

# All your eggs in one basket?

Egg substitutes have numerous tangible benefits and are now in common use. Hayley Brown probed in more depth

**T**o use egg or not to use egg: that is the question. Whether 'tis better in food processing to suffer the application and storage difficulties posed by using egg, or to take starch, soy or whey proteins and by using them overcome a sea of manufacturing troubles?

Probably not something that Shakespeare often pondered over, but to the modern-day manufacturer of mayonnaise, salad dressings and bakery goods, a profound question indeed.

There are benefits and drawbacks with using egg substitutes, which can vary from application to application. Sales forces of egg replacement products will say that the advantages are the health, price, storage, and spoilage benefits.

And if the armed forces wake up to the smell of scrambled egg replacement, then it must be pretty healthy, right? Alleggra, a soy based full-function egg replacement is used by the UK's Ministry of Defence. It has a higher protein content than egg, 24% less total fat, 75% less saturated fat and 19% fewer calories, according to Richard Burrell, Alleggra Foods UK sales director.

Indeed, in some applications such as scrambled egg mixtures and omelettes,

Alleggra contains sufficient soy protein to allow for product claims approved by the US Food and Drug Administration for reduced risk of coronary heart disease.

There are a vast amount of replacements on the market for a range of applications, some of which include potato starches, waxy maize starches, soy flour, soy lecithin, hydroxypropylmethylcellulose (HPMC), carrageenan and locust bean gum, milk derivatives and whey protein. Egg yolk replacements also include phospholipases (enzymes), proteins and emulsifiers.

These are often supplied as dry mixes for a variety of sweet and savoury product applications, including baked goods, dressings and sauces, as well as pastas, noodles and soups.

But why replace egg in the first place? To cut costs, obviously, but also to address safety concerns, says Steve Mott, technical services director ADM Speciality Food Ingredients: "There have been widespread concerns over the safety of egg products. With continued speculation over a shortage, government agencies and the food industry are seeking viable alternatives to poultry products, without compromising on quality."

One option is the use of soy proteins, and soy, like egg, is a rich source of iron, zinc, phosphorus and

B-vitamins, and has been linked with improving bone health and relieving symptoms of the menopause. Wheat protein isolate, when used in batter systems such as cakes and doughnuts, also helps provide a softer texture, Mott continues. "These can actually improve the flavour attributes and reduce the need for incorporation of very high levels of sugar or sweeteners."

As for the cost issue, there is no question that there has been a renewed interest in egg alternatives lately due to rapid price increases of hen's eggs, says National Starch Food Innovation. These vary from country to country and farm to farm, and whether or not they are free-range.

Price "without doubt" is the main motivation for using replacements, says the firm, which offers a number of products that allow manufacturers to reduce or replace eggs as prices reach record highs.

The ingredients group claims to do this by combining its instant starches. "There's so much that a manufacturer can do with different starch combinations," says Laurent Guerindon, product line manager, instant starches and co-texturisers. In Latin America the company is working on producing a low fat mayonnaise by replacing both egg and oil with a blend of starches.

It is developing a mayonnaise-style dressing containing 20% fat – although one frustrating drawback is that it cannot actually be labelled mayonnaise because it doesn't contain enough egg.

Higher prices of eggs also occur when there is a perceived threat to >>>



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## Egg replacement

Wheat protein isolate provides a smoother batter texture for cake-making

supply, such as the recent outbreak of avian flu in major supply areas. There is also an increased shelf-life associated with replacements and significantly fewer occurrences of spoilage when compared to egg products. So there are perceived savings in storage space, as well as ease of transport.

With the pressure on food manufacturers to reduce costs showing no signs of abating, egg reduction and replacement will continue to gather pace, according to DSM Food Specialties, which has recently developed Cakezyme, a microbial phospholipase ideal for baked goods such as cakes and muffins.

This enzyme treatment of whole egg can substantially extend the freshness of cake products and as a result the quantity of egg in the product can be reduced, while still achieving baseline freshness, claims DSM.

While certain egg replacements are 'clean' label, such as soy protein, those designed to replace egg whites can be less consumer friendly, however.

Egg white contains natural preservatives that are used inside the egg to avoid microbial attacks. To replicate these natural preservatives requires time, effort, safety studies and the addition of more difficult 'chemical-sounding' names to the product label, says Theo Verleun, DSM industry manager, food processing.

"The current economic downturn has instigated a new trend, in which consumers want to go back to nature and spend less money on developed or assembled expensive foods.

"But the synergy between various egg constituents is almost impossible to copy unless the label of the food product is large enough to add a long list of chemical compounds."

He adds: "This will not make a good impression on consumers, who prefer to see less on the label: less complex wording, fewer ingredients and more natural elements.

"Some of the naturally present functionalities in eggs can be replaced by other alternatives. Sometimes these alternatives on a per kg price can look tempting.

"However, when looking at overall

**With continued speculation over a shortage, government agencies and the food industry are seeking viable alternatives to poultry products**

food quality, taste, flavour, function and regulatory costs for the complex mixture, the natural egg products will continue to be the first choice for both consumers and food product formulators."

Developing the perfect egg replacement for its multitude of end uses is a challenge for the technical community and various options are tried and tested again and again.

Such a replacement has to be at least equal to, or even better than, a real egg, otherwise it will generally not be accepted by consumers as an alternative solution.

In certain applications it is possible to

replace egg completely, and a good example is mayonnaise, says Paulo Braga, European technical manager, food, at Univar. But the structure, texture and consistency alter somewhat, to become more like a dressing than a creamy mayonnaise: "But normally major changes in the formulation are not needed, rather only small adjustments, like the addition of water, proteins, fat or emulsifiers, he claims.

"The egg is a complex and unique food due to its rich nutritional value, texture, flavours and colour."

In some cases, however, eggs are not so easily replaced. The emulsifying properties of egg yolk are made possible by a complex mix of naturally available phospholipids and lysophospholipids which are hard to replicate and egg white functionalities, like foaming, gelling or even binding properties, are also entirely unique to the humble egg.

Tim Finnigan, head of new product development at the vegetarian meat-substitute manufacturer Quorn, says that he would "love nothing more" than to replace the egg used in the product with a substitute.

After all, one of the major attractions of a replacement is that it can penetrate niche markets and appeal to special diets, including vegan and egg-allergic consumers.

Unfortunately, he says, Quorn has to include egg because nothing binds the ingredients together in the same way. "So we have one of the most successful vegetarian products on the market, but we are completely missing the sales opportunities in the vegan market simply because we have found no suitable alternative to the egg," he adds.

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