A database of vegetarian foods

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Abstract The recent food scares combined with the wide body of literature suggesting improved health status of vegetarians has apparently fuelled the growth in the number of vegetarians and semi/demi vegetarians. This expansion has been met by a considerable growth in the vegetarian convenience food market. A database of vegetarian convenience foods has been created which shows that there is a large and increasing number of vegetarian convenience foods available which show great within-product ranges in terms of nutritional composition. The database indicates that vegetarian convenience foods are often high in fat and saturates and their consumption would not assist in meeting current dietary targets.

Introduction
Over recent years there have been considerable changes in eating habits. Lifestyle changes, the recognition of the importance of healthy eating and the number of highly publicised food safety issues have all contributed to these changes and, are recognised as key factors responsible for the growth in vegetarianism (Mintel, 2000a). Robinson and Hackett (1995) described different grades of vegetarianism, which ranged from people who just avoid “red” meat and those who avoid all foods of animal origin and might restrict their intake of some plant foods also. Here the term vegetarian refers to the Lacto-ovo definition, which is a diet that includes eggs and dairy produce but excludes meat, poultry and fish. Evidence for recent increases in the numbers of vegetarians of all types is available from a number of sources, with comparable results. The 1997 Realeat survey reported that 1.2 million people (2.1 per cent of the total population) claimed to be vegetarian; in addition 2.6 per cent of the population at the time avoided red meat (semi/demi vegetarian) and a further 30 per cent claimed to eat less red meat. By 1997 vegetarians numbered 3 million, representing 5.4 per cent of the population with 14.3 per cent no longer eating red meat (semi/demi vegetarian) (Realeat Survey, 1997). In 1999 the number of vegetarians fell slightly to 5.0 per cent, probably as a result of abated concern over BSE. However, the number of red meat avoiders (semi/demi vegetarian) and reducers reached record levels; the number of non-red meat eaters (semi/demi vegetarian) was more than three times the level in 1984 (Realeat, 1999) at 45 per cent of the population in England. Recent statistics illustrate that females continue to be more disposed to vegetarianism than males; not only are there more than twice as many vegetarian women (6.7 per cent) than men (3.2 per cent), but the number of female semi/demi vegetarians is 18.2 per cent compared to males 8.3 per cent (Realeat, 1999).

Throughout history the vegetarian diet has been advocated by various religious and cultural groups for ethical or idiosyncratic reasons, which resulted in vegetarians being looked upon as deviant (Whorton, 1994). More
recent motivating factors contributing to the growth in vegetarianism have occurred concerning BSE in infected cattle and the link with CJD in humans, E. coli and Salmonella in poultry. The latest Realeat Survey (1999) reported how food scares were motivating factors for 11.3 per cent of vegetarians. Increasing concern for animal welfare is also seen as contributory to the growth of vegetarianism. In addition there has been a growth in awareness of the need for a healthy lifestyle, which has resulted in an increased awareness of the need for what is perceived to be a healthy diet. This emergence of “new-age” vegetarianism, prompted by food scares and concerns for animal welfare, has resulted in greater acceptance by society at large.

The emphasis on a low fat intake and especially a low saturated fat intake has often been interpreted as requiring a low or meat-free diet. Thus there has been a great demand for meat-free products. Between the years 1995-2000 the vegetarian convenience market saw a growth of more than 60 per cent. This growth in vegetarian convenience foods suggests a new era of vegetarianism for some who are heavily dependent on vegetarian convenience foods.

Beardsworth and Keil (1991) proposed that the increased availability of vegetarian alternatives facilitated the increase in the number of semi/demi vegetarians and meat reducers. Marlow Foods (1999) however claim that the phenomenal growth of “meat free” is a direct result of a conscious choice to improve health. Thus, it is not clear whether the number of vegetarians has led to an increase in the number of vegetarian convenience foods or vice versa. What is clear is that the market has expanded and is now worth an estimated £428 million (Mintel, 2000a) and is still growing.

Despite reports of the increase in numbers of vegetarians, meat reducers and avoiders Mintel (2000b) reported that fruit and vegetable consumption has fallen since 1995 by 0.2 per cent and 0.4 per cent respectively. This, with the sudden growth in the vegetarian convenience food market, raises the question, what are today’s vegetarians eating? Nathan’s (1995) study was the first to identify the emerging role of vegetarian convenience foods. This longitudinal study of children found that the deficit of fat in the diet from meat in vegetarian diets was being completely replaced by fat from other sources, to which vegetarian convenience foods made a large contribution. Similarly Robinson (1998), using adults to illustrate what happens to free living subjects when they select their own vegetarian diet, found that vegetarian convenience foods were well represented and contributed 16.7 per cent of the fat intake. Such studies together with recent market growth figures for vegetarian foods suggest a new era of vegetarianism. From a minority market, once the preserve of traditional health food shops, has emerged the vast meat-free market for the masses, resulting in wide choice and easy availability.

Health concerns appear to have fuelled the vegetarian food market; however, a Food Commission Report (1995) found that not all vegetarian products are necessarily healthy, with half the calories in 17 out of 21 products coming from fat, including in some cases relatively unhealthy hydrogenated fats. A modern vegetarian diet, heavily dependent upon vegetarian-specific convenience foods,
may therefore be no guarantee of a healthy diet. Almost all studies of the diets (and health) of vegetarians have preceded the boom in vegetarian convenience foods and have therefore looked at the impact of “traditional” vegetarian diets. It is likely that these data are no longer valid. Hence what is known about vegetarianism in terms of health is likely to be outdated. New studies are required to investigate the impact of modern vegetarianism; however, despite information contained in the food tables (Holland et al., 1992a) and its supplement Vegetable Dishes (Holland et al., 1992b), there is a lack of information on the growing number of vegetarian convenience foods.

However, the sheer size and growth rate of the vegetarian-specific market will cause problems in studying modern vegetarians’ dietary intake. Dietary assessments are only as good as food composition tables, and the effect such a new wide range of products has, in terms of modifying and updating food composition tables, is likely to have important implications for dietary survey data of modern vegetarians.

The aim of this study was therefore to document the range of vegetarian convenience products currently available in order that their total impact on dietary intake can be evaluated.

Method
Using Microsoft Access™ a food database has been developed, and data have been gathered on the range of vegetarian convenience foods that are available on the market. The vegetarian products were identified by scanning the stock of local retailers, from foods mentioned in a variety of ongoing surveys and by contacting various companies (manufacturers, retailers and wholesalers) from the Food Trades Directory (Hemming Group, 1999). Letters were sent to the companies which were asked to provide details of their vegetarian lines including the nutritional composition, price, ingredients and storage and cooking instructions of the products. These details were then recorded in the database. Responses from the companies varied with some providing more detailed information than others; for some foods, information from packets was also used to supplement database records.

Results
The database so far lists 1,249 vegetarian products, which are either manufactured, handled as wholesale or produced for retail by 104 different companies (Table I). As can be seen in Table I, 15 companies handle more than 50 per cent of the vegetarian products held in the database, with the top five companies handling more than one quarter of the vegetarian products whilst the top ten companies deal with more than two-fifths of the products.

The range of products is large and increasing. Table II indicates the great range of product types. Burger type products have the greatest range with 67 different products being identified including nut, bean tofu, Quorn, cheese, Soya, vegetable/veggie and burger mixes. Vegetarian pie products closely follow with 63 different types, including amongst others: Quorn, cheese, tofu.
and vegetable/vegetarian. Vegetarian varieties of sausages, curry, pasta and pizza also show a substantial range of product types.

Many of the products contained in the database are high in fat, but there is a wide variation in the fat content of the vegetarian products (Table III). The percentage of energy from total fat for products held in the database ranges from 1.3 per cent to 74.5 per cent. Data on the amount of total fat is available for only 333 (26.6 per cent) products; in almost two-thirds of these there is at least 33 per cent of energy coming from fat with a further 104 products providing more than 50 per cent of energy from fat. Furthermore, saturated fat provides more than 10 per cent of energy in 89 products and more than 15 per cent in 73 of the 203 products (for which data are available). Data relating to the
<table>
<thead>
<tr>
<th>Product</th>
<th>Total fat (g/100g) range</th>
<th>Energy from fat (%)</th>
<th>Saturated fat (g/100g) range</th>
<th>Energy from saturated fat (%)</th>
<th>Food table data or meat examples (g/100g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burgers</td>
<td>0.2-2.4</td>
<td>2.0-50.0</td>
<td>0.5-6.6</td>
<td>3.0-34.6</td>
<td>22.9</td>
</tr>
<tr>
<td>Pies</td>
<td>1.3-1.7</td>
<td>1.0-7.04</td>
<td>0.4-4.0</td>
<td>1.9-26.4</td>
<td>20.7</td>
</tr>
<tr>
<td>Sausages</td>
<td>3.5-18.3</td>
<td>30.6-55.4</td>
<td>0.5-8.0</td>
<td>4.4-24.2</td>
<td>20.7</td>
</tr>
<tr>
<td>Curry</td>
<td>0.4-9.9</td>
<td>23.0-68.5</td>
<td>0.8-4.0</td>
<td>5.2-40.0</td>
<td>11.4</td>
</tr>
<tr>
<td>Pasta</td>
<td>0.8-10.6</td>
<td>13.0-67.1</td>
<td>0.2-4.6</td>
<td>3.2-29.1</td>
<td>5.8</td>
</tr>
<tr>
<td>Pizza</td>
<td>5.4-16.8</td>
<td>25.2-57.9</td>
<td>2.4-5.4</td>
<td>11.2-18.6</td>
<td>10.7</td>
</tr>
<tr>
<td>Pasties</td>
<td>3.0&lt;sup&gt;a&lt;/sup&gt;</td>
<td>28.4&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.9&lt;sup&gt;a&lt;/sup&gt;</td>
<td>18.0&lt;sup&gt;a&lt;/sup&gt;</td>
<td>16.3</td>
</tr>
<tr>
<td>Bakes</td>
<td>2.9-14.8</td>
<td>25.1-57.6</td>
<td>0.5-3.8</td>
<td>4.3-24.7</td>
<td>5.9</td>
</tr>
<tr>
<td>Tofu</td>
<td>3.0-17.6</td>
<td>38.0-70.4</td>
<td>0.5-4.3</td>
<td>4.3-30.4</td>
<td>b</td>
</tr>
<tr>
<td>Chilli</td>
<td>0.1-13.2</td>
<td>1.3-51.8</td>
<td>0.2-2.0</td>
<td>1.6-16.5</td>
<td>4.5</td>
</tr>
<tr>
<td>Lasagne</td>
<td>1.5-7.1</td>
<td>16.9-49.5</td>
<td>0.8-3.1</td>
<td>7.1-24.1</td>
<td>6.1</td>
</tr>
<tr>
<td>Grills</td>
<td>2.1-12.3</td>
<td>27.0-54.0</td>
<td>0.5-6.4</td>
<td>3.5-28.0</td>
<td>23.1</td>
</tr>
<tr>
<td>Casserole</td>
<td>1.4-15.9</td>
<td>20.0-74.5</td>
<td>c</td>
<td>c</td>
<td>6.0</td>
</tr>
<tr>
<td>Mince</td>
<td>0.8-18.5</td>
<td>2.9-46.8</td>
<td>0.5-0.5</td>
<td>4.9-4.9</td>
<td>9.7</td>
</tr>
<tr>
<td>Nuggets</td>
<td>9.5-14.6</td>
<td>34.2-52.7</td>
<td>1.0-1.3</td>
<td>3.6-5.5</td>
<td>13.0</td>
</tr>
<tr>
<td>Kiev</td>
<td>11.6-11.7</td>
<td>47.8-48.4</td>
<td>3.1</td>
<td>12.9</td>
<td>16.9</td>
</tr>
</tbody>
</table>

**Notes:**<sup>a</sup>Nutritional data available for only one product in the database;<sup>b</sup>no comparable meat example;<sup>c</sup>missing nutritional data

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polyunsaturated fat content exists for only 131 of the 1,249 products in the database. More than 91 per cent of these products contain less than 6 per cent of energy as polyunsaturated fat whilst 11 products (8 per cent) contain more than 6 per cent of energy from polyunsaturated fat, of which four products provide more than 10 per cent of energy as polyunsaturated fat. The polyunsaturated to saturated fat ratio ranges from the very low (0.04) to very high (7.0).

There is also variability in the nutritional value within product types. Burger products show the greatest range in values for total fat with a range of 0.2 grams to 24.0 grams per 100 grams. Several other product types also show a wide range in terms of their total fat content: pies, sausages, chilli, casserole and mince. Conversely vegetarian Kievs show the lowest range in values for total fat ranging from 11.6 grams to 11.7 grams per 100 grams. The variability is also great for the saturated fat content of the products; sausages show the greatest range of values (0.5-8.0 grams per 100 grams) whilst mince and nuggets have lower ranges in saturated fat content.

Table III also compares the fat content of the vegetarian products with that of their meat equivalents. In nine (60 per cent) of the products in table III the vegetarian varieties exceed the meat equivalents in terms of the amount of total fat per 100 grams.

The range in recommended storage methods of the products is limited; the majority (416) of products are to be kept frozen, 398 are to be kept refrigerated whilst only 134 products are to be kept in a cool dry place.
Discussion

It appears that vegetarian convenience foods are often high in fat and saturates and their consumption would not assist in meeting current dietary targets. The range in terms of nutritional values for several products is vast; the range in the amount of total fat for burger and chilli products is more than a 100-fold difference. Whilst it is recognised that such products would not represent total daily intake, for reference some comparisons will be made to the Dietary Reference Values (Department of Health, 1991). The per centage of energy from total fat clearly shows that even at the lower end of the range several of the products in Table III (tofu, nuggets and Kievs) provide more than the proposed population average for the per centage of energy from total fat. Therefore, such products would not contribute to a general lowering of fat intake. At the upper end of the range pies, curry, pasta, tofu and casserole products provide more than double the recommended value for the per centage of energy from total fat. Based on the recommended population average of per centage energy from saturated fat, three of the products (pizza, pasties and Kievs) exceed the population average at the lower end of their range, whilst at the upper end of the range seven products provide more than double, with two products providing more than three times the proposed population average of per centage energy from saturated fat. These results show that a modern vegetarian diet composed largely of vegetarian convenience foods is not necessarily low in fat. Such findings are similar to those of the Food Commission report (1995), which found that not all vegetarian products are healthy, with large proportions of calories coming from fat. Similarly Leighfield et al. (1993), after analysing two vegetarian ready meals, found that 73 per cent and 44 per cent of energy came from fat and one of the products had a P:S ratio of 0.21. The authors stated that the vegetable ingredients they were based on would have less than 1 per cent fat and a P:S ratio higher than 0.4.

Robinson (1998) illustrated the reliance on vegetarian convenience foods in people who were about to change or had recently changed to a vegetarian diet of their own accord. At baseline, the intake of vegetarian convenience foods represented 18.8 grams per person per day, providing 2.2 per cent of energy and 2.5 per cent of the fat intake. Within the 18 month study period, intake of vegetarian convenience foods rose to 86.6 grams per person per day, which represented 10.4 per cent of total energy and 16.7 per cent of the total fat intake. On changing to a vegetarian diet, the 22.5 per cent of energy as fat previously attributable to meat and meat products appeared to be mainly accounted for by increases in the contribution of vegetarian convenience foods. A controlled experimental study of volunteers who changed to a self-selected vegetarian diet for three months (Robinson, 1998) also reported an increasing reliance on vegetarian convenience foods, with an increase of 78.4 grams per person per day following the switch to a vegetarian diet.

Comparisons between vegetarian convenience products and their meat equivalents (Chan et al., 1996) show that a reliance on vegetarian convenience foods in place of meat and meat products does not appear to offer any
advantages in terms of fat content. For the majority of products in Table III, the amount of total fat (g/100g) at the upper end of the range exceeds that of an average meat counterpart. Whilst the literature suggests that many people turn to vegetarianism in an attempt to follow what is perceived to be a healthy diet, a modern vegetarian diet may in fact prove to be detrimental to health unless great care is taken to read and interpret the food labels correctly. However, only 129 products provided relevant information enabling skilled consumers to make an informed choice.

The growth and size of the vegetarian convenience market, together with the recent studies of vegetarians (Nathan, 1995; Robinson, 1998) suggest that many vegetarians effect a straightforward swap of meat convenience foods for vegetarian convenience foods. This has resulted in a new generation of vegetarians, and it is therefore likely that what we once knew about vegetarians is outdated.

The database illustrates the wide range of vegetarian products together with the range in nutritional value, and shows that there is no standard vegetarian product even within well defined categories, for example, burgers. This has major consequences for food composition tables and hence dietary surveys. Furthermore there is a general lack of nutritional information. These factors make dietary surveys severely problematical. It is not possible to conduct chemical analysis of all foods consumed, but food tables are never comprehensive enough. The implications of habitually eating one set of vegetarian convenience foods compared to another are totally different. Unfortunately any dietary surveys of vegetarians may not acknowledge and cope with the diversity of products available and so, until food tables contain sufficient information on the nutritional value of vegetarian convenience foods, databases such as these will need to be compiled and maintained at great cost. Many of the manufacturers supplied information on the understanding that it would not be passed on to other parties. Thus each project will have to start almost from scratch.

It appears that vegetarian convenience foods are often high in fat and saturates and are not necessarily healthier than meat equivalents. It is therefore likely that the health benefits previously enjoyed by vegetarians are probably being eroded as vegetarian and omnivorous diets converge. Whilst meat and vegetarian products are becoming more alike in terms of taste, appearance and fat content, it must not be forgotten that there are likely to be substantial nutritional differences. As many studies have shown, a vegetarian diet has the potential to be healthy by including a wide variety of foods including fruits and vegetables. A diet high in processed foods, regardless of being termed vegetarian will not support a healthy diet as the results here show.

References


