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<th>Ready-meals with a difference</th>
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Intel data shows that the value of the frozen ready-meals market in the UK has been reduced by the effect of price promotion, while chilled ready-meals continue to be a big rival in the market place. This has caused the main players to diversify into premium and luxury range prepared meals. The developing market for food in central and Eastern Europe may also represent an opportunity for increased sales of these products.

Most ready-meals are made up of a combination of carbohydrate (eg rice, potato or pasta), protein (fish or meat), vegetables and sauce. Despite increasing awareness of the health benefits from eating fish, ready-meals containing fish are less common than those containing chicken or beef and the appearance of such fish meals on the market are a relatively recent occurrence.

**Phases of sous vide and freeze-chilling**

R&D on ready-meals has been a major focus at Ashtown Food Research Centre (AFRC) for a number of years. Much of the activity has been focused on freeze-chilling, which is a combination of freezing and chilling as the name suggests. This gives major logistical benefits for the processor as large amounts of a particular ready-meal can be produced, held in deep freeze, and then lots can be tempered and released into the chill chain as required, ie the consumer buys the meal as a chilled product.

R&D shows that freeze-chilling is a safe and suitable technology for most types of ready-meal and also for other products such as fresh fish fillets held in modified atmosphere packs (MAP).

**The trial - Lasagne formulation**

When Lasagne contained salmon sauce (half of which was salmon puree), béchamel sauce, gluten free pasta sheets and Malcolm Chinese style fried rice (60%), prepared by sous vide technology, a control sample was submitted to sensory evaluation and the results were compared with a commercial sample of conventional salmon lasagne and the results were compared with the commercial sample. Adjectives for the evening meal based on these responses an average scoring was calculated as being 91.2.

The nutraceutical targets were based on 400g of lasagne (see per 165g of Ashtown lasagne). These were: no added preservatives, no added lactose, no added sugar, added omega 3 (150mg), added dietary fibre (15mg), added glutamic acid (2g), added turmeric (15mg) and added golden yellow (2mg). The main emphasis was on nutritional balance and on the sensory properties, in that it encourages growth and proliferation of beneficial gut bacteria. It also attempts to restore gut function in young infants and the inclusion of 7g in the current study. Astaxanthin (Marinek, USA) was added from algae and was a highly available form of calcium as proven in trials relating to bone health. No inclusion level of adding per 100g portion is required, however the current level of the recommendation daily allowance for calcium.

**Béchamel sauce**

Initially, the focus was on the béchamel sauce component of the lasagne as it was used as the carrier for the nutraceuticals. Psychometric and taste panel tests were conducted to study how the sauce properties were influenced by the gluten free ingredients and by the nutraceutical inclusions. The gluten free sauce was prepared by adding mix-in a control heat source for a specified period and containing simmered milk powder (15g), pre-cooked chicken, from fish, sunflower oil and water (fish nutritional sauce c/o Wolfish, SMF wheat flour, sunflower oil and water). The gluten-free lasagne sauce was less starchy than its wheat containing counterpart as indicated by the high moisture content of the gluten free lasagne (35.9% vs 45.5% respectively). The gluten free lasagne was highly acceptable at 99.9% (n=150). The gluten-free lasagne was the same as the wheat containing lasagne and had a higher whiteness, yellowness (6.5) ratio, higher colour meter value (6.8 vs 6.6 K, 5.9% of 19.7 vs 9.3) and higher onion (9.3). A triangle test panel indicated a difference between the panelists with n=19 and it was correctly identifying the odd sample out. Due to the differences, it was suggested large by nature factors or a further investigation is the need to test the gluten-free and wheat containing sauce in a total panel.

**Effect of inclusions**

A range of nutraceuticals were added to the sauce, both individually and together (Table 1). All of the inclusions (individually) reduced the white color except the canola.
a difference

Place and competition is strong both in terms of choice and price. But in this special show that there is more than one way to add value to these products.

Salmon lasagne with nutraceuticals

Graffiti-free pasta sheets were cooked in boiling water containing a small amount of salt for 90 seconds. The lasagne was formulated as outlined above, and the cooked gluten-free pasta sheets were mixed with salmon slice in between, then was then layered with bechamel sauce containing the nutraceutical, which was then covered with mezzebiana lasagne. The finished product was then oven-baked at 195°C and closed overnight at 20°C for one day, it was then tempered at 15°C overnight and sealed for 24-48 h to a thickness of eight mm, for eight days. The tempering process was conducted at 60, 70, 80 and 90°C to a total number of partings: 10, 10, 10, 10 and 10. The internal temperature of the emulsion-free salmon lasagne and a commercial wheat-containing salmon lasagne showed a period of 5.5 h and a change of 25°C with a 3.3°C lower for the latter.

The differences were determined by measuring the internal quality than the wheat lasagne with the same process. The gluten-free emulsion was also tested by potentially danger-free tests, which were performed by the customer with the manufacturer without any alteration in the internal quality. These results are shown in the table, which contain the nutraceutical. The customer is now entering all data, as the finished product in the finished product.