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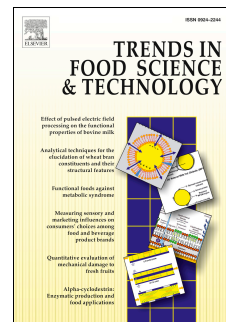
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1 A review on technological parameters and recent advances in the fortification of processed cheese

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7 **Abstract**

8 *Background*

9 Although the consumption of processed foods is growing in overseas markets, the increased
10 awareness of consumers to health and wellbeing in recent years has led to a decline in the
11 growth of processed food sales in the Western market. The added pressure on the food
12 manufacturing industry to increase the perceived healthiness of processed foods has opened up
13 new market potential in the area of fortified processed foods, such as processed cheeses.

14 *Scope and Approach*

15 This review paper provides an overview of the current methodologies into the production of a
16 processed cheese with added health benefits, including the use of probiotics and prebiotics,
17 vitamin and mineral fortification and the addition of plant macromolecules.

18 *Key Findings and Conclusions*

19 Processed cheeses with increased health benefits have been of great interest to manufacturers,
20 with reduced salt and reduced fat options commercially available. Although processed cheeses
21 fortified with vitamins, mineral, probiotics and prebiotics are not as widespread, further work in
22 these areas has been identified as a way to produce high value processed cheese products with
23 added health benefits.

24 **Keywords:** Processed Cheese, Fortification, Probiotics, Vitamins

26 **1.0 Introduction to Processed Cheese**

27
28 Cheese has been present in the human diet for many years, with recent literature suggesting
29 early cheese-making practices date as far back as 5,200 BC (Salque et al., 2013). Although the
30 high protein and calcium content of natural cheese is a proven nutritional energy source, issues
31 arising over its low stability lead to the initial production of processed cheese (PC), a natural
32 cheese derivative with higher stability and reduced need for refrigeration (Guinee, Caric, & Kalab,
33 2004). Since processed cheese was first manufactured in the early 20th century, many different
34 types of processed cheese have been manufactured around the world. In the United States,
35 processed cheese can be sub-divided into four main cheese groups depending on the relative
36 amount and type of ingredients used in its manufacture, namely pasteurized blended cheese
37 (PBC), processed cheese blocks (PCB), processed cheese foods (PCF), and processed cheese
38 spreads (PCS) (Carić & Kaláb, 1993), and legally has to contain more than 51% natural cheese. As
39 well as these major groups, processed cheese analogues (PCAs) can also be manufactured to
40 reduce the amount of natural cheese in the raw material. These analogues can be produced from
41 either dairy, part-dairy, or non-dairy derivatives (Guinee et al., 2004; Mounsey & O'Riordan,
42 2007), with or without the inclusion of natural cheese. In the US, analogue cheese is further split

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