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FOOD FRAUD - A CURRENT ISSUE BUT AN OLD PROBLEM

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Abstract²

Purposes: This article addresses the topic of food fraud which has been so widely and variously reported over recent months and years. Its purposes are to set current experience into an historical context and to illustrate the tension between the science of deception and the science of detection.

Approach: This is a desk study of published literature and historical documentation, together with interviews with those professionally concerned with detection and enforcement.

Findings: The piece concludes that with all the scientific developments and analytical techniques that seem so mind-bendingly sophisticated, there remains the basic problem of a lack of resources.

Implications: It is asserted that we owe more to the memories and the reputations of those who pioneered the effort to combat food fraud. Without a considerable increase in the resources made available for the appliance of the science we have and are developing, the battle will never be fully engaged, yet alone won.

Originality/value: This review is unique in that it seeks to take a long view of current concern, and even scandal, showing that we have been here before and that we ought to know better by now.

Keywords: food fraud, food science, food history, Food Standards Agency

Introduction

Food fraud is big business. Its true extent is unclear but consumers are undoubtedly being cheated out of hundreds of millions of pounds each year in the UK alone:

When we have done surveys on individual foods the level of fraud is often around 10 per cent ...The UK food sector alone is worth around £70 billion per year, so a small percentage of fraud can be worth a lot of money.³

Why sell meat when you can sell water?⁴

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³ Woolfe, M., a scientist in the FSA's enforcement division in London. See *New Scientist* issue 2577, 15 November 2006, 40-43.

⁴ A reference to the infamous 'Golden Water Tap Technique' advertised by Food Equipment suppliers. See http://www.shropshire.gov.uk/portal_commisar.nsf/viewCommitteeItem/80256D810051CA7F80256C6A003EA01D?OpenDocument

The profit potential in selling and supplying less than was asked or expected is obvious. For example, meat processors have the technology to incorporate so much added water into cured meat products that more than half of what appears to be meat can be added water. Consumers will not know unless they are told, unless it is prominently and specifically declared on the label. This is not a legal requirement in either the UK or the USA. Added water in cooked or cured meat must be declared in the product name, but there is no requirement to declare the amount.⁵ In the UK 'Ye Olde Oak' has recently been declared top for selling the lowest percentage of meat in its ham, which is 55% meat and 37% water, with additives including gums and polyphosphates, sugar and salt making up the remaining 8%.⁶ The Food Commission, 2005, reported:

the economic advantage for an individual producer and the overall loss to the consumer of adding water to meat and cured meat is staggering ...Just 1% of undeclared added water in bacon and ham alone would amount to the annual consumption in the UK of 4,662 tonnes of water in the mistaken belief that it is meat.⁷

1 Nothing New

In ancient Rome and Athens, there were laws regarding the adulteration of wines with flavours and colours.⁸ In the thirteenth century France and Germany passed food control statutes and King John in England made a proclamation regarding penalties for the adulteration of bread. More extensive legislation regarding adulteration of human food was passed by Henry III. In the UK some of the commonly used food additives in the 18th and early 19th centuries were poisonous. To whiten bread, for example, bakers added alum and chalk to the flour and the weight of the finished loaves was increased with mashed potatoes, plaster of Paris (calcium sulphate), pipe clay and even sawdust. Rye flour or dried powdered beans could be used to replace wheat flour and the sour taste of stale flour was disguised with

⁵ In the USA cooked ham, for example, can be sold under four different names: 'cooked ham,', 'cooked ham with natural juices,' 'cooked ham, water added,' and 'cooked ham and water product — x% of weight is added ingredients.' As you go down the list of names, less and less real meat protein ("minimum meat PFF percentage" *protein fat free percentage*) has to be in the product. For cooked ham and water products the minimum meat PFF is less than 17%. See: <http://www.cfsan.fda.gov/~lrd/9CF319.html> and <http://www.mouseprint.org/?cat=3>

⁶ <http://www.foodqualitynews.com/news/ng.asp?n=59629-survey-finds-branded>; also Lawrence, F., *The Guardian*, 3 November 2005;

⁷ Food Commission (2005), Survey published in issue 69 of the *Food Magazine*, pp.1, 6,7. www.foodcomm.org.uk/latest_watermeat_apr05.htm

⁸ Sumar, S., and Ismail, H., 'Adulteration of foods – past and present', (1995), *Nutrition & Food Science*; 95(4), 11-15.

ammonium carbonate. Brewers often added mixtures of bitter substances, some containing poisons like strychnine, to 'improve' the taste of the beer and save on the cost of hops. By the beginning of the 19th century the use of such substances in manufactured foods and drinks was so common that consumers had begun to develop a taste for adulterated foods and drinks; white bread and bitter beer were in great demand.⁹

Amongst the first to expose such practices was Frederick Carl Accum. He was born in Bückeberg, a small German town some 20 miles southwest of Hanover on 29 March 1769.¹⁰ His father was a Jewish merchant and 'soap boiler.' His mother was a Huguenot. The family was moderately prosperous. He wrote widely on chemistry¹¹ but his best known book is his *Treatise on Adulterations of Food and Culinary Poisons*, published in 1820. He makes his purpose clear in the Preface:¹²

To such perfection of ingenuity has the system of counterfeiting and adulterating various commodities of life arrived in this country, that spurious articles are everywhere to be found in the market, made up so skilfully, as to elude the discrimination of the most experienced judges ...The eager and insatiable thirst for gain, is proof against prohibitions and penalties; and the possible sacrifice of a fellow-creature's life, is a secondary consideration among unprincipled dealers. However invidious the office may appear, and however painful the duty may be, of exposing the names of individuals who have been convicted of adulterating food, yet it was necessary for the verification of my statement.

⁹ Royal Society of Chemistry; see

<http://www.rsc.org/Education/EiC/issues/2005Mar/Thefightagainstfoodadulteration.asp>

¹⁰ Browne, C. A., 'Life and Chemical Services of Frederick Accum', (1925), *Journal of Chemical Education*, 2, 829- 51, 1008-1035.

¹¹ In 1801 he was engaged by Sir Humphrey Davy as a 'chemical operator' at the Royal Institution in London and provided demonstrations for his lectures. Within a year, Accum left and started work on the teaching and books by which he is still, if dimly, remembered. In 1803 he published his *System of Theoretical and Practical Chemistry* in two volumes. This was the first chemistry text book to be published by advance subscription and also the first to be printed on paper prepared from straw, rather than wood pulp. This straw-based paper has survived the ravages of time far better than the more usual woodbased paper and the Royal Society of Chemistry's copy is in an excellent state of preservation.

http://www.rsc.org/images/cw01_accum_tcm18-32850.pdf

¹² *A Treatise On Adulterations Of Food, And Culinary Poisons, Exhibiting The Fraudulent Sophistications Of Bread, Beer, Wine, Spirituous Liquors, Tea, Coffee, Cream, Confectionery, Vinegar, Mustard, Pepper, Cheese, Olive Oil, Pickles, And Other Articles Employed In Domestic Economy, And Methods Of Detecting Them* (1820, London: Longman, Hurst, Rees, Orme, and Brown).



Black and white photograph of an oil painting by Samuel Drummond
en.wikipedia.org/wiki/Friedrich_Accum

It is clear that the current fashion of ‘naming and shaming’¹³ is nothing new. The book’s original cover was light green with white designs of snakes writhing around a rectangle enclosing a spider’s web, in which a large spider was terminally embracing a fly. Above there was a banner showing a skull and cross-bones with ‘There is Death in the Pot’ written underneath.¹⁴ The first edition of a 1,000 copies was sold out within a month and the second edition appeared later that year. Unsurprisingly perhaps, he received a number of threatening but anonymous letters. An American reprint appeared in Philadelphia in 1820 and a German translation in Leipzig in 1822.

¹³ For example, as recommended by the Food Fraud Task Force in September 2007 (FSA 07/09/07 para.109) Food Fraud Related Prosecution Database ‘The FFTF considered that a centralised food fraud related prosecution data base would be practical and beneficial in helping to deter food fraud activities ... the adverse publicity for those businesses appearing on the database would act as a deterrent for others considering food fraud ... it should be publicly available in order to provide consumers with information about food businesses and help them make informed choices ... also supported by the recent Macrory report, p.91 *Transparency through publishing enforcement actions*, which states: “When regulators make a decision to enforce and impose a formal sanction, I believe this should be a matter of public record.” Macrory was also anxious ‘to ensure that no longer should rogues find it cheaper to ignore regulations and take the penalty than comply.’

see: http://bre.berr.gov.uk/regulation/reviewing_regulation/penalties/index.asp

¹⁴ a quotation from the Old Testament ‘there is death in the pot:’ II Kings chap.4, v. 40

The first chapter dealt with water. Then he moved on to expose the adulteration of wine and beer, bread, brandy, cream, lozenges, custards and olive oil. There are shorter sections dealing with counterfeit tea, coffee, pepper and poisonous cheese and pickles. The largest section is devoted to the widespread adulteration of beer. This despite statutes carrying heavy penalties dating from the time of Queen Anne to King George III. He reported that the major London brewers were producing beer of approximately 7.25% alcohol but by the time it was supplied to the publicans it had dropped to an average 4.5%. Beyond dilution, it was being treated with green vitriol, alum and salt to give it a good 'cauliflower head' when it was poured and cocculus indicus, used by the dyeing and tanning trade, was added to enhance the bitter taste. Accum 'named and shamed' brewers who had been convicted of adulterating beer and druggists convicted of supplying them with the harmful materials, quoting court reports. The profit potential is reflected in the level of fines deemed necessary as a deterrent. These amounted to £400 in serious cases.

Similar treatment was meted out to grocers who similarly adulterated their produce. For example, old and faded cayenne pepper was laced with red lead, ground pepper was mixed with pepper dust (warehouse sweepings), used tea pickles were boiled in copper vessels and half-pence coins were added to produce 'a lively green colour.'¹⁵ Tea and coffee drinking had become popular in the UK but both were expensive – fertile ground for the trickster. Exhausted tea leaves and coffee grounds could be bought for a few pence per pound from London hotels and coffee shops. The leaves were boiled with copperas (ferrous sulphate) and sheep's dung, then coloured with prussian blue (ferric ferrocyanide), verdigris (basic copper acetate), logwood, tannin or carbon black, before being resold. Coffee grounds were adulterated with other roasted beans, sand, gravel, mixed with chicory, dried endive roots. The chicory itself was adulterated with roasted carrots and turnips. The dark brown coffee colour came from 'black jack' (burnt sugar). Children were not safe. Poisonous colourings were found in jellies and sweets, and in the wrappers. The bright colours used to attract children often contained lead, copper or mercury salts.

But Accum was to fade from the popular memory within a few years. There was a scandal involving him allegedly damaging books in the Royal Institution's library. The

¹⁵ Although when the practice ceased customers complained, not recognising the risks of the toxicity. Charles Dickens observed 'green as it was, it seems that the customers were still greener' cited in Postgate, J., 'Lethal Lozenges And Tainted Tea: John Postgate And The Crusade For Safe Food,' (2001, Brewin Books), a *biography written by his great grandson*

public turned against him. He was discharged at one trial but when a second was listed he did not appear, became acutely depressed, forfeited his bail and returned home to Germany. Within a few years he became Professor of Technical Chemistry at the Gewerbe Institut and simultaneously Professor of Physics, Chemistry and Mineralogy at the Bau Akademie. His final book, and the only one he wrote in German, appeared in 1826 and concerned the chemical qualities of building materials. He died in Berlin on 28th June 1838. The adulteration of food and drink would continue virtually unchecked in Britain for a further 40 years after Accum's departure, until the Adulteration Act 1860.¹⁶

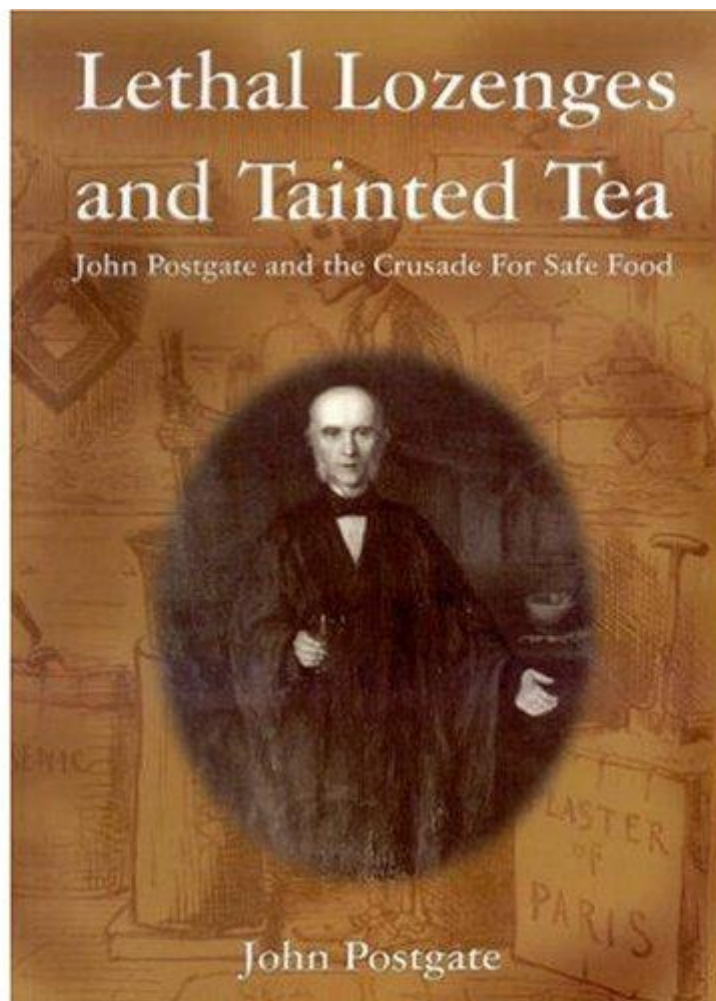
At about the time of Accum's death Dr. John Postgate was working in Birmingham. He was an austere, self-assured doctor, chemist and academic who became aware of the nature and extent of food adulteration when treating his patients.¹⁷ He spent more than 20 years campaigning for legislation to outlaw the practice, having to face powerful commercial vested interests and the widespread indifference of Parliament. He saw that it was not enough simply to ban adulteration, but that reliable systems were required for detection and monitoring. He argued particularly strongly for the appointment of public analysts. Gradually he gained support in Birmingham at public meetings¹⁸ and a petition was sent to Parliament. He also took his work and attitudes home where his family did not appreciate the 'general contempt for the luxuries and comforts of life' that he urged upon his medical students.¹⁹

¹⁶ Act for preventing the Adulteration of Articles of Food and Drink 1860; For further biographical material See: Lawson Cockroft. http://www.rsc.org/images/cw01_accum_tcm18-32850.pdf

¹⁷ See Postgate, 'Lethal Lozenges And Tainted Tea,' (2001).

¹⁸ For example: a conference in Birmingham 'called together not merely with the view of assisting with the exposure and denunciation of the practice of adulteration so disgracefully prevalent, but principally in order to devise means whereby it may be kept in check, or even entirely prevented in future,' *The Lancet*, 29 April 1854, p.477.

¹⁹ Postgate, 'Lethal Lozenges And Tainted Tea,' (2001).



Brewin Books (27 Nov 2000)

Thomas Wakley, MP, surgeon, founder and editor of *The Lancet*²⁰ strongly supported Postgate's work, publishing a series of reports and articles between 1851 and 1855. Arthur Hill Hassall, a doctor practising in London, had taken great exception to a speech in Parliament in 1850 by Sir Charles Wood, then Chancellor of the Exchequer, saying that he had been advised that neither chemical nor any other tests could show for certain whether or not coffee contained chicory. Knowing that this statement was untrue, he sampled coffee bought in London and showed that it was easy to identify chicory mixed with coffee using nothing more elaborate than a good microscope. His work was widely reported and drawn to Wakley's attention. He created the Analytical Sanitary Commission. Hassall agreed to be the Commission's chief analyst and was the sole author (despite the constant use of 'we' and 'they') of

²⁰ *The Lancet* is the world's leading independent general medical journal, published weekly from editorial offices in London and New York. It was founded in 1823 by Thomas Wakley, who named it after the surgical instrument called a lancet, as well as an arched window ('to let in light').

the analytical reports, published in *The Lancet*, in so far as they concerned adulterated food and drink.²¹

Between January 1851 and the end of 1854, Hassall bought more than 2,500 samples of food and drink for analysis. Wakley gave him complete freedom and published his reports without changes or additions. He also undertook to bear any expenses that might be incurred as a result of legal action. The Commission had been set up to report the:

records of the results of microscopical and chemical analyses of the solids and fluids consumed by all classes of the public ...It will appear, on reflection, as somewhat remarkable that the interests of the public in these important particulars should not hitherto have been watched over and protected by any authorised body or commission ...we propose then, for the public benefit to institute an extensive, and somewhat rigorous, series of investigations into the present conditions of the various articles of diet of the inhabitants of this great metropolis and its vicinity ...the microscope and test tube throughout these investigations will be our constant companions ...one highly important feature will be the publication of the names and addresses of the parties from whom the different articles, the analysis of which will be detailed, were purchased. The advantages of such a course of proceeding require no explanation.²²

Unlike Frederick Carl Accum, 35 years earlier, 'desiring to avoid all appearance of harshness,'²³ at first they just named the streets where the commodities were bought. But they warned that three months later, if no improvement had been observed, they would 'name and shame' the sellers thus:

the honest tradesman or merchant will also be benefitted; he has nothing to fear, but, on the contrary, much to gain, for while he will be able to secure fair prices for a genuine commodity, his name also will be made known to the public, and he will be upheld in his true light and character as an upright and honourable tradesman ...the urchin who filches a bun or a penny piece is punished but these dishonest traders and even poisoners go unpunished, an insult to common sense.²⁴

Discussing 'the nefarious practice of adulteration' they describe the chemical and biological structure of the 'pure product' and then that of the substances added: arrow root adulterated with potato, coffee with chicory, 'exhausted' tea leaves dried and reused, milk commonly, even usually, watered and sometimes further

²¹ Henry Letheby, Medical Officer of Health for London, was also involved when adulterated drugs and medicines were analysed.

²² *The Lancet*, 4 January 1851, p.20.

²³ *Ibid.*

²⁴ *The Lancet*, 4 January 1851, p.21

adulterated with sheep's brains, opium with wheatflour, sand and sugar,²⁵ beer with water and salt.²⁶ Names were named:

'fine Ceylon coffee' – very little coffee, a great deal of chicory and some roasted corn, purchased in the Edgware Road ... praise for 'excellent' coffee from Mr J. F. Betts, 262 Oxford Street and Messrs Knight and Son, 83 Gracechurch Street.²⁷

bread bought from J L Bragg, 2 Wigmore Street ...adulterated, containing a considerable quantity of alum.²⁸

and, from a hawker in the Whitechapel Road:

These cheroots were made up of two twisted wrappers or layers of thin brown paper, whilst the interior consisted entirely of hay, not a particle of tobacco entering into their composition.²⁹

Following upon Hassall's reports a Parliamentary Committee of Inquiry was established. The evidence obtained confirmed the accuracy of his work. For example, Thomas Blackwell (of Crosse & Blackwell's) gave evidence that the greening of preserved fruits and vegetables with copper salts and colouring of red sauces for potted meats with iron compounds were common. He admitted that his firm used these additives, not realising that they were so objectionable.

The first Food Adulteration Act was passed in 1860 although many recommendations were omitted – most importantly perhaps the compulsory appointment of food inspectors. This shortfall was remedied in 1872 by the Adulteration of Food and Drugs Act strengthening enforcement powers by requiring the appointment of a public analyst and empowering local enforcement officers to take samples and bring prosecutions. In 1874 the Society of Public Analysts was founded with Hassall as its first President. A Select Committee was set up and its Report provided the basis for the Sale of Food and Drugs Act 1875. This 1875 Act created two basic adulteration offences: the mixing of injurious ingredients; and selling to the prejudice of the purchaser a food not of the nature, substance or quality demanded. These offences have been incorporated into all subsequent UK food safety legislation. The Public Health Act 1875 gave local enforcement officers powers to inspect and seize. There

²⁵ *The Lancet*, 11 February 1854, p.165

²⁶ *The Lancet*, 23 September 1854, p.278

²⁷ *The Lancet*, 4 January 1851, 24-25

²⁸ *The Lancet*, 25 October 1853, p.399

²⁹ *The Lancet*, 5 November 1853, p.444

were further amendments in 1879, and the Margarine Act 1887 and the Food Adulteration Act 1899 eventually established a legislative framework.

2 Food Fraud Today

Beer - the deception might be as simple as a simple lie. For example, on an industrial estate in Alperton, West London, traders were taking delivery of three tankers of 'an Australian type' lager (approximately 5,000 gallon in each) every week, 'racking' it (putting into kegs) then selling it on as branded and popular Fosters and Carling Black Label to pubs that, it was alleged, knew its provenance.³⁰

Spirits - alternatively, consumers might be deceived by misplaced faith in the label on the bottle.³¹ Spirits substitution or 'tipping' is the notorious practice of refilling a branded spirit bottle with another spirit, usually of an inferior quality. In November 1999 1 in 12 on-licensed outlets, or 8%, were substituting at least one spirit brand at any one time, a deception worth £43 million each year in the UK. Perhaps unsurprisingly, a trade association representing most of the major spirit brand owners was formed to work with enforcement authorities to catch and prosecute offenders (the International Federation of Spirits Producers UK). There have been many prosecutions and name and shame articles in local newspapers. Last year the substitution rate had been reduced from 1 in 12 outlets, or 8% to 1 in 50 outlets or 2%, saving consumers over £30 million every year.

This success has been largely due to the appliance of science: sharpening the tools of the trade. Trading Standards Officers are equipped with 'Authenticity Test Kits' involving the use of simple dipsticks that recognise natural ingredients (deliberately) present in major spirit brands. If the dip stick changes colour all is well, if not a formal sample is taken for further analysis.³²

Fish – farmed salmon costs about £5/kilo, line-caught costs about £15/kilo. Unsurprisingly, therefore, the Food Standards Agency in the UK carried out a

³⁰ 'Infringement Report,' (1996, Brent and Harrow Trading Standards Department)

³¹ In the Final Report of the Food Fraud Task Force FSA 07/09/07 20 September 2007 at para.17, *Environmental Health News*, 13 July 2007 p.2 is cited – recounting the story of a raid upon a factory making and decanting industrial spirits and selling the bottles on as vodka.

³² <http://www.ifsp.co.uk/content/view/29/2/>

snapshot survey into the labelling of fish on retail sale.³³ First they looked at whether consumers are being told (as required by labelling regulations³⁴) whether the fish was caught or farmed and their geographical origin. They found that 15% of retailers provided consumers with no information, or incorrect information about the fish or their origin. Smaller businesses, such as local fishmongers, scored worst. This might be surprising, given that such traders often seek to fill 'niche' markets against supermarket competitors. In the second part of the survey, samples of fish described as 'wild fish' were purchased to investigate the extent to which they actually were wild. Wild fish samples were purchased from supermarkets, fishmongers, fish auctions, and specialist food shops, and analysis was carried out using the extracted oil from samples of sea bass, sea bream and salmon. The results were then compared to the results in a database of authentic wild and farmed fish. It was found that about one in ten fish sold as 'wild sea bass' and 'wild sea bream', and one in seven fish described as 'wild salmon', were farmed fish. Again, it is the science that leads the way. The analysts compared the samples, using the way that the different diets of wild and farmed fish alter the composition of the fatty acids within them, and the carbon, oxygen and nitrogen isotopic signatures of the extracted fish.³⁵

Beef – food fraud involving beef takes at least two forms: gender and origin. Beef from male animals is commercially more valuable than beef from female animals. This is because cows are used for reproduction and are normally slaughtered only when older, when the length and rigidity of muscle fibres is increased and the level of collagen is higher resulting in tougher meat of lower quality and thus lower commercial value. Unscrupulous sellers sell the latter as the former. However, the scientists are catching up here too.³⁶ A technique has recently been developed which can facilitate the sexing of boned, packaged and chilled, ready for sale beef. The principle of the technique is the same as used for sexing pre-implanted cattle embryos

As to origin fraud, as an example, Brazilian sirloin beef costs about £4.50/kilo. British costs £8.50. Once the meat is unbagged and unbadged it is difficult to tell them

³³ Food Standards Agency, 'Farm Fish Sold as Wild,' (May 2007), <http://www.food.gov.uk/multimedia/pdfs/fsanews67.pdf>

³⁴ Fish Labelling (England) Regulations 2003 SI.2003/461.

³⁵ see: http://www.fsascience.net/2007/05/03/born_to_be_wild

³⁶ Curi, R. *et al*, 'Bovine carcass sexing by PCR method'. (2002) *Brazilian Journal of Veterinary Research and Animal Science*, 39(3), 147-148

apart. Therefore the research is underway to develop the analysts' detective capability. The UK Central Science Laboratory in York³⁷ is developing a form of 'fingerprinting' technique whereby the chemical elements of grass, nutrients and especially water can be identified. Thus beef that was grown in Brazil can be identified apart from that grown elsewhere by analysing the effects left by the water it drank and the water content of the grass it ate.

Rice - 'Basmati' rice costs more than twice the price of other 'more ordinary' varieties. It currently accounts for about 37% of the UK dry rice market by value, with a value of £50m per year. It is known as the 'Prince of Rice'. The word Basmati refers to its aroma – literally 'the fragrant one.'³⁸ It is premium long grain rice. Its high value reflects a combination of fragrance with grain elongation on cooking, giving a characteristic grain shape and integrity. 'Basmati' is the customary name for certain varieties of rice with these unique properties that are grown exclusively in the northern part of the Western Punjab (on both sides of the Indian and Pakistani border), Haryana State and Western Uttar Pradesh in India.³⁹ There are 11 varieties from India and 5 from Pakistan that can use this appellation. Anything else is fraud, and fraud is common here.

The UK Food Standards Agency recently surveyed⁴⁰ samples of the rice sold in the UK as Basmati and found that more than one sample in six contained high levels of other non-Basmati varieties - of 363 samples examined, 196 (54%) were found to contain only Basmati rice, non-Basmati rice was detected, at some level, in 167 (46%) of the samples analysed. 63 (17%) samples had a non-Basmati rice content greater than 20%, and 31 samples (9%) having a non-Basmati rice content greater than 60%.⁴¹ Allowing that mixing of grains occurs accidentally during the growing, transportation and milling processes, these figures are indicative of fraud. One FSA official calculated that the fraud cheated consumers out of over £5 million that year.⁴² The analysts use a DNA process to identify Basmati varieties from others. Samples

³⁷ 'We are an organisation dedicated to applying science in protection of foodchain safety and environmental health. Through developing and applying knowledge we support our customers in assessing risks, delivering sustainable environmental solutions and responding to emergencies.' <http://www.csl.gov.uk/>

³⁸ <http://www.tilda.com/default/flash.htm>

³⁹ <http://www.food.gov.uk/multimedia/pdfs/basmati.pdf#page=1>

⁴⁰ Food Standards Agency, 'Survey on Basmati rice', (March 2004)

<http://www.food.gov.uk/science/surveillance/fsis2004branch/fsis4704basmati>

⁴¹ <http://www.food.gov.uk/science/surveillance/fsis2004branch/fsis4704basmati>

⁴² *New Scientist*, issue 2577, 15 November 2006, 40-43

are pulverised, dissolved and then screened to see the characteristic 'fingerprint' of 12 chromosomes. It seems that chromosome 10 is particularly important to identification. 'Markers' are identified and an assessment made in accordance with 14 to 20 of them.⁴³ At the Natural Resources Institute (NRI) and the University of Greenwich researchers have been developing a method to differentiate Basmati rice from non-Basmati rice based on gas sensor technology – investigating whether aromatic differences may be sufficient to differentiate between Basmati rice and other long grain varieties using a low-cost portable gas sensor array developed by the NRI.⁴⁴ It seems that the fundamental characteristic of the 'Prince of Rice', fragrance, may be enough to protect its integrity.

Olive Oil – 'Adulterated olive oil is now the biggest agricultural fraud in the EU.'⁴⁵ In 2006 sales of extra-virgin olive oil in Britain reached £71 million. It seems that so much 'extra-virgin Italian olive oil' is brought in from Tunisia or Libya and so much ordinary olive oil is coloured with green chlorophyll that the Italians have introduced a new law.⁴⁶ Producers must now state on the label where the olives were grown and pressed. Where the oil is blended, a precise breakdown of the various oils will have to be listed. The European Commission has suggested that the law breaches EU competition regulation.⁴⁷ In any event it may not be enough. Profits are 'comparable to cocaine trafficking, with none of the risks.'⁴⁸ But while chemical tests can identify some adulterated oils, they cannot detect the most sophisticated scams. Even the stringent taste tests established by the International Olive Oil Council (IOOC) to determine which oils qualify as 'extra virgin' have their limitations - in Italy producers often successfully appeal a negative verdict by arguing that samples were incorrectly collected or stored or by resubmitting their samples to a friendlier panel.⁴⁹ A television investigation by RAI, the state broadcaster, tracked a load of olio di sansa, the oil that is extracted from the pulp after the extra virgin has been pressed, as it passed through Turkey. When the oil left the Turkish port on its way to Italy, it was

⁴³ <http://www.tilda.com/radio/radio.htm>

⁴⁴ http://www.food.gov.uk/science/research/researchinfo/choiceandstandardsresearch/authenticityresearch/q01list_riceandpasta/q01030/

⁴⁵ Wilson, B., *Sunday Telegraph Magazine* 9 March 2009; also

http://www.telegraph.co.uk/wine/main.jhtml?xml=/wine/2008/03/09/st_beewilson.xml

⁴⁶ Legge n. 206/04 and decreto attuativo n. 243/07 and see

<http://olivegazette.blogspot.com/2007/10/italian-labelling-law-passed.html>

⁴⁷ <http://www.eubusiness.com/news-eu/1204304521.23/>

⁴⁸ Mueller, T., *The New Yorker*, 13 August 2007 also

http://www.newyorker.com/reporting/2007/08/13/070813fa_fact_mueller

⁴⁹ Weil, A., MD., <http://www.drweil.com/drw/u/QAA400316/Olive-Oil-Fraud>

certified as extra virgin.⁵⁰ In the early spring of 2008 400 members of the Italian Police launched Operation Golden Oil, raiding nearly 100 farms. They found invoices to the EU for €6.5 million of subsidies and receipts for €39 million of 'Italian' oil made with non-Italian olives. Coldiretti, the farmers' union, said the amount of foreign oil being imported and re-labelled as Italian 'rose by a quarter in 2007'.⁵¹

3 Fraud on the Label

'**Organic**' – the global market for organic food and drink was valued at \$27.8 billion in 2004. North America and Europe together comprise 96% of global revenues. The highest growth has been seen in North America. Sales in US and Canada are expanding by over \$1.5 billion a year.⁵² In 2006 US sales totalled \$16.9 billion, or 3% of all retail sales of food and drink.⁵³ Germany has the largest market for organic foods in Europe, valued at about \$4.5 billion in 2005.⁵⁴ The UK market is next largest, followed by the Italian and French markets, then Switzerland, Austria, Sweden and the Netherlands. The UK currently has the most dynamic market. Retail sales were worth approximately £1.6 billion in 2005, an increase of 30% on the previous year.⁵⁵ This means that throughout 2005 organic sales grew by around £7 million every week.

Unlike claims that fish is wild or that beef is British, assertions that food and drink is organic is an imprecise claim. In the UK any product sold as organic in the UK must display a certification symbol or number, showing, or at least asserting, that it complies with minimum government standards (which are set to meet European and international standards, such as those of the International Federation of Organic Agricultural Movements (IFOAM). The Soil Association's⁵⁶ organic symbol is the UK's main certification mark, appearing on approximately 70% of organic food produced in the UK.⁵⁷

⁵⁰ <http://www.telegraph.co.uk/news/main.jhtml?xml=/news/2007/05/07/nfood07.xml>

⁵¹ Moore, M., *Daily Telegraph*, 6 March 2008; also

<http://www.telegraph.co.uk/news/main.jhtml?xml=/news/2008/03/05/witaly105.xml>

⁵² <http://www.organic-consultancy.com/articles/IFI/0906.shtml>

⁵³ <http://envirostats.info/2007/07/21/0191/>

⁵⁴ <http://www.organic-consultancy.com/articles/IFI/0906.shtml>

⁵⁵ Soil Association, 'Organic Market Report 2006,'

<http://www.soilassociation.org/web/sa/saweb.nsf/b0062cf005bc02c180256a6b003d987f/a9de83033f1ed0d9802571a400395660!OpenDocument>

⁵⁶ <http://www.soilassociation.org/web/sa/saweb.nsf/Living/HowKnow.html>

⁵⁷ On 12 June 2007 European Agricultural Ministers reached political agreement on a new regulation on organic production and labelling. The EU organic logo will become mandatory but it may be accompanied by national logos. Foods will only be able to carry the organic logo

In terms of organic farming in the UK, the key features are avoiding the use of artificial fertilisers and pesticides, and the use of crop husbandry to maintain soil fertility and control weeds, pests and diseases.⁵⁸ Controls on organic arable systems cover soil fertility, crop rotation, crop protection, organic seed and organic crop storage and in terms of livestock: feeding, housing, health management and the use of manures.⁵⁹ In the US, organic food is defined as food produced according to organic standards as defined by the USDA.⁶⁰ These cover crops grown without the use of conventional pesticides, artificial fertilizers, or sewage sludge, animals reared without the routine use of antibiotics and without the use of growth hormones, food processed without ionizing radiation and without the use of a wide range of food additives and food produced on all levels without the use of genetically modified organisms.

A key feature of consumers' increasing demand for organic produce is that it is outstripping the domestic agricultural industry's ability to supply. Therefore producers are masquerading⁶¹ as organic suppliers and produce is being imported from sources where its provenance is uncertain. Short of frequent farm visits, there is no foolproof way to check whether a particular food on a supermarket shelf has been produced organically because there are so many different criteria and most are hard to verify scientifically. For example, synthetic fertilisers (banned in organic farming) are almost impossible to distinguish from natural ones: 'Finding a test for organic food is the holy grail.'⁶² Inspections and the visibility of paper trails are essential tools. Prosecutions are brought and reported: Stephen Sains, a butcher in Richmond, was fined for falsely labelling food:

...the worrying case of the honey roast ham, and the lamb and mint sausages, and the dry-cured streaky bacon, and the English lambs' liver, calves' liver, free range chicken breasts and fillet steaks. In fact, large quantities of the meat Stephen Sains was selling in his shop, Organic World, in the affluent borough of Richmond in south-west London, was not organic at all ... He was fined £6,020 and ordered to find a new name for his shop which is fronted by a glass window proclaiming an engraved motto: 'Purity, quality,

if at least 95% of the ingredients are organic. The catering sector will be excluded but this will be reviewed by 2011.

⁵⁸ since 1973 the inputs and practices used in organic farming have been strictly regulated in accordance with EU Regulation 2092/91 and the Organic Products Regulations 2004.

⁵⁹ <http://www.defra.gov.uk/farm/organic/systems/index.htm>

⁶⁰ <http://agriculture.senate.gov/Legislation/Compilations/AgMisc/OGFP90.pdf> and <http://www.ams.usda.gov/nop/Consumers/brochure.html>

⁶¹ <http://www.commondreams.org/news2007/0117-05.htm> in the US and http://observer.guardian.co.uk/uk_news/story/0,6903,1553438,00.html in the UK

⁶² Brereton, P., a food scientist at the UK government's Central Science Laboratory in York. *New Scientist*, issue 2577, 15 November 2006, 40-43

welfare' ...(he) plans to rename his shop The Real Butcher, (and) was rumbled only because environmental health officers conducted a spot hygiene check.

Andrew Portch, who ran a stall under the banner Somerset Organics at Barnes farmers' market just up the River Thames, was found to have misleadingly labelled a number of premium-priced products, including cheese, sausages and game. This month, Portch was fined £3,130 and ordered to pay £1,870 in costs. His company's website promises: 'Here at Somerset Organics our core philosophy is to produce and supply the highest quality certified Organic food from the county of Somerset.'⁶³

The power of publicity is an enforcement tool in itself. But the science is catching up. One of the criteria that define organic meat involves the use of antibiotics. Organic meat farmers are only allowed to use them to fight infections once each year. For pigs, turkeys and chickens that probably means once in their lives. However, some farmers give their animals frequent, low-level doses because animals without infections are likely to be more hungry and die heavier. But this risks losing the 'organic' status and price. Whilst the level of antibiotics in an animal can be measured after death, there has been no way of testing the history of an animal's antibiotics regime. However, at the UK Central Science Laboratory in York a technique has been developed whereby shining ultraviolet light on sections of an animal's bones can reveal its antibiotic consumption in the shape of rings. The number of rings in the bones reflects the number of treatments it received, like the rings in tree trunks.⁶⁴

'Free Range' - the term is used colloquially to mean something like 'low stocking density,' 'pasture-raised,' 'grass-fed,' 'old-fashioned,' 'humanely raised,' 'cage-free', 'free running', 'free-roaming', 'naturally nested', 'able to wander freely' and 'wander at will' and 'wander outside', yet definitions are few and often vague.

In the UK, the Department for Environment, Food and Rural Affairs says that a free range chickens must have daytime access to open-air runs during at least half of their life.⁶⁵ Unlike in the United States, this definition also applies to eggs.

In the US the Department of Agriculture (USDA) loosely defines 'free-range' beef, pork, and other non-poultry products are as coming from animals who ate grass and lived on a range. No other criteria-such as the size of the range or the amount of

⁶³ Doward, J., and Wander, A., *The Observer*, 21 August 2005

⁶⁴ *New Scientist*, issue 2577, 15 November 2006, 40-43

⁶⁵ Council Directive 1999/74/EC, Commission Regulation 2295/2003/EC, as amended by Commission Regulation 1515/2004/EC and Welfare of Farmed Animals (England) (Amendment) Regulations 2002

space given to each animal are required before beef, lamb, and pork can be called 'free-range.' 'Free-range' and 'free-roaming' facilities are rarely inspected. The USDA relies 'upon producer testimonials to support the accuracy of these claims.'⁶⁶ All specific USDA definitions of 'free-range' refer only to poultry. USDA requires that chickens raised for their meat have access to the outdoors in order to receive the free-range certification. Free-range chicken eggs, however, have no legal definition in the United States. Likewise, free-range egg producers have no common standard on what the term means. The European Union regulates marketing standards for egg farming which specifies a minimum condition for Free Range Eggs requiring that 'hens have continuous daytime access to open-air runs, except in the case of temporary restrictions imposed by veterinary authorities.'⁶⁷

Beyond inspection there is little that can be done to ensure that the 'free range' requirements are met, although it has been suggested⁶⁸ that since egg shells are still quite soft when the eggs are laid, if they hit and perhaps bounce on the floor of a cage there will be marks which can be seen under fluorescent lamps.

'Mixed' products – the nineteenth century scientists, Accum, Postgate and those published in *The Lancet* focussed on products which were wrongly described and, more often than not, adulterated. Their techniques have been refined so that the true content can usually be identified in the most sophisticated of products. The DNA testing that is used to identify rice varieties is used to spot beef, lamb, pheasant, turkey and pork, but it is not yet able to distinguish wild boar from pork:

The race in trying to identify methods of analysis to match the ingenuity of the adulterators is an ongoing race and a constant battle ...Delays in developing and collaboratively testing such analytical methods in the past have been exploited by the adulterators as methods of analysis are often out of date by the time they are implemented and used for enforcement.⁶⁹

Food fraud cannot usually be identified by following a paper trail. Detection requires 'state of the art' scientific analysis. There is a Food Authenticity Branch within the UK Food Standards Agency which is responsible for running the authenticity programme.

⁶⁶ Donovan, M. E., Official U.S. Department of Agriculture/Food Safety and Inspection Service letter, 11 April 1996. cited at <http://www.cok.net/lit/freerange.php>

⁶⁷ Commission Regulation (EC) No 2295/2003 23 December 2003 introducing detailed rules for implementing Council Regulation (EEC) No 1907/90 on certain marketing standards for eggs: OJ L 340, 24 December 2003, p.16

⁶⁸ <http://www.tilda.com/radio/radio.htm>

⁶⁹ Sumar, S., and Ismail, H., 'Adulteration of foods – past and present,'

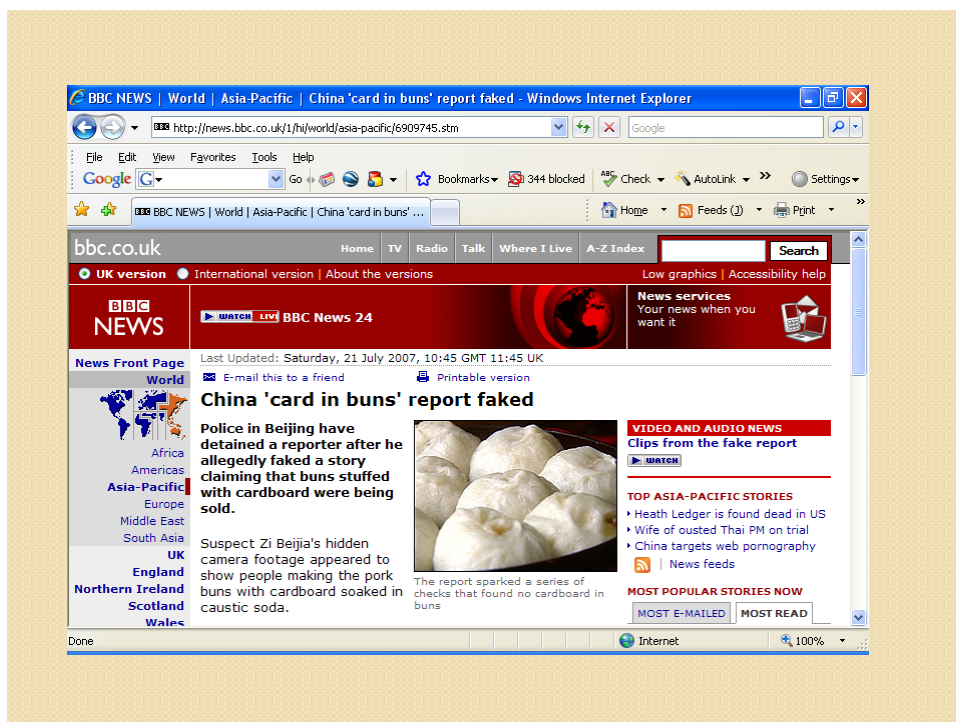
It is often consulted by other EU food government agencies and laboratories for advice and exchange of best practice in analytical techniques. The methodologies delivered by the authenticity programme are disseminated, mainly for the use of public analysts. Recently they offered grants to help towards the purchase of 'lab-on-a-chip' equipment. It is a fast, safe, cheap, and easy to use method of analysing biological samples, 14 public analysts' laboratories now have access to it.⁷⁰

Sometimes the task is easy. In mid-July 2007 China Central Television Station showed an undercover interview conducted with a hidden camera. The opening shot was of cardboard piled in a heap between rows of shabby houses. A man was followed into a ramshackle building where steamers were filled with many fluffy white buns, called baozi. They are traditionally stuffed with minced pork, but not this time. Cardboard was soaked in water, and an industrial-use caustic soda, a poisonous chemical, was added. The cardboard lost its normal colour, became softer and started to look more like pork. The filling recipe was 60% cardboard to 40% pork fat.⁷¹ The story ran on news outlets around the world, including the BBC News website. It sparked a spot check of more than two dozen vendors by health authorities but none were found to contain cardboard. On Saturday July 21 it was reported that the police in Beijing had detained the reporter for allegedly faking the story. They said that he had been investigating the quality of pork buns and finding nothing to report had filmed the fake story under pressure to produce a result. Beijing Television made a public apology during its evening news broadcast for the 'vile impact on society.'⁷²

⁷⁰ Final Report of the Food Fraud Task Force FSA 07/09/07 20 September 2007, para.34.

⁷¹ <http://www.boreme.com/boreme/funny-2007/steamed-bun-of-cardboard-p1.php>

⁷² <http://news.bbc.co.uk/1/hi/world/asia-pacific/6909745.stm>



Nevertheless, at the end of January 2008 there were reports that dozens of people in Japan had become ill after eating imported dumplings containing insecticide, including a five-year-old girl who fell into a coma but later regained consciousness.⁷³ This story became more complicated in February, after the Chinese health minister, Yoichi Masuzoe, said they may have been deliberately contaminated.⁷⁴

The controversy follows a series of genuine food scares in China. In 2005 thirteen babies died of malnutrition after being fed powdered milk that had no nutritional value.⁷⁵ In August 2006 about 40 people in Beijing contracted meningitis after eating partially cooked snails at a chain of restaurants.⁷⁶ In November 2006 a dye farmers fed to ducks to make their eggs look fresher was found to contain cancer-causing properties, and 5,000 ducks were culled.⁷⁷ In March 2007 Melamine was found in wheat gluten exports from China for use in pet food, prompting a recall of at least 100 pet food brands and in 2007 the former head of China's State Food and Drug Administration, Zheng Xiaoyu, was executed for corruption.⁷⁸

⁷³ <http://www.guardian.co.uk/world/2008/jan/31/japan.china>

⁷⁴ <http://www.guardian.co.uk/world/2008/feb/05/china.japan>

⁷⁵ <http://www.pekingduck.org/archives/001166.php>

⁷⁶ <http://china.org.cn/english/2006/Aug/178630.htm>

⁷⁷ <http://www.bio-medicine.org/medicine-news/Food-Safety-Chief-Executed-for-Bribery-in-China-23591-3/>

⁷⁸ http://www.chinadaily.com.cn/china/2007-07/10/content_5424937.htm

Back in the UK, a National Food Fraud Database has been set up in order:

to provide a resource for UK food authorities undertaking investigations and/or prosecutions in relation to food fraud. Information about suspect or illicit activity ...gathered from various sources, particularly from local authorities, but also from other agencies, including HM Revenue and Customs, Defra and the MHS ...it is] an additional and useful tool to assist local authorities in combating food fraud. However, the capability of this intelligence system is, of course, dependent upon the quantity as well as the quality of data input. It is therefore essential that all information, about known or suspected food fraud activity, as well as any details of individuals associated with such activity, is forwarded to the Food Standards Agency for inclusion on this database.⁷⁹

In April 2006 the UK's Food Standards Agency Board agreed to set up a new Food Fraud Task Force 'to consider and report on all issues which are likely to significantly impact on food fraud, and in particular, to consider the current controls in place and their suitability to control and deter food fraud.'⁸⁰ Recognising and building upon previous work, such as that of the Waste Food Task Force in 2003,⁸¹ the Task Force reported in September 2007, making 16 recommendations and 16 further suggestions that, they say, 'may require further discussion and debate.'⁸²

Their recommendations fall under two headings: those for the FSA, and those for local authorities. It is suggested that the FSA develops its existing Food Fraud Database into a more comprehensive Food Fraud Intelligence Unit in order to increase awareness amongst enforcement bodies of the need for intelligence and to share that intelligence between the various enforcement bodies including local authorities, Government departments in the UK and across the EU. There exists a team of specially trained enforcement officers available upon request to advise other enforcers who are investigating illegal meat activity. It is dramatically named 'The Illegal Meat Task Force'. It is recommended that this unit be developed into a Rapid Response Food Fraud Investigation Team, by extending its remit to cover all types of food fraud and co-opting additional experts in such fields as software forensics, investigative experience and analytical skills. Realising that most raids take place on intelligence received,⁸³ it is suggested that a free-phone fraud line be set up, so that

⁷⁹ http://www.food.gov.uk/multimedia/pdfs/enf_e_06_045.pdf

⁸⁰ <http://www.food.gov.uk/news/newsarchive/2006/apr/fraud>

⁸¹ 'The Report of the Waste Food Task Force,' January 2003 Food Standards Agency FSA/0725/0103

⁸² Food Standards Agency, 'Final Report of the Food Fraud Task Force,' (07/09/07) 20 September 2007

⁸³ The FFTF considered the value of educating the public about food fraud, and enlisting their help in identifying and reporting suspicious activities. Making complaints to the enforcement

informants can report food fraud directly to the FSA. (There is a food fraud e-mail address which allows local authorities to forward intelligence reports to the FSA for the Food Fraud Database.) Noting that improved intelligence gathering and better sharing of information between food enforcement agencies is a vital element in the control of food fraud, eight of their recommendations are grouped together as ways and means of 'improving intelligence handling'. Regarding local authorities, it is proposed that each appoints a Lead Food Fraud Officer. There is a FSA Fighting Fund to provide for 'special' activities.⁸⁴ This should be retained and kept under review.

Conclusion

So the world turns. In the nineteenth century there was a gradually building campaign in the UK which resulted in changes in the law and the appointment of public analysts. Today we have sparkling science. We have a 'Task Force' in the UK. We have the law in place, but is it effective? Is it being enforced? One public analyst wrote recently:

routine sampling - to detect the watering of milk or high levels of fat in mince, for example - is in terminal decline. Imagine a town with a population of 300,000 and the number of different food products that those people eat at home, at work and at play in a day. On average only one of those foods will have been sampled for a public analyst to test for safety, nutritional content or authenticity. For every £100 spent on food by consumers, less than one penny is spent by local authorities on testing.⁸⁵

Another analyst has pointed out that there are now only 39 Public Analysts in the UK and 27 of them are over 50 years of age.⁸⁶

What of the 'front line' enforcement troops – Environmental Health Officers? As part of a BBC TV programme⁸⁷ a survey was conducted amongst local authorities in England, Scotland and Wales. Two-thirds reported job vacancies. The UK currently

authorities allows them to develop a better picture of food fraud in their area. It was recognised that publicising the outcome of successful legal proceedings of food fraud cases may have a deterrent effect on others contemplating such activities -as long as the sanctions are recognised as sufficient to truly deter rather than suggest ways of making money., at para.143

⁸⁴ Since its inception in 2003, 23 applications have been made for funds. 19 applications have been approved resulting in the allocation of circa £0.5 million. Funds to pay for surveillance, extra staff, legal fees and specialist assistance (public analyst fees) have been awarded. Ibid. at para.128

⁸⁵ *New Scientist*, issue 2580, 2 December 2006, p.20

⁸⁶ Alan Richards Association of Public Analysts. Dispatches Channel 4 (UK) January 2008

⁸⁷ http://www.bbc.co.uk/pressoffice/pressreleases/stories/2005/11_november/07_real.shtml

lacks more than 700 EHOs. Two authorities each lack 13 officers – one in England and one in Scotland. Some of these struggling authorities told the programme’s researchers that they were unable to meet performance targets - specifically food and health and safety inspections - and that they were providing only a bare minimum service. One anonymous source said that public health was low on the council's agenda and another said:

We always seem to be the department where cuts are made. We are “expendable”...There is a distinct lack of resources and personnel within the department to effectively deal with environmental health matters.⁸⁸

The Food Fraud Task Force wrote:

If food fraud is to receive a higher profile and, when detected, to be followed up in an appropriate manner, it is important that enforcement officers be given the resources to do this. Whilst LAs have had to comply with strict targets for numbers of hygiene inspection etc., this has restricted the LA diverting resources to an area, such as food fraud activity, resources that may be posing a greater risk.⁸⁹

It would seem to follow that priorities and resources must follow the appliance of science if we are to protect the public and preserve the spirits of Accum, Postgate and the rest, all those years ago.

⁸⁸ *Ibid*...

⁸⁹ Final Report of the Food Fraud Task Force FSA 07/09/07 20 September 2007 para.117