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<th>Ready-meals with a difference</th>
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<td><strong>Publication date</strong></td>
<td>2008</td>
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<tr>
<td><strong>Item record/more information</strong></td>
<td><a href="http://hdl.handle.net/10197/6947">http://hdl.handle.net/10197/6947</a></td>
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Mintel 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). Trials have also been conducted on fish processed by sous vide technology which ensures a gentle and low temperature process that causes minimal damage to the product in terms of nutritive value and sensory properties. A number of fish species in gourmet sauces have been processed at AFRC by sous vide technology with good outcomes.

**Going beyond 'low fat'**

We are in the era of 'healthy choices' and ready-meal companies are responding to this with meals containing reduced salt and calories. However, companies are only just beginning to realise the potential of ready-meals as carriers of functional (healthy) ingredients and nutraceuticals. Such meals have applications in all sectors of the community but especially to the elderly who may find meal preparation difficult and who may also be lacking in trace minerals and other nutritives (eg dietary fibre).

The production of such enriched meals is likely to be a major growth area in the near future especially when the inherent health benefits of fish are superimposed, ie these items become 'doubly' attractive.

These drivers led to the current study at AFRC on the formulation, preparation and freeze-chilling of a gluten-free salmon lasagne containing nutraceuticals and also a sous vide processed ready-meal of the same formulation but with Rigati pasta instead of sheets (still gluten-free).

The gluten-free aspect was introduced as intolerance to gluten and to flour-containing products is becoming more widespread in Europe. For example, one in 60 people in Ireland is a diagnosed coeliac and it is suspected that a much higher number are undiagnosed, ie latent coeliacs.

The research was conducted in association with Irish ready-meal producer, Dawn Fresh Foods as part of the EU-funded Seafoodplus project. For further information contact Ronan Gormley at ronan.gormley@teagasc.ie

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**R&D ROUND-UP**

Ready-meals, both chilled and frozen, are well established in the international market report Marina Braida and Ronan Gormley of Ashtown Food Research Centre in Dublin

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**THE TRIAL - LASAGNE FORMULATION**

The gluten-free lasagne contained salmon sauce (60% of which was salmon paste), béchamel sauce, gluten free pasta sheets and sautéed mixed vegetables. Visual tests were conducted with 50 panelists who were asked to score a commercial sample of conventional salmon lasagne and the gluten-free version in terms of world-ness and adequacy for their evening meal. Based on these responses an average scoring was calculated as below:

- The nutraceutical targets were based on 400g of lasagne (ie 164g of salmon sauce). These were: 20g protein, 1 diet fibre (3.3g) and 150mg sodium (15mg). The total carbohydrate value was 24.7g (11.3g of which was starch).

**Béchamel sauce**

Initially, the focus was on the béchamel sauce component of the lasagne as it was used as the carrier for the nutraceuticals. Physicochemical and taste panel tests were conducted to study how the sauce properties were influenced by the gluten free ingredients and by the nutritional inclusions. The gluten free sauce was prepared by separating over a constant heat source for a specified period and contained skimmed milk powder (15%), corn starch from maize flour, sunflower oil and water (the conventional sauce contained SMP, wheat flour, sunflower oil and water).

The gluten-free herb and cheese sauce was less viscous than its wheat containing counterpart as indicated by household viscometer readings (speed 3 of 35 vs. 4950 respectively at 20°C and 22°C vs. 3497 at 20°C). The effect was more pronounced using the Malins three stage viscosity system (Malins Micro Systems, Surrey, UK) in break extension mode (sensitivity (A) 5.5 vs. 5.65 (5°C) and 5.1 vs. 4.99 (10°C)). The gluten-free sauce was slightly whiter than the wheat-containing sauce and had a higher whiteness and yellowness (5/5) ratio (tinted colour meter 0.4 at 5°C, 0.5 at 20°C). A triangle taste panel indicated a difference between the sauces with 11 out of 12 testers correctly identifying the odd sample out. The extent of the difference was considered large by some testers but much more moderate by 2/3 of these and no complaint by three. However, the difference was not significant in a preference test with eight testers preferring the gluten-free sauce and 1 tester preferring the wheat containing sauce. Both sauces exhibited sheen browning, in they thickened on standing.

**Effect of inclusions**

A range of inclusions were added to the sauce, both individually and together (Table 1). All of the inclusions (individually) enhanced the overall acceptability of the panel.
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 follows above and the cooked graffiti-free pasta (both were coated with salmon sauce) in between, this was then boiled with the sliced salmon, containing the nutraceuticals which was transferred with mattar sauce. The finished was then chilled (30C) and dried overnight at 40F.

for one day, it was then tempered at 49C overnight and dried at 250C to a thin type for eight days. The end products were conditioned at 90% RH and dried for at least 5% moisture. The products were stored in a chamber with controlled temperature and moisture. The performance of the nutraceuticals were tested against salmon lasagne and a commercial which salmon lasagne showed a preference ratio of 5/6 and a score of 2.49 versus 1.96 in favour of the latter.

The differences were established in colour and taste which contained salmon than in the salmon lasagne with the addition of the added nutraceuticals. The nutraceuticals were also tested by potential consumers in laught for the number of product that they consumed in the salmon lasagne with (which contained the nutraceuticals). The company is now adopting and developing a similar technique on the fish-free product.