

SYMPOSIUM: FATS AND OILS IN COSMETICS AND PHARMACEUTICALS

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The Role of Fats and Oils in Pharmaceuticals¹

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ABSTRACT

The role of fats and oils in pharmaceuticals continues to change. One measure of this change is given by an examination of various national compendia which highlight changes within our own country over the years. These changes are compared with those taking place elsewhere. Attention is also given to the categories of pharmaceutical products utilizing fats and oils.

The role of fats and oils in pharmaceuticals reached a zenith of sorts in ancient Egypt, in the prescription given in the Ebers papyrus for a baldness remedy consisting of the fat of a lion, hippopotamus, crocodile, cat, serpent and ibex. Since that time the pharmaceutical industry has used an ever decreasing variety of less exotic fats and oils.

On the other hand, although it is difficult to assess the volume of sales for pharmaceutical uses of any or all fats and oils, it appears rather safe to say that this volume has increased substantially along with the increases in population and living standards. While the present paper is limited to the basic fats and oils, it is fair to state that the

role of fats and oils in modern pharmaceuticals is to a large degree the role of fat derivatives.

In the U.S. in the ethical drug field there are two primary compendia, the United States Pharmacopeia (USP) and the National Formulary (NF). All the products listed in these compendia are recognized legally as drugs. Since these compendia are revised periodically, an examination of successive editions permits one to observe trends in the use of pharmaceutical substances.

The scope of this present review is confined to the past 35 years and will deal with the compendial drugs official in 1936 and in 1971, with some observations on interim changes.

In 1936 there were 23 monographs on fats, oils or preparations containing fats or oils in the Eleventh Revision of the USP. The sixth edition of the National Formulary had 19 such monographs. The grand total was 42 monographs. Contrast this to the present situation: eight USP XVIII monographs and six NF XIII monographs for a grand total of 14 compendial monographs in 1971.

It came as a shock to me to realize that there is only one, currently listed, official fat—theobroma oil. This fat is better known to the public and to most in the health professions as cocoa butter. It is useful as a base for suppositories, as an emollient and as a lubricant in massage.

Back in 1936 official solid fats were more in evidence. Lard was used as such, or in a modified form as benzoated lard, as a vehicle for ointments. The cost was right, but the problems were stability and pharmaceutical elegance. To provide stiffer ointment vehicles for warmer seasons or climates, cerates of various formulations were prepared. The simplest of these, known simply as cerate, utilized 70% benzoated lard along with 30% white wax. Another formulation was rosin cerate with 50% lard, while compound rosin cerate contained 30% prepared suet, 13% linseed oil and no lard in any form. Some of the cerates of 1936 were medicated; cantharides cerate contained 20% of benzoated lard while cerate of lead subacetate forecast the shift in formulation that was to come by containing no true fat or oil (but having 20% of wool fat), and replacing

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lard with white petrolatum.

Prepared suet or mutton suet, as we have just noted, was also official in 1936 for use in various ointment bases. It found less official use in the form of tallow sticks for use on chapped skin as well as in the ubiquitous tallow candles which were still a drug store staple of that period.

In today's compendia in addition to theobroma oil, we find these oils: castor, corn, cottonseed, olive, peanut, sesame, linseed, expressed almond, cod liver in both destearinated and nondestearinated forms and persic oil, as well as vitamin A of the USP and oleovitamin A and D of the NF.

Three of today's oils were admitted to USP XI, official between 1936 and 1942, by means of supplemental revisions. These were persic oil, oleovitamin A and D, and oleovitamin A; the name of the latter preparation was changed to Vitamin A in 1964. Peanut oil made its compendial debut in 1947. The other nine oils and the one fat which are official today enjoyed the same status in 1936.

What, then, were the other fats, oils or their preparations which were official in 1936 but are so no longer?

There were four emulsions of cod liver oil in 1936. There was the plain emulsion as well as those fortified with hypophosphites, malt or egg. Oddly enough a related product, halibut liver oil, was not official either in 1936 or in 1971, having enjoyed this status only from 1942-1965.

Olive oil was found in a variety of preparations. On one end of the formulation scale there was 3% olive oil in paraffin dressing, 5% in ointment of scarlet red and 33% in plaster of lead oleate. On the other end there was 95% olive oil in phenolated oil.

Our pharmaceutical archives reveal that phosphorylated oil contained 50% expressed almond oil and that ammonia liniment contained 74% sesame oil.

There were three purgative oils official in 1936. These were castor oil, aromatic castor oil and croton oil. It took 30% of other ingredients to make castor oil aromatic, but apparently this was another case where good taste lost out. The remaining potent and drastic purgative oil, croton oil, with its effective dose of one drop was apparently too difficult to handle.

The compendia in 1936 also provided specifications for bland vegetable oils that were used as solvents in official ampoules of camphor, or bismuth and potassium tartrate, or of bismuth subsalicylate. These bland oils were also used for the preparation of such other official preparations as solution of irradiated ergosterol or iodized oil.

There was 34% cottonseed oil in compound ointment of tar and 80% in camphor liniment. Linseed oil was found in such diverse products as compound rosin cerate (13%), soft paste of zinc oxide (25%), saponated solution of cresol (35%) and soft soap (40%).

Castor oil, because of its ability to dissolve in alcohol, could be added to the extent of 3% to collodion, where it helped to make the collodion film more flexible, hence leading to the improved official preparation, flexible collodion.

Interestingly enough, among the official oils of 1936 we find chaulmoogra oil—a product associated with the treatment of leprosy. While leprosy is undoubtedly a disease about which most people are poorly informed, there seems to be good agreement at the present time that chaulmoogra oil is not very useful in the treatment of leprosy.

While theobroma oil has been with us throughout the period under survey, syrup of prepared cacao which utilized 1% theobroma oil is no longer official. One might observe parenthetically that in the U.S. the manufacture and nonpharmaceutical use of chocolate syrup has not suffered from this loss of formal drug status.

Now the foregoing review of various official oils and fats does not provide a total picture of the use of these products

in ethical pharmaceuticals in 1936 and 1971, but it does have the merit of providing a useful close approximation. The United States Pharmacopoeia has always selected its products on the basis of therapeutic merit, while until 1965 the National Formulary selected its products on the basis of extent of use; so the compendia did reflect the market quite well up to 1965. Since the National Formulary has implemented the same criteria for admission as the USP, we are no longer able to draw as good conclusions, particularly with respect to extent of use, as was once possible.

To fill out our survey of ethical pharmaceuticals we can take a brief look at the fats and oils included in the Second Edition of *The International Pharmacopoeia* published by the World Health Organization in 1967. This compendium lists peanut oil, chaulmoogra oil, cod liver oil, halibut liver oil, castor oil and sesame oil. The Latin Pharmacopoeial titles, as behooves an international compendium, are *arachis* (peanut), *hydnocarpus* (chaulmoogra), *jecoris aselli* (cod liver), *jecoris hippoglossi* (halibut liver), *ricini* (castor) and *sesame* for sesame.

There is a new entry among pharmacopoeias of the world and this is the European Pharmacopoeia. Intended to replace the national pharmacopoeias of essentially the common market countries, this is a reference compilation of considerable future importance. In contrast to the International Pharmacopoeia, a compilation of standards available for national adoption, the European Pharmacopoeia will provide mandatory standards for the participating sponsors. The first volume of the European Pharmacopoeia was published in 1969 and contains only a relatively small number of monographs but none on fats or oils. While many pharmaceutical substances and preparations will be included in the European Pharmacopoeia, this first volume contains only those monographs which were available in completed format at the time of publication. Therefore the absence of fats and oils from this volume is not a value judgment, but is nevertheless to some degree indicative of the continuing trend away from basic oils and fats in pharmaceutical preparations.

If pharmacopoeias indicate the trend, this is further underlined by subsidiary publications. Cutting's *Handbook of Pharmacology* barely mentions several fats and oils. Somewhat more space is devoted to fats and oils in Remington's *Pharmaceutical Sciences*, 14th Edition (1970), an encyclopedic publication; yet, in contrast to the size of the reference text, the space allotted is very limited.

The *AMA Drug Evaluations of 1971* touches on the use of some oleaginous bases and vegetable oils present in various commercially available creams and lotions. This reference indicates that these oils are generally well tolerated on both normal and chronically diseased skin, but are not to be used on weeping dermatoses. It also observes that they are similar in physical effect on the skin and differ in odor, emulsification characteristics and propensity to turn rancid.

Abbott's "Covicone Cream," a protective cream which contains castor oil, is cited. This publication also indicates that bath oils are helpful in the treatment of dry skin as well as in pruritic and eczematous dermatoses. The described bath oils have either a combined vegetable oil base ("Geri-bath, Dermik) or a cottonseed oil base ("Lubath," Texas). *AMA Drug Evaluations* mentions only one commercial preparation ("Lipomul Oral") containing fat intended for internal use for the sake of its fat content. "Lipomul" is an emulsion containing 67% corn oil and is used as a high calorie dietary supplement in underweight and malnourished individuals during prolonged convalescence and chronic illness, as well as postoperatively to furnish calories and to spare dietary protein for body protein deposition.

As we all know, not every pharmaceutical product ends up in the pharmacopoeia. Many products are commercially available for many years before being considered for

compensial admission or after deletion therefrom. During the past 11 years I have been associated on the national and international levels with the selection of nonproprietary names for new pharmaceutical substances. About 2000 new compounds have been named in these 11 years, but not one of them, to the best of my recollection, was a fat or fatty oil.

The above survey does not take into consideration the extent of use of fats and oils in proprietary pharmaceutical preparations. Here I will spare you a review of the state of affairs in years past, since there is a rather large vacuum as far as this kind of information is concerned.

Due to the diligence of George Griffenhagen, editor of the *Journal of the American Pharmaceutical Association*, we do have some available information about the composition of many of today's over-the-counter (O-T-C) preparations. This information is not complete, but this is not due to lack of effort on the part of the many authors who cooperated in the preparation of articles on various classes of these O-T-C preparations. Enough information is at hand to enable us to draw a general conclusion that the use of fats and oils in these products is rather slight.

The American Pharmaceutical Association (APhA) publication on O-T-C products has data on a thousand or more O-T-C products. Of these, four diaper rash ointments contain cod liver oil (but topical vitamin oil is no better than any other emollient oil), five preparations containing castor oil are used as wart or corn removers, and there is a mention of the use of cottonseed oil in bath oils.

The APhA publication lists two burn remedies which contain cod liver oil and a half-dozen or so hemorrhoidal products which contain a variety of ingredients including theobroma oil, cod liver oil, shark liver oil, castor oil and soybean oil. Emollient eczema and psoriasis preparations, again about six in number, contain sulfated vegetable oils, polyunsaturated vegetable oils, olive oil, castor oil and coconut oil. One antiseborrheic preparation contains a token amount of castor oil; more significant amounts of castor oil are found in the two proprietary laxative preparations listed in this O-T-C publication.

Vegetable oils are mentioned as useful in enemas as lubricants, as well as to soften hardened fecal matter and to facilitate its passage. However no commercial enema preparation containing an oil or fat is listed. One listed enema does contain soft soap, and glycerin suppositories do contain sodium stearate.

There are some fats or oils in such reducing preparations as "Ayds," "Carnation Slender" and "Metrecal." While this may appear a bit surprising, these preparations are used to

reduce appetites while providing nutritional requirements. On the other hand it is well established, despite some publicity in recent years given to safflower oil as a reducing aid, that calories do count and that the intake of fats must be restricted in any reducing program.

Add to the above uses that of polyunsaturated vegetable oil in "Oilatum" soap and cream and undoubtedly a few other preparations not covered by the *Handbook of Non-Prescription Drugs* or my own investigation and even then the verdict—already stated—appears inescapable.

We are all aware that fats and fatty oils were among the earliest pharmaceutical products. This of course derives from their widespread distribution and availability in nature, as well as from their properties which accounted for their early use in emollients, lubricants and liniments. It is to be acknowledged that many fats and oils, such as goose grease, tallow, butter, lard and olive oil, among others, procured outside the usual pharmaceutical channels, have been used and continue to be used for medicinal purposes by the consumer as emollients, liniments, enemas, laxatives and in other applications.

In modern medicine fats and oils still serve as pharmaceutical vehicles. We have noted their use in various ointments and creams. Another important use is as a nonaqueous vehicle for intramuscular injections. Here the oils are used to suspend water-soluble substances when it is desired to decrease the rate of absorption and hence prolong the duration of action of these medicaments; they are also used to dilute oil-soluble substances. Oils for injection must be liquid at room temperature, be relatively stable and be capable of being metabolized. They must also be safe in the volume used and of course should not affect the therapeutic efficacy of the medicament. Only vegetable oils meet these requirements. The USP provides additional standards and tests that oils to be used as solvents for injections must meet in order to minimize tissue irritation and to detect adulteration.

Another use for fats is an adjunct to medications. One such use is in the administration of griseofulvin, a fungistatic antibiotic, that is effective by oral administration against superficial infections caused by some common dermatophytes. Some patients absorb griseofulvin poorly and as a result attain lower blood levels of the drug as well as less satisfactory clinical results. It has been demonstrated that higher blood concentrations of griseofulvin may be obtained if a meal high in fat content is eaten prior to use of the drug.

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