetic Detergents and Odors," by Flett, Toone, and Booth in the *American Perfumer*, June, 1947, that the detergent "Nacconol" NRSF can behave as a deodorant in the strictest sense of the word. Odors of all types may be weakened by the use of strong "Nacconol" solutions or by use of the dry powder.

"Nacconol" NRSF rather com-

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pletely deodorizes some substances whereas it appears to have very little effect on others. This variation in behavior is an important consideration in the preparation of cosmetics. Many cosmetic preparations now contain synthetic detergents and all such preparations are perfumed. In compounding such products the cosmetic chemist must make certain that the perfumes chosen will not be deodorized by the surface-active agent. For example, very strong solutions of "Nacconol" NRSF will seriously weaken the odor of the proprietary perfume, Chanel No. 5, whereas they have very little, if any, deodorizing action on the perfume, Freshette.

Anise and Cinnamic Aldehyde are hardly affected.

In all cases there appears to be some deodorizing action by the strong "Nacconol" NRSF solutions. The deodorization varies; sometimes it is weak but generally it is quite significant. The deodorizing action of dry "Nacconol" NRSF is shown in Tables 2, 3, and 4. Table 2 shows the deodorizing action on common chemical substances, Table 3 on commercial perfumes and Table 4 on aromatic materials. In all cases the deodorizing action is very selective and by proper choice suitable perfuming materials may always be found. Table 5 shows the deodorizing action on ordinary household odors.

TABLE 1—DEODORIZING ACTION OF "NACCONOL" NRSF SOLUTION—ODOR OF AROMATIC CHEMICALS IN SOLUTION

"Nacconol" NRSF Solution *vs.* Distilled Water Control

Aromatic	Slightly Weaker	Appreciably Weaker	Considerably Weaker
Civet Art AA	..	..	X
Oil Thyme SP. WH	..	X	..
Oil Petitgrain SA	..	X	..
Oil Peppermint RD	..	X	..
Oil Anise RD	X	..	..
Terpineol	..	..	X
Cinnamic Aldehyde	X	..	..
Vanillin	..	X	..
Phenylethyl Alcohol	..	X	..
Oil Patchouly SU	..	..	X
Citral	..	X	..
Benzyl Salicylate	X	..	..

The selective deodorizing action of water solutions of "Nacconol" NRSF on aromatic chemicals is shown in Table 1. It will be noticed, for example, that a product like Terpineol is rather completely deodorized while products like Oil of

DEODORIZING BY PREVENTION

The very offensive odors which develop with large colonies of bacteria are probably nature's warning of the presence of these enemies of man. The "Nacconol" NRSF

TABLE 2—DEODORIZING ACTION OF DRY "NACCONOL" NRSF—CHEMICALS

Odor in "Nacconol" NRSF *vs.* Odor in Sodium Sulfate Control

Chemicals	Slightly Weaker	Appreciably Weaker	Much Weaker
Lauryl Alcohol	X	..	..
Capryl Alcohol	..	X	..
Amyl Acetate	..	..	X
Acetic Anhydride	..	..	X
Diethyl Cellosolve	X	..	..
Butyl Cellosolve	..	..	X
Cyclohexanone	X	..	..
Lauryl Amine	..	..	X
Geraniol	..	..	X
Aldehyde C_{16}	X	..	..

TABLE 3—DEODORIZING ACTION OF DRY "NACCONOL" NRSF—PERFUMES

Odor in "Nacconol" NRSF *vs.* Odor in Sodium Sulfate Control

Perfumes	Slightly Weaker	Appreciably Weaker	Much Weaker
Formarome Violet	..	X	..
Russian Leather	..	X	..
Lavande	..	X	..
Balsamarome	..	..	X
Carnation	..	X	..
Rosex	X	..	..
Chanel No. 5	..	X	..
Freshette	..	X	..

TABLE 4—DEODORIZING ACTION OF DRY "NACCONOL" NRSF—AROMATIC MATERIALS

Odor in "Nacconol" NRSF *vs.* Odor in Sodium Sulfate Control

Aromatic Materials	Slightly Weaker	Appreciably Weaker	Much Weaker
Civet Art AA	..	X	..
Oil Thyme SP. WH	..	X	..
Oil Petitgrain SA	..	X	..
Oil Peppermint RD	X	..	..
Oil Anise RD	..	X	..
Terpineol	..	X	..
Cinnamic Aldehyde	X	..	..
Vanillin	..	X	..
Phenylethyl Alcohol	..	X	..
Oil Patchouly SU	X	..	..
Citral	X	..	..
Benzyl Salicylate	X	..	..

serves to prevent the formation of such odors by the destruction of the bacteria which cause them to develop. Deodorants of this type have become of increasing interest in recent years. For this purpose it is necessary to have a product which can control the vigorous bacteria associated with our bodies, without causing a toxic action.

The principal concern of the cosmetic chemist in the subject of per-

TABLE 5—DEODORIZING EFFECT OF DRY "NACCONOL" NRSF—HOUSEHOLD ODORS

Household Odors	Appreciably Deodorizing	Very Strong Deodorization
Onion	..	X
Garlic	X	..
Cabbage	X	..
Sauerkraut	X	..
Burnt Crisco	..	X
Fish	X	..

come a practical necessity. Where bacteria are to be controlled on the body, as for example under the arms, rapid killing action is not necessary. This makes it possible to find products with low toxicity but with very satisfactory bactericidal action.

TABLE 6—BACTERICIDAL ACTION

"Nacconol" NR 1:500 (Ordinary Washing Solution)

Organisms	Time for Complete Kill	Organisms Killed in 5 Minutes, %
Staphylococcus aureus	24–48 hr.	99.5
Streptococcus hemolyticus	0–5 min.	100
Eberthella typhosa	Over 24 hr.	73
Corynebacterium diphtheriae	0–5 min.	100
Diplococcus pneumoniae	1–2 hr.	98.7
Streptococcus mastitidis	0–2 min.	100

TABLE 7—BACTERICIDAL ACTIVITY OF 1:500 "NACCONOL" NR AGAINST STAPHYLOCOCCUS AUREUS

	5 Minutes at 37°C.		
	Control count,	"Nacconol" NR—	
pH	Millions per Ml.	Count, Millions per Ml.	Bacteria Killed, %
2.0	1	0	100
3.8	17,000	0	100
5.1	9,000	1	99.99
6.2	3,000	50	98.33
7.0	30,000	140	99.53
7.8	17,000	180	98.94
8.8	27,000	160	99.41
9.9	12,000	150	98.75
11.9	600	7	98.83

sonal deodorants is the matter of perspiration. Fresh perspiration, in most cases, is not offensive but where bacteria are present, an offensive odor can develop in a few hours. This odor can become very serious in 24 hours.

The so-called body odor has become increasingly objectionable to people and its elimination has be-

The effectiveness of "Nacconol" NRSF against a series of common bacteria is shown in Table 6. Although the actual killing of resistant organisms like Staphylococcus aureus requires 24 hours, the multiplication of the bacteria stops at once, and the number is reduced to less than 1% of the original number in 5 minutes. Less resistant organisms are completely eliminated in a very short time.

The rate at which "Nacconol" NRSF eliminates the very resistant Staphylococcus aureus can be increased by decreasing the hydrogen ion concentration as shown in Table 7. For many skin preparations lower hydrogen ion concentrations are preferred.

A deodorant to be effective over any considerable period should have some affinity for the skin. This will cause the material to be held in

the area where it is to be effective. "Nacconol" NRSF when used in a relatively strong solution forms a loose combination with the skin and remains combined with it even after a light rinse. When fresh perspiration is excreted by the skin it dissolves the combined "Nacconol." This property makes it possible to hold the deodorant in the desired area where it remains effective for a long period of time.

Deodorization by Washing Away

Odors and the bacteria which are their principal cause are associated with the outside of the skin. It is well known that they can be washed away. The extent to which they can be washed away varies greatly with the type of washing preparation used. When the bacteria and waste products from the body are washed away with a strong solution of the "Nacconol" NRSF, a subsequent control over bacteria will result and the deodorizing effect just described will be obtained. In bubble baths, however, the concentration is far too low to exert any antiseptic action and their deodorization is limited to the immediate washing effect.

Deodorization by Destroying Odors

The removal of odors by destroying them involves chemical reaction of a greater or lesser magnitude. The odors can be removed by oxidation and reasonably mild products are available which have this action. Even surface-active agents are available which have a strong oxidizing action. In general the ordinary surface-active agent is quite unreactive except in the matter of forming salts. "Nacconol" NRSF can form salts with the amino compounds which very often accompany odors. If the amino compound is sufficiently complex, the resulting salt will be insoluble. The very strong deodorizing effect of "Nacconol" NRSF on Lauryl Amine, as shown in Table 2, is probably largely due to the formation of a salt.

Application of the Detergent Deodorant

The actual preparation of deodorants containing an alkyl aryl sulfonate detergent has been accomplished in a number of ways. They can be applied in creams, liquids, powders, or cakes. In many cases the deodorizing action can be accomplished by the use of the detergent in any form.

Creams

Creams are available with a strong deodorant action. These are particularly useful in the kitchen where it is practically impossible to wash the residual smell of fish and onion from the hands. The cream containing "Nacconol" is applied directly to the area where the undesired odor persists. In this case the detergent behaves strictly as a deodorant.

Deodorant Solutions

Substances to be used as deodorants can be applied in solutions such as shampoo solutions and bubble

baths. Hair acquires an odor characteristic of the individual and it may in certain instances become offensive. This odor, for the most part, is washed away in a shampooing operation. In the case of dogs the so-called doggy odor can reach the point of being seriously objectionable. Where a simple washing operation does not remove sufficient odor the detergent may be applied directly to the washed hair. It is often desirable not to rinse the hair too thoroughly after a detergent shampoo thus leaving a residual deodorizing material and permitting some control of the organisms on the hair.

Solutions of detergents are often used for bubble baths. As bubble baths they are effective in washing away odoriferous substances and bacteria which cause them. The ordinary bubble bath is so dilute that there is no residual effect and no impediment to the development of odor from fresh perspiration.

Deodorant Powder

Deodorants can, of course, be prepared as powders to be used either in the powder form or in solution. Where the powder is used in solution, the same comments hold as hold for the deodorant solutions. Unless substantial amounts are used they serve only to wash away odors without any residual effect.

Deodorant Detergent Cakes

A recent development now being studied is the detergent soap cake. These soap cakes were developed by our Company during the last World War to provide Navy salt water soap at the time when the supply of coconut oil from the Philippines was suddenly cut off. Cakes of soap containing substantial amounts of "Nacconol" have all of the antiseptic action required for the control of perspiration odors. The material can be applied by working up a lather from the detergent cake, as for example under the arms, and then wiping away the suds with a damp cloth. The effectiveness of this treatment is easily tested by washing under one arm with the "Nacconol" cake and under the other arm with ordinary soap. The deodorizing action will be apparent in a few hours and strikingly evident in a day.

The effectiveness of the deodorant action also carries over to garments which would otherwise acquire an offensive smell through the accumulation of perspiration. The use of this detergent cake substantially eliminates the odor of perspiration in the garments. As a matter of fact if garments which have an offensive smell due to perspiration are moistened with "Nacconol" and aired, the offensive odor will disappear.

Deodorants

The consciousness of human odors has developed rapidly in recent years. The important developments in personal deodorants have taken place in the last 40 years. During that period there has been a steady improvement in the cleanliness of people in this country and

each day sees higher standards. Improved methods of deodorizing find ready acceptance and soon become necessities. The deodorant manufacturer has found a rapidly expanding demand and market for products which are simple to use and effective in practice. The public has learned the priceless value in the use of deodorants.

The cosmetic chemist is contributing generously to our social life by removing that offensive barrier of smell which throughout the ages has been holding people apart.