4. Mechanically recovered meat (MRM)

Introduction

4.1 Mechanically recovered meat (MRM) was derived from the flesh-bearing bones and carcass remnants of cattle, sheep, pigs and poultry. It was used in the manufacture of a range of processed meat products for human consumption. Following the emergence of BSE, concerns were raised that spinal cord and other potentially infective tissue might be getting into MRM. This chapter examines the process of mechanical recovery of meat and the effect on it of the measures introduced to minimise the risk of transmission of the BSE agent.

Some features of the industry

The nature and use of MRM

4.2 If a butcher’s knife was used to remove meat from a carcass, quite a lot of meat was left on the bone, especially on the ribs. In the 1950s mechanical hand tools were developed to minimise wastage by recovering this meat and, by the early 1960s, automatic machines were being employed. These machines have been in use since then to recover residual meat attached to the bone ‘which would otherwise be difficult or uneconomical to remove’.

4.3 MRM has been defined as:

. . . residual material, off bones, obtained by machines operating on auger, hydraulic or other pressure principles in such a manner that the cellular structure of the material is broken down sufficiently for it to flow in puree form from the bone.

4.4 MRM was used to make various meat products including meat pies, sausages and so-called ‘economy burgers’. It has also been suggested that it was included in soups and prepared meals. MRM was deemed suitable for such uses as the texture of the meat was not a necessary quality in the finished product. According to a minute from Dr Tim Render of MAFF’s Animal Health (Disease Control) Division:

It can be used in any product containing chopped or minced meat. But in practice it is used in very few fresh, raw meat products and in few fresh

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242 YB89/11.6/4.7
243 SEAC6 tab 1 p. 6
244 ‘BMMA Standard for the Preparation of Mechanically Separated Meat’ (SEAC17 tab 6)
245 T63 p. 121
246 The Leatherhead Report, ‘Audit of Bovine and Ovine Slaughter and By-Products Sector (Ruminant Products Audit); p. 5 (IBD6 tab 17)
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cooked products. The main use is, apparently, in products at the bottom end of the market, such as frozen sausages, burgers and pies etc.247

4.5 The concentration of MRM in such products would typically be about 10 per cent by weight.248 However, it appears that some contained a higher proportion of this type of meat. Mr Stephen Ridge, Quality Assurance Executive with Somerfield supermarkets, told the Inquiry:

If you want to buy the cheapest economy burger you can get, it can be made very largely out of mechanically recovered meat.249

4.6 The Inquiry also heard that MRM was widely used in institutional catering at outlets such as schools, hospitals, the armed services and prisons.250 A report undertaken for MAFF in 1997 also found evidence of the use of MRM in baby food:

In the past, there has been uncertainty regarding the use of MRM in baby foods, but our survey indicates that at least one manufacturer was using beef MRM during the period 1983–88.251

Supply and price of MRM

4.7 Meat-cutting plants removed the cuts of meats from the slaughtered carcasses. Some of these plants then processed the remaining bones themselves to recover MRM.

But equally you could have a stand-alone MRM plant where the bones are sent from the cutting premises to that plant and the MRM [is] produced quite separately from the cutting premises.252

4.8 During 1986–96, MRM was recovered from the carcasses of various animals, but the overwhelming majority of carcasses processed were those of chickens. About 100,000 tonnes of MRM was produced annually. Of this, 85 per cent was derived from poultry, only about 5 per cent (or 5,000 tonnes) from bovine material and the remaining 10 per cent from pigs and sheep.253 In 1995, MRM production from bovine material was reported as having fallen to approximately 2.2 per cent (or 2,000 tonnes) of all MRM, with around 90,000 tonnes of MRM a year still being produced from pigs, sheep and poultry.254

4.9 It is not clear how many plants were producing MRM in 1986. Most producers of MRM processed meat from all species – chicken, sheep, cattle and pigs – but some processed from only one. In November 1995, it was reported that there were ‘only six large plants in Britain producing beef MRM’.255 By 29 January 1996, 14 operators had registered with MAFF as producers of MRM.256

247 YB95/11.16/8.1
248 The Leatherhead Report, ‘Audit of Bovine and Ovine Slaughter and By-Products Sector (Ruminant Products Audit)’, p. 4 (IBD5 tab 17)
249 T63 p. 121
250 T63 p. 121
251 The Leatherhead Report, ‘Audit of Bovine and Ovine Slaughter and By-Products Sector (Ruminant Products Audit)’, p. 5 (IBD5 tab 17)
252 T37 p. 55 – Mr Peter Soul, MAFF; T129 pp. 38–9 – Mrs Katherine Brown, Meat Hygiene Division, MAFF
253 YB95/11.277.2; the Leatherhead Report, ‘Audit of Bovine and Ovine Slaughter and By-Products Sector (Ruminant Products Audit)’, p. 6 (IBD5 tab 17)
254 YB95/11.28/8.7
255 YB95/11.277.2
256 SEAC31 tab 16 para. 6
4.10 In 1995, Mr J Slinger of the Federation of Fresh Meat Wholesalers put the value of bovine MRM at 80p per kilogram.257

**Regulation of production of MRM**

**The Meat Products and Spreadable Fish Products Regulations 1984**

4.11 The Meat Products and Spreadable Fish Products Regulations of 1984 did not prohibit the consumption of any part of a carcass. They did, however, define what could and could not be marketed as meat. They also prohibited the marketing of products that contained organs that were rarely consumed (such as lungs, rectums and testicles) unless the product was cooked prior to sale. The definition of meat included ‘the skin, rind, gristle and sinew in amounts naturally associated with the flesh’, as well as the more commonly consumed organs such as heart, kidney, liver and also head meat. The definition excluded brains, intestines and other organs that are not normally consumed.258 Thus, under the Regulations, MRM was meat.

4.12 Bones from carcasses classified as unfit for human consumption could not be used in the production of MRM. However, apart from the voluntary Code of Practice of the British Meat Manufacturers’ Association (BMMA), there were no other restrictions on what bones from ‘fit’ carcasses were used in the process.

**The BMMA Code of Practice**

4.13 The BMMA issued a Code of Practice for the production of MRM as early as August 1987.259 This Code aimed to regulate conditions for the production of MRM, including raw materials, manufacturing techniques, hygiene, temperature and packaging. The BMMA believed that:

> ...a product complying with this Standard will conform with good manufacturing practice and fall within the definition of meat set out in the [Meat Products and Spreadable Fish Products Regulations].260

The Code of Practice was consistent with, and largely based upon, domestic legislation, much of which had been made in response to EU legislation (see vol. 14: Responsibilities for Human and Animal Health).

4.14 In a paper prepared by MAFF for a SEAC meeting in November 1990, it was noted that ‘the majority of manufacturers of beef MRM adhere to the British Meat Manufacturers’ Association’s (BMMA) draft code of practice’.261
Processes for mechanical recovery of meat in 1986

Bones for processing

4.15 The carcass bones from which MRM was recovered were already stripped of most meat before the process began. Furthermore, MRM was not derived from all the bones of cattle carcasses. Usually only the vertebrae, ribs, shoulder blade and the pelvis were used. 262

4.16 MRM could be recovered from both cooked and uncooked bones. 263 As discussed below, the machines squeezed the remaining meat as well as certain components from the bones during processing. Long bones, with high marrow content, were considered unsuitable because of the high concentration of calcium, iron and purines in the marrow. 264

4.17 The BMMA Code of Practice required that the bones from which meat was to be recovered be refrigerated and that the meat be recovered within a specified period. For instance, uncooked bones generally had to be chilled to 7°C or below and the meat removed within 96 hours of slaughter. 265

Recovery of meat

4.18 The machines used to recover the residual meat varied in design and action. 266 Many used a piston to subject bones to very high pressure in order to extract the flesh from them. They then forced the resultant slurry out through a series of sieves that filtered out any large particles. Any connective tissue or collagen was also removed at this point, being a by-product of the process. 267 Mr Peter Soul of the MHS described the process for the Inquiry:

The machine was basically a device that put the bones under high pressure and squeezed the MRM through a sieve leaving behind bone pulp which was then ejected. Vertebral columns could go through MRM machines in the same way as any other bones other than the head. 268

4.19 It is apparent that the different mechanical methods applied produced different results:

There are a number of different machines which put the bones under pressure to a greater or lesser extent and produce more of a slurry or less of a slurry. 269

4.20 The end product of the process did not resemble ‘meat’ in the traditional sense. Rather, as Mr Wildman of Sainsbury’s supermarkets explained, it is ‘more of a slurry than a recognised piece of meat’. 270 It has also been described as a ‘puréed mixture of meat and bone marrow’. 271 Although research found that MRM
contained comparatively higher levels of calcium, iron and total purines and lower levels of nitrogen and connective tissue, its gross composition did not differ significantly or consistently from meat deboned by hand.\textsuperscript{272}

**Vertebral column and spinal cord**

4.21 The vertebral column, together with the ribs, was the major source of bovine MRM. Because of the difficulty of deboning it by hand, the vertebral column – ‘an intricate collection of bones’\textsuperscript{273} – was the part of the skeleton which had the most commercially attractive amount of meat still attached.\textsuperscript{274}

4.22 Parts of the spinal cords were also inadvertently incorporated into MRM when processing the vertebral column:

   The carcass is normally split using a circular saw and this shatters the spinal cord, and the sides of beef, after being boned out, have the residual bone treated hydraulically to produce re-claimed meat that will include spinal cord pieces, etc. This meat is used in all types of convenience foods.\textsuperscript{275}

4.23 The Inquiry also heard from Mr Keith Baker, Assistant Chief Veterinary Officer, who agreed that if pieces of spinal cord were left on the carcass, their most likely destination was MRM.\textsuperscript{276}

4.24 A report prepared for MAFF in 1997 endeavoured to audit the supply of bovine products to humans and animals between 1980 and 1995. It found that at least one major MRM producer regularly removed spinal cord ‘for quality reasons’, ‘although it was admitted that this had been done more thoroughly after the 1989 SBO ban’. Another MRM manufacturer said that although spinal cord was generally removed before recovery of MRM, prior to 1989 one-quarter of the vertebral columns it processed would have had part of the spinal cord attached. Based on such information, the report estimated the possible extent of contamination of beef MRM with spinal cord prior to the SBO controls:

   The average contamination of beef MRM with spinal cord would therefore be ca 0.04%. However, there would be likely to be considerable variation about this figure; the worst-case (where all of the vertebral columns contained an intact spinal cord) would give ca 2.8% contamination. A 100g meat product, containing 10% of such beef MRM, would contain 0.28g spinal cord.\textsuperscript{277}

**Bovine heads**

4.25 The BMMA Code of Practice required that the head be excluded from the MRM recovery process.\textsuperscript{278} It was noted in 1990 by MAFF that there was ‘no

\begin{footnotesize}
\textsuperscript{272} YB80/6.18/2.1
\textsuperscript{273} T107 p. 98 – Mr Keith Baker, Assistant Chief Veterinary Officer
\textsuperscript{274} The Leatherhead Report, ‘Audit of Bovine and Ovine Slaughter and By-Products Sector (Ruminant Products Audit)’, p. 5 (IBD5 tab 17)\textsuperscript{275} YB89/08.22/7.2 – letter from Ulster Farm By-Products
\textsuperscript{276} T107 p. 98–9
\textsuperscript{277} The Leatherhead Report, ‘Audit of Bovine and Ovine Slaughter and By-Products Sector (Ruminant Products Audit)’, p. 5 (IBD5 tab 17)
\textsuperscript{278} 90 SEAC17 lab 6 p. 22
\end{footnotesize}
4.26 Although a representative of the Chartered Institute of Environmental Health (CIEH) suggested that heads were used in the MRM process, the weight of evidence was against this proposition.281 The exclusion of heads was confirmed in evidence provided to the Inquiry by Mr Keith Baker, Mr Christopher Clark of the MHS, Mr Ray Bradley of MAFF’s Central Veterinary Laboratory and Mr Colin Maclean of the MLC.282 Mr Soul also said that heads were never included ‘because the enamel of the teeth was such as to damage the machine’.283

Legislative changes and developments in the process post-BSE

Bovine Offal Prohibition Regulations 1989 (the 1989 SBO Regulations)

4.27 The 1989 SBO Regulations prohibited the use of Specified Bovine Offal (SBO), including the spinal cord, for human consumption.

4.28 As explained in Chapter 2, spinal cord was removed from the vertebral column as a normal part of dressing the carcass. However, under the Regulations, manufacturers of MRM were required to ensure that no SBO entered MRM for human consumption.

4.29 At least one plant ceased production of MRM from cattle bones in June 1989 (before the introduction of the 1989 Regulations), because of its concern that it was impossible to be sure that potentially infective central nervous tissue was fully removed from vertebral columns.284

4.30 Following the introduction of the 1989 Regulations, other plants, such as the one visited by the MAFF Parliamentary Secretary, Mr David Curry, in June 1990, stopped bovine MRM production for the same reason.285 The alternative of sorting and inspecting bones was not considered viable:

Canvins [the plant visited] however said that they did not wish to sort out bones for MRM because it would be labour intensive. When they were producing it, all the bones were automatically conveyed to the MRM machine.286

4.31 Sorting and inspection of incoming carcass remnants may have been a cost-effective alternative for larger MRM plants. The report prepared for MAFF in 1997 found that:

279 YB90/6.18/2.1
280 YB93/5.7/2.3
281 T56 p. 116
282 T107 p. 98; T62 p. 23–4; T42 p. 120; T59 p. 123
283 T37 p. 55
284 YB89/6.30/2.1; YB89/7.27/2.2
285 YB90/6.22/41; YB90/6.25/14.1
286 YB90/6.25/14.1
MRM manufacturers’ inspection procedures for the removal of residual spinal cord were tightened up considerably, following the SBO ban.\(^{287}\)

4.32 In 1995, Mr Slinger, the operator of a plant in Great Harwood, told the MAFF Minister, Mr Douglas Hogg, that his firm had invested heavily in veterinary controls:

Indeed, his own veterinary staff had firm instructions to impound any material which on arrival included spinal cord, to separate it out, take photographic evidence and press for prosecution.\(^{288}\)

4.33 Vol. 6: *Human Health, 1989–96* examines the concerns which were expressed about the safety of MRM following the emergence of BSE.

The Specified Bovine Offal (Amendment) Order 1995

4.34 This Order came into force on 15 December 1995.\(^{289}\) It banned the use of the ‘vertebral column of a bovine animal in the recovery of meat by mechanical means’.\(^{290}\) It also banned the use of meat derived in this way in human food,\(^{291}\) and required all MRM plants to be registered with MAFF.\(^{292}\)

4.35 As discussed above, the vertebral column was significant in the production of bovine MRM. Before the Order was introduced, MAFF acknowledged that ‘there would be an effect on some companies’.\(^{293}\) The *Leatherhead Report* concluded that the ‘ban on the use of vertebral column for beef MRM production effectively brought an end to this industry in the UK’.\(^{294}\)

4.36 The remaining 95 per cent of MRM, which was primarily produced from poultry, is unlikely to have been directly affected by the 1995 Order, although concerns were expressed that the legislation would have a ‘detrimental impact on the image of all MRM products’.\(^{295}\)

The market for MRM

4.37 The Inquiry heard that mechanical recovery of meat was regarded in positive terms during the 1980s:

I think it is important to point out that during the 1980s . . . the MRM process was heralded as a very, very good process. It was producing sound protein material that could be used in foods. So the actual research that went behind the process of mechanically recovering meat was heralded as one of the great food technology drives of the 1980s.\(^{296}\)
4.38 However, MRM was a product declining in popularity before the emergence of BSE. The introduction of the 1989 SBO Regulations and concerns over bovine spinal cord made bovine MRM even less attractive.

4.39 Mr Wildman of Sainsbury’s supermarkets said that his company took steps to eliminate bovine MRM from its products in June 1988. He said that concerns about the microbiological standards of MRM already existed and that the emergence of BSE ‘served as an additional reason to eliminate MRM’.

4.40 Mr Stephen Ridge, Quality Assurance Executive at Somerfield, told the Inquiry that his company also eliminated bovine MRM from its own brand products from 1990 onwards:

   There was certainly some concern about the microbiological standard of some of the MRM. But this is also concern that the pressing process was actually going to potentially extrude a certain amount of lymphatic and nervous tissues. So I think it was taken on a basis of: put them both together and we just will not use that material; and we have not used mechanically recovered beef ever since.

4.41 On 25 June 1990, the Consumers’ Association called for a prohibition on the use of bovine spinal column in MRM. In the same month, the MAFF Parliamentary Secretary, Mr David Maclean, described it as ‘a product which is universally disliked’. A paper produced by MAFF for a SEAC meeting in November 1990 noted that there was ‘very little demand’ for MRM.

4.42 In June 1992, Safeway supermarkets stopped using MRM in both human and pet food in response to perceived consumer concerns about its quality.

   Although Safeway does sell a few branded products that contain mechanically recovered meat, the company does not permit its use in its own-branded products.

4.43 Before the introduction of the Specified Bovine Offal (Amendment) Order 1995, MAFF representatives met with industry members and were told that adverse publicity about the safety of MRM had led to a ‘drastic reduction in sales’.

4.44 Although the production of bovine MRM has now largely ended in the UK, the Inquiry heard that the production of other MRM has not ceased:

   MRM is still a product which is recovered, particularly from poultry meat, and is generally sent to the Far East and places such as that.

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297 S166 Wildman para. 3
298 T63 p. 120
299 YB90/06.25/17.1
300 YB90/6.00/2.2
301 SEAC6 tab 1 p. 6
302 S165 Robertson paras 10–11
303 YB92/6.00/4.1
304 YB95/12.5/1.2
305 T63 p. 122 – Mr Wildman, Sainsbury’s