Common uses of emulsifiers in food

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Add oil to water and the two liquids will never mix. At least not until an emulsifier is added. Emulsifiers are molecules with one water-loving (hydrophilic) and one oil-loving (hydrophobic) end. They make it possible for water and oil to become finely dispersed in each other, creating a stable, homogenous, smooth emulsion.

The ancient Greeks already used the emulsifying power of beeswax in cosmetic products, and egg yolk was probably the first emulsifier ever used in 'food production' back in the early 19th century. Because of the rather short-term stability of egg yolk, the manufacturers switched to lecithin derived from soybeans, which has been an important food product since the 1920's. But the most important breakthrough for emulsifiers came ten years later when certain derivatives of fatty acids (mono- and di-glycerides) were introduced. In 1936, their use was patented for ice-cream production. Nowadays, emulsifier food additives play an important role in the manufacture of food products such as margarine, mayonnaise, creamy sauces, candy, many packaged processed foods, confections and a range of bakery products.

Some common applications of emulsifiers

Bread

It is possible to make bread without emulsifiers but the result is often dry, low in volume and easily stales. As little as 0.5% emulsifier added to the dough is enough to achieve an enhanced volume, a softer crumb structure and a longer shelf-life. There are two types of emulsifiers used in bread: dough strengtheners (e.g. diacetyl tartaric acid esters (E 472e) and sodium or calcium stearoyl-2-lactylate (E 481, E 482)) and dough softeners (e.g. mono- and di-glycerides of fatty acids (E 471)). Dough-strengthening agents make the dough stronger and result in bread with an improved texture and volume. Dough-softening agents allow obtaining a softer crumb structure and increased shelf-life.

Chocolate

All chocolate products contain 0.5% of lecithin (E 322) or ammonium phosphatide (E 442). These emulsifiers are added to provide the right consistency of the chocolate, so it can be moulded into plates of chocolate, chocolate bars etc.
If the chocolate has been stored at too high temperatures, its surface may appear dull or white. This is called ‘bloom’ which makes the product less attractive to the customer. Sorbitan tristearate (E 492) can delay the development of bloom.

Ice-cream

Ice-cream is one of the most complex foods we encounter; both a foam and an emulsion it contains ice crystals and an unfrozen aqueous mix. Emulsifiers are added during the freezing process, to promote a smoother texture and ensure the ice-cream does not melt rapidly after serving. They also improve freeze-thaw stability. Mono and diglycerides of fatty acids (E 471), lecithin (E 322) and polysorbates (E 432, E 436) are commonly used in ice-cream production. All this applies to other desserts such as sorbet, milkshake, frozen mousse and frozen yogurt as well.

Margarine

Emulsifiers give margarine the required stability, texture and taste. To ensure that the water droplets are finely dispersed in the oil phase, mono and diglycerides of fatty acids (E 471) and lecithin (E 322) are widely used. Citric acid esters of mono and diglycerides

- (E 472c) prevent the margarine from splattering while polyglycerol esters
- (E 477) and lactic acid esters make up for the good quality of margarine used to bake cakes, for example.

Processed meat

Sausages dominate Europe’s processed meat industry. The main components of sausages are meat proteins, fat and water, which are bound together in a stable emulsion. Emulsifiers stabilise this emulsion and distribute the fat finely throughout the product. And in low-fat meat products, food additives are responsible for making them as pleasant as their full-fat counterparts. The food industry uses mono and diglycerides of fatty acids (E 471) and citric acid esters (E 472c) for manufacturing processed meat.

Legislation

Emulsifiers currently used in food production are either purified natural products or synthetic chemicals that have very similar structures to the natural products.

Just like any other food additive, emulsifiers are subject to stringent EU legislation governing their safety assessment, authorisation, use and labelling, Regulation (EC) No 1333/2008 of the European Parliament and of the Council of 16 December 2008 on food additives. These legislations require all added emulsifiers, as all food additives, to be declared on food packaging with either their name or E-number.

More information

1. Regulation (EC) No 1333/2008 of the European Parliament and of the Council of 16 December 2008 on food additives
2. Hasenhuettl G E & Hartel R W (eds): Food Emulsifiers and Their Applications, Culinary and Hospitality Industry Publications Services