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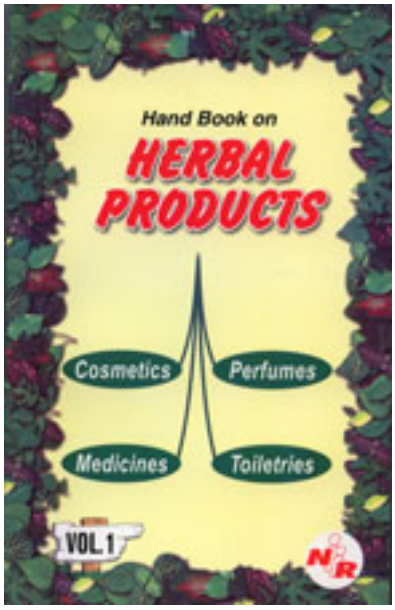
Handbook on Herbal Products (Medicines, Cosmetics, Toiletries, Perfumes) 2 Vols.



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Herbal products combine the skills of specialists in chemistry, physics, biology, medicine and herbs. These are less likely to cause any damaging effect to health. These days a number of products that are using the herbal formulae have got lot of attention and have been witnessing a huge rise in demand not only nationally but on international arena. Bath and beauty products use herbs for both their scents and therapeutic qualities. Herbal products are replacing the synthetics products because of its harsh nature. Herbal products are in huge demand in the developed world for health care for the reason that they are efficient, safe and have lesser side effects. The formulations based on herbs are safe and effective.
Both the volumes covers processes, formulations, analysis methods with the addresses of raw material and machinery suppliers, project profiles, list of manufacturers, exporters and overseas importers of various herbal medicines, cosmetics, perfumes and toiletries. The book also contains addresses of different Ayurvedic & Unani medicines research institutes.
The major contents of the book (both volumes) are: herbal cosmetics, perfumes, analysis of cosmetics, toxicity and test method, infrared spectra of some naturally occurring sequiterpene hydrocarbons, ayurvedic medicines, analysis of ayurvedic medicines, ayurved siddha unani companies and their products, machinery, directory of perfumes and flavours, manufacturers of standardized herbal extracts.
The book is very useful for new entrepreneurs, manufacturers of herbal products who can easily extract the relevant formulation and process from the book.

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Sample Chapter:

Herbal Cosmetics

Cosmetic

Any substance, preparation, or treatment, applied to the person (a) to cleanse, (b) to alter the appearance, (c) to promote the attractiveness of the person. The term thus includes all creams, powders, lotions, and coloring agents applied to the face, scalp, hair, and hands, and many borderline products, such as deodorants, depilatories, and oral and suntan preparations.

According to the broad definitions in the preceding section, the various kinds, of cosmetic products are best grouped in three principal classes: (1) for the skin, (2) for the hair, and (3) for the nails. In form they may be dry powders, pastes, solid or liquid emulsions, or aqueous, alcoholic, or oily solutions. The methods of manufacturing are essentially those employed for the manufacture of other commercial products of similar form. In the following pages, therefore, specific information will be given only for those products that require special techniques, or notes on other points of special interest.

Cosmetology

A branch of applied science that deals with the external embellishment of the person through the use of cosmetic products and treatments. As specified in most state laws, the regions of the body that may be treated in cosmetology are the head, neck, upper chest and back, arms, and hands (now extended to include lower legs and feet). The permitted treatments are hairdressing, haircutting, temporary and permanent waving, hair bleaching and coloring, and corrective and preventive care, by massage or otherwise, of scalp and skin on face, chest, back, arms, and hands. Related branches are body massage, electrolysis, and chiropody.

INGREDIENTS OF HERBEL COSMETICS

Both organic and inorganic natural materials are used in the manufacture of herbel cosmetic products; the former have undergone a gradual shifting from natural vegetable and animal substances, through metallic compounds, to the synthetic organic. As only certain substances of a class may have the properties desired for a certain cosmetic product, the range of possible ingredients is usually limited.

Among the types of organic substances used in cosmetics are: natural and synthetic oils, fats, and waxes; liquid, semisolid, and solid hydrocarbons; soaps and synthetic surface-active agents; starches, gums, and resins; dyes and pigments; acids, alcohols, and esters; alkyl-and alkanolamines; and many others. The inorganic substances include water and hydrogen peroxide; metallic salts and oxides; acids, ammonia, fixed alkalies; and many others.

Cosmetic Emulsions

Cosmetic lotions and creams are emulsions of water-based and oil-based phases. An emulsion is a two-phase system consisting of two incompletely miscible liquids, the internal, or discontinuous, phase dispersed as finite globules in the other. Special designations have been devised for oil and water emulsions to indicate which is the dispersed and which the continuous phase. Oil-in-water (o/w) emulsions have oil as the dispersed phase in water as the continuous phase. In water-in-oil (w/o) emulsions, water is dispersed in oil, which is the external (continuous) phase (8-9) (see Emulsions).

Properties of Emulsions

The properties that are most apparent, and thus are usually most important, are: case of dilution, viscosity, color, and stability. For a given type of emulsification equipment, these properties depend upon: (1) the properties of the continuous phase, (2) the ratio of the external to the internal phase, (3) the particle size of the emulsion, (4) the relationship of the continuous phase to the particles (including ionic charges), and (5) the properties of the discontinuous phase. In any given emulsion, the properties depend upon which liquid constitutes the external phase, ie, whether the emulsion is o/w or w/o. The resulting emulsion type is

controlled by: (1) the emulsifier: type, and amount, (2) the ratio of ingredients, and (3) the order of addition of ingredients during mixing.

The dispersibility (solubility) of an emulsion is determined by the continuous phase; thus if the continuous phase is water-soluble; the emulsion can be diluted with water; conversely, if the continuous phase is oil-soluble, the emulsion can be diluted with oil.

The ease with which an emulsion can be diluted, increased by decreasing the viscosity of the emulsion. The viscosity of an emulsion when the continuous phase is in excess is essentially the viscosity of the continuous phase. As the proportion of internal phase increases, the viscosity of the emulsion increases to the point that the emulsion is no longer fluid. When the volume of the internal phase exceeds the volume of the external phase, the emulsion particles become crowded and the apparent viscosity is partially structural viscosity.

An emulsion is stable as long as the particles of the internal phase do not coalesce. The stability of emulsion depends upon: (1) the particle size; (2) the difference in density of the two phase; (3) the viscosity of the continuous phase and of the completed emulsion; (4) the charges on the particles; (5) the nature, effectiveness, and amount of the emulsifier used; and (6) conditions of storage, including temperature variation, agitation and vibration, and dilution or evaporation during storage or use. The stability of an emulsion is affected by almost all factors involved in its formulation and preparation. In formulas containing sizable amounts of emulsifier, stability is predominantly a function of the type and concentration of emulsifier.

Emulsifiers

Emulsifiers can be classified as ionic or nonionic according to their behaviour. An ionic emulsifier is composed of an organic lipophilic group (L) and a hydrophilic group (H). The hydrophilic- lipophilic balance (HLB) is often used to characterize emulsifiers and related surfactant materials. The ionic types may be further divided into anionic and cationic, depending upon the nature of the ion-active group. The lipophilic portion of the molecule is usually considered to be the surface-active portion.

Nonionic emulsifiers are completely covalent and show no apparent tendency to ionize. They can, therefore, be combined with other nonionic surface-active agents and with either anionic or cationic agents as well. The nonionic emulsifiers are likewise less susceptible to the action of electrolytes than the anionic surface-active agents. The solubility of an emulsifier is of the greatest importance in the preparation of emulsifiable concentrates.

Emulsifiers, being surface-active agents, lower surface and interfacial tensions and increase the tendency of their solution to spread.

O/w emulsifying agents produce emulsions in which the continuous phase is hydrophilic; hence, such emulsions are generally dispersible in water and will conduct electricity. The surfactants that are capable of producing such emulsions usually have an HLB of more than 6.0 (preferably 7), the hydrophilic portion of their molecules being predominant. (Between HLB 5 and 7 many surfactants will function as either w/o or o/w emulsifiers, depending on how they are used).

O/w emulsifiers		HLB
P.E.G. 300 distearate	nonionic	7.3
sorbitan monolaurate	nonionic	8.6
P.E.G. 400 distearate	nonionic	9.3
triethanolamine stearate	anionic	12.0

P.E.G. 6000 monolaurate	nonionic	19.2

W/o emulsifiers produce emulsions in which the continuous phase is lipophilic in character (oil, wax, fat, etc). Such emulsions are not generally dispersible in water and do not conduct electricity. The surfactants capable of producing such emulsions usually have an HLB of less than 6.0 and preferably below 5. The lipophilic portion of their molecules is predominant.

W/o emulsifiers		HLB
lanolin alcohols	nonionic	ca 1.0
ethylene glycol monostearate S/E	nonionic	2.0
propylene glycol monostearate S/E	anionic	3.2
sorbitan monooleate	nonionic	4.3
P.E.G. 200 dilaurate	nonionic	6.0

COSMETICS FOR THE SKIN

Under cosmetics for the skin may be included all preparations used for conditioning or embellishment-creams, lotions, masks, powders, colorings and products used for personal hygiene-toilet soaps, accessories for the bath, deodorants, and hair removers.

CREAMS

Creams constitute the largest class of cosmetic preparations used on the skin. Although the variety may seem bewildering, every true cream consists basically of an emulsion of oily and watery substances in solid or liquid form. According to their function, creams fall into three principal groups: cleansers, emollients, and finishers. Most cleansing creams and all emollient creams are water-in-oil emulsions; most of the finishing creams are oil-in-water emulsions. The Toilet Goods Association has published standards for most of the raw materials used in the making of cosmetic creams.

Cleansing creams are of three types: cold creams, "quick-liquefying" creams, and liquid cleaners. A satisfactory cleansing cream is a water-in-oil emulsion that melts at the temperature of the body and spreads readily over the skin. The oily ingredients should be light enough to penetrate a little to clear the skin of impurities, and flow away. It should not contain any appreciable amounts of substances that might be retained by the skin. The product should not be sticky; after it is removed, the skin should feel smooth, clean but not greasy, and relaxed.

The product known as cold cream is of historical interest because the original recipe for a cream of this kind dates from the Ceratum refrigerans Galeni, introduced by Galen, a physician of ancient Rome (A.D. 130-200). It consisted of almond oil, bees-wax, and rose water; the designation cold was undoubtedly applied to it because of the sensation produced on the skin as the water evaporated. An early modification of the recipe, long official in some pharmacopeias, contained spermaceti and a small amount of borax as an auxiliary emulsifying agent; still later, varying amounts of mineral oil, paraffin, and other related substances were included. This type of cleanser is satisfactory for the normal skin as well as for a skin that tends to dryness. Some typical compositions for cold cream are given in Table I (3, 4, 6 9, 13). Among other fatty and waxy materials occasionally incorporated in cold creams are: carnauba wax, castor oil, ceresin, cocoabutter, olive oil, oleic acid, peanut oil, sesame oil, stearic acid (triple pressed, XXX), and certain synthetic fats and waxes. Among many newer emulsifying agents are: aminoglycol, alkanolamines, and

esters of polyhydric alcohols. Distilled or de-ionized water is now used instead of rose water: practically all cleansing creams are delicately perfumed.

Table I. Compositions of Cleansing Creams.

[td colspn=6 align=center]Typical recipe, % by wt. in[td align=left]Ingredient

1	2	3	4	5	6
Almond oil	34	50	35	-	-
-	Beeswax	16	12	12	8
13	5	Lanolin	-	-	15
-	-	20	Mineral oil	-	-
-	50	45	-	Paraffin wax	-
-	-	-	-	35	Spermaceti
-	12	8	12	6	55
Borax	1	1	-	1	1
-	Distilled water	-	-	-	-
35	35	Stronger rose water	49	25	28
29	-	-	Total	100	100

The so-called quick-liquefying creams as originally prepared were not really creams, that is, emulsions, but simply mixtures of liquid and solid hydrocarbons, melted together and perfumed. The principal purpose of this type of product is to melt and spread rapidly, but it is not equally effective in removing all kinds of dirt. As the long continued use of petroleum hydrocarbons is admittedly drying, cleansers of this type are more satisfactory for skins that tend toward oiliness. To meet this criticism, some compositions have ben modified to contain animal and vegetable fats and waxes, and even to produce them as emulsions. For some typical compositions, see Table II.

Table II. Compositions of Quick-Liquefying Creams.

[td colspn=5 align=center]Typical recipe, % by wt. in:[td align=left]Ingredient

1	2	3	4	5
Beeswax				

16

-

9

-

7

Ceresin

-

12

-

-

12

Mineral oil

74

88

50

50

43

Ozokerite

5

-

-

-

-

Paraffin wax

5

-

18

30

-

Petrolatum

-

-

23

20

38

Total

100

100

100

100

100

Emollient creams are those intended for the special purpose of softening the skin, and are usually employed as lubricants or while resting. They were formerly designated "skin foods," "rejuvenating creams," "nourishing creams," etc., and are now recognizable as "night creams," or "massage creams," etc.

In physical properties, emollient creams often are of a heavier consistency than cleansing creams; because of the presence of lanolin, they are often yellowish and appreciably tacky. As lanolin, itself, is entirely too viscous to permit free motion over the skin, emollient creams contain varying percentages of vegetable and mineral oils. To avoid the yellowish tinge, mixtures of sterols with inert hydrocarbons-the so-called absorption bases-are often substituted for lanolin.

Other ingredients of emollient creams may be: benzoinated land, cocoa butter, beeswax, spermaceti; almond, corn, castor, and olive oils; hydrogenated vegetable oils; cetyl and stearyl alcohols, glycerol, glycol, and derivatives; lecithin, vitamins and estrogenic substances. Because of the relative case with which lanolin creams seem to penetrate the skin, they serve as vehicles for products with specifically intended properties; that is, bleaching, astringent, and medicated creams. The effectiveness of organotherapeutic agents, as applied externally in cosmetic creams, has been the subject of intensive research and is still a subject of controversy despite steadily encouraging reports on research. Some typical compositions for emollient creams are given in Table III.

Table III. Compositions of Emollient Creams.

[td colspn=5 align=center]Typical recipe, % wt. in:[td align=left]Ingredient

3

4

5

Almond oil

-

-

10

10

-

Beeswax

20

8

4

10

-

Borax

1

-

-

0.5

-

Cetyl alcohol

2

2

-

-

-

Cholesterol

2.5

2

-

-

3

Cocoa butter

7

6

-

10

-

Lanolin (anhydrous)

-

10

10

5

50

Olive oil

-

50

10

-

-

Lecithin

-

1

-

-

-

Petrolatum (solid or liquid)

45.5

-

20

40

-

Stearic acid (XXX)

-

-

-

-

10

Spermaceti

-

-

4.5

5

-

Triethanolamine

-

-

-

-

-

8

Perfume

1

1

0.5

0.5

1

Preservative

0.5

1

0.2

0.5

1

Water, to make

100.0

100.0

100.0

100.0

100.0

Products that are high in lanolin content are specifically good as lubricants for massage of a dry skin. For the oily skin, a composition containing little or no lanolin is more satisfactory; many operators find a cleansing cream satisfactory for this purpose.

Finishing creams are those used after the skin is cleansed (and in facial treatments, after the massage) as a foundation for make-up. They are of two types: vanishing creams and pigmented foundations.

Vanishing creams is essentially an oil-in-water emulsion of stearic acid and water in which a small amount of a suitable emulsifier serves as the binder. The latter may be formed in situ by first mixing a portion of the stearic acid with sodium or potassium hydroxide, triethanolamine, aminoglycol, etc. This type of product is readily recognizable by its pearly luster. Sodium stearate produces a relatively harder, and potassium stearate a relatively softer, cream; the latter is usually preferable.

The so-called vanishing creams do not actually disappear into the skin, but simply spread a thin smooth film over it, which temporarily conceals roughness and enhances the effect of face powder. Because some skins are appreciably dry, modifying substances are usually added to the basic emulsion; glycerol is often present as a humectant. Among the substances used to vary the properties of vanishing creams are: cocoa butter, lanolin, cetyl alcohol, benzoinated lard, mineral oil (for superficial oiliness), and certain synthetic

waxes.

The proportion of glycerol present is a most important factor. Many of the objections to vanishing creams in the early days were due to an inadequate understanding of the properties and effects of glycerol. As it can combine with water in all proportions, it may serve as a humectant and be beneficial to the skin; if used in excess, it may extract water from the tissues causing a drying or burning sensation. In humid weather it also absorbs moisture from the atmosphere, causing stickiness and spotting in face powder. In the past, certain imported creams of this type were found to contain as high as 50% of glycerol; American products are uniformly lower in content. Some typical compositions for vanishing creams are given in Table IV.

Table IV. Compositions of Vanishing Foundation Creams

[td colspn=5 align=center]Typical recipe, % by wt.in:

Ingredient	1	2	3	4	5
Cetyl alcohol	-	-	0.5	0.5	-
Glycerol	10	10	5	8	6
Lanolin	-				

1

5

-

4

Mineral oil

-

2

5

-

-

Potassium hydroxide

1

0.5

-

-

2

Sodium hydroxide

-

0.5

-

0.4

-

Stearic acid (XXX)

25

22

20

20

15

Triethanolanine

-

-

2

1.2

-

Perfume

0.5

1

0.5

-

-

Water, to make

100.0

100.0

100.0

100.0

100.0

Pigmented foundations are modifications of the heavy creams used as theatrical make-up. Any good recipe for vanishing cream can serve as the base, the opacity being supplied by incorporating a good powder composition in appropriate shades. Some of these products are applied like vanishing cream, directly from the tube or jar, and are carefully spread over the skin a little at a time. Others, in the form of a compressed cake of cream or paste, are applied with water and a sponge, and allowed to dry. Depending upon the composition, the effect of one of these foundations may or may not be satisfactory without the application of face powder over it.

If properly compounded, these pigmented foundations (also called cake make-up and powder base) may be used on any type of skin. They are especially effective on skin that tends to oiliness because they give a smooth finish and effectively conceal the conspicuous pores and other blemishes commonly found in oily skin.

Special creams comprise all those whose composition is modified to effect some definite purpose, such as bleaching or tightening the skin, or clearing it of minor lesions.

A stringent creams are used during facial treatments for the mas-sage of an oily skin, and for overnight use at home. Almost any good emollient cream can serve as a basis; substances added for the astringent effect are alum, zine phenolsulfonate, zinc sulfate, and the like. The exact nature of the mechanism by which an astringent cream functions is not definitely understood (see Astringents). As the so-called pores (actually the pilosebaceous openings) cannot be reduced in size, it is believed that the appearance of reduction results from varying degrees of swelling in the tissue surrounding the lumen of the pore. In practice the use of an astringent cream is usually supplemented by application of an astringent lotion.

Bleaching creams contain a variety of ingredients, selected either for lightening the color of the skin or for covering it with an opaque white film. Any good composition for emollient cream can serve as the basis, and the product is used both in beauty shops and at home, either as a step in a facial treament or overnight. Stronger bleaching agents incorporated in these creams are mercury compounds (chiefly ammoniated mercury, permissible to 5%); among the milder compounds commonly used are peroxides of hydrogen, magnesium, and zinc, and mild (weak) acids, such as dilute acetic, citric, and lactic. As they act slowly, these creams are supplemented by the use of bleaching lotions. The whitening creams contain titanium dioxide or zinc oxide (occasionally bismuth "subnitrate") and simply spread white pigment over the face. Older products of this type appear as thick pastes, compounded with water instead of in a cream base, or as powders, to be mixed with water.

Acne creams, intended to help in clearing the complexion of pustules and other minor lesions, are more properly classed as drugs than as cosmetics. A good emollient cream should serve as the base, preferably one very soft in consistency so that the product can be spread easily without irritating the skin. Among the active ingredients commonly employed for treatment of acne are: benzoin, b-naphthol, cade oil, camphor, boric and salicylic acids, phenol, sulfur, zinc carbonate (calamine), and zinc oxide. The composition of such a cream should be based on sound dermatological principles.

"All-purpose" creams are actually misnamed. From the foregoing discussion of the desired properties and the functions of various standard types of cosmetic creams, it should be clear that no single product can serve the purpose of all of them equally well. A cleansing cream, for example, which is intended to act superficially and leave the skin relaxed and receptive, cannot also carry effective substances into the skin, constringe it, and serve as a basis for make-up. The composition that most nearly meets multiple demands could be a well-compounded cold cream containing additional lanolin, which both softens the skin and leaves sufficient residue to serve as a foundation for powder and makeup.

Miscellaneous special creams (for example, eye creams or throat creams) are generally emollients with a base of lanolin, stiffened with natural or synthetic waxes, and containing compounds intended specifically to make wrinkles and fine lines less conspicuous.

Estrogenic Creams, The possibility of improving the condition and appearance of the skin by the external application of estrogenic substances has been for several years a subject of controversy between medical authorities and scientific investigators. Intensive research, however, undertaken independently by several reputable manufacturers, has yielded results that substantiate the claims made for estrogenic creams. According to one published report (3a), topical application of a well-compounded estrogenic cream causes considerable improvement in the skin of older women (deficient in estrogenic substance), without evidence of systemic effects or any indication of malignancy (see also Hormones).

Protective creams, also called industrial creams, came into long-delayed recognition during World War II through the need for protecting the hands from injury-or merely soiling-in the prosecution of many industrial processes. The widespread adoption of these products and their admitted success should insure for them a permanent place in industrial plants.

The wide diversity of chemical irritants might seem to call for almost as many protective agents. The ideal product must spread easily and if possible penetrate into the hair folicles; it must remain stable in contact

with most chemical agents, providing an oily film of low surface tension; it must not dehydrate the skin; and it must be readily removable with any good soap.

Protective creams are of four types: mixtures of fats and oils; jellies containing physical barriers; emulsions; and soap bases. Each type offers certain advantages and disadvantages, but the best all-around product seems to be an emulsion of fats and waxes with water, made with triethanolamine, and incorporating magnesium stearate or talc as the physical and chemical barrier (13).

The advantages of these protective creams in preventing industrial dermatoses are inestimable. The success of similar products, applied by women to protect their hands while doing their daily household chores, should stimulate research for better protectin of the hands in chemical and other industrial plants.

Liquid Creams

Practically any of the creams described here can be made in fluid form. Some manufacturers offer an entire line of liquid cleansing, emollient, and finishing creams (occasionally called "milks"); for advantages and disadvantages, these must be tested and judged on individual properties and personal preference. The compositions may contain up to 90% of water.

The most popular use of liquid creams is as so--called hand lotions, of which the long established "honey-and-almond cream" is typical. They are usually oil in-water emulsions, much improved in recent years by the use of the newer emulsifying agents, notably triethanolamine, polyhydric alcohol fatty acid esters, etc. As the stability of such emulsions is of paramount importance, the methods of manufacture frequently depend upon the nature of the emulsifying agents used, and are usually more complicated than those suitable for solid creams.

Manufacture of Creams

For the manufacture of most creams in emulsion, form, the following equipment should be available: mixing kettle, with thermometer (or thermostat) and agitator; source of heat-steam or water in jacket of kettle (direct heating is usually not advisable); melting container for fats, or immersion heater for removing small amounts of solid fats from drums. For fatty mixtures, pastes, and ointments, a colloid mill or some form of homogenizer is also required. The actual pieces to be used depend upon the nature of the ingredients, occasionally upon the type of emulsifying agent employed. For makig small batches of cream, some items of household equipment, such as a double boiler, an egg beater, a meat chopper, and many of the modern mechanical mixing and emulsifying devices have proved satisfactory.

The oils, waxes, emulsifiers, and other oilsoluble components are heated to 75oC in a steam-jacketed kettle. The water-soluble components (alkalis, alkanolamines, polyhydric alcohols, and preservatives) are dissolved in the aqueous phase and heated to 75oC in another steam-jacketed kettle. To allow for evaporation of water during the heating and emulsification, about 3-5% excess water (based on formula weight) is added.

The procedure for preparing o/w and w/o emulsions is to add the warmed inner phase very slowly to the outer phase (also at 75oC), stirring constantly and homogenizing to assure efficient emulsification. Finely dispersed o/w emulsions can also be prepared by adding the aqueous phase to the oils. Initially the low concentration of water forms a w/o emulsion according to the phase-volume relationship. The slow addition and emulsification of the water increases theviscosity of the system while the oil phase expands to a maximum. At this point, the continuous oil phase breaks up into minute droplets as emulsion inversion occurs, characterized by a sudden decrease in viscosity. This emulsification technique proceeds smoothly at the critical inversion point in a well-balanced, low oilwax system, but it frequently causes coagulation in high oilwax emulsions. The conventional procedure of adding the iner phase to the outer is preferable for creams and lotions.

The rates of addition and mechanical agitation of the dispersed phase are critically important in determining the efficiency of emulsification. The product formed may vary from a completely dispersed inner phase in a

well emulsified system, to a mixed emulsion in a poorly emulsified system, the latter owing to excessive rate of addition of inner phase and to inadequate stirring. This in turn affects the consistency, viscosity, and stability of creams and lotions.

Total stirring times and cooling rates are important to lotion viscosity, cream consistency, and emulsion stability. Experimental formulas are often developed in vessels that are not equipped with a heating and cooling jacket. Under these air-cooled conditions, longer stirring times are necessary. The transition to full-scale production in jacketed equipment introduces a variable in the physical factors contributing to emulsion preparation. If cooling is started too soon after emulsification is complete, crystallization of the higher melting waxes may occur.

The temperature at which the perfume oils are added to the cream or lotion is another factor contributing to emulsion instability. The addition of perfume to a w/o amulsion proceeds smoothly owing to its solubility in the external phase. In o/w systems, the oils must break through the continuous aqueous phase to the emulsified.

If the cream is to be hot-poured, it is stirred to 5oC above the congealing point, any required color solutions are added, and the cream held at that temperature with occasional stirring during the filling procedcure. If cold-filling is preferred, the cream is stirred to 35oC, any color solutions are added, and filling proceeds at room temperature.

In the packaging of creams they are transferred to containers either while they are still warm enough to be fluid, or after they are cooled. Most cold creams, cleansing creams, and emollient creams are filled warm; vanishing creams, pastes, and ointments are usually filled while cold. Apparatus includes gravity-and vacuum-operated devices. Precautions to be observed are the avoidance of air pockets in the tubes or jars, effecting of a neat smooth surface onthe cream, and complete cooling of the jars before capping.

In any modern, well-equipped factory, manufacturing proceeds in an efficient manner through continuous successive operations from the mixing kettles to filling, labeling, packing in boxes or cartons, and optional steps such as the enclosing of inserts, outer wrapping, and sealing. Equipment is available, or can be devised, to meet the needs of the most exacting packaging problem.

The manufacture of liquid creams is more complicated because of the possibility of breaking the emulsion. As stated earlier, the method of manufacture may vary considerably with the nature of the emulsifying agent, but the proportions and purity of ingredients, the manner and speed of mixing, and other factors are highly important. All creams should be perfected in small batches before any attempt is made to make them on a large scale.

Liquid creams may be filled by gravity from large tanks, handfilled with multiple nozzles, or filled entirely automatically by vacuum apparatus. The manner of closing the bottles varies depending upon whether the closure is a cork with a decorative top, a glass stopper, a threaded metal or plastic cap, etc.

All jars, bottles, and closures must be perfectly clean before they are filled, and kept free from all contamination during the entire manufacturing process.

Cosmetic Lotions

The oils and waxes in lotions are identical to those of an emollient cream but they are present in lower concentration. An o/w emollient lotion usually contains more water than the corresponding cream; a w/o type may thave the same water content, with oily components replacing part of the waxlike materials. These lotions are preferred for use during the day because they produce a lighter or less oily emollient film. However, they can be formulated to contain the same concentration of oil phase ordinarily used in creams. The sales appeal of emollient lotions dervies partly from their convenience and partly from the greater variety of package design possible for liquid emulsions.

The formulation of lotions of all emulsifier and emulsion types is similar to that of emollient creams. The emulsion must be stable at elevated temperatures (45-50oC) for whaterver period is deemed necesary and

at room tempertures for a minimum of one year. In the freeze-thaw test of emulsion sability, the lotion is subjected to a temperature of-5oC for 24 h and is then allowed to return to room temperature, at which time it should be stable and pourable.

An example of an all-purpose hand, face, and body lotion prepared with an anionic emulsifier is: 4.00% stearic and (triple-pressed), 1.50% lanolin anhydrous, 1.50% mineral oil, 1.00% cetyl alcohol, 0.80% triethanolamine, 0.25% preservative [methyl and propyl paraben (5:1)], 90.60% distilled or deionized water, and 0.35% perfume.

A representative all-purpose hand, face, and body lotion, prepared with cationic emulsifiers is: 1.00% cetyl alcohol, 0.50% stearyl alcohol, 1.00% lanolin anhydrous, 4.00% mineral oil, 0.10% N-(colaminoformylmethyl) pyridinium chloride, 0.80% N-(colaminoformylmethyl) pyridinium chloride stearate, 0.25% preservative [methyl and propyl paraben (5:1)], 6.00% propylene glycol, 64.80% distilled or deionized water, 0.125% sodium chloride, 0.125% sodium benzoate, 11.00% distilled or deionized water, 0.30% perfume, and 10.00% denatured alcohol no. 40.

In composition, the lotions used in cosmetic treatments vary according to the purpose for which they are intended; that is, they may be astringent, bleaching, cleansing, emollient, medicated, or refreshing lotins; still others are especially compounded for the eyes and for after shaving.

Table V. Compositions of Astringent Lotions

[td colspn=4 align=center]Typical recipe, % by wt. in:[td align=left]Ingredient

1

2

3

4

Alcohol

10

16

50

10

Alum

1.5

4

-

1

Boric acid

3

-

-

-

Glycerol

5

2

-

10

Zinc phenolsulfonate

-

2

2

-

Zinc sulfate

-

-

-

1

Water, to make

100.0

100

100

100

Astringent lotions are generally used inthe treatment of oily skin and conspicuous pores. For an immediate degreasing effect, some recipes contain as much as 50% of alchol (ethyl or isopropyl), but results seem to be more satisfactory with less alcohol and a good selection of salts or other compounds of aluminum, magnesium, and zinc. Mild acids, for example, acetic, boric, citric, and salicylic, extract of witch hazel, b-naphthol, and resoreinol, are also used. In planning an astringent lotion it must be remembered that many compounds that might seem suitable because of their property of coagulating proteins will be incompatible with certain other substances and compounds in solution. The properties of all proposed

ingredients should be studied before any decision is made.

Bleaching lotions are not so much in demand now as they were formerly, undoubtedly because of the vogue for tanning. At best the merits of such preparations are questionable. As the pigment-forming mechanism of the skin is situated at the base of the epidermis, any true bleaching agent strong enought to penetrate to the site of pigment and actually lighten the color of it could readily harm the epidermis itself. Melanin, the pigment in skin and hair, can be bleached to a lighter color by hydrogen peroxide (at least 5%, 17-volume). A clear bleaching solution may be made of hydrogen peroxide and rose water or orange-flower water. Other suggestions are for mild acids (acetic, citric, lactic, tartaric) in scented water, with or without the addition of glycerol (to 10%). Potassium chlorate, sodium perborate, and other oxidizing chemicals are also included occasionally in bleaching lotins.

Cloudy lotions or those containing a sediment, which are to be shaken before application, may contain bismuth subnitrate, ammoniated mercury (maximum allowed, 5%), or metallic peroxides (zinc, magnesium). Lotions recommended especially for lightening freekles usually contain ammoniated mercury, which causes exfoliation of the pigment and may irritate the epidermis.

Another type of so-called bleaching lotion actually masks, rather than lightens, the color of the skin. Like the whitening creams, these lotins usually contain zinc oxide or titanium dioxide with various proportions of alcohol, glycerol, and water. As delicate flesh tints may also be added, such products often serve more properly as liquid powders.

In cosmetic treatments, as given professionally in the beauty shop, bleaching lotions are applied to supplement the usually stronger action of bleaching creams and pastes; at home they are generally used instead of these products.

Cleansing lotions are used to supplement the action of cleansing creams, and at any time for quick cleansing or for more thorough cleansing than is afforded by soap and water; they are of several types. Lotions intended for cleansing the dry skin should contain relatively little alcohol or mineral oil, and only small percentages of alkaline salts or synthetic surface-active agents because all of these ingredients can only aggravate a tendency toward dryness. Borax and triethanolamine may be present to the extent of 1%; glycerol (or glycol compounds) to 5-10%; ethyl or isopropyl alcohol to 5-10%. Tincture of benzion is occasionally included; magnesium carbonate is also added to some mixtures to serve as a mechanical aid to cleansing. Such lotions must bewell shaken before they are applied, because the white powder settles on standing.

Cleansing lotions for oily skin many contain up to 50% of alcohol. Although the primary purpose of these lotions is to remove oil and shine from the face, many of them are so compounded that continual use may have an astringent effect and thus counter act the oily condition. Among the compounds included are synthetic detergents, mild acids (boric, salicylic), acetone, camphor, and witch hazel.

Freshening lotions (formerly called skin toning lotions) are used for mild stimulation of the skin, and for the complete removal of creams before the application of make--up. Alcohol may or may not be present; rose water or orange-flower water is often used as the base. Preservatives are usually required. Menthol, when used for cooling effect, must be kept to the minimum, as its secondary reaction is an occasionally unpleasant overstimulation of the skin. Glycerol is included for its humectant properties. Other common ingredients of skin fresheners are alum, camphor, witch hazel, and mild organic acids (3, 6, 9, 10, 13).

Medicated lotions, although used for their cosmetic effect in certain treatments, are on the borderline, if not actually over the line, into the category of drugs. It is not permissible to recommend any true cosmetic lotion for the cure of any lesion or eruption in the skin. All such claims require proof of accomplishment, and a declaration of the active ingredients of the product on the label.

Lotions commonly used for the alleviation of minor blemishes may contain antiseptics, such as alcohol, phenol, hexylresorcinol; also camphor, sulfur, resorcinol; and various zinc compounds (phenolsulfonate,

carbonate, sulfate, oxide). For indirect alleviation of minor conditions by thorough cleansing of the skin, triethanolamine, either alone or in compounds with fatty acids, is used; certain synthetic detergents of the class of fatty acid sulfonates or alkyl sulfates are also used in some of the newer products.

Shaving lotions are offered for either before or after shaving. Before-sharing preparations may be of two types: (1) Those intended primarily to soften the beard usually have as active ingredient a wetting agent, in a base of water and glycerol, perfumed and tinted. Those to be applied before using an electic razor act like strong astringents, contracting the skin to make the hair stand up more straight. After-shaving lotions are usually similar in composition to astringent lotions, with a higher percentage of alcohol, which serves to cool, the skin and to counteract any irritation. The alcohol also acts as a mild antiseptic to aid against infection of any abrasions. As many of the suggested ingredients may deteriorate, lotions of this type should contain preservatives.

Special Lotions

In addition to the various types of lotions used as washes for the skin of the face, at least two other types have become popular and have been the subjects of considerable sound research.

Eye lotions, used to cleanse, soothe, and brighten the eyes, should be so compounded that in pH and osmotic pressure they approxmiate the natural fluid, tears. Many older, compendia gave recipes for eyewashes, based on herbal extracts (camphor, cherry laurel, eupharasia or "eyebright," fennel, fleabane, snakewort, witch hazel), which could well serve the same purpose in modern preparations. In practice, herbal extracts are usually combined with boric acid, ammonium, potassium, or sodium chloride, sodium borate or salicylate, zinc salts or other suitable compounds. If any natural organic substances are used, a preservative must be added; for obvious reasons this should be selected with great care. Claims for eye lotions should be most conservative. Nothing of this kind should be recommended for the treatment of abnormal or pathological conditions; otherwise the product falls automatically into the class of drugs.

Hand lotions are of two principal types; (1) creamy fluids ("honey and-almond" type). (2) thin mucilages. They deserve to be even more widely used than they are at present because of the protection they afford to the skin of hands and arms (and legs) in cold weather, and, at any time, to hands that are exposed to soap and water or any other cause of defatting.

About the oldest of the preparations still in use is a mixture of glycerol and rose water. It was made formerly with 50% of glycerol, but the quantity has been cut to an average of 25%; in commercial production, a perservative should be added. Sorbitol is also used in place of some of the glycerol.

The familiar translucent, gelatinous or mucilaginous hand lotions consist of one or more gums (acacia, chondrus, karaya, tragacanth) with varying percentages of alcohol, glycerol (or glycols), boric acid, camphor, or benzoin; benzoic acid or one of the newer benzoic acid esters to used as the preservative.The gums are occasionally also added to the emulsion type of hand cream. Other thickening agents used in hand lotions are agar, marsh-mallow root, starch, pectin, and the extracts from seeds of flax, psyllium, and quince.

Manufacture of Lotions

To have the proper esthetic appeal, a lotion that is intended to be clear should have the brilliance and clarity of a jewel, whether water-white or colored. Clouding can be prevented by careful study of all the ingredients of the product, in relation to their mutual interactions and compatibility. Stability at various temperatures is also important; otherwise, certain ingredients may precipitate out of the solution under varying climatic conditions. Time should always be allowed for possible changes during storage; "shelf tests" should preferably be of the full duration, rather than accelerated.

Most solutions of these types improve if they are allowed to stand for a while before they are filtered and bottled. Whenever possible, filtration by gravity is preferable to the application of vacuum or pressure. As a mechanical aid in clarification, fuller's earth, asbestos, magnesia, talc, or other substances that are inert to

the solution may be distributed over the filtering medium.
As insurance against deterioration, all bottles, caps, and filing apparatus should be cleaned, and the atmosphere of the room should be kept as free as possible from all sources of contamination. The filling and capping of bottles by available standard equipment presents no difficulties.
For mucilaginous lotions, the gum-producing substances must be soaked in water, and some must be forced through sieves or fabrics to prepare them for combination with the other ingredients. General information cannot be given for all conditions; successful preparation of any product requires carefull attention to all steps in the manufacturing process outlined for it.
Deodorants and Antiperspirants
Deodorant and antiperspirant products are marketed as aerosols, creams, gels, lotions, powders, soaps,and sticks.
The FDA product and ingredient review panel for over-the-counter antiperspirants (OTC panel) has assigned three classifications to antiperspirants: category 1, safe to use; category 2, does not meet requirements, remove offending materials; category 3, may be marketed while testing continues.
The initial proposal states that color and fragrance apparently have no effect on safety; buffers do not apparently make a product more effective; a product, to remain on the market, must be at least 20% effective on at least one half of the persons tested. With a confidence rate of 95%, special tests will be set up to evaluate claims of extra effectiveness (30% or more); products aimed at combatting problem and emotional perspiration will require special tests; if a new ingredient is used tests are required for skin irritation and compatibility with normal flora.
Active Ingredients
Aluminum chloride, once commonly used in deodorants and antiperspirants, may cause fabric damage and skin irritation because of its low pH. This has led to the development of various basic aluminum compounds. The most widely used compound is aluminum chlorhydroxide (ACH) . Other compounds that have been or are now used are: basic aluminum bromide, iodide, and nitrate, and basic aluminum hydroxychloride-zirconyl hydroxy oxychloride, with the without glycine. Zirconium salts, formerly used in antiperspirants, were banned for use in aerosol in 1977.
An example of an antiperspirant rollon is: 33.60-40.60% methyl cellulose 65 HG (high gain), 400 mPa.s (=cP), 3% solution [96.9% distilled or deionized water, 3.0% methyl cellulose 65 HG, 400 mPa.s (=cP), 0.1% methyl paraben]; 30.00-36.0% aluminum chlorhydroxide complex, 50% solution; 16.25-29.25% alcohol SDA no. 40; 4.65% propylene glycol; and 2.50% solubilized perfume [solubilizer and perfume oil (4:1)].
Deodorant-Antiperspirant Sticks
Sodium stearate, the primary gelling agent for deodorant sticks, constitutes about 7-9 wt% of these products. The grade employed depends on the fatty acid used in making the stearate.Derivatives such as acetylated sucrose distearates also can be used but are more common in antiperspirant sticks to gel cetyl alcohol-based formulations (typical use level, 28%).
There are three main types of stick formulations for antiperspirants: hydroxyethyl stearamide, which produces clear-melting, homogeneous sticks; stearamides and cetyl alcohol dry-powder dispersions of ACH; and stearamides coupled with propoxylated alcohol. The stearamide wax content is 26-29%; the active concentration, 20-25%.
Volatile silicones, the siloxanes, are employed in the newer antiperspirant sticks at levels as high as 40-50%. They function as a processing aid, reducing cracking and crumbling of the stick. The tetrameric and pentameric cyclic silicones are preferred because of their volatility (see Silicon compounds). When the stick is applied to the skin, the silicones evaporate, leaving the ingredients on the skin in a nonsticky film. The silicones are useful in pump antiperspirants, acting as a lubricant for valves and a suspending agent for the

active material. The compounds also act as skin lubricants and emollients.

A typical deodorant stick formula is: 75.35 wt % alcohol SDA no. 40; 17.00 wt % propylene glycol; 6.00 wt % sodium stearate, purified USP; 1.50 wt % perfume; and 0.15 wt % trichlorocarbanilide.

A typical antiperspirant stick formula is: 27.5 wt % stearic acid monoethanolamide; 240 wt % poly (dimethylsiloxane) (low viscosity, volatile); 20.0 wt % rehydrol powder: 15.0 wt % propoxylted myristyl alcohol; 9.0 wt % propylene glycol; 3.0 wt % distilled or deionized water; 1.0 wt % perfume; and 0.5 wt % myristyl lactate.

A typical dry compressed antiperspirant stick formula is: 65.75 wt % microcys talline cellulose; 25.00 wt % ultrafine powdered aluminum chlorohydrate; 9.00 wt % talc; and 0.25 wt % magnesium stearate.

Deodorizers merely prevent the emanation of an odor from the sweat, or substitute a pleasant odor for an unpleasant one. These products pass as true cosmetics and therefore require no statement of ingredients on the label. They may be prepared as powders, creams, or liquids; as used under the arms, on palms or soles, and on sanitary napkins, the first two types predominate. Common ingredients are: boric, benzoic, and salicylic acids; zinc oxide and peroxide; magnesium carbonate, talc and hydroxyquinoline sulfate. A few typical recipes are given in Table VI.

Table VI. Compositions of Deodorizers.

[td colspn=5 align=center]Typical recipe, % by wt. in:<td colspan='3' align='center'>Powders<td colspan='3' align='center'>Creams<td colspan='3' align='center'> Liquids[td align=left]Ingredient30

1

2

3

1

2

3

1

2

3

Alcohol

-

-

-

-

-

-

50

-

-

Boric acid

-

40

10

10

15

03

-

-

Colloodial clay

-

-

-

04

-

-

-

-

-

Glycerol

-

-

-

16

-

-

15

-

-

Hydroxyquinoline sulfate

-

10

-

-

-

-

-

02

-

Petrolatum

-

-

-

-

65

62

-

-

-

Salicylic acid

-

-

02

-

-

03

04

-

-

Talc

38

90

48

08

-

-

-

-

-

Water

-

-

-

40

25

15

28

98

95

Zinc peroxide

32

-

-

-

-

-

-

-

-

Zinc phenolsulfonate

-

-

-

02

-

05

-

-

05

Zinc stearate

-

-

10

20

-

-

-

-

-

Total

100

100

100

100

100

100

100

100

100

Antiperspiratns are strong astringents that are believed to coagulate and precipitate proteins in the skin at the site of application; the sweat is thus deflected to other regions. Products that thus "affect a function of the body" are considered drugs rather than cosmetics, and all active ingredients must be listed on the label. Antiperspirants are usually prepared as liquids, creams, and paste in sticks. The active ingredients of first choice are salts of aluminum and zinc, of which many organic and inorganic salts are available; those most commonly used are the chloride, sulfate, chlorohydroxide complex, and acetate of aluminum (also potassium alum), and the chloride, sulfate, and phenolsulfonate of zinc. Other ingredients are formalin, hexamethylenetetramine, tannic acid and tannin, and hydroxyquinoline sulfate.

The compounding of these products calls for considerable care to keep within limits of solubility of the salts, but especially to avoid irritation of the skin and damage to clothing. The liquid preparations have most commonly been the more serious offenders on the last point.

The simplest antiperspirant is a 16-20% solution of aluminum chloride in distilled water; this may be modified by adding alum, hydroxyquinoline sulfate, glycerol, and other organic compounds. As a base for the creams, the vanishing type seems to be the most generally satisfactory, using glycerol monostearate as the principal ingredient. A few typical recipes are given in Table VII.

Table VII. Compositions of Antiperspirants.

[td align="center"]Typical recipe, % by wt. in:<td colspan='2' align='center'>Liquid<td colspan='3' align='center'>Cream<td colspan='2' align='center'>Stick

Ingredient

1

2

1

2

3

1

2

Alcohol

-

6

-

10

-

-

-

Alum

8

22

-

-

10

5

-

Aluminum chloride

10

10

-

5

-

-

-

Beeswax

-

-

-

-

-

25

-

Boric acid

10

-

-

-

-

-

-

Formalin

-

-

-

1

-

-

-

Glycerol monostearate

-

-

25

15

25

-

20

Glycerol

-

-

-

-

-

-

10

Hexamethylenetetramine

-

-

-

-

-

-

-

3

Lanolin

-

-

-

-

-

6

-

Hydroxyquinoline sulfate

-

22

2

3

-

2

-

Petrolatium

-

-

8

4

-

30

-

Mineral oil

-

-

-

-

-

10

-

Titanium dioxide

-

-

4

-

2

2

-

Talc

-

-

-

-

-

15

-

Water

72

80

61

62

58

-

67

Zinc phenolsulfonate

-

-

-

-

5

5

-

Total

100

100

100

100

100

100

100

Manufacture of Deodorants. A few points should be observed in the making of various deodorants. Perfumes should be selected with care in order to avoid any that may be incompatible with the ingredients of the products, or that may be irritating. Hydroxyquinoline sulfate is readily contaminated and discolored by contact with iron or other metals; therefore, if it is not handled properly it may impart color to the finished product after it has stood for some time.

Deodorizers and antiperspirants are packaged in many ways: the powders, in carton, plastic, or metal containers with a sifter top; the liquids (1) in small bottles with a glass or plastic applicator and a small rubber sponge, (2) on saturated pads, packed closely in air-tight jars, and (3) most recently in flexible plastic bottles, which can be squeezed to spray the fluid through an atomizer. The creams must be in jars of convenient size with good closures; sticks are mounted in holders of wood, plastic, or coated metal.

Definitions : A sunscreen sunburn preventive agent is an active ingredient that absorbs 95% or more of light in the uv range of 290-320 nm. A sunscreen suntanning agent is an active ingredient that absorbs up to 85% of light in the uv range of 290-320 nm but transmits light at wavelengths longer than 320 nm. A sunscreen opaque sunblock agent is an opaque agent that reflects or scatters light in the uv and visible range at wavelengths of 290-777 nm.

Recommendations

The panel recommended the product designations based on SPF factors in Table VIII.

Table VIII. Sunscreen Product Designations Bases on SPF Factors

Skin type	Sunburn and tanning history	Recommended SPF factor product category designation
1	burns easily, never tans	8 or more (max)
2	burns easily, minimal tan	6-7 (extra)
3	bunrs moderately, normal tan	4-5 (moderate)
4	burns minimally, tans well	23 (min)
5	burns rarely, tans profusely	2 (min)
6	never burns, deep pigment	none indicated

Sunscreens

The sun emits energy in a continuous band throughout the electomagnetic spectrum. The shorter wavelengths are absorbed in the upper atmosphere so that at sea level the radiation extends from a cutoff near 290 nm through the near ultraviolet to the conventional end of the ultraviolet range, which is near 400 nm. The intensity of the radiation varies nonlinearly throughout this range.

The production of erythema and the subsequent production of melanin pigment are both maximum with 296.7 nm radiation. As the wavelength increases, both responses fall rapidly, so that 10 Âμ W/cm2 of 307 nm radiation, 100 Âμ W/cm2 of 314 nm. 1000 Âμ W of 330 nm, and 10,000 ÂμW of 340 nm radiation are required to equal the effect of 1 Âμ W/cm2 of 296.7 nm radiation in the production of erythema.

A unit of erythemal flux, the E-viton, is equivalent to the erythema induced by 10 Âμ W/cm2 of 296.7 nm radiation. The response of the skin to an E-viton (or viton) is constant: irradiation by 10 vitons for one hour produces the same erythemal response as 5 vitons for two hours. The effects owing to irradiation by different wavelengths are additive. About twenty minutes exposure to midsummer sunlight (or 40 viton min) ae needed to produce a minimum perceptible erythema (MPE) on normal Caucasian skin. Thus 1 E-viton acting for 40 min produces an MPE. 10 E-vitons acting 4 min or 40 E-vitons acting for 1 min will produce the same MPE.

With the realization that prolonged exposure to sunlight produces most of the ageing effects on skin and the clear implication of exposure in at least three types of skin cancer (basal cell cancer, squamous cell cancer, melanoma), use of products that protect the skin from excessive exposure has become increasingly widespread.

Sunscreens are of two types: physical and chemical. Physical screening agents, such as titanium dioxide and zinc oxide, are opaque materials that block and scatter light, and thus act as mechanical barriers. Their action is nonselective over all wavelengths. Chemical screening agents, which act by absorbing uv light, offer selective protection against certain uv wave bands, depending on their absorption spectrum. Anthranilates, cinnamates, benzyl and homomenthyl salicylate, and p-aminobenzoic acid (PABA) and its ester derivatives belong in this category and have maximal absorption in the sunburn region. A useful sunscreen resists wash-off from swimming or sweating and does not come off during exercise or rubbing. Maintenance of significant protection following swimming or sweating would suggest that the chemical is substantive or can diffuse into the horny skin layer. PABA and its esters are moderately substantive and give appreciable protection after intensive sweating and brief periods of immersion in water (5 to 10 min).

Sunscreen products for over-the-counter (OTC) human use are reviewed in a report on recommendations to the FDA by the OTC panel on Topical Analgesics. Definitions and recommendations made by the panel are reviewed below.

Sun Protection Factor (SPF)

The panel defined the ratio of the amount of energy required to produce a minimum erythemal dose (MED) to the amount of energy to produce the same MED without any treatment by the SPF. Examples given are: SPF to immersion. This probably reflects the time required for penetration into the stratum corneum. It is highly important, especially during the first few days of exposure to the sun, to reapply PABA-type sunscreens after swimming. With repeated daily applications increased protection.

Sunscreens with much greater resistance to swimming can be formulated with acrylate polymers, which leave flexible films on the surface. A chemical sunscreen incorporated in the formulation will tend to be bound in the film and remain in place despite sweating and bathing.

Table X lists some effective physical and chemical sunscreens; information on various sunscreens is included in patents (17-18).

Natural oils (in order of effectiveness)

1.Mink oil
2.Sfflower oil
3.Avocado oil
4.Peanut oil
5.Sweet almond oil
6.Jojoba oil
7.Sesame oil
8.Coconut oil
9.Persic oil
10.Olive oil

Clear Sunscreen Lotion: 74.50 wt % poly (alkylene glycol) (Ucon LB-625, Union Carbide); 20.00 wt % alcohol denatured no. 40; 5.00 wt % PABA (sunscreen); and 0.50 wt % perfume.

Opaque Sunscreen Lotion: 67.60 wt % distilled or deionized water; 10.00 wt % sesame oil (preserved, contains antioxidant); 10.00 wt % mineral oil (Saybolt viscosity at 37.8oC is 65/75); 5.00 wt % PABA (sunscreen); 3.00 wt % stearic acid, triple pressed; 2.90 wt % propylene glycol; 0.50 wt % cetyl alcohol; 0.50 wt % triethanolamine, 98 wt % solution; 0.25 wt % preservative [methyl and propyl paraben (5:1)]; and 0.25 wt % perfume.

Because of the extent of sunscreen application to skin, any perfume used must be chosen with attention to its potential to irritate. Careful testing of its stability to heat and sunlight are also required.

Project Profiles

HAIR OIL

Cost Calculation

1. Rated Planted 1000 Litres Hair Oil/day
   5000 Nos. Bottles of 100 ml. Capacity
   1000 Nos. Bottles of 150 ml. Capacity
   500 Nos. Bottles of 500 ml. Capacity
2. Land Building Rs. 9,25,000
3. Plant and Machinery Required Rs. 4,25,000
4. Other Fixed Expenses Rs. 3,25,000
5. Fixed Capital Required Rs. 16,75,000

6. Raw Material/Month Rs. 22,45,450
7. Salary Wages/Month
(i) Salary Wages Rs. 70,000
(ii) Overheads Utility Rs. 1,20,000
8. Working Capital Required Rs. 24,15,450
9. Total Capital Required Rs. 89,21,350
10. Production Cost/Annum Rs. 3,07,46,368
11. Turnover/Annum Rs. 3,45,00,000
12. Profit/Annum Rs. 37,53,632
13. Fixed Cost/Annum Rs. 26,72,968
14. B.E.P. 41.5%

BATH AND MASSAGE OIL

Cost Calculation

1.Rated Plant: 200 kg bath oil/massage oil/day of 100 ml bottles
Working Hours/day-8
Working days/annum-300
Working days/month-25
2. Land and Building Required Rs. 4,20,000
3. Plant and Machinery Required Rs. 2,15,000
4. Other Fixed Expenditure Rs. 2,45,000
5. Fixed Capital Required Rs. 8,80,000
6. Raw Material Required/Month Rs. 10,02,400
7. Salary Wages/Month Rs. 29,500
8. Overheads and Utility/Month Rs. 1,75,000
9. Working Capital Required/Month Rs. 12,06,900
10. Total Capital Required Rs. 45,00,700
11. Production Cost/Annum Rs. 1,53,80,476
12. Turnover/Annum Rs. 1,80,00,000
13. Profit/Annum Rs. 26,19,524
14. Fixed Cost/Annum Rs. 18,76,276
15. B.E.P. 41.73%

NEEM OIL

Cost Calculation

1. Rated Plant: 500 kg. Neem oil/day
Working hours 16 hours/day
Working day/annum 300
Working days/month 25
2. Land and Building Required Rs. 9,25,000
3. Plant and Machinery Required Rs. 9,10,000
4. Other Fixed Expenditure Rs. 4,55,000
5. Fixed Capital Required Rs. 22,90,000
6. Raw Material Required/Month Rs. 7,08,000
7. Salary Wages/Month Rs. 57,000
8. Overheads and Utility/Month Rs. 1,60,000
9. Working Capital Required/Month Rs. 9,25,000

10. Total Capital Required Rs. 50,65,000
11. Production Cost/Annum Rs. 1,22,93,075
12. Tournover/Annum Rs. 1,32,00,000
13. Profit/Annum Rs. 9,06,925
14. Fixed Cost/Annum Rs. 22,34,675
15. B.E.P. 71.13%

VICKS LIKE COMPOUNDS

Cost Calculation

1. Rated Plant: 200 kgs Vicks like Compound/day
   Working hours/day 8
   Working days/month 25
   Working days/annum 300
2. Land and Buidling Required Rs. 3,00,000
3. Plant and Machinery Required Rs. 8,00,000
4. Other Fixed Expenditure Rs. 5,00,000
5. Fixed Capital Required Rs. 25,00,000
6. Raw Material Required/Month Rs. 11,94,750
7. Salary Wages/Month Rs. 70,000
8. Overheads and Utility/Month Rs. 5,00,000
9. Working Capital Required/Month Rs. 17,64,750
10. Total Capital Required Rs. 77,94,250
11. Production Cost/Annum Rs. 2,27,92,465
12. Turnover/Annum Rs. 2,55,00,000
13. Profit/Annum Rs. 27,07,535
14. Fixed Cost/Annum Rs. 43,51,465
15. B.E.P. 61.64%

SUNCARE/SKIN LIGHTENING COMPOUNDS

Cost Calculation

1. Rated Plant: 100 kg. Sun Care Ointment/day
   Working Hours/day 8
   Working days/annum 300
   Working days/month 25
2. Land and Building Required Rs. 4,50,000
3. Plant and Machinery Required Rs. 2,50,000
4. Other Fixed Expenditure Rs. 2.70.000
5. Fixed Capital Required Rs. 9,70,000
6. Raw Material Required/Month Rs. 1,38,672
7. Salary Wages/Month Rs. 38,500
8. Overheads and Utility/Month Rs. 1,02,500
9. Working Capital Required/Month Rs. 18,09,016
10. Total Capital Required Rs. 18,09,016
11. Production Cost/Annum Rs. 37,76,937
12. Turnover/Annum Rs. 45,00,000
13. Profit/Annum Rs. 7,23,063
14. Fixed Cost/Annum Rs. 10,97,673

15. B.E.P. 60.28%

EYE DROPS

Cost Calculation

1. Rates Plant: 6000 numbers of drops, 15 ml capacity containers/day
   Working Hours/day 8
   Working days/annum 300
2. Land and Building Required Rs. 7,20,000
3. Plant and Machinery Required Rs. 12,00,000
4. Other Fixed Expenditure Rs. 5,80,000
5. Fixed Capital Required Rs. 25,00,000
6. Raw Material Required/Month Rs. 4,00,000
7. Salary Wages/Month Rs. 60,000
8. Overheads and Utility/Month Rs. 1,50,000
9. Working Capital Required/Month Rs. 6,10,000
10. Total Capital Required Rs. 43,30,000
11. Production Cost/Annum Rs. 84,44,500
12. Tournover/Annum Rs. 12,00,00,000
13. Profit/Annum Rs. 38,55,500
14. Fixed Cost/Annum Rs. 21,32,500
15. B.E.P. 37.49%

HERBAL LIVER TONIC

Cost Calculation

1. Rated Plant: 10,000 Bottles of 100 ml. Tonic/day
   Working days/month 25
   Working days/annum 300
   Working hours/day 8
2. Land and Building Required Rs. 8,00,000
3. Plant and Machinery Required Rs. 12,00,000
4. Other Fixed Expenditure Rs. 3,55,000
5. Fixed Capital Required Rs. 23,55,000
6. Raw Material Required/Month Rs. 3,85,000
7. Salary Wages/Month Rs. 35,500
8. Overheads and Utility/Month Rs. 7,89,000
9. Working Capital Required/Month Rs. 12,09,500
10. Total Capital Required Rs. 59,83,500
11. Production Cost/Annum Rs. 1,59,31,780
12. Turnover/Annum Rs. 3,00,00,000
13. Profit/Annum Rs. 1,40,68,220
14. Fixed Cost/Annum Rs. 47,11,200
15. B.E.P. 25.09%

LAL TOOTH POWDER

Cost Calculation

1. Rated Plant: 2 Tons Tooth Powder/day of which 50 gm pack of 1 Ton
   100 gm pack of 500 kg.
   200 gm pack of 500 kg.

2. Land and Building Required Rs. 17,75,000
3. Plant and Machinery Required Rs. 11,10,000
4. Other Fixed Expenditure Rs. 7,40,000
5. Fixed Capital Required Rs. 36,25,000
6. Raw Material Required/Month Rs. 14,19,250
7. Salary Wages/Month Rs. 69,000
8. Overheads and Utility/Month Rs. 5,32,000
9. Working Capital Required/Month Rs. 20,20,250
10. Total Capital Required Rs. 96,85,750
11. Production Cost/Annum Rs. 2,63,56,810
12. Turnover/Annum Rs. 3,60,00,000
13. Profit/Annum Rs. 96,46,190
14. Fixed Cost/Annum Rs. 49,98,610
15. B.E.P. 34.13%

SHAMPOO

Cost Calculation

1. Rated Plant: 500 Litres/day
   Working Hours/day 8
   Working days/month 25
   Working days/annum 300
2. Land and Building Required Rs. 9,25,000
3. Plant and Machinery Required Rs. 7,40,00
4. Other Fixed Expenditure Rs. 5,25,000
5. Fixed Capital Required Rs. 21,90,000
6. Raw Material Required/Month Rs. 9,00,000
7. Salary Wages/Month Rs. 3,30,000
8. Overheads and Utility/Month Rs. 3,30,000
9. Working Capital Required/Month Rs. 12,89,000
10. Total Capital Required Rs. 60,57,000
11. Production Cost/Annum Rs. 1,67,97,135
12. Turnover/Annum Rs. 1,87,50,000
13. Profit/Annum Rs. 19,52,865
14. Fixed Cost/Annum Rs. 31,94,335
15. B.E.P. 62.05%

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