

Cod-Liver Oil Emulsions.*

By PROFESSOR GAY (Montpellier University).

Cod-liver oil emulsions, the use of which has become general, have their origin in the old form of emulsive syrups with a cod-liver oil basin, but the objection which caused the latter to fall into disuse is avoided. These syrups, although satisfactorily disguising the taste and smell, only contained about 8.5 per cent. of oil. Emulsions as now prepared are intended to disguise the appearance, taste, and smell of the oil, and to contain, as a rule, 50 per cent. of the active ingredients; they also serve for administering such remedies as phosphates, hypophosphites, arseniates, creosote, eucalyptol, etc., when their association with cod-liver oil is desired. Numerous processes have been proposed for the preparation of cod-liver oil emulsion. The main object of this paper is to discover a formula which can be used extemporaneously, and, in addition, fulfil other necessary conditions. We will first discuss the conditions which should be fulfilled by a formula for an emulsion, as we now understand it.

(1) *Simplicity, no Special Form of Apparatus being Needed.*—All commercial formulae have their good points. It has been shown that a prolonged and energetic pounding—which is ensured by using mechanical beaters, or Merier's beater with its three-jointed pestles—ensures the stability of the emulsion by favoring the perfect division of the fatty body, but a pharmacist's working formula should only require the use of a mortar.

(2) *Use of the Usual and Unobjectionable Emulsifying Agents.*—The most popular agents can be grouped as follows:

(a) USUAL EMULSIFYING AGENTS.

Gum Acacia.

Gum Tragacanth.—Acacia emulsions are more stable if tragacanth is used as well.

Gum and Starch.—The combination is useless.

Glycerin.

Glycerin and Gum.

Geatin (white gelatin or Irish moss).

Yolk of Egg.

Condensed Milk.

Saponin.

(b) DIGESTIVE FERMENTS OR THEIR PRODUCTS.

Malt Extract.—The preparation of the U.S. Pharmacopœia should not be used, as it is only the dextrin and maltose contained in this extract which are of service, the diastase being no use at all.

Pancreatin.

Peptone.

(c) ALKALINE SUBSTANCES.

Sodium Carbonate.

Lime Water.

Glycerin and Lime (prescribed by many practitioners).

Saccharated Lime.

*Translated from the *Repertoire de Pharmacie*.

With regard to the above emulsifying agents, the use of saponin or quillaia does not seem free from danger; malt extract, condensed milk, and other agents are not generally used, whilst alkaline substances answer in special cases. I prefer to use gums.

(3) *Stability of the Emulsion.*—Absolute stability is impossible; even the best makes require to be shaken before taking; still, separation should be slow, and brisk agitation should cause perfect re-emulsification. This result is easily arrived at by means of gums.

(4) *Greater Strength.*—Fifty per cent. is the usual standard. This leaves a sufficient margin for alteration in the emulsifying agent, and, if necessary, in the other remedies.

(5) *Suitable Correctives.*—Although it is difficult to disguise the odor, the taste is more easily masked, but the acrid sensation in the throat is seldom entirely suppressed. Two classes of correctives are used:

(a) SWEETENING CORRECTIVES.

Sugar, glycerin, and various syrups have often been combined with the oil with good results. Stout has recommended ammoniated liquorice, using 50 to 60 grammes to each litre of oil. Saccharin may, perhaps, be looked upon as the most powerful corrective. Its intense sweetness overcomes the taste of the oil. The proportion used varies from 0.05 to 0.2 grammes per litre. M. Eisenhitz has proposed to dissolve it in its own weight of acetic ether previous to introducing it into the oil. But as the question arises whether it is advisable to give saccharin in long-repeated doses, especially to children or to invalids whose digestive organs are weak, it is, perhaps, better to confine ourselves to sugar and liquorice.

(b) AROMATIC CORRECTIVES.

The combination of various essences with the oil is a well-known plan. Bitter almond, citron, neroli, eucalyptus, mint, canella wintergreen, aniseed, sassafras, vanilla, and roasted coffee are looked upon as the most efficacious, whether used alone or variously combined. The use of a perfumed spirit is, in my opinion, still more efficacious, cognac, rum, and kirsch can be recommended. Robinson has proposed using a ten per cent. solution of chloroform in alcohol in the proportion of 4 grammes to 30 of oil, whilst Foster recommends 10 drops of ether to each tablespoonful of oil. Care should be taken not to use essences exclusively, as they are apt to fatigue the stomach.

(6) *Sufficiently Lengthy Preservation.*—To guarantee indefinite keeping properties, as manufacturers are in the habit of doing, is useless, as such a condition of things can only be arrived at by the excessive addition of preservatives, such as glycerin, spirits, and essences. The use of glycerin is recommended by many authors and specialists in the quadruple capacity of emulsifying agent, by reasons of its

viscosity, and of sweetening, preservative, and analeptic agent. The last effect does not seem certain, seeing that the nutrient properties of glycerin have been disputed. With regard to its emulsifying power, is not its viscosity balanced by its high density? I prefer to exclude it from a general formula. It will suffice for our purpose, since the preparation is made extemporaneously, if its keeping qualities can be guaranteed for the time necessary to use up such quantities as the pharmacist may be able to sell, say, one to two litres.

The formula which I propose fulfils the foregoing requirements satisfactorily, and the simplicity of the process in particular excels all others. Two forms of it have been worked out in response to the different tastes of patients and physicians: first, a creamy emulsion having a mixture of acacia and tragacanth as the emulsifying base, and a stable consistency which only allows of a very slight aqueous separation at the bottom, even after standing for a long time; secondly, a liquid emulsion, having a basis of acacia and liquid consistence, which soon separates into two layers, easily mixed by being shaken when taken.

A. CREAMY COD LIVER OIL EMULSION.

Cod-liver oil.....	500 grammes
Finely sifted sugar.....	190 "
Powdered gum acacia.....	5 "
Powdered gum tragacanth.....	5 "
Coffee infusion.....	200 "
Rum or kirsch.....	100 "

Mix the sugar and gums in a mortar; weigh the oil and cold coffee infusion into the bottle which will contain the emulsion, and shake until mixed. Pour into the mortar, at the same time constantly stirring, sufficient of the mixture to make a semi-liquid; weigh the spirit and add it to the mixture of oil and coffee remaining in the bottle; shake and mix with the emulsion by degrees.

B. LIQUID COD-LIVER OIL EMULSION.

The creamy emulsion can be modified so as to form the liquid emulsion by replacing the tragacanth by the same quantity of acacia. The corrective chosen in these typical formulae imparts a color of *café au lait* to the emulsions, in which the odor and especially the taste are conveniently disguised. But in this particular the formula can be modified *ad lib*. Various remedies can also be introduced.

(7) *Change of Correctives.*—First, the spirit can be omitted and the quantity of coffee infusion increased to 300 grammes; in this case the coffee no longer suffices to cover the taste of the oil, and it becomes necessary to such an essence as bitter almonds dissolved in the oil to the extent of 20 or 30 drops per kilogramme. Secondly, one of the essences previously mentioned can be substituted for the coffee itself, by dissolving previously in the cod-liver oil; the infusion of coffee is then replaced by water or an aromatic water. Thirdly, a more intense sweetness is obtained by mixing 30 grammes of glycerin with the aqueous vehicle.