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<td><strong>Publication date</strong></td>
<td>2008</td>
</tr>
<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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Ready-meals with

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

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 (e.g., 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 chains as required, i.e., 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 nutritious value and sensory properties. A number of fish species in gourmet sauces have been processed by sous vide technology with good outcomes.

**Going beyond 'low fat'**

We are in an 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 realize 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 nutrients and neuro-nutrients (e.g., dietary fiber). 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, in these items become "doubly" attractive.

Three 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, i.e., latent coeliaics.

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

** THE TRIAL - LASAGNE FORMULATION**

The gluten-free salmon lasagne (460g of which was salmon paste), bechamel sauce, gluten free pasta sheets and Surveillance meadow (e.g., leek, spinach) were all prepared as per protocol. Experienced assessors were asked to score a theoretical sample of conventional salmon lasagne and the gluten free product on tenderness and acceptability for their evening meal. Based on these responses an average scoring site was calculated as below.

The nutraceutical targets were based on 60g of lasagne (245 of which was salmon paste). These were: omega-3, 6, 9, 135mg; total polyphenols (antioxidants) 210mg; and lycopene (in tomato sauce) 9mg. A high score was assigned to each of these desirable nutritional factors.

The addition of 10g (dry weight) of three other ingredients was included as the unfolded receptor and the meal was eaten. The meal was prepared by the research team and assessed by 15 assessors for acceptability and for nutritional content as per the nutritional targets for the best sample scored by 15 assessors. The algae was a raw algae extract and the salmon paste was a conventional salmon paste.

**Béchamel sauce**

The texture of the béchamel sauce was tested on a viscometer.

**Effect of inclusions**

A range of inclusions were added to the sauce, both individually and together (Table 1). All of the inclusions (individually and together) except the protein were tested.
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

Sous-vide processed salmon pasta

Griffith's free pasta sheets were cooked in boiling water containing a small amount of salt (1% w/v). The pasta was incorporated into a sauce (salmon lasagne). The finished product was then supplied with a flavoured sauce containing the nutraceuticals. The salmon was fish stock (25°C) and sealed overnight at 10°C for 1 day. It was then tempered at 7°C overnight and tempered at 25°C to a thin type for 8 days. The flaxseed-cooked sheets were cooked at 25°C for 4 days and then tempered at 25°C overnight. The sheets then underwent a specific washing and treatment (acid and alkali) to remove any nutraceuticals. A cross section of the fish stock (salmon lasagne) was then observed at a specific level of 100 × 20 µm.

The nutraceuticals were incorporated into a sauce containing sodium caseinate (5% w/v), sodium chloride (8% w/v), and water (deionised) and was heated to 100°C. The sheets were then cooked at 100°C for 4 days and then tempered at 25°C overnight. The sheets were then observed at a specific level of 100 × 20 µm.

The finished product: salmon lasagne