DISHING THE DIRT

The Secret History of Meat

Viva!

A Viva! Report
by Alistair Currie RGN, BSc

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Meat: "The flesh, including fat, and the skin, rind, gristle and sinew in amounts naturally associated with the flesh used, of any animal or bird which is normally used for human consumption."
Definition of meat in Meat Products and Spreadable Fish Products Regulations 1984

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Preface

Chicken nuggets originate in a commercial hatchery, incubated in vast ovens before the chicks emerge. From the hatchery, the chicks are transferred to a windowless, wooden shed where 30,000 of them are scattered over the litter floor. There they stay for six weeks, picking up infections such as campylobacter, and spreading parasites and other infection among the flock. Together, they drop tonnes of faeces onto the litter - which is never changed. Almost all will develop leg problems - many will actually suffer dislocations and even fractures. Many will develop heart problems and diseases like bronchitis. The industrially-produced feed they eat is sometimes laced with antibiotics and other drugs to try to keep disease at bay - but still in that single shed, more than thirty will die every day. Six weeks after hatching, the chicks are taken to the slaughterhouse and killed automatically, their throats cut and innards scooped out by machines.

To loosen their feathers, their corpses are immersed in a tank of hot water - contaminated with blood, faeces, feathers and whatever infections their skin carried. After butchering, the scraps of muscle and sinew still attached to their bones are blasted off with high pressure water and the resulting slurry strained through a mesh. After that, it is bound together with gums, flavoured with sugar and artificial chemicals, wrapped in breadcrumbs, heated up and served, as nuggets, to you.

100,000 chickens die in broiler sheds in Britain every day. That means that on the day they are taken to slaughter, 100,000 chickens are so ill they would have died anyway. Some of those diseased birds will become nuggets and some will become Sunday dinner. The people who eat them, however, will never know - and chicken is far from the only meat with a dirty secret…

Introduction

Given the chance, meat will kill you. We try to contain its dangers with a whole range of precautions but all it takes is for meat to be poorly butchered, inadequately cooked or left out of the fridge a little too long and it will show its true colours. The overwhelming majority of all food poisoning in the UK originates from animal produce and there are millions of cases and hundreds of deaths caused by meat every year. Nor can care in the kitchen protect us from all of meat's risks - BSE spread unobserved for many years in the cattle population and even today we do not know how many people may have contracted CJD as a result. Globally, the epidemic may have only just begun: experts fear that countries like China may harbour the disease and be unwilling to admit to its existence for fear of the economic consequences. New diseases are constantly emerging: the killer infection *E. coli 0157* only evolved in the last few decades and wasn't identified until the 1980s, after it had already claimed human lives - something it continues to do. Meanwhile, the routine administration of antibiotics to billions of farmed animals has contributed to the emergence of so-called "superbugs" - antibiotic-resistant bacteria which are a major and growing threat to human health. Antibiotic-resistance, like bird flu, foot-and-mouth and BSE, does not respect borders: what other diseases which were created or exacerbated by human interference are out there waiting to be discovered? In a global meat and livestock marketplace, our health and welfare is at the mercy of too many business interests, too may incompetent, neglectful or indifferent governments and too much luck.

Why, in this day and age of efficient, industrial food production and pre-packaged, processed meat are millions of British people still infected with food-borne illnesses? Why is it that despite all our theoretical knowledge and expertise, illnesses fatal to human beings are allowed to develop and spread on our farms? And why is it that farmed animals themselves suffer from endemic diseases and are so often the victims of devastating epidemics like BSE and bird flu?

This report will show that animal and human diseases are utterly intertwined - that what causes half of all pig carcases to show signs of pneumonia at slaughter also leads to food poisoning; that what causes lameness and heart failure in broiler chickens is implicated in bird flu fatal to human beings; and that mastitis in dairy cows and variant Creutzfeld-Jacob Disease in humans are ultimately symptoms of the same fundamental problem.

As individuals and as a society, we need to look at the processes which put meat on our plates - the hidden and unpalatable reality of the lives and deaths of farmed animals and the flawed and fallible systems which make food products from their flesh. What becomes clear in conducting such an examination is that those processes do not exist to serve consumers or protect animals' health but are designed solely to fulfil the needs of powerful business interests - interests to whom meat is simply a commodity and for whom meat production is about no more than squeezing costs and boosting profits. But while meat may be a commodity like any other to supermarkets, agribusiness and financial institutions, it is a substance like no other in its origins. What underlies this huge business edifice is still the messy, dirty and shocking business of turning walking, eating, excreting, thinking animals into cuts of meat. From farm, to abattoir, to butchery and packaging, it's time to peel back the wrapping and expose the rot beneath.

Part One: The Human Cost of Dirty Meat

Some say meat is murder. In the long term for human beings, it may be more like suicide. Meat causes death, disease and environmental destruction. Agricultural techniques have contributed to the growth of antibiotic-resistant bacteria ("superbugs"), the spread of food-borne illness and the emergence of lethal conditions like new variant CJD. Our appetite for meat has partly led to the prevalence of the fatal diseases of affluence in our society - cancer, diabetes and cardiovascular disease - and contributed to hunger in the developing world by demanding land and resources be devoted to feeding our farmed animals instead of human beings. Reliance on meat and livestock proved disastrous for the United Kingdom when BSE wiped out our export markets and foot-and-mouth decimated our countryside and the tourist industry on which it depended. As the nations most recently affected by bird flu have learned, meat is not something that you can ever rely on. Not as a commodity, not as a way of life - and certainly not as a food.

Witness Report:
A mother describes her eight year old daughter's illness after contracting *E. coli 0157* poisoning through eating an infected hamburger:

"The pain during the first 80 hours was horrific, with intense abdominal cramping every 10 to 12 minutes. Her intestines swelled to three times their normal size and she was placed on a ventilator. Emergency surgery became essential and her colon was removed. After further surgery, doctors decided to leave the incision open, from sternum to pubis, to allow Brianne's swollen organs room to expand and prevent them from ripping her skin. Her heart was so swollen it was like a sponge and bled from every pore. Her liver and pancreas shut down and she was gripped by thousands of convulsions, which caused blood clots in her eyes. We were told she was brain dead."

Brianne survived the ordeal but suffered permanent kidney, liver and brain damage.[4]

This report cannot examine all the ills which derive from meat: instead it will focus simply on the product on our plates - how it gets there, where it comes from and what comes with it. As meat sales have declined and vegetarianism grown, so the vested interests reliant on meat have worked harder and harder to reinforce the idea that the dead flesh of slaughtered animals is a healthy, wholesome and desirable product. Marketing men and women, advertisers, package designers and lifestyle editors have done their very best to disguise the true nature of meat and position it as something modern, fresh and clean - to make a silk purse out of this sow's ear. The reality is anything but.

Of Meat, Microbes and Men

95 per cent of food poisoning is caused by animal products - either directly or through their contamination of other foods [1] - and the Government's Food Standards Agency estimates that there are 5.5 million cases in the UK every year.[2] Food poisoning is a disease we simply do not take seriously enough - in the words of the former head of the FSA, "it is a real illness which kills people" [2]. The people it kills also tend to be the most vulnerable - the old and the very young. All of the 21 people who died as a result of the infamous outbreak of

Food poisoning bacteria

Pathogen	Natural Source	Confirmed Cases (2003, provisional)	Estimated total cases	Deaths (2000)
Salmonella spp	Chickens, eggs, ducks, turkeys	14,853	150,000-500,000	119
Campylobacter spp	Poultry meat, unpasteurised milk	43,455	450,000-5 million	86
Listeria	Soil, animal manure, water	225	675	68
E.coli 0157	Cattle	675	?	22
Bacillus cereus	Widely in environment	500 a	?	0
Clostridium botulinum	Soil, vegetables, fish	0	?	0
Clostridium perfingrens	Intestines of mammals	166 a	50-60,000	89

a. 2000 figure (no 2003 figure available)

Confirmed cases from Health Protection Agency data, diagnosed by laboratory testing.

Estimated figures based on multiplication of confirmed cases to reflect under-reporting, eg x10 for salmonella, x3 for listeria etc (after Lacey)

Death figures: GK Adak, SM Long SJ O'Brien (2002) Trends in indigenous foodborne disease and deaths 1992-2000 Gut 51; 832-841

E.coli 0157 in Scotland in 1996 were over 65 [3]. In fact, over 500 people became ill in that single incident and 149 required hospitalisation, including children. The cause? Inadequate precautions taken in a single butcher's shop.

Food poisoning is the illness that results from the contamination of food with harmful bacteria and a relatively small number of types of bacteria are responsible for almost all the serious food poisoning in this country (see table). Symptoms of food poisoning are generally the same, whatever the bug - abdominal cramps, diarrhoea and vomiting. Patients become dehydrated and for those who are already vulnerable, the resulting disturbance in their body chemistry can lead to kidney and even heart problems. *E. coli 0157* is so dangerous because it produces a specific toxin which attacks the bowel and kidneys. This 'verotoxin' causes such severe

damage to the lining of the gut that haemorrhage and bloody diarrhoea result. Its damage to kidneys is even worse, leading to haemolytic uraemic syndrome (HUS) which leads in turn to kidney failure. Infection with *E. coli 0157* is now the leading cause of acute kidney failure in children.

E. coli 0157 is of concern because it is so dangerous once infection takes hold but other bacteria cause more deaths because they infect more people. Between them, salmonella and campylobacter account for millions of cases of food poisoning each year (see table on previous page) and kill hundreds. Because most people do not report symptoms or do not have lab samples taken if they do, confirmed cases hugely under-represent the number of people who become ill across the country - hence the FSA's estimate of 5.5 million. Other illnesses which are not diagnosed as food poisoning may also be caused by infected food - this is certainly the case with many *staphylococcus aureus* infections, for instance.

Salmonella, campylobacter, listeria and E.coli are picked up by animals on farms, transmitted through their faeces (see Part Two) and frequently spread further at slaughter (see Part Three). Unfortunately, while strenuous (if only partially successful) measures have recently been undertaken to reduce the incidence of contamination of meat products, any progress in this area may be nullified by the emergence of increasingly dangerous antibiotic-resistant strains of these bacteria. According to the head of the US Centre for Disease Control's Infectious Diseases branch, "increasing antimicrobial resistance is [a] general trend among the foodborne bacterial pathogens".[5] In other words, the antibiotics used to treat all of these infections have become increasingly ineffective in recent years. So far, there has always been another line of defence but - as will be detailed below - the ranks of effective antibiotic treatments are being thinned down further every year. The growth of antibiotic resistance in these infections is directly linked to farming techniques.

Food poisoning also has an impact beyond the health sphere. One estimate put lost working days in the UK at 23 million per year [6] and costs including health care are thought to run between £750m [7] and £1bn [8] every year. And it isn't just working lives which are disrupted: 4,000 cases of food poisoning were reported to the FSA in December 2002 [9] - and that's just the reported cases. How many other Christmases were ruined by infected turkeys - up to two-thirds of whom carry campylobacter? [10]

BSE: Made in Britain

The first case of Bovine Spongiform Encephalopathy (BSE) was diagnosed in England in 1986, although it may have been present in the national herd since the 1970s. Since then, over 180,000 British cattle have caught the disease on over 37,000 farms.[11] Although BSE has disappeared from the headlines, it has not disappeared from our cows and over 500 cases were detected in the UK in 2003.[12] The Government claims to be confident that no infected cattle or material from them is now being eaten by the public. The problem is, the Government has reassured us before.

"There is no scientific evidence that BSE can be transmitted to humans or that eating beef causes it in humans"
Prime Minister John Major, December 1995

Variant Creuzfeld-Jacob Disease (vCJD) is the human version of BSE and it has killed 143 people in the UK since the first recorded case in 1995 (Source: CJD Surveillance Unit). vCJD has the same devastating effect on human beings as it has on cattle, directly damaging the tissue of the brain causing dementia, incapacity and death. Diseases of this kind

commonly have very long incubation periods between infection and the development of symptoms - in human cases measured in decades. Scientists knew this when BSE was discovered in 1986 and knew that if BSE was infecting human beings there would be no evidence one way or the other for years. Despite this uncertainty, throughout the 80s and early 90s, the Government maintained that there was no health risk to human beings from eating beef. They were wrong.

The Government did take action over BSE. As a precaution, they ordered that infected cattle should be slaughtered and their carcases disposed of but by the time this order came into force - almost 2 years after the first diagnosis - at least 600 cattle with the disease had already entered the human food chain and the number of infected cattle showing no symptoms is unknown. The problem was compounded by the Government initially offering farmers just half the value of each cow in compensation, little incentive for honesty. In 1989 a ban was introduced on "high-risk" parts of the animal (such as brains and spinal cords) entering the human food chain - although the official inquiry into BSE later concluded that it was poorly enforced.

At every step on this escalating process, the Government reassured the public that they had done enough. In 1990, the Chief Medical Officer Sir Donald Acheson informed the public that beef was "safe to eat", despite evidence that it had been contracted by a cat - presumably from meat in cat food and proving beyond doubt that the disease could infect species other than cattle. A few months later - in a publicity stunt that remains one of the most brazen and ill-considered ever undertaken by any politician - agriculture minister John Gummer reinforced the "beef is safe" message by feeding a burger to his 4 year-old daughter before the cameras of the press.

While the Government and industry (see below) maintained that all was well, behind the scenes scientists and officials were trying to find out what was really going on. Suspicions about the original source of the disease quickly focused on its similarity to the well known sheep disease, scrapie. Scrapie had been known for hundreds of years and until that point had never been implicated in disease in any other animal, including humans. Scientists speculated that it may now have passed to cattle because of one of livestock agriculture's most widespread and - until then - little known practices: feeding rendered animal protein to farmed animals, including members of their own species. While the general public fondly imagined that sheep and cattle grazed in the summer and ate straw in the winter, the reality was that commercial feeds were - and still are - universally used in livestock production. To the agricultural industry - like every business - waste is anathema and slaughtered animals still carry a great deal of material after meat for human consumption has been removed. Recycling that protein in the form of so-called meat-and-bone meal (MBM) seemed like a crafty way of putting it to use - even though it was being fed to animals which were, and had always been, entirely herbivorous. It was thought that cattle had contracted BSE as a result of eating feeds containing scrapie-

infected sheep's brains: in fact, the scientists were wrong about the specific cause but right about the problem. Cattle caught BSE from the infected brains of other cattle - it wasn't just meat and bone that was being recycled in that feed. As the Official Inquiry into BSE put it:

"BSE developed into an epidemic as a consequence of an intensive farming practice - the recycling of animal protein in ruminant feed. This practice, unchallenged over decades, proved a recipe for disaster."[13]

When, in March 1996, the Spongiform Encephalopathy Committee announced the discovery of vCJD, they pointed the finger at BSE-infected meat as the likely source of this new infection. With this announcement, the Government's previous attempts to defend the UK cattle industry from the inevitable economic consequences of beef being associated with a fatal illness were blown out of the water: the EU imposed a ban on the export of all British cattle and beef products within days. In October 1996, researchers at St Mary's hospital announced that traces left behind by the distinctive protein which causes BSE were also present in vCJD. The link was now unequivocal: vCJD was caught by eating BSE-infected cattle and no one knew how many human beings had been infected. Thanks to that long incubation period, we still don't.

With the benefit of hindsight, it is clear that the Government of the time failed to do all they could to contain the risk of vCJD. Once the horse had bolted, they worked hard to bring BSE under control and to overturn the export ban but it still took the incoming Labour administration until December 1997 to ban beef 'on the bone'. The official inquiry described the Government's initial response as

"preoccupied with preventing an alarmist over-reaction to BSE because it believed that the risk was remote. It is now clear that this campaign of reassurance was a mistake."[13]

The Government gambled that BSE did not present sufficiently grave a problem to risk potential economic damage to the British beef industry. Instead they waited for more evidence and more research and told the British public that everything was just fine. Whether one interprets this as a cynical calculation or indecisive wishful thinking, the BSE debacle confirms that relying on politicians to safeguard public health is a very dangerous game.

Right at the Government's side, the meat industry also played a part in reassuring the public of the safety of British beef. In its submission to the BSE Inquiry the Meat & Livestock Commission (MLC) claimed "The MLC has always firmly believed that the promotion of greater efficiency in the livestock industry and the livestock products industry is entirely compatible with, indeed promotes, the interests of consumers."

In examining the consequences of feeding cattle to cattle, that compatibility is hard to detect. The MLC was (and still is) also responsible for the marketing of all British red meat and while they may have disingenuously claimed that there was no contradiction between their role and the interests of consumers, their behaviour does not support that claim. Within days, for instance, of the announcement of the discovery of BSE in a cat, the MLC ran full-page advertisements promoting the safety of beef and held a press conference to reinforce the message. In their 1997/8 Annual Report, the MLC bragged how they had increased minced beef consumption by 18 per cent with targeted advertising. [14]

The BSE Inquiry later concluded that the MLC was guilty of running a campaign in which "hyperbole replaced accuracy" and that they produced "inaccurate statements to the public… which exaggerated the safety of beef". In the absurdly gentlemanly language of official reports the Inquiry concluded that

"The MLC was particularly assiduous in seeking to counter the suggestion that it might be dangerous to eat beef. Regrettably this enthusiasm led on occasion to statements which were not scientifically correct. "[13]

BSE Today

Cattle are still being diagnosed with BSE at a rate of about five a week in the UK. The Government assures us that all infected cattle are caught and that existing precautions - the tracing of cattle, the removal of Specified Risk Material (SRM) and so on - protect those who still eat beef. But are the precautions in place the right precautions and do we know they are being adhered to?

Scientific research demonstrates very clearly that BSE can infect animals from mice to sheep to pumas. A new BSE-like illness has recently been found in sheep [15] while some scientists suggest that BSE may have infected thousands of sheep before the ban on feeding animal protein to sheep and cattle was introduced.[16] An EU inspection in 2002 (fourteen years after the regulations on SRM were introduced) found workers in a sheep abattoir contaminating carcases on the removal of SRM [17] and an audit by the Meat Hygiene Service in 2004 discovered that hundreds of so-called "casualty" cattle may be slipping through the testing net [18] (problems in slaughterhouses will be examined in more depth in Part Three). Meanwhile, the House of Commons Public Accounts Committee has described the system used to track cattle - the system on which the detection and control of BSE depends - as "inefficient, overly burdensome and based on obsolete technology".[19] Increasingly sensitive tests have also revealed that prions (the microscopic infective agents which cause BSE, vCJD and scrapie) can be found in muscle, not just the nervous tissue removed as SRM. Following the recent discovery of a scrapie prion in a sheep's leg, a researcher in the field predicted: "Within the next year, somebody will make a big splash by finding it [the BSE prion] in the muscles of cattle, and the beef industry will go crazy". [20]

A still greater concern, however, is the global trade in animals, meat and feed. Meat and bone meal was widely exported from Britain and other EU countries in the '80s and '90s and authorities acknowledge that BSE was exported with it. [21] After high risk materials like brains and spinal cords were banned from MBM exported to the EU, it still found its way to other destinations - in 1991, Thailand, for instance, bought over 6,000 tonnes of it.[22] When the UK finally stopped exporting MBM in 1996, other countries - proudly and wrongly asserting their BSE-free status - took over the business. Live animals are still exported from the EU

all over the world.
Foreign governments and producers learned a great deal from Britain's trauma. Unfortunately, one of the lessons they learned was that BSE is bad for business and the response of some was to protect their industries at any cost. Despite the fact that it had imported both live cattle and MBM from the UK in the 1990s, the US Government denied the possibility that BSE could have infected American cattle and only banned the feeding of cattle to cattle in 1997 (although, incredibly, they still allowed animals that had been fed on cattle to be fed back to cattle). The US cattle industry, meanwhile, unsuccessfully sued the talk show host Oprah Winfrey for discussing the risk of BSE on her TV show. The US grudgingly introduced testing for the disease in 2002, but tested only 5,000 cows in the first instance. Despite Canada announcing that it had discovered BSE in May 2003, the US Government continued to offer reassurances until its own first case was diagnosed in December 2003. It has now introduced new precautions and testing but so far on a voluntary basis: only 20,000 of the 35 million slaughtered each year in the US will be tested randomly and beef producers have little incentive to volunteer cattle for testing. In the words of *New Scientist* magazine "if any cow looks suspicious there is bound to be a temptation to shoot, shovel and shut up" - in other words, dispose of the cow and say nothing about the potential infection in others in the herd. [22]

In France - the country most enthusiastic about banning British beef - the national testing programme officially checked only obviously unwell animals and uncovered just a handful of cases in the 1990s. Recent research and modeling now shows that 300,000 cases of the disease must have gone undetected between 1991 and 2001 while 50,000 severely infected animals may have entered the food chain. [23] Each individual cow, of course, feeds a far larger number of human beings.

In total, 24 countries have now declared cases of BSE - but not until they had no other choice. Even more alarmingly, not all countries in the beef business have a free press or an accountable political system to pressure leaders into disclosure. China exported $55m-worth of beef in 2002 [22]: if its cattle are infected with BSE, would anyone bet their health on the Chinese government being frank about it?

Learning Our Lesson

BSE has not gone away - and nor has the risk of vCJD. It does appear likely that the most apocalyptic predictions of the extent of CJD in the UK will not come to pass but if that is the case, it is no grounds for complacency. The global extent of BSE/vCJD infection has yet to emerge and the conduct of many Governments - including our own - in response to it gives no cause for confidence that it will be managed effectively or even competently. As the management of bird flu also shows (see Part Two), in a global market for meat and livestock, national problems are now everyone's problems.

BSE was caused by intensive farming practices and if we have escaped a human epidemic, that is a product of good luck, not good judgment. It is true that the specific risk of BSE/CJD was impossible to predict when cattle were first fed to cattle but with hindsight it is utterly clear that ignorance is no excuse: the intuitive repulsion that rational people feel for turning herbivores into cannibals turned out to be a far more reliable judgment on its wisdom than the financial calculations of the farming industry. BSE reinforces the message: ultimately, farming is about putting money in pockets, not food on the table.

Like bird flu, BSE also illustrates the way in which Governments have a conflict of interests between protecting public health and promoting commercial interests. The litany of farmed animal epidemics from foot-and-mouth through BSE to bird flu is an object lesson in the risks inherent to livestock farming: the history of the management of risks to human beings from those illnesses shows that our own health is at stake. The unanswerable question is: what's next?

The conventional rubric in response to crises like the BSE disaster is that "lessons were learned". Today, the Government argue that rules have been tightened, new systems are in place and old mistakes will not be repeated. The fact remains that the institutions on which we relied to assure our safety let us down. Perhaps they have learned their lesson but the more important question is - has the public learned its lesson? Are we going to continue to rely on government and officials to protect us?

Antibiotic-resistance: a self-inflicted wound?

Antibiotics transformed the treatment of infections and infectious diseases when they were discovered in the middle of the 20th Century. Today, the emergence of antibiotic-resistant bacteria threatens a return to the days when simple infections could prove fatal. The most famous of these so-called "superbugs" is MRSA, UK cases of which have multiplied 25-fold in the last ten years,[24] but concentration on this one organism has sometimes masked the breadth of this problem: according to Professor Peter Collignon, Director of Infectious Diseases at Canberra hospital "Overall, there are almost no bacteria where there is not resistance to more antibiotics then there were 10 or 15 years ago".[25] Dr Sandy Macara of the British Medical Association went even further: "there is a real prospect that the majority of our antibiotics could become impotent for the purposes on which we have relied upon them for 40 years."[1]

Underlying this frightening development is a simple law of nature: the survival of the fittest. Antibiotics (also known as antimicrobials) are drugs which destroy or inhibit the growth of bacteria (bacteria which are killed or controlled by a certain antibiotic are said to be "sensitive" to it). Different antibiotics target different bacteria but even within a single species or strain, bacteria are not identical. Some will have mutations which allow them to survive treatment and so when antibiotics are used, these resistant bacteria will multiply. So, although mutations providing resistance to antibiotics are rare, each use of the antibiotic will cause the resistant strains to increase in number. Over time, the resistant bacteria completely replace the sensitive forms and the result is that the antibiotics become ineffective. The irony is, each time we treat an illness with antibiotics, we are encouraging this process to take place.

Unfortunately, the bacteria which infect animals are the same as or very similar to those which infect human beings and so the antibiotics used to treat human diseases and those used to treat farmed animals are also similar and in some cases identical. Thus, each time we treat farmed animals with antibiotics we create antibiotic-resistant bacteria which have the potential to infect us too. In the words of the European Agency for the Evaluation of Medicinal Products, "Animals undoubtedly represent a source of antibiotic-resistant microorganisms for humans". [26]

"Excessive use of antimicrobials, especially as growth promoters in animals destined for human consumption, presents a growing risk to human health"
World Health Organisation 1997

A classic example of this kind of antibiotic resistance is found in a bacteria we have already discussed and whose name will recur in this report many times: salmonella. There are over 2,000 strains of this particular bacteria but in general salmonella infections in both animals and humans used to respond to treatment with "simple" antibiotics. Over the last few years, however, important disease-causing strains have become resistant to a range of antibiotics including ampicillin (a close relative to penicillin), chloramphenicol, trimethoprim and, most recently, a class of antibiotics known as fluoroquinolones, of which the most common in use in human beings is ciprofloxacin. When researchers in Taiwan encountered the first ciprofloxacin-resistant salmonella strains they uncovered both the frightening pace at which this problem can emerge and its origin. Samples from patients taken in 1997 were all sensitive to ciprofloxacin - by 2001, half of all samples were resistant. When the researchers then studied the DNA of the resistant bacteria, they were able to trace it back to pigs. Pigs had been treated by fluoroquinolones and so the salmonella carried by them had become resistant. When humans handled and ate their meat, they became infected with the new resistant strain and the human fluoroquinolone, ciprofloxacin, no longer worked.[27] Fortunately, one last line of antibiotics, third generation cephalosporins, were still effective. Alarmingly, salmonella strains resistant to those have now emerged in the USA.[28]

In fact, as early as 1997 The World Health Organisation (WHO) identified salmonella as one of four kinds of infection in which antibiotic resistance had already been transmitted from animals to man. The other bacteria were campylobacter, E. coli and enterococci (a kind found in animal intestines): it is no coincidence that these are all common causes of food-poisoning. Food poisoning is normally caused by th transfer of bacteria carried by animals to humans. When ingested, antibiotic-resistant bacteria from animals can either infect humans directly or transfer the genes providing their resistance to similar bacteria. Either way, eating animal flesh is the simplest and most direct way of introducing animal infections into our bodies. According to the head of the US CDC's Infectious Diseases branch, in the case of the disease-causing bacteria commonly found in animals, "the principle driver of increasing resistance is the use of antibiotics in agriculture".[5]

Antibiotics in Agriculture

The use of antibiotics is not simply common in agriculture but underpins the intensive farming techniques

which are used for over 90 per cent of farmed animals in the UK. We shall examine the reasons for this in a moment but the scale of agricultural antibiotic use is simply staggering: in the UK 433 tonnes of antibiotics were sold for farmed animal use in 2002 [29] - roughly the same amount as was used in human medicine. Bearing in mind that the normal dose of antibiotics is measured in milligrams, the amount of treatments this represents is astronomical. Over the last 30 years, agricultural use of penicillin-type antibiotics has increased by over six times and tetracyclines by 15 times while a Government report in 1998 found that some pig farms used up to 10 different antibiotics simultaneously to dose pigs of various ages and conditions.[1]

There are three reasons for this massive scale of antibiotic use. Firstly, and obviously, hundreds of millions of farmed animals are bred in the UK each year. Most, however, live only a few weeks or months before slaughter, theoretically reducing their chances of contracting disease and requiring medication. In practice, however, farmed animals are at particular risk of infectious disease because of the conditions in which they are kept and so require medication with antibiotics on a scale quite disproportional to their numbers and physical size. Thirdly, antibiotics are used not simply to treat or prevent disease but as so-called "growth promoters" - additives to feed which help animals put on weight more quickly and so enhance profits.

Added Extras

When we eat animals, we eat what they ate - and that includes the drugs that were fed to them. Clearly, all drug residues in meat have the potential to pose risks in their own right but residues of antibiotics may also contribute to antibiotic resistance in organisms living naturally in the human gut. For this reason, there are rules in place which are supposed to prevent us from taking a dose of the drugs animals are given before their deaths. In theory, animals are given no active medications before slaughter - a "withdrawal period" of days or weeks allowing the residues of medications to be excreted from their bodies. The withdrawal period does not guarantee that their flesh will be free from residues - simply that they will be at what is judged to be an acceptable level. In the UK, the Veterinary Medicines Directorate, a branch of Government, monitors these residues. Their Veterinary Residues Committee's report in 2003 found 89 contaminated products out of 35,399 analyses - a level of 0.0025 per cent.[30] 71 residues were of the poultry feed additives, nicarbazin and lasacolid and were thought to be due to non-medicated feed becoming contaminated with medicated feed at the production stage. The committee bluntly stated: "this continued occurrence of feed additive residues in poultry products is unacceptable".

While the level of contamination appears low, replicated on a national scale it provides frightening evidence of the prevalence of food residues: if we estimate that 40 billion meat meals are eaten in the UK each year, around 100 million meals are likely to be contaminated with residues. While residues are not an important component in the development of antibiotic resistance, this level of contamination is an alarming indication of poor procedures and inadequate regulation.

Stop Press: Batches of organic chicken sold by - among others - Waitrose and Tesco have been withdrawn from sale after being found to be contaminated with the banned feed additive, nitrofuran. Nitrofuran was banned in 1995 because long term exposure was thought to increase cancer risk.[151]

Factory Farming

Antibiotics are not simply helpful in factory farming - they are essential to it (see Part Two). Intensive farming emerged in the later 1940s at precisely the time that antibiotics became widely available. Previously, the inevitable consequences of dirt and overcrowding had prevented intensification of livestock agriculture. Antibiotics provided a solution: they opened the door to the system we have today.

"Treatment may be given to sows for metritis, mastitis and for diseases such as erysipelas and leptospirosis. In most indoor herds antibiotic treatment starts soon after birth. Piglets will receive drugs for enteritis and for respiratory disease. From weaning (usually 3 weeks) all piglets are gathered, mixed and then reared to finishing weights. Weaners usually develop post weaning diarrhoea caused by E. coli which occurs on day 3 post weaning.

"Post-weaning diarrhoea is quickly followed by a range of other diseases. Glassers Disease (haemophilus parasuis) occurs at 4 weeks, pleuropneumonia at 6-8 weeks, proliferative enteropathy from 6 weeks and spirochaetal diarrhoea and colitis at any time from 6 weeks onward.

"…At 8 weeks the pigs are termed growers and moved to another house. Here they will develop enzootic pneumonia, streptococcal meningitis (Streptococcus suis) and, possibly, swine dysentery. Respiratory disease may cause problems until slaughter."
Ministry of Agriculture, Food and Fisheries, 1998.[31]

As Part Two also makes clear, farmed animals in the 21st century are at greater risk of infectious diseases than ever before. Their bodies are placed under increasing physical stress in the attempt to enhance "productivity", be it faster weight gain, more offspring per litter or more litres of milk. Local, national and international trade in live animals mixes animals from different farms and regions, spreading disease (such as foot and mouth) in the process. For this reason, farmers treat their animals with antibiotics or similar medications both when these diseases occur (therapeutic use) and also on a routine basis to prevent them from developing - so long, of course, as the cost of treatment does not exceed the cost of the disease. This preventative use of antibiotics is known as prophylaxis.

Animals kept outdoors are at risk from infections contracted from their environment - from soil and wild animals for instance, risks which can never be eliminated. Animals kept indoors are at even greater risk of infectious illness, however, because of the dirty conditions in which they are kept, the psychological stress of confinement and, above all else, overcrowding. Up to 30,000 chickens may be kept in a single shed, each with a floor space just centimeters bigger than their own bodies when full grown. Respiratory infections transmitted by droplets in the air spread rapidly because of the physical proximity of every bird to its neighbours. Because chickens are coprophagic (excrement-eating) and kept on litter which is never changed, intestinal infections are passed on through faeces. Ducks and turkeys are kept in almost identical conditions while so-called free-range poultry of all kinds are still kept in flocks numbering in thousands.

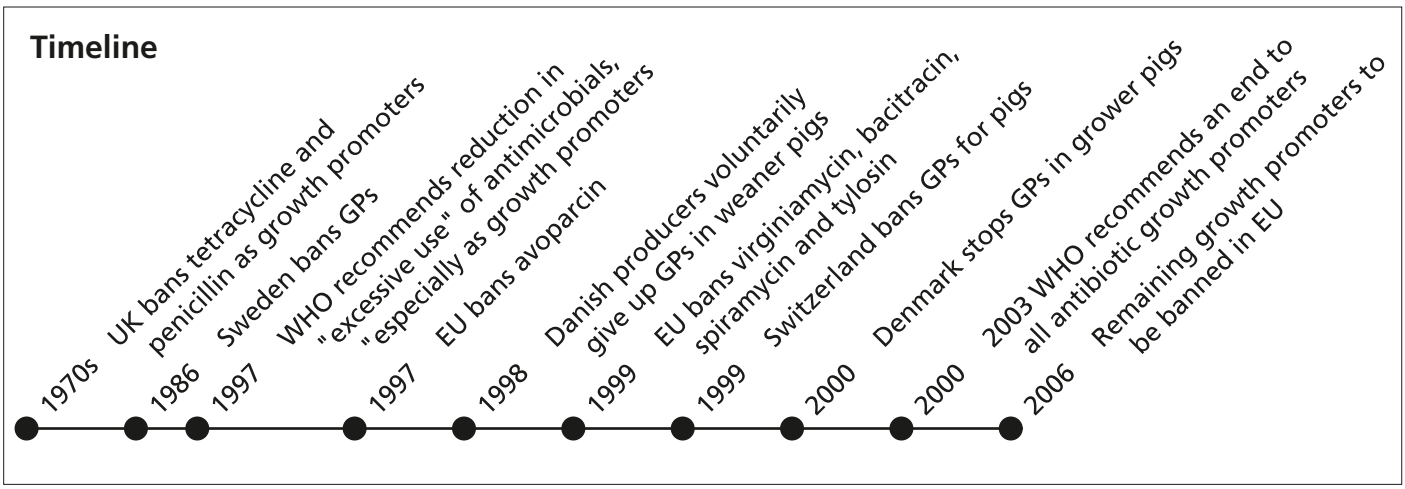
Pigs are overwhelmingly kept indoors - on a smaller scale but in equally insanitary and overcrowded conditions. Prophylaxis is widely used to prevent the inevitable respiratory and gut infections - but with, as the Government report in the box makes clear, limited success. Traditionally "free-range" animals such as cattle and sheep are also housed indoors for increasingly long periods.

Infectious diseases by definition strike more than one animal at a time and so in intensive farming, animals are

medicated, both prophylactically and therapeutically, en masse - usually by adding medication to their feed or water. The concentration of animals and the administration of multiple doses, however, also multiplies the opportunities for resistant bacteria to spread: one study found that the treatment of a chicken flock in which all campylobacter was sensitive to fluoroquinolones led to 100 per cent resistance within days - in other words, all the sensitive bacteria had been replaced with resistant bacteria.[5] Similarly, strains of swine dysentery now exist which are completely resistant to all antibiotics.[28] Not all bacteria respond so dramatically but when this kind of response is replicated on a global scale, it is clear that intensive livestock production is driving the evolution of some resistant bacterial strains on a staggering and unprecedented scale.

Prescribing for Profits

The discovery that antibiotics can enhance the growth of farmed animals was made entirely by chance in 1949, when an American drug company researcher discovered that chickens given a feed containing antibiotic residue gained weight 20 per cent faster than normal.[33] The exact mechanism by which antibiotics achieve this is still not fully understood but it is now thought to be a consequence of two separate actions. Firstly, the antibiotics kill a proportion of the bacteria that are normally found in animals' guts, allowing more food to be absorbed directly by the animal and reducing the amount of toxins produced by the bacteria themselves (although it should be stressed that having bacteria in the gut is normal for all animals and they do play an important role in digestion overall). Secondly, since growth promoters (GPs) have been banned in some countries (see below) it has been found that they do in fact play a role in suppressing the illnesses that arise from intensification, reducing death rates and farmers'costs.



Needless to say, the industry was not slow to capitalize on this fortuitous discovery and by the 1970s, it was estimated that 40 per cent of all the antibiotics produced in the USA were going into animal feed and the resultant increased growth was adding $2bn a year to US farmers' profits.[33] Currently growth promoters are estimated to increase growth and feed-conversion ratios by between 3 per cent and 11 per cent depending on the species[34]- the difference between profit and loss for some farmers (an average broiler yields just 3p profit to the producer).[35]

Perhaps most remarkably, this massive exercise in drug administration was originally almost completely unregulated and while restrictions have been introduced over the decades (see below) even today, farmers in the UK obtain antibiotic growth promoters to dose their livestock simply by buying medicated feed. No prescription is required.

"Following the introduction of fluoroquinolones for use in poultry, there has been a dramatic rise in the prevalence of fluoroquinolone-resistant Campylobacter in poultry and infections in humans in many countries," World Health Organisation [32]

Awareness of the risks associated with prescribing antibiotics to farmed animals is far from new: it was first addressed by a Government committee in the 1960s - examining resistance in salmonella, in fact. Unfortunately, the committee's recommendations and the subsequent Government action followed the typically conservative, step-by-step approach beloved of all bureaucracies and foot-dragging followed every inquiry and report until well into the 1990s (see timeline). Finally, in the mid '90s, the EU banned a number of growth promoters with the closest similarity to human medicines but all GPs will not be banned fully in the EU until 2006 - fully 20 years since Sweden introduced a total ban. In the USA, powerful business interests are still fighting any such restrictions - indeed, penicillin is still used as a growth promoter in the US, 30 years after its use was banned in the UK. Meanwhile, banning growth promoters has barely appeared on the radar of many significant producers across the world. The importation into the EU of meat derived from animals treated with growth promoters will not be banned.

Banning Growth Promoters: Will it Help?

Considering the growing problem of antibiotic resistance, the use of antibiotics as growth promoters appears to be one of the most reckless and unsustainable applications of medications in agriculture. Because of the low doses used, however, GPs account for only about 10 per cent of total antibiotic usage and because doses are low, they exert less selective pressure on bacteria. In fact, the banning of some growth promoters has so far failed to produce a significant decline in the level of antibiotic resistance found in the human population.[36]

There is even some evidence that a ban may be counterproductive. In 1998, pig producers stopped using GPs in Denmark. The result was that the sale of therapeutic antibiotics - those used for treating disease - rose dramatically.[37] In the UK, the 1997 ban on the use of tylosin as a growth promoter was marked by increased sales of the drug as a treatment for ileitis (gut inflammation)[37] and use of antibiotics of the category to which it belongs nearly doubled[38] - despite a decline in the number of pigs over that period. This increase in use also reflects the far higher doses that are given when an antibiotic is administered therapeutically rather than for growth promotion.

Similarly, in 2000, it was announced - with some fanfare - that all UK broiler chickens produced under the new Red Tractor farm assurance scheme would be raised without the use of growth promoters - a significant step as the Red Tractor covered about 85 per cent of broiler production. Three years later, the Red Tractor scheme discreetly dropped the policy and the reason they cited was declining bird welfare and increased prescriptions for therapeutic antibiotics.[39] With (at the time of writing) little over a year to go until growth promoters are banned across the EU, the industry appears remarkably complacent about the implications of the ban - perhaps because they anticipate simply administering antibiotics to their animals in other ways.

Cold Turkey

Growth promoters enhance the profitability of intensive farming: prophylactic and therapeutic antibiotics

A Selection of Antibiotic-Resistant Bacteria

Bacteria	Resistant to	Link with agricultural use	Causes
Vancomycin-resistant MRSA	All antibiotics	Vancomycin identical to avoparcin, used as GP in farmed animals until 1997. DNA sequencing shows vancomycin resistance derives from avoparcin use. (a)	Wounds and other infections in hospital MRSA may be responsible for 20,000 deaths a year
Vancomycin-resistant *enterococcus faecium* (VRE)	Multiple antibiotics, including penicillins, gentamicin and vancomycin	Strains from pigs and poultry now found in human faeces (b)	Hospital-acquired infections, genitor-urinary tract infections (UTI), endocarditis (inflammation of the lining of the heart) and meningitis
Salmonella Entericum DT104	Ampicillin, streptomycin, chloramphenicol, tetracyclines, sulphonamides	Origin of resistance thought to be aquaculture (c)	Food poisoning
Fluoroquinolone-resistant Campylobacter jejuni	Multiple antibiotics, including ciprofloxacin, erythromycin and tetracycline	Identified by WHO in 1997 as caused by agricultural use of fluoroquinolones (d)	Food poisoning
Multiple-resistant E. coli	Multiple antibiotics including trimethoprim, ampicillin	Patterns of infection in farmers found to reflect infection in their animals (e)	Food poisoning

a. Soil Association press release 18/6/99

b. The European Agency for the Evaluation of Medicinal Products, 1999, Antibiotic Resistance in the European Union Associated with Therapeutic Use of Veterinary Medicines

c. Teale C 2003 Antimicrobial resistance – a threat to sustainable agriculture. State Veterinary Journal 13 (1) 26-29

d. WHO press release 20/10/97 Antibiotic Use in Food-Producing Animals Must be Curtailed

e. Spread of Antibiotic-Resistant E. coli From Animals to People May Be Common, Reuters Medical News, July 17, 2001

underpin it. Antibiotics allow farmers to crowd thousands of animals together, automate their feeding and pare labour costs to the bone. Organic livestock farming which eschews the use of antibiotics unless absolutely necessary has, as a direct consequence, vastly greater production costs than conventional farming. Currently only a little over two per cent of meat sold in the UK is organic and with prices of organic chicken near double those of conventional broilers, it is clear that organic food production will remain a niche market. Without the administration of hundreds of tonnes of antibiotics, broiler and pig production in the UK would be financially unsustainable. With great reluctance, European regulators have finally accepted that antibiotic growth promoters are unjustifiable and the industry will be forced to change: what no politician or agro-businessman is willing to do is confront the far larger problem of the use of antibiotics in agriculture overall.

No fewer than 20 of the antibiotics used for the treatment of ill human beings in the UK are currently administered to farmed animals, while dozens more, virtually identical to human medications, are administered at a rate of over 1000kg per day. The transfer of antibiotic resistance from animals to human beings is now an established fact but while our farming industry remains dependent on antibiotics, they will continue to be applied, regardless of the consequences.

Part Two: The Lives of Farmed Animals

All Farms are Factory Farms

In the UK today, less than 2 per cent of our population are directly involved in agriculture. To the overwhelming majority of us, food production in the 21st Century is as alien and mysterious as space exploration - little wonder then, that the anachronistic fantasy of Farmer Giles chewing hay and sending Daisy off to market still lingers in our culture. To understand the meat on our plates, we need to dispense with these comforting illusions and examine modern farming as it really is.

As any farmer will tell you, farming is a business. Success in business is underpinned by a simple principle - maximising productivity and minimising cost. Producing animals for food is entirely about getting as much meat or other product out of them as possible while spending as little as possible in the process. Whether a farmed animal is confined to a battery cage or roaming a Scottish hillside, the same principle applies. A farmer's priority is not to have healthy or happy animals but to have productive animals and the two do not amount to the same thing. If feed and labour costs can be reduced far enough by cramming 30,000 chickens into a single shed, then the increased stress on individual animals is worth it. If it is cheaper to let a few lambs die of cold than employ another shepherd, then that's what a farmer will do. If pigs can be bred to produce litters of twelve in which one or two piglets may starve to death, that makes far more sense than a litter of eight in which all piglets survive. Husbandry techniques subject animals to physical and mental stress but if the outcome is more meat at less cost, that is a price the farmer is happy to pay. The ruthless logic of profit and loss dictates how animals live and when they die.

The greatest cost in raising animals intensively is their food and thus the Holy Grail of farming is to maximise "feed-conversion ratios" - in other words, to get the biggest output of meat, milk or eggs from the smallest input of feed. The more quickly animals gain weight, the sooner they will carry enough meat to be ready for slaughter and the sooner the farmer can stop spending money and start making it. By selectively breeding animals with the best feed-conversion, modern farming has created new strains of animals whose bodies could never survive or even arise in nature. Animals are "designed" to gain weight above all else, including their health. These distorted priorities have led, for instance, to the situation in which turkeys are so large they can no longer mate naturally.

Farmed animals are slaughtered as soon as they reach the point of maximum profitability. Once they carry sufficient meat, feeding them is a waste of money. That means that most are killed at the point of physical maturity - a point which now comes for many of them before they have even reached reproductive maturity: people don't eat chickens, pigs and ducks - they eat chicks, piglets and ducklings. Years of selective breeding have thus produced animals which are never intended to survive into adulthood and the consequence is that they are prone to ill health and disease as described above. However, not all animals die young: animals sent for slaughter must be replaced so more must constantly be bred. The animals used as breeding stock, however, need to have all of the productive 'qualities' of meat animals (because their offspring are killed for meat) but are kept alive far longer.

The consequences include grossly-overweight sows - a fifth of whom go so lame they have to be killed - and chickens whose food has to be rationed to prevent them from growing so big they would die.

Today, all farms are factory farms. Some look more like factories than others but the same principles of efficiency and cost-cutting apply across the board and the impact on animal health is the same. Nevertheless, different kinds of farms carry different problems and risks and a brief look at farming techniques will help to explain the litany of disease, infection and welfare problems uncovered in the following section.

Intensive Farming

These are the classic factory farms. In the UK, 95 per cent of chickens, 99 per cent of ducks, over 90 per cent of meat pigs and the overwhelming majority of turkeys are reared intensively. Crowded together indoors, these animals eat, breathe and excrete in the same physical space every day. The inevitable result is dirty and unhealthy conditions, frequently compounded by poor hygiene standards as a result of paring labour costs to the bone. The overcrowded, insanitary conditions have the same effect as in human slums: infectious illnesses are transmitted rapidly through the populations. To keep these illnesses at bay, farmers routinely dose animals with drugs such as vaccines and antibiotics but death rates of 5-15 per cent of all animals are still common on intensive units.

Feeding is usually automatic and standardised industrial feed is carefully formulated for maximum weight gain. Feed costs are the largest expense in intensive production so price is a critical factor in the farmers choice of feed. Factory-produced feeds may become contaminated with animal by-products, drugs and infections, either at source or on-farm. In all intensive units, sheer numbers of animals preclude the possibility of detecting individual animals' health or welfare problems.

Extensive farming

'Traditional' farming may be more pleasing to the eye but animals in fields are also at risk from the way they are kept. Vulnerable to the vagaries of their environment they can and do fall prey to parasites, infection, weather and the condition of the land on which they are kept - partly because selective breeding for 'productivity' has weakened their ability to resist these natural hazards. In many cases, such as hill sheep, standards of supervision are necessarily poor because the animals are roaming over wide areas: diseases of neglect invariably result. Food may be labelled "free range" if animals have spent only a portion of their lives outside or have simply had access to an open-air range. Free range poultry are usually kept in flocks which still number in the thousands or tens of thousands and even cattle and sheep may also be confined indoors for considerable periods - such as during the winter or for fattening prior to slaughter. At these times, extensively-farmed animals are at the same risk of infectious illness as intensively-reared animals.

"…the State Veterinary Service found about 150 dead sheep and 16 dead cattle… they found scores of livestock corpses scattered over fields. Sheep were roaming and grazing among the carcasses." The animals starved to death. The farmer was fined but not banned from keeping livestock.
The Herald 13/10/04

Organic Farming

Organic farming is basically designed to ensure that food products and the land used to produce them are as free as possible from artificial chemicals such as drugs and synthetic fertilisers. It is primarily concerned with the quality of food rather than the treatment of animals, although in practice organic standards usually set higher levels of welfare than are found in non-organic systems. This is mainly because where the use of drugs and chemicals is restricted, better care must be taken of individual animals in order to safeguard their health. In general, organic systems favour outdoor rearing, lower stocking densities and more "natural" husbandry techniques, such as longer periods before weaning.

This approach does not necessarily reduce levels of disease, however. These more expensive techniques are reflected in the price of organic food, a premium which allows organic farmers to accept greater losses of animals during rearing. The mortality rate of organic broiler chickens, for instance, is double that of intensively reared chickens - parasites and infectious disease being easily acquired from the environment and fewer drugs being used to control them. Similarly, scab, a skin infection in sheep (see below) appears to present a greater risk in organic sheep than non-organic because the use of conventional treatments is restricted.[40] The organic ideal of chemical-free farming may sometimes be obtained at the expense of animal health.

Markets and transport

As commodities, animals are traded and transported whenever the opportunity for profit exists and for some this may occur at several stages in their lives. Animals such as chickens are bred in specialist hatcheries before being sold on to producers for "growing" while livestock farmers of all kinds replenish their herds or "improve" their breeding stock by buying "replacements" in. Pigs may be traded several times, from breeders to growers to "finishing" units and all animals face transport to slaughter. Livestock markets see thousands of animals passing through them, with animals crowded into pens for inspection by potential buyers. Despite the recent experience of foot-and-mouth in the UK, basic standards of hygiene and welfare are frequently neglected [41] and the potential for cross-contamination at markets and on farms themselves is considerable. In transport lorries, stressed animals are packed together, sometimes in layers with the animals in the top tiers dropping excrement on those below.

The Lives of Chickens

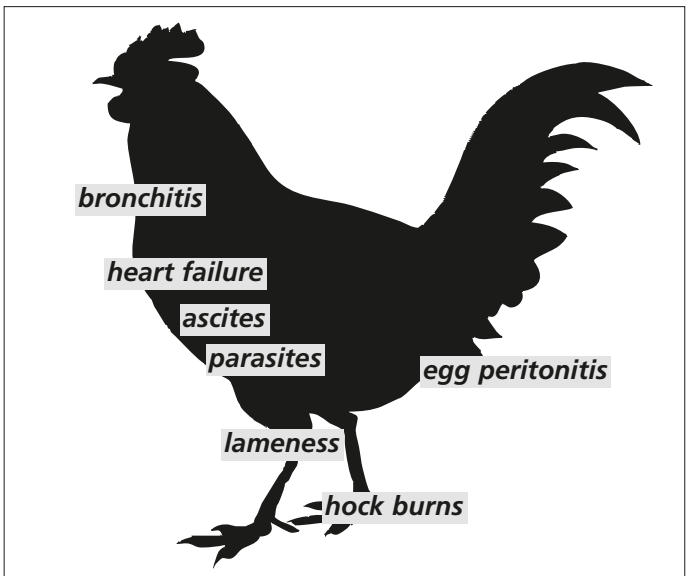
At any one time, over 100 million broiler (meat) chickens are being raised in the UK - over 95 per cent of them on factory farms. Despite the fact that they live for only a fraction of their natural lifespans, the broiler industry still expects around one in every twenty chickens to die during the few weeks between hatching and slaughter - a figure equivalent to 100,000 dying every day. Of course, only the sickest birds fail to survive so these figures indicate a huge underlying problem of disease and animal suffering. Examining the lives of broiler chickens, it isn't hard to see why that is the case.

Feathered Frankensteins

Broiler chickens are highly selectively bred for maximal weight gain, especially to satisfy the demand for breast meat. They now reach slaughter weight almost twice as quickly as they did 40 years ago.[43] Because the breeding process has artificially prioritised muscle development, broilers' bones, hearts and lungs have not been able to keep pace with their increased weight and the consequence is birds under enormous physiological stress from both skeletal and circulatory diseases. Broilers have seven times the mortality rate of laying hens, even though layers live for years rather than weeks.[43]

The level of leg problems in broilers has been bluntly described by Government advisory body the Farm Animal Welfare Council as "unacceptable".[44] One survey found that over 90 per cent of chickens had an abnormal gait (ie were lame to some extent),[45] and post-mortem studies show birds suffering from fractures and/or dislocations.[43] While some of these problems may have been caused at or just before slaughter (see below) even an industry survey in 2002 found instances as high as 28 per cent of birds in a single flock detectably lame.[43] The specific causes of lameness vary and include tibial dyschondroplasia and femoral head necrosis, caused by infection. Tibial dyschondroplasia has been found in 50 per cent or more of birds in European studies.[43] Research shows that given the choice lame birds show a preference for food medicated with pain killers, indicating that their disability is also a source of pain.[46]

The hearts and lungs of these birds must provide oxygen and blood to all the excess muscle and this puts them under severe strain. The result is circulatory diseases such as heart failure and ascites - a build up of fluid in the birds' abdomens because their hearts are not strong enough to pump it round their huge bodies. The EU's Scientific Committee Animal Welfare found evidence of ascites in chicks just 3 days old, a shocking indictment of the physical deformities created by selective breeding.[48] A major cause of death in broiler chickens is so-called "flip over", more scientifically-known as Sudden Death Syndrome. The colloquial name is an accurate if callous description of the problem - birds collapse suddenly following a



877 million slaughtered in the UK in 2003 [42]
Natural lifespan, 7 years: slaughtered at 6 weeks (meat chickens), 2-3 years (laying hens)

brief period of very obvious distress, falling on their backs and dying within seconds. Although they show no apparent signs of illness before death, SDS is caused by acute heart failure and bigger birds are more likely to die from this condition.[46]

In the Ghetto

Thanks to breeding for weight gain, broiler chickens are born with the health problems noted above but factory farming techniques place them at even greater risk of disease. Up to 30,000 birds may be housed in a single shed and usual practice in the UK is for them to remain on the same litter throughout their lives. Over that period, accumulated excreta turns the litter from loose and dry chippings into a moist, spongy mass. To maximise time spent feeding, birds are frequently given just one hour of darkness in every 24 - placing them under still greater strain. Insanitary conditions and overcrowding are a recipe for both infection and the physiological stress which decreases resistance to disease. Broilers are thus vulnerable to a range of infectious diseases.

Viva! Investigator's Report:

"When you enter a broiler shed, the first thing you notice is the air: not only is it choking with dust and feathers but there is a powerful stench of ammonia. If the chicks are near the end of their lives, the litter will be spongy underfoot, sodden with liquid faeces and the birds themselves will be filthy, especially on their breasts and legs. You don't have to look far to see sickly birds. Scrawny, featherless chicks will be all around and you will always find others scarcely able to walk because they are so lame. Pretty often, you'll also find birds gasping for breath in the last stages of life. Open wounds are a common sight - usually from feather-pecking. It's rare not to find birds that have already died and you'll occasionally find the desiccated remains of birds that obviously died some time ago. One thing that really strikes you is how hard it is to keep track of individual birds when there are thousands all around: if you turn around and then look back, they're gone. It's completely obvious that stockmen wandering through the shed have no chance of detecting ill birds."

Viva! have investigated the biggest broiler producers in the UK, Grampian and Faccenda, as well as many smaller producers.

Coccidiosis is a parasitic infection of the intestines and most chickens are infected with it by the time they are a few weeks old.[47] Coccidia are single-celled protozoa and their 'eggs' survive in chicken sheds despite cleaning. These eggs are ingested by new birds as they are introduced to the sheds and passed on in their droppings. The main symptom is bloody diarrhoea. Because intensive conditions provide perfect conditions for the spread of this disease, broilers are routinely dosed with medication to control it although the main drug used, nicarbazin, has been shown to cause hormonal problems and birth defects in animals studies.[49] Larger parasites such as roundworms can also affect chickens, especially free range and organic flocks which forage in the open.

Other infectious diseases include infectious bronchitis and infectious bursal disease. IB will usually infect every bird in a flock once it takes hold but it can be hard to detect at first: signs of the disease range from decreased growth rate to the deaths of a quarter of all birds in an infected flock.[46] IBD targets birds' immune systems and can cause high mortality - it is "prevalent wherever poultry are kept".[50]

"the single most severe, systematic example of man's inhumanity to another sentient animal"
Professor John Webster on lameness in broilers [47]

Skin diseases are also common, some as a result of prolonged contact with moist, infected litter, causing ammonia burns and blisters. These are sometimes visible on processed chicken on sale in the form of black or brown marks on the legs, known as hock burns. Any break in the skin will quickly become infected by the faeces-soiled litter and further infection may spread through the bloodstream.

The End of the Road

After six to seven weeks of being "grown", all the chickens in each shed are sent for slaughter on the same day. In a process known as "depopulation", thousands of birds are caught and loaded in boxes for transportation by lorry to the abattoir. Rough handling during catching is thought to be responsible for a significant number of leg injuries detected at slaughter. Birds who have known nothing but the ventilated, temperature-controlled interior of a huge shed for their entire lives are then driven in open-sided lorries to the slaughterhouses. Crammed tightly into boxes, they may peck and claw at one another. The entire process is so stressful that around half-a-million chickens each year die in the short period between catching and slaughter.[43]

Chicken Farming and Human Illness

Salmonella are intestinal bacteria, found in all animals including humans. Salmonella cause up to half-a-million cases of food poisoning and over 100 deaths in the UK per year (see Part One). The bacteria may be introduced to chicken flocks from outside the sheds, transmitted from parent to offspring through eggs or simply linger in inadequately cleaned poultry sheds. The bacteria are excreted in the faeces of infected chickens and as chickens eat faeces, it spreads easily in broiler chicken flocks. It rarely causes illness in the birds themselves. Despite a huge campaign against it, it is still found in over 40 million butchered chicken carcases a year.[51]

Like salmonella, campylobacter are bacteria found in the gut of many animals, although most commonly in poultry [52] (see Part One). Infection of an entire flock will usually take just a few days although it is actually more common in free-range and organic birds because it is widespread in the environment.[52] Responsible for up to 5 million cases of food poisoning a year in the UK, campylobacter is found in half of all chicken on supermarket shelves.[51] Chicken is the largest single source of campylobacter poisoning.

Bird Flu

One of the most devastating illnesses that can affect chickens and other poultry is avian influenza or bird flu. Outbreaks of the disease occur regularly throughout the world and the outbreak which was first detected in January 2004 in the Far East has still not been brought under control at the time of writing (October 2004). Bird flu is a classic example of a 'local' problem having global importance as affected countries such as

Thailand and Vietnam have become increasingly significant exporters of poultry - the UK imported 12,000 tonnes of frozen chicken from Thailand in 2003.[53] Tesco, in particular, sourced much of its chicken in Thailand. Nor is the disease solely found in developing nations: in 2003 an outbreak as close as Holland led to the slaughter of 60 per cent of its national flock.

In a scenario familiar from BSE, the devastating economic consequences of export bans as a result of bird flu make both producers and governments reluctant to admit to the problem. Many scientists believe that the current outbreak could have originated in China [54] but the Chinese aren't letting on. What is sure is that the Thai authorities protested that their outbreak of bird flu was chicken cholera, possibly for as long as two months after the disease was first detected - presumably in an attempt to preserve their export markets.[55, 56]

Bird flu is a highly infectious viral disease, spread by direct contact with faeces from infected birds, contaminated feed, water, equipment and clothing, from eggs in hatcheries and wild birds acting as carriers of the virus. It causes a variety of symptoms in poultry, including respiratory distress and diarrhoea. Both the disease and the control methods used to contain it - mass slaughter of animals - carry enormous welfare implications for poultry but the risks associated with the disease are not confined to birds.

Like all viruses, the bird flu virus is constantly mutating and at least two strains at present can infect humans: the less virulent H9N2 and the more deadly H5N1. Although only 44 cases of H5N1 have been confirmed in the current outbreak at the time of writing, 32 of these cases have been fatal - a mortality rate of over 75 per cent.[57] Total numbers are low because at present the virus can only be caught directly from birds but the major concern for human health is that if the virus mutates further, it could become transmissible from human to human. Many scientists now believe that the flu epidemic of 1918 which killed 40-50 million people worldwide was a mutated bird flu virus [58] and similar mutations have led to two other epidemics. The World Health Organisation has warned that there is a real risk of such a mutation occurring and that current vaccines may not be effective against the new illness. Peter Cordingley, regional co-ordinator for the WHO in Manila expresses the risk in the bluntest terms: "We don't have any defence against the disease," he says. "If it latches on to a human influenza virus then it could cause serious international damage".[59] New reports from Thailand (September 2004) indicate the first instance of human-to-human transmission of bird flu. WHO have confirmed that a mother caught the disease from her daughter. Both died.[60]

Laying Hens

There are around 30 million laying hens in the UK, approximately 70 per cent of whom are still kept in battery cages.[61] Where broilers have a lifespan of six-to-seven weeks before slaughter, laying hens are expected to live for two to three years - before being slaughtered for low grade meat once their 'productivity' falls off. While layers are markedly smaller than broilers, and thus spared some of the consequences of inflated size, they have also been selectively reared for productivity - today producing hundreds of eggs a year where they used to produce just a few dozen. Layers are thus prone to many of the same infectious diseases and parasites as broilers as well as diseases specific to them. Ironically, layers suffer bone and leg problems too but for completely different reasons to those affecting broilers.

A major and distressing cause of death in layers is egg peritonitis - infection and inflammation in the

abdominal cavity caused by eggs. There are a number of causes of this disease, including the virus which causes infectious bronchitis in broilers, and E. coli infection of the laying duct. If hens are unable to expel an egg it may cause infection leading to peritonitis, especially if the egg breaks internally, providing a rich medium for bacterial growth. Prolapses may also occur, where part of the laying duct protrudes from the hen. Hens naturally peck at anything unusual and the result is that pecking from other birds turns the prolapse into a bloody and infected wound.

As for lameness in layers, the problem here is not excessive size but a combination of two problems - lack of exercise and weakening of bones due to calcium loss. Caged birds, in particular, get so little exercise that they have no opportunity to build up leg strength. The shells of eggs are high in calcium and egg production leads to lowered calcium in the bones, increasing the risk of fractures and lameness. Brittle bones are more easily broken and one survey found that 14 per cent of caged birds were actually suffering from broken bones while a further 13 per cent had healed fractures.[62]

Among caged birds, welfare and disease problems of all kinds may be exacerbated by difficulty in inspecting birds - cages are stacked in tiers and the top and bottom layers may be both poorly lit and difficult for stock keepers to reach and see.

Salmonella and Eggs

The "salmonella scare" of 1988 was the fore-runner of many recent food crises. The then junior health minister, Edwina Currie, provoked outrage by stating that most egg production in the UK was affected by salmonella. Egg sales plummeted and the minister lost her job. Although figures never backed her claim about the level of contamination, the minister's concerns were well grounded, based as they were on the advice coming to her that a new salmonella strain was linked directly to eggs.[63] The industry howled and her head rolled but 10 years later, a vaccination programme was undertaken which now sees 80 per cent of chickens vaccinated against one of the most common strains of salmonella (*salmonella enteritidis*). Sixteen years down the line, salmonella contamination of eggs is a third of the level it stood at when Mrs Currie made her comments, the most recent survey indicating a contamination rate of one box of eggs in every 290.[64]

While this improvement is certainly welcome, as 27 million eggs are eaten in the UK each day, this is still nearly 100,000 infected eggs in total per day. Imported eggs may not reach even that standard - Spanish eggs infected with salmonella are thought to have led to over 6,000 cases of food poisoning in the last two years.[65]

Turkeys

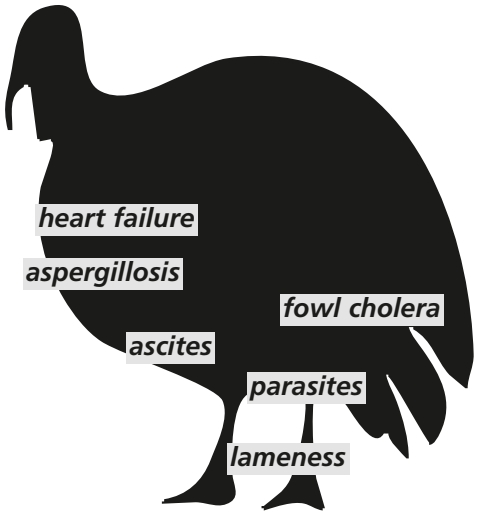
After chickens and farmed salmon, the animal subjected to factory farming in the greatest numbers is the turkey. Over 20 million are reared and killed each year, a third of those at Christmas. Turkeys have also been selectively bred for maximal weight gain and the result is an animal that has lost the ability to fly and suffers from a litany of diseases. Breeding stags are so large that they are incapable of mating naturally and require to be masturbated by a stock keeper to provide semen for artificial insemination. Pathologically obese, they suffer from clogged coronary vessels, heart failure, ascites and congested livers.

Viva! Investigators Report

"The smell and noise was absolutely overpowering and we had hardly entered the shed when we found birds 'flipped over' - one died right in front of us. Lame birds were easy to find, dragging themselves along on their wings. They had little chance of making it to the drinkers and feeders. We also found a feeder that was completely blocked - it's impossible to say how long it had been that way but it looks as though regular "inspections" by flock-keepers hadn't picked it up.

"The breeding flock looked even worse: huge stags, some with open wounds, lurching along, their feathers in a dreadful state."

Viva! has investigated the UK's biggest turkey farmers, including Bernard Matthews and Kerry Foods.



21 million slaughtered in the UK in 2003 [42]
Natural lifespan, 10 years: slaughtered at 8-26 weeks

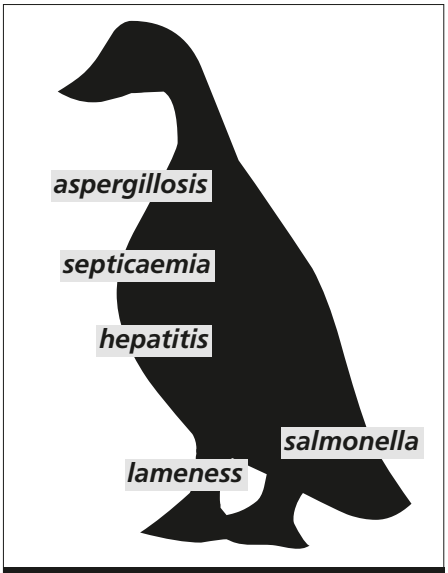
Needless to say, turkeys suffer from severe lameness. Most have degeneration of the hip joints leading to severe lesions. Dr Colin Whitehead of the Agricultural and Food Research Council states that 70 per cent of the heavier birds are "suffering pain rather than just discomfort".[66] One consequence of severely reduced mobility is birds unable to walk to feeding and watering points. These so-called starve outs account for as many as a million deaths in turkey sheds each year

Turkeys are also as vulnerable to infectious disease and parasites as broiler chickens, suffering from both diseases which afflict all poultry and specific diseases of their own. These include Paramyxovirus 2 and Blackhead disease. Pasteurellosis, or fowl cholera is especially prevalent in turkeys, its effects ranging from mild infection to severe illness and death. The fungal lung infection aspergillosis is found in all poultry but turkeys seem especially vulnerable.

Ducks

20 million ducks are reared and slaughtered for meat in the UK each year - over 95 per cent of them in intensive conditions virtually indistinguishable from those in which chickens and turkeys are reared. These naturally aquatic animals are denied any water in which to swim and the law does not even oblige producers to provide water for them to preen themselves.

Many of the illnesses from which they suffer are familiar from other poultry: pasteurellosis, bird flu, infectious bursal disease, aspergillosis, starve-outs and salmonella and e. coli infections - all are greatly exacerbated by factory farming. Ducks are also susceptible to duck plague - a highly infectious disease caused by the herpes virus and duck virus hepatitis which can cause death within hours of onset. Ducks are prone to developing septicaemia (blood poisoning) as a result of infectious illnesses. An outbreak of septicaemia in 2003 on a farm belonging to one of the UK's major duck producers, Kerry Foods, led to the RSPCA having to put down nearly 100 ducks - something which should have been done by the farm itself. In a subsequent prosecution, counsel for the RSPCA said "this is a case about lack of inspection".[67] Mortality rates for ducks are about 5 per cent - in other words a million birds a year.



20 million slaughtered in the UK in 2003 [42]
Natural lifespan, 10-15 years: slaughtered at 6-7 weeks

Like all poultry, ducks are also prone to leg disorders as a result of selective breeding for greater size. Ducks now reach weights of 3.5 kg in just 49 days, compared to 40 years ago, when it took 63 days to reach the same weight.[68]

For more information on ducks, see Viva!'s report , Duck Out of Water.

"Mallards fly, swim and walk efficiently but the heavier domestic birds, in particular those selected for meat production, may be unable to fly, have difficulty in walking and be subject to leg disorders."
Council of Europe, 1999 [69]

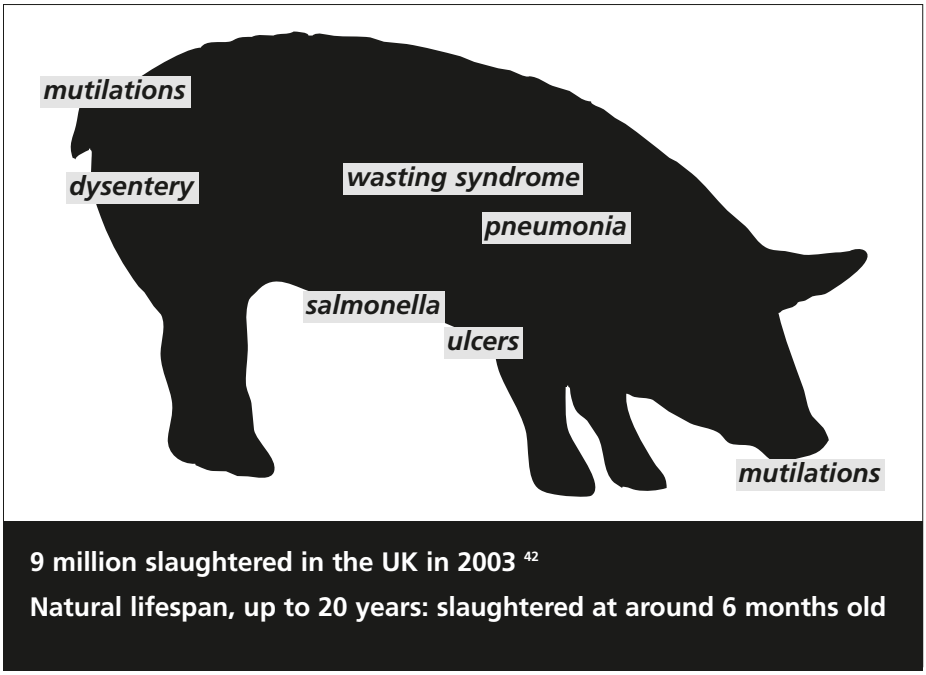
Geese

Stop Press: At the time of writing, an outbreak of goose parvovirus has been diagnosed in the UK for the first time in 23 years. Causing weakness, anorexia, diarrhoea and nasal discharge, this highly infectious disease has so far killed over half of all animals infected. Geese may carry the disease while showing no symptoms and transmit it through faeces or eggs.[70]

The Lives of Pigs

The overwhelming majority of pig production in the UK is intensive. 75 per cent of breeding sows are kept indoors for their entire lives and only 1 per cent of all 'finishing' pigs - ie those being prepared for slaughter - are kept outside. At any one time, over 90 per cent of Britain's five million pigs will be confined indoors in factory farms.

Pigs are confined in buildings with concrete or slatted flooring for ease of cleaning. A grown pig, however, produces 10 times the faeces of a human being and efficient and complete cleaning of pens containing 10 or 20 pigs in sheds containing hundreds of pigs is simply impossible to achieve. Inevitably, pigs end up lying in their own excrement. Straw or other bedding is used in some systems but replacing it frequently is time consuming and expensive so it often becomes fouled.



9 million slaughtered in the UK in 2003 [42]
Natural lifespan, up to 20 years: slaughtered at around 6 months old

Wild pigs - which are exactly the same species as all farmed pigs - normally have litters of around 6-7 piglets. However, this level of productivity is insufficient for the meat industry and selective breeding has led to sows who now routinely produce litters of double this size. More piglets means smaller and weaker piglets and more competition for their mothers' milk. As a result, although more pigs are born, around one in 20 are born dead and one in ten fail to survive to weaning.[71] This means, on average, more than one piglet dying in every litter. Causes of death include starvation, chilling, infections and being lain on by the mother. "Overlying" is the most common cause of death but frequently masks underlying problems - weak and hungry piglets are most likely to be crushed. Farmers would obviously prefer all piglets to survive but so long as their losses are not greater than their competitors, they will not be concerned. Piglets which die before weaning consume no commercial feed and thus incur virtually no costs. Ten live pigs from a litter of 12 is still a more profitable proposition than all piglets surviving in a litter of seven.

In order to re-impregnate breeding sows as soon as possible, weaning takes place at either three or four weeks depending on the system used. Naturally weaning would be a gradual process, not completed until the piglet was two to three months old. Abrupt, early weaning puts piglets' immature digestive systems under stress, resulting in scours, severe diarrhoea. According to one animal feed expert, pigs are weaned at the time of "peak vulnerability"[72] and another notes that "young pigs have considerable difficulty digesting their feed from weaning until two months of age".[73] Scours are not confined to newly-weaned pigs, however. Swine dysentery, E. coli infections, rotavirus salmonella and porcine intestinal adenomatosis all cause scours in pigs - in many cases fatally: up to three-quarters of all pigs on a farm infected with swine dysentery may die.[74] *Pig Farming* magazine identified the contributing factors to scours and their list of culprits reads like a description of factory farming: poor hygiene, overcrowding, lack of or unclean bedding, overcrowding and dirty water or feed bins.[75]

The dirt and overcrowding of factory farms leads directly to another major category of pig illnesses: respiratory disease. This has been described by an Upjohn veterinary adviser as possibly the most important disease threat to pigs.[76] Lung lesions associated with pneumonia are found in as many as 50 per cent of pig carcasses at slaughter[74] while 80 per cent of pig herds are affected by enzootic pneumonia, the most common type.[77] Pleuropneumonia causes anorexia, fever and laboured breathing in pigs and blood-stained froth may be seen at the mouth - mortality among infected pigs may be as high as 50 per cent.[74] Atrophic rhinitis is an infective illness causing sneezing followed by distortions of the nose and even bones of the face: 20-30 per cent of pigs at slaughter may show signs of the disease.[78]

Rob Hill/Viva!

Viral diseases have become increasingly common in recent years. In 1991 the UK was struck by the first of many new illnesses - porcine reproductive and respiratory syndrome which is now endemic in the UK and causes increased abortions and premature births in breeding pigs and respiratory disease in weaned pigs.

Two more new diseases thought to be viral in origin have emerged in the last few years: post-weaning multisytemic wasting syndrome (PMWS) and porcine dermatitis and nephropathy (PDNS). PMWS strikes down newly weaned piglets and may cause up to 20 per cent of piglets to die. Signs of infection range from laboured breathing and jaundice to unexplained deaths in a herd. While a virus has been implicated in its spread, mortality from PMWS is associated with low standards of hygiene, high stocking densities and early weaning - in other words, again, the characteristic features of factory farming. PDNS mainly affects older pigs and causes kidney damage and haemorhaging under the skin. Because these diseases have a huge impact on productivity, farmers take them very seriously indeed.

Amongst many other illnesses, pigs are also widely affected by meningitis, which may be present in up to 50 per cent of pigs.[79] This bacterial infection results in sudden death of pigs that seem in good condition. If the pig is seen alive, he may show signs of incordination, tremor, paralysis and spasms before dying within four hours of showing symptoms. Exudative dermatitis, also called "Greasy Pig Disease", is a very distressing illness causing piglets to develop excess secretions which can rapidly lead to infected lesions, skin loss and death. Up to 60 per cent of finishing pigs may suffer from stomach ulcers [80] and a recent abattoir survey found six out of 10 batches of pigs had roundworm infection.[81] A similar survey found that 24 per cent of finishing pigs had mange.[82]

Mutilations

Pigs are also subject to intentional damage. Because piglets have sharp teeth which can cause damage to other pigs, teeth are often ground down or clipped with pliers - often exposing the pulp. On animals under 7 days old no anaesthetic is required but not only is the process itself very painful, it causes continued severe pain to piglets until they lose their milk teeth around 50 days later.[83] Tails are also clipped to prevent other piglets from biting them - again, without anaesthetic on piglets under 7 days old. Around 40 per cent of all piglets are subjected to these mutilations.[84] Pigs with sufficient mental stimulation and adequate nutrition very rarely tail-bite but these painful mutilations are simpler and cheaper for farmers to perform than providing environmental enrichment on factory farms.

Viva! Investigator's Statement

"There's nothing else on earth like the smell of a pig farm. It lingers on your clothes for hours after you've left but the pigs have no escape. No wonder that you can hear coughing and wheezing so frequently from the pigs themselves. Standards of cleanliness vary from dirty to disgusting. I've seen farms festooned with cobwebs and infested with flies and rats and mice are common sights. Pigs are often caked in faeces or splashing around in slurry. Straw doesn't get changed often enough and can be rank. Pigs are actually pretty clean animals given the chance but packed together in tiny pens with nowhere else to go they have no choice but to p--- and s---- on one another.

"If you visit a breeding unit, you'll also find dead and dying piglets almost without fail. Often the bodies of piglets are just left lying in the pens - sometimes you'll find them heaped up in piles or in buckets. I've found them actually decomposing on more than one occasion.

"The other thing you often find is drugs - vaccines, antibiotics and supplements. It's like the farmer is constantly struggling to keep them alive."

Viva! has investigated and filmed on over thirty UK pig farms.

Mixing it up

Unlike chickens, which will remain in the same shed from days old to slaughter, pigs are frequently moved - sometimes within the farm, sometimes from one farm to another. They are taken from their mothers abruptly at weaning and mixed with other litters and are likely to be moved again a few weeks later for 'growing' and again later for 'finishing'. Some farms specialize in just one part of the process. As animals which have evolved to live in stable family groups this mixing is extremely stressful for pigs and leads to fighting, injuries and lowered resistance to disease and infection. It also provides a perfect opportunity for the spread of disease.

Pig Farming and Human Illness

In 2000, the ministry of agriculture calculated that 23 per cent of the nation's pigs are affected by Salmonella and that 5.3 per cent of carcasses checked were infected.[85] There is no evidence of any improvement in levels of contamination since that time. Further, live transport and markets transmit this disease. Up to 20 per cent of Salmonella-free pigs are infected during transport and at the abattoir from contaminated excreta.[86]

Pigs also carry campylobacter and E.coli while listeria is carried on 58 per cent of pigs' skin.[87]

For more information on pig farming in the UK, see Viva!'s Pig in Hell report.

The Lives of Cattle

The image of cows grazing in the field remains an unchanging constant in the countryside. Behind the picture of tradition and tranquility, however, lies exploitation and the dedicated pursuit of productivity. Whether they

are dairy cows, driven to secrete huge quantities of milk at a devastating cost to their health, or beef cattle, designed to simply eat, get big and die, cattle are devastated by ill health, pain and disease.

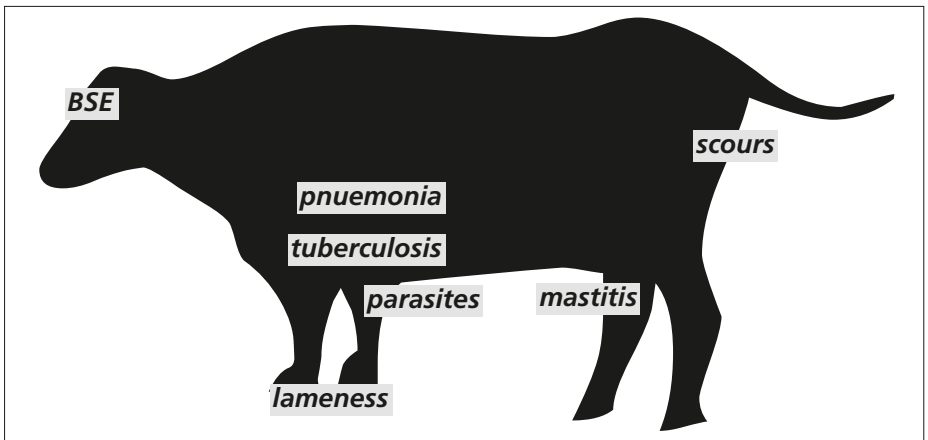
Against Nature

Traditional grazing may be the most visible aspect of cattle farming but it represents only a part of the life of a cow. Today, cattle are almost universally kept in housing in winter and there is an increasing trend towards what the industry euphemistically calls, "year-round housing" - in other words, intensive farming for cows. Cattle no longer subsist on grass and straw but are given commercial supplements designed to maximise feed-conversion while selective breeding has led to specialised - and unnatural - cows whose health suffers accordingly (see below).

When it does occur, grazing on pasture may provide animals with the fresh air, exercise and mental stimulation which are denied to indoor-reared animals but it also exposes them to a range of environmental hazards. Unlike wild animals, domesticated animals have no evolutionary pressure to develop resistance against such diseases and the farmer's reliance on vaccines, antibiotics and other medications is all that stands between them and a deceptively hostile landscape. Wild animals also roam over wide areas in relatively small numbers: farmed animals, densely packed into fields, exist in a far from natural state and the consequence is increased vulnerability to disease.

The concentration of cattle in fields - just like chickens in broiler sheds - provides parasites of all kinds with a rich food supply, fostering colonisation of the land on which they graze. Liver fluke is a common infection of both cattle and sheep, siting itself in the liver and causing anaemia, poor condition, scours (diarrhoea) and - in the worst cases - death. The fluke is a microscopic parasite which survives in wet pasture, reproduces inside snails and is then passed to cattle as they eat contaminated grass. Cattle are also afflicted by ostertagia, stomach worms, and, like chickens, suffer from coccidiosis, causing bloody diarrhoea and even death in calves.

Scours are a fact of life for cattle and probably the commonest cause of death in calves.[88] Early weaning plays a significant part in the development of scours in dairy calves (see below) but a range of causes exist for cattle of all kinds. As well as the above parasites, scours are also caused by (among others) salmonella and E. coli infections and rotavirus. Rotavirus is a highly infectious viral illness which destroys the lining of the small intestine, preventing reabsorption of water causing severe diarrhoea. Another bacterial infection picked up from pasture is Johne's Disease, which cannot be treated with



2.25 million slaughtered in the UK in 2003 [42]
Natural lifespan, approximately 25 years; slaughtered at 5-10 years (dairy), 1-2.5 years (beef)

antibiotics and causes severe weight loss in cattle. Widespread wherever dairying takes place, cases of Johne's in the UK have more than doubled in the last 10 years.[12] In a reminder that not all problems are natural in origin, however, cattle are also afflicted by tyre wire disease, which is exactly what it says it is. Wires from the tyres used as weights for tarpaulins on many farms work loose as the tyres degrade and are eaten by cattle - usually mixed in with straw - causing severe pain and distress.

"To imagine the pain of laminitis it helps to imagine crushing all your fingernails in the door and then standing on your fingertips."
Professor John Webster [46]

Parasites do not just affect the digestive system and the self-explanatory lung worm burrow through the intestinal wall after being eaten and migrate to the lungs where the larvae hatch and cause coughing, panting and death. The worms are large enough to be seen with the naked eye on autopsy. Like most farmed animals, cattle also suffer heavily from pneumonia, which affects 1.9 million cattle annually and kills 157,000 calves a year.[89] 3 calves in every hundred die of pneumonia 90 and vaccines exist for only half the known infections which cause it.[91] Cattle are also susceptible to tuberculosis: about 5 per cent of herds were infected in 2003 but numbers are currently rising by 18 per cent per annum.[12]

Again like pigs and chickens, cattle are also plagued by lameness. Around 30,000 cattle each year are affected so badly that they are culled [92] while one abattoir survey found that three-quarters had foot or leg changes at slaughter which could lead to lameness.[93] The RSPCA estimate that one million cattle each winter suffer from digital dermatitis - a very painful inflammation of the hooves [92] - and the Veterinary Times has described the level of digital lameness in cattle as at an "all time high".[94] Over the last six years, according to research, lameness incidence has increased from 38 to 55 cases/100 cows.[95] This is despite the fact that the Government advisory body, the Farm Animal Welfare Council, described lameness in dairy cattle as "at an unacceptably high level" back in 1997.[96] The list of causes of lameness is a very long one, cows being at risk from both infections caught from the soil and damage caused by hard flooring in cow sheds. For dairy cows, the unnatural gait caused by the size and weight of their udders (see below) contributes to laminitis, essentially inflammation of the hoof.

Daisy is Dying

Dairy cattle are among the most exploited, abused and stressed animals on the planet. Producer's margins in the dairy industry are very low indeed so maximising milk productivity is utterly essential. Cows, like every other mammal, only lactate when they have offspring to nurse so a dairy cow's life is a constant cycle of pregnancy and lactation - both extremely demanding physiological conditions. On top of this physiological stress comes a powerful psychological stress: the separation of mothers from calves. Most dairy calves are weaned within days and sometimes hours of birth. After being allowed to suckle her colostrum - the first milk

"The dairy cow is a supreme example of an overworked mother. She is by some measures the hardest worked of all our farm animals and it can be scientifically calculated. It is equivalent to a jogger who goes out for six to eight hours every day, which is a fairly lunatic pursuit. In fact the only humans who work harder than the dairy cow are the cyclists in the Tour de France, which is the ultimate in masochism really."
Professor John Webster [66]

produced by the mother after birth, which provides vital immunity to the calf - they are taken from their mothers as soon as possible in order to maximise the amount of milk available for human consumption. The consequence - just as with piglets - is scours for calves and additional stress for their mothers.

Rob Hill/Viva!

For the same reason, the dairy cow is also one of the most striking examples of selective breeding producing an animal afflicted with a body that could never survive in nature. A 'productive' dairy cow will supply up to 12,000 litres of milk per year from massively distended udders - working out at between 25 and 40 litres of milk per day (allowing for periods when she is not lactating). This is approximately 10 times more than her calf could require and is a product of artificial selection and careful nutrition. Milk is a high protein, high energy substance and producing it in such quantities places a huge burden on the cow. The typical dairy cow is extremely thin, with pelvic and rib bones easily visible - indeed, those qualities are signs of a 'good' specimen of a dairy cow. The energy lost in milk production is so great, however, that most Fresian/Holsteins manage only a little over three lactations before becoming exhausted and being culled as unproductive.[97] Because cows only lactate when they have offspring to feed, an infertile dairy cow is a useless dairy cow: 125,000 are slaughtered simply for being infertile each year.[92]

Dairy cows suffer hugely from mastitis, infection of the udders - in fact, this disease kills more dairy cows than any other disease that afflicts them. Around one million cases arise each year and 90,000 cattle are culled for it.[92] Infection can be picked up from pasture, E. coli being a major cause when distended, low-hanging udders become contaminated by manure. Other infective agents include *staphylococcus aureus* and klebsiella. Mastitis causes pain, inflammation and pus-production, which can be visible in milk. Farmers monitor the amount of the cow's immune and udder cells in milk in order to try to pick up mastitis before obvious symptoms appear: 200-250 million cells per litre is considered an acceptable figure in the UK.[98]

Beef on the Bone

While some cattle are 'mixed' breeds, used for both dairy and beef production, none are ideally suited to both. Around half of British beef comes from specialised beef cows, which have been bred to produce a significantly different kind of body to dairy cattle - one in which muscle weight gain is the priority. Some have been specifically bred for so-called double-muscling, overdevelopment of muscles caused by a genetic mutation. Belgian Blues are the most common double-muscled breed in the UK but while the mutation favours lean meat production, it comes at a considerable price to the animals. Easily fatigued and stressed, double-muscled cows are also so muscular around their hind-quarters that their birth canals cannot stretch enough to expel their large calves: nearly half of all Belgian Blues require Caesarian section and over one in ten calves die at birth.[99]

Double-muscling is a result of a very specific mutation but in general, breeding and feeding for weight gain leads to predictable problems: lameness (one study finding 98 per cent of beef bulls studied had joint or bone problems) [99] and metabolic problems such as bloat (excess gas production, which can be fatal) and acidosis, a disturbance in the chemical balance of the body.

Cattle And Human Health

Cattle are a major source of E.coli infection and food poisoning. One severe case of *E. coli 0157* infection recently was caused by a child simply being splashed with manure but consumption of meat is the more common route for this infection. Both tuberculosis in cattle and brucellosis (an uncommon infection causing outbreaks of spontaneous abortions in a herd) can be contracted by human beings and, of course, BSE is the source of variant CJD in human beings (see Part One).

Infection in milk has been recently linked with Crohn's Disease, a chronic inflammation of the lining of the gut, causing ulcers and severe diarrhoea, often leading to internal bleeding and other complications. Around 200,000 people in the UK suffer from Crohn's. A bacterium carried by cattle (*Mycobacterium avium paratuberculosis*) has been found in the guts of all sufferers of the disease. Many doctors believe it is contracted through dairy products. At least 17 per cent of dairy herds carry the bug, with about 5 per cent of milk on sale testing positive for it.[100]

Lastly, lactose intolerance - in other words, inability to digest dairy products - is extremely common worldwide: it occurs in 75 per cent of human beings and although Caucasian people tend to have lower levels, it is still estimated that four to five million British people are affected.[101] Symptoms include bloating and diarrhoea.

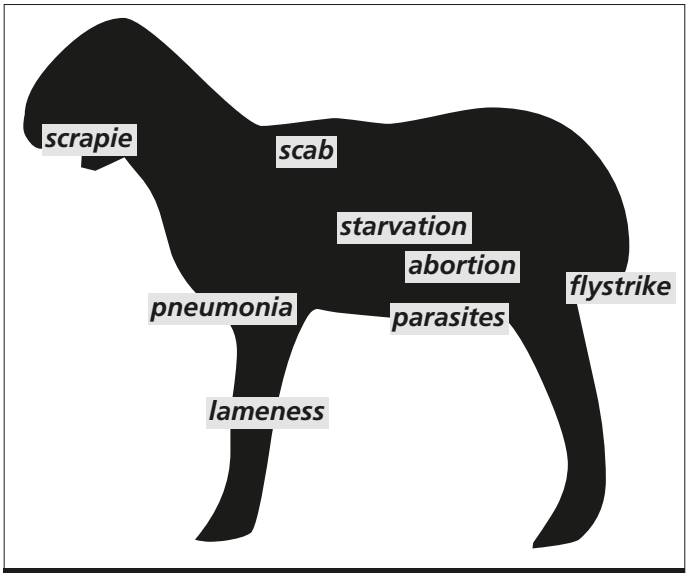
Stop Press: October 2004. An Irish man in his twenties has just been diagnosed with vCJD. Doctors report that he has never received a blood transfusion - it is therefore likely that he contracted the disease directly through eating infected beef or beef products.[102]

The Lives of Sheep

Of all food animals in the UK, sheep are the most likely to be reared out of doors and, in the case of hill sheep, may even lead semi-wild existences, roaming over large areas and interacting with their keepers comparatively rarely. That does not mean, however, that they are immune to the financial imperatives which put all farmed animals at risk of disease. Sheep are reared extensively because that is normally the most cost-efficient way of rearing them - not because it ensures their health or welfare. Sheep are originally animals from dry, mountainous areas and their feet are not suited to soft pasture like that found in many lowland sheep areas. They are also, just like cattle, stocked at very high densities in lowland areas - and, like cattle, increasingly housed indoors for extended periods. Little surprise then that high on the list of diseases afflicting sheep are those we have already encountered in other farmed animals - lameness, pneumonia and parasites.

"Diagnosis of sick, unthrifty young lambs is relatively simple, because 90 per cent of the time they are either starving or have pneumonia."
Sheep Diseases
RM Jordan[105]

According to Defra, the UK's ministry of agriculture, 92 per cent of sheep flocks in the UK "have a problem with lameness" and some 3 million



15 million slaughtered in the UK in 2003 [42]
Natural lifespan, 10-12 years: slaughtered (lambs), 3-6 months

individual sheep may become lame each year.[103] Two major causes of lameness in sheep are scald, a bacterial infection and footrot, a secondary infection on top of scald. Scald is caught from a bacteria found in sheep droppings and is thus easily acquired from intensively-used pasture or dirty bedding in housing. Footrot causes inflammation and even necrosis (death) of soft tissues under the hoof and produces a foul smelling discharge. A survey in Scotland found that 40 per cent of farmers thought footrot a "medium" or "large" problem but only 6 per cent of them vaccinated against it.[104] Sheep also suffer from digital dermatitis, similar to the condition suffered by cattle.

Pneumonia in sheep is frequently caused by pasteurella, an extremely widespread infection which also causes general illness and "loss of condition". Farmers vaccinate against pneumonia but vaccines are not always effective. Because symptoms are not obvious in individual animals, pneumonia may often pass untreated by the farmer.

Parasites are a common problem for sheep, with familiar culprits like round worm, coccidiosis and liver fluke picked up from pasture. Up to 1,000 liver fluke may infest a single sheep's liver. Because of their wooly coats, sheep are also at particular risk of skin infestations. The Leather Confederation estimates that 14 per cent of sheepskins are damaged by lice or mites.[103] Sheep mites are the cause of the very common, scab. Scab is well named: an allergic reaction to the mites' droppings leads to blistered lesions on the sheep's skin which form scabs. As the mites spread over its skin, the inflammation and scabbing spreads causing intense irritation. In severe cases, infestation can cover the sheep from head to tail. While all herds may be afflicted by scab, hill sheep are most at risk. Farmers are obliged by law to treat scab as soon as they detect it but hill sheep may be irregularly inspected, allowing the infestation to take hold. Dipping can prevent it but is not practiced by all farmers: the National Sheep Association estimated that only 30 per cent of farmers in Scotland dip their sheep.[103]

A particularly distressing problem unique to sheep is fly strike. Blowflies lay their eggs in the fleece, commonly in the inevitably faeces-soiled area around the rump. When the larvae hatch they feed on the sheep's skin, causing open wounds that may then attract further infestation. Essentially, the sheep is being eaten alive by maggots. In the words of the University of Bristol Parasitology department:

"The maggots feed directly on the skin of the infested sheep, creating serious welfare and economic problems. The presence of feeding

> *"Every year millions of lamb deaths are due to the mind-boggling absurdity of lambing in the worst time of year (December to February), to poor hygiene and overstocking in sheds, and to ewes not producing enough good quality colostrum because they are in poor condition."*
> Veterinary Surgeon, MW Allen [108]

blowfly maggots causes considerable distress to the sheep and if untreated may lead to its death within a few days. Strike affects over a million sheep and 80 per cent of farms each year in the UK."[106]

Flystrike is also an acknowledged problem in organic systems.[107]

The attractive and popular sight of lambs playing in the field also masks an ugly reality - disease and death in both ewes and lambs. It is widely accepted that at least 10 per cent and perhaps as many as 20 per cent of lambs die before weaning and sale and around one in twenty ewes may die during pregnancy or at lambing.[103] Ewes die for many reasons, including difficult births, malnutrition (especially if she is carrying more than one lamb, see below) and infections. Lambs - especially those born outside - die from difficult births, hypothermia, starvation and infectious illnesses like pneumonia. As with cattle, heavily muscled lambs and ewes may make the birth process more difficult while breeding of ewes for higher "productivity" - either more pregnancies per year or more lambs per pregnancy - increases the risk. Abortion is a common problem in sheep, frequently caused by infections such as chlamydia, campylobacter, toxoplasmosis and salmonella.

Scrapie is still a problem in the UK, with official estimates putting the number of cases at around three per 1000, although some suggestions put the infection rate considerably higher.[103] Of particular concern is the possibility that scrapie may mask symptoms of BSE - as revealed in Part One, sheep can be infected with BSE in laboratory conditions and the possibility of sheep carrying the disease is very real.

Like other cloven-hoofed animals, sheep are, of course, at risk of foot-and-mouth (see below).

Sheep and Human Illness

Sheep meat is capable of transmitting all the common food-borne pathogens, including salmonella, campylobacter and e.coli. Like other meats, it may also be contaminated by *clostridium perfingens* which sheep may pick up from infected soil. This species of clostridium is most famous as the cause of gas gangrene in infected wounds although it more commonly causes food poisoning, tens of thousands of cases estimated per year.

Whether sheep carry or transmit BSE/vCJD is still not known (see below). At present the Food Standards Agency is advising that there is no risk but further research is being carried out.

Foot and Mouth Disease

Foot and mouth disease caused major epidemics in the UK in 1967 and 2001. The virus affects cloven-footed animals and cattle, sheep, pigs, and goats are all susceptible to it. The common signs of the disease are vesicles (blisters) in the animal's mouth or on the feet - hence its name - and vets report that tongues can become so inflamed that their outer coating may simply slough off entire.[93] Other symptoms include fever, lameness and being off feed. Cattle experience reduced milk yields, sore teats when milking, and frothy saliva around the lips. FMD is rarely fatal and it usually runs its course in two or three weeks after which the great majority of animals recover naturally.

The 2001 crisis, which ended up costing the UK £8 billion,[109] began early in February at Burnside pig farm in Northumberland. It was reported that the source of the outbreak may have been infected meat fed in swill to the pigs. The farmer, Robert Waugh, said that he collected school and restaurant waste to swill feed his pigs, and that he had not fed the pigs "anything that hadn't already been served up on bairns' plates".[110] School dinners, however, contain burgers, sausages, mince and other cheap processed meat made from mechanically recovered meat (MRM) - a slurry obtained from pig and chicken bones, (see Part 3). Farmers are supposed to check their animals daily by law but despite the fact that vets found the animals had been showing obvious signs of the illness, Mr Waugh did not report the cases of foot and mouth at his farm (he was later found guilty of nine animal health and cruelty charges [109]). When the outbreak was first identified in Essex, it was discovered that Mr Waugh's infected animals had been sent there for slaughter. What only emerged years after the outbreak (and the semi-official inquiries into it) was that warning signs about Mr Waugh's preparation of swill were missed by a Government vet who inspected his property not long before the disease emerged. The vet later guiltily admitted, "Had this inspection been more rigorous... then this awful 2001 FMD epidemic would never have come about".[111]

The contagious nature of the virus meant that Mr Waugh's ignorance was critical. Infected animals excrete the virus a few days before signs of the disease develop. Forced ventilation in factory farms, gives rise to large viral plumes which can travel by air for long distances and the virus is found in great quantity in the fluid from the blisters, and in saliva, milk and dung. It can be spread by infected animals and carcasses touching healthy animals, by transportation, markets, farms, carried on clothing and infected meat in feed.

By September 2001, over 10,000 farms had been affected and over 6 million animals slaughtered. The disposal of carcases on such a scale posed problems of its own. In some areas, residents were forced to live with the smell of smouldering animals for weeks, and the risk of inhaling the cancer-causing dioxins released. The Department of Environment confirmed that fires lit during the first six weeks of the crisis released 63 grams of dioxins into the atmosphere - 18 per cent of the UK's average annual emissions.[112] Also notorious was the UK-wide disinfectant programme - which was regularly flouted - and the use of landfills to bury animal bodies: in Watchtree, near Great Orton, 500,000 carcasses were disposed at a single site.[113]

> *"Although the killing involves these horrific scenes, in economic terms it's a quick, complete fix; afterwards you can resume exports. Intensive farming is based on productivity. It's better productivity-wise to eradicate it completely."*
> Abigail Wood, vet and researcher, University of Manchester [115]

Vaccines have been available for 50 years (although because there are 80 strains of foot and mouth they are only partially effective) but the EU has banned the vaccine because it implies the disease is endemic. Effectively, the industry gambles that the cost of an outbreak every 20 years or so will be less than that of losing foreign markets. Today, Defra says: "Slaughter remains the basic control policy because widespread disease throughout the country would cause significant welfare problems and be economically disastrous" due to the effects of the disease, namely:

"Affected animals lose condition and secondary bacterial infections may prolong convalescence. The most serious effects of the disease however are seen in dairy cattle. Loss of milk yield will certainly be experienced. Chronic mastitis may develop and the value of a cow is permanently reduced."[114]

So, this slaughter-all tactic was for commercial reasons. After fully recovering from the disease the animal's milk and meat production is affected and productivity is lost.

A report by a committee of the European Parliament slammed the handling of the crisis, accusing the government of breaking animal welfare laws, generating miles of unnecessary red tape, and damaging human and environmental health.[116] The Royal Society's Infectious Disease in Livestock report and the official Anderson Lessons to be Learned enquiry both highlighted ministers' failure to prepare for the outbreak and advised that vaccination should form part of a future strategy for containing the disease - although they supported culling of diseased and contaminated animals. The Anderson enquiry stated this should be vaccination to live rather than vaccination to kill, and so burning animals on mass pyres should not be used as a strategy in future for disposing of slaughtered cattle.[117]

Still Learning Our Lesson

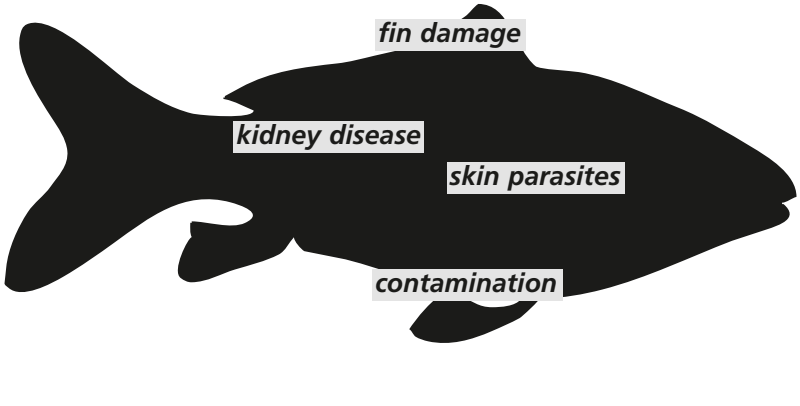
In the case of foot and mouth, the stable door was shut after the horse was long gone by banning swill - just as the feeding of cattle to cattle was banned after BSE. The fact remains, in 2001, a bloody-minded farmer unwilling to accept the consequences of his actions and a less-than-rigorous inspection by an official vet cost the lives of millions of animals and devastated the rural and national economy to the tune of billions of pounds. With international trade and tourism growing, the government admits another outbreak is quite possible. A Defra spokesman says: "A careless person throwing a sandwich over a fence to a pig - and we could see the start of another outbreak."[118] Livestock agriculture's killer combination of commercial self-interest and official neglect could strike again at any time.

Fish and Sea Food

Fish is frequently perceived as the "healthy" meat - when it's perceived as meat at all. Fish themselves are seen as the ultimate free-range and organic animal, swimming at liberty through the pristine waters of the ocean before being scooped up in nets and delivered fresh and shiny to the plate. Needless to say, this is another anachronistic illusion and far from guaranteeing their wholesomeness, the fact that fish are marine animals is the source of the threat they pose.

Fouling Nemo

There is no longer anything pristine about the ocean. Environmental contaminants from pesticides and



NB The number of fish and other 'seafood' animals killed and eaten for consumption in the UK is unknown: catches are measured by weight rather than numbers of animals. Age and size of individual animals within a species may vary considerably.

fertilisers to animal slurry and industrial waste reach all our waterways and are ultimately discharged into the sea. As a proportion of seawater, contaminants are tiny but by eating fish, we manage to magnify the risks they pose to our health. Uniquely among the animals we eat, many fish are (naturally) carnivorous, many species consumed by us being at the top of the marine food chain. At every level of that chain, when fish eat other fish they also consume the environmental pollutants in their bodies. A big fish like a salmon or a tuna will act as a concentrated reservoir of all the pollutants acquired by all the fish it has eaten - and then it is eaten by us.

The kind of pollutants acquired by fish are some of the nastiest we have. Of most concern are metals such as mercury and the industrial chemicals, dioxins and PCBs. Mercury damages kidneys and the nervous system, can increase the risk of heart attack and poses a particular risk to unborn children. PCBs may damage the immune system, increase the risk of some cancers, and contribute to infertility and birth defects. These pollutants are known as Persistent Organic Pollutants or POPs because they are toxic and persist in natural systems. They are fat soluble and thus 'bioaccumulate' in food chains, stored in the fatty tissues of animals, including fish - and, of course, humans.

The facts are stark: all fish are contaminated by POPs. When MAFF (the UK ministry of agriculture at the time) tested 132 samples of marine fish in 1999, all contained dioxins and PCBs.[119] The World Health Organisation sets a recommended limit on consumption of contaminants like POPs, called the Tolerable Daily Intake or TDI. The Food Standards Agency (FSA) conducted further testing in 2002 and when its findings were analysed by the Consumer's Association, they concluded that as much as a third of the UK population was exceeding the TDI for PCB contaminants.[120]

In the case of mercury, a Department of Health committee in 2002 stated that fish was the most important contributor to dietary exposure to mercury.[121] Levels are so high that the FSA sets limits on consumption: pregnant and breast-feeding women and children under 16 are advised to limit consumption of tuna and avoid some species altogether.[122] In fact, the FSA recommends that women and girls shouldn't have more than two portions of oily fish a week "if you think you might have a baby one day" because of the risk of bio-accumulation within their bodies. However, the FSA also describe the process of recommending safe limits as a "balance" between the frequently-publicised health benefits of oily fish and the risks posed by contaminants. What they fail to mention is that all the health benefits derived from fish can be derived from plant sources, meaning there is no need to endanger one's health by eating fish at all.[123]

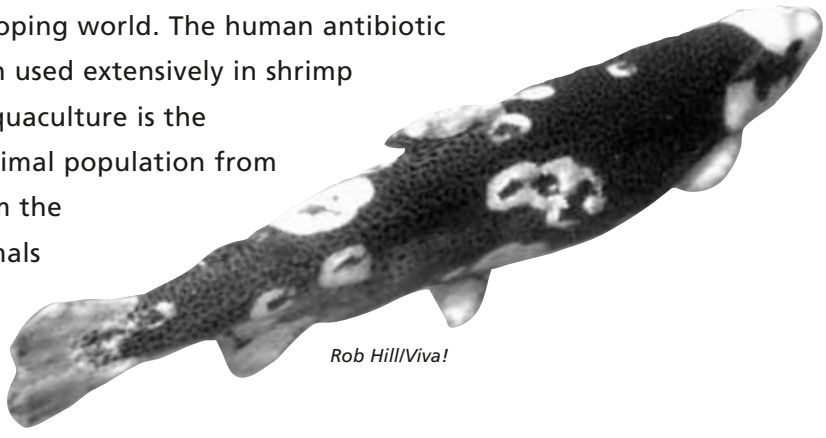
Farming Nemo

Our appetite for fish is increasingly being satisfied by farmed fish, or aquaculture, as it is officially known. Aquaculture is the fastest growing sector of food production in the world, as all the economic advantages of intensification are magnified by declining and increasingly inaccessible populations of wild fish. Virtually all salmon sold in supermarkets in the UK is now farmed [124] while farmed trout is increasingly popular and the farming of cod - effectively wiped out in the wild - has just begun on a commercial basis. Predictably, however, the diseases and health problems associated with intensification have been no brake on the progress of this cash-driven juggernaut.

The problem of contamination is actually magnified in farmed fish. Farmed in coastal waters, inevitably the most contaminated parts of the marine environment, fish in aquaculture are also subject to the same pressures to maximise feed conversion as other farmed animals. That feed takes the form of concentrated, industrial feed, just like the kinds used in land-based farming - except that it is made from other fish, that have been caught at sea. The result is that farmed fish ingest concentrated pollutants as well. A study in 2002 found that farmed salmon show higher levels of PCBs, organophosphates and polybrominated diphenylethers (PBDEs, used as flame-retardants industrially) than wild salmon.[125] Research in August 2003 found Scottish farmed salmon had 16 times the level of dioxin-like PCBs than wild salmon.[126]

With up to 50,000 salmon crammed into a single sea cage, it isn't hard to predict the kind of health problems which might arise. Effectively, of course, farmed fish swim in a permanent solution of their own excrement and this exacerbates all the other problems to which they are prone. Fin damage from the physical trauma of constant contact with other fish or sides of the pen is common - it may also be caused by cannibalism, just as with land animals such as chickens and pigs. Parasites afflict fish just as they do land animals, sea lice posing a huge problem to farmed salmon. These small crustaceans infest the skin and feed on blood and flesh and penned salmon are an ideal feeding ground for them (they drop off when wild salmon return to fresh water to spawn but farmed salmon, of course, never do that). Sea lice are treated by dousing the fish with toxins like organophosphates or medicating them in-feed. Diseases like furunculosis (which causes boil-like lesions on the skin), bacterial kidney disease and infectious salmon anaemia may sweep through overcrowded pens and are responsible for millions of death a year. Mortality of smolts (the immature salmon introduced to the cages) may be as high as 30 per cent before slaughter - an indication of severe health and welfare problems.[127]

Antibiotics are used both prophylactically and therapeutically in aquaculture in just the same way as land-based farming, and have been implicated in antibiotic resistance.[5] Shrimp are also farmed on a huge scale, especially in the developing world. The human antibiotic chloramphenicol, for instance, has been used extensively in shrimp aquaculture. A particular problem in aquaculture is the impossibility of isolating the farmed animal population from wild sea animals, or the farm itself from the surrounding environment. Farmed animals regularly 'escape' into the wild, while wild animals may consume their feed



Rob Hill/Viva!

or swim in contaminated water from sea cages. The acquisition or transfer of antibiotic-resistance from farmed to wild fish or molluscs is inevitable.

In the Pink

The flesh of wild salmon has a distinctive pink colour, caused by natural dyes in the animals they feed on. The concentrated feed given to farmed salmon don't contain these dyes and as a result, farmed salmon is naturally grey. To compensate for this deficiency, a dye is added to their feed. The most common dye used in Britain is canthaxanthin - which is also used in poultry feed to add colour to both chicken flesh and the yolks of eggs. There is some evidence that damage to the human eye may be caused by high levels of canthaxanthin. The risk has recently been considered by the European Commission who expressed concern that people who eat high amounts of eggs, poultry and farmed fish may exceed recommended doses.[128] They recommended lowering the dose added to fish feed by about two-thirds, a move which has been resisted by the salmon industry who are concerned that the lower dose will fail to have the desired cosmetic effect.

Witness Statement

"Whilst training and working within the aquaculture industry, I, like the vast majority of my peers, was indifferent to the stress, injury and disease suffered by fish. Husbandry techniques, rearing systems and feeding regimes have evolved in the name of profit, with the inconvenience of disease and mortality being an acceptable 'evil' costed into the fish farmer's spreadsheet. With the sheer number of fish involved, individual animals are inevitably lost amongst the swirling mass of indiscernable bodies. I still see unacceptable levels of injury, for example fish left to die and rot amongst the living, left to suffocate in air and gutted alive.

Cynically, injury, disease and mortality are an inevitable consequence of intensive fish farming. The fish farmer will attempt to juggle fish losses within acceptable economic levels and, to a point, individual fish are expendable. Even organic rearing systems, that set out to improve the lives of farmed fish, seem no more than a damage limitation exercise, still leaving fish exposed to unacceptable levels of suffering as well as exposing the consumer to undesirable levels of dangerous compounds."

This former fish farmer now uses his knowledge and experience to campaign against the aquaculture industry. He has asked for his name to be withheld.

Seafood and Human Health

Nemo's Revenge

In addition to human-derived toxins, fish and other seafood may harbour a number of dangerous bacteria and parasites, such as *vibrio paraharemolyticus* and *vibrio cholerae*, which can cause classic and sometimes very serious food poisoning. Seafood is also responsible for a portion of salmonella and campylobacter poisoning. Almost all of seafood's natural pathogens are easily destroyed by proper cooking but inadequate cooking or poor kitchen hygiene can allow them to survive and infect whoever eats them. As raw fish, sushi carries specific risks, including *Diphyllobothrium latum*, a fish tapeworm that can grow up to six feet long in the human intestine.

Fish and especially shellfish can also acquire natural toxins from plankton on which they feed. Some of these toxins are incredibly dangerous to humans, targeting the nervous system and causing paralysis, coma and even death. Contamination of mussels with diarrhetic shellfish poisoning was first detected in 1990 and has led to the closure of a number of cockle and mussel beds since while paralytic shellfish poisoning has led to the closure of scallop beds in Scotland. [129]

Hepatitis A, a viral infection of the liver, is found in raw or partially cooked shellfish which have been contaminated by sewage. The Norwalk virus found in raw oysters and mussels causes stomach cramps, dehydrating diarrhoea and fever. It is most common in children who have yet to build up immunity but may also affect hospital patients. There are thousands of cases each year, although - like all food poisoning - the exact number is unknown.[130]

Part Three: The Deaths of Farmed Animals

In the slaughterhouse

Like farming, slaughter is an industrial process designed to minimise the time taken to turn living animals into meat and by-products. Today, abattoirs are highly mechanised and many abattoir workers are still paid on piece work, ie by the number of animals they kill and butcher. Over two-and-a-half million animals are slaughtered in Britain's 350 abattoirs each day, a rate that works out at around 25 per second. Clearly, the speed and "efficiency" of this process favours neither vigilance, thoroughness or care.

Numerous opportunities for contamination or the spread of disease arise in the slaughterhouse - and the consequence is that even animals free of infection when they enter the slaughterhouse may leave it as infected meat. Animals from many different farms pass through each abattoir, increasing risk of cross-contamination of equipment. Frequently covered in filth from the transport lorry, animals are supposed to be clean at slaughter but a superficial hosing down is likely to be the very most that dirty animals receive - and that may even spread infection. There is also nothing, of course, to prevent animals from defecating and contaminating themselves and others after any cleaning has taken place. In 2002/3, 128 sheep and 52 cattle were rejected at abattoirs by official vets (see below) for being too dirty [131] but no chickens, despite the fact that they outnumber sheep and cattle by forty times, are the main source of salmonella and campylobacter infections and, as we know, they live and are transported in the most unhygienic conditions.

All animals are also supposed to be inspected by the official vet to guarantee their health but on average, each vet is responsible for over 6,000 animals per day. [131] Clearly, only the most superficial examinations can be undertaken and the consequence is that only the most apparent illnesses are diagnosed. Any animals showing minimal symptoms or none will almost certainly pass the inspection process.

Prior to slaughter, animals are stunned using either the captive-bolt pistol (in cattle), electricity or (more rarely) gas. In the case of poultry, the electric shock is usually administered using an electrified water bath: birds are hung upside-down on the mechanised slaughter line and the line dips their heads into the bath as it passes over it. The bath inevitably becomes fouled with excrement, contaminating birds as they come through.

After stunning, animals are bled to death by cutting their throats as they are suspended upside-down. Larger animals will drain copious amounts of blood, contaminating clothing, equipment, walls and floors. Although blood is unlikely to harbour bacterial infection in healthy animals, animals with infection will undoubtedly face slaughter and blood stains and splashes provide a medium for bacterial growth in the slaughter

Viva! Witness Statement

"We visited an abattoir in south Wales. Of the 18 pigs we saw killed, 3 became conscious after being knifed. They struggled so violently they freed themselves from their shackles and plunged into the bleeding pit below. They entered the scalding tank covered in blood. The vet did nothing."

Viva! has filmed at abattoirs across the UK.

area. After bleeding, many animals are immersed in scalding tanks to loosen hair and feathers - vats of hot water which inevitably become fouled with blood, dirt and excrement, forming a medium for bacterial transmission and multiplication.

Following the scalding tank, animals are butchered, the first stage of this being disembowelling. In the case of poultry this process is performed automatically by a machine but the gutting 'spoon' is not sterilised between animals. In larger animals, an incision is made in the belly by a slaughterman and the intestines hauled out by hand: all animals' guts are host to huge populations of bacteria and intestinal contents may easily contaminate the flesh at this stage. So toxic are these parts of the body that an abattoir worker died recently when he was overcome by fumes clearing out a tank blocked with entrails.

Witness Statement.

A visiting journalist describes the scalding tank in a chicken slaughterhouse:

"It was 3pm and, as at many factories, the water was only changed once a day. It was a brown soup of faeces and feather fragments, and, the hygiene inspector pointed out, 'the perfect temperature for salmonella and campylobacter to survive and cross-contaminate the birds'."
The Ecologist [55]

Specified Risk Material (or SRM) is also removed during butchery. These are the parts of cattle, sheep and goats which are thought to carry BSE/CJD: brains, spinal cords and parts of the intestines and skeleton. If this procedure is not carried out efficiently then there is a risk of contamination of the "meat" portions of the carcase - something which undoubtedly still takes place.[132] Remarkably, despite the rules, the supervision and the known risks, entire spinal cords are still occasionally being left in place in abattoirs in the UK,[133] while over a hundred and twenty breaches of the SRM rules were uncovered in imported meat in 2003.[133]

Mmm, MRM!

Once the animal has been butchered for meat and the edible offal removed, about half of it is still left. Little is wasted, however. Once the carcase has been manually butchered, plenty of meat is still attached to the bone and this can be harvested by blasting the bones with high pressure water, producing what is known as mechanically-recovered meat - or MRM. Effectively a meat slurry, it is usually strained through mesh to remove bone fragments and then used as a generic 'meat' ingredient in low-cost products. MRM from sheep and cattle has been banned as a consequence of BSE but it is still derived from pigs and poultry.

The remaining portions of the carcase still have considerable value. Gelatine is produced from animal bones, hooves, skin and connective tissue (like tendons) and used in products ranging from sweets to low-fat yoghurts to

photographic film. The skin of some animals goes for leather while feathers may be used for soft furnishing (UK slaughterhouses produce 150,000 tonnes of feathers per year). Pet food manufacturers take a proportion of offal and also some of the products of the final stage in processing - rendering. Rendering essentially takes what's left of the carcase, including feathers, some organs, heads and other parts and melts it down to produce concentrated fat and protein for use in various manufacturing processes and to produce meat and bone meal. MBM derived from animals deemed fit for human consumption is still used in pet food manufacture in the UK.

Regulatory Failure

Official responsibility for slaughterhouses is divided between local authorities and the Meat Hygiene Service (MHS) the latter taking specific responsibility for animal health and welfare and meat safety. The MHS employs a vet - known as an Official Veterinary Surgeon or OVS - in every abattoir who is responsible for checking the condition of live animals on arrival, monitoring their welfare at stunning and slaughter and ensuring that meat hygiene rules including those pertaining to SRM are adhered to. OVSs are effectively based in the abattoirs they oversee and may consequently be reluctant to challenge the practices of the people they associate with on a daily basis. Indeed, in 1998 a survey of meat inspectors (who support the work of the OVS in larger abattoirs) found that 75 per cent had been verbally abused at work, over half reported violence or intimidation and 10 per cent had been threatened with a weapon (presumably, often a slaughterman's knife).[134]

OVSs cannot physically monitor all the standards for which they are responsible and may be reluctant to take action for a variety of reasons: the result is inadequate regulation. An official audit in 2003 concluded that **the MHS had failed to meet its target "to strictly enforce the hygiene requirements of the fresh meat, poultry meat, and wild game meat hygiene and inspection regulations"**.[131] The audit found 17 "major" non-compliances out of 159 audits, an average of more than 10 per cent.[131]

Vice-President of the Association of Meat Inspectors, Peter Comrie, was scathing about the MHS' failings at a seminar in 2004. Declaring that meat hygiene standards had declined in abattoirs since the MHS took over responsibility for them in 1995, Mr Comrie also criticised giving ultimate responsibility for food hygiene to vets, who were not specialists in the subject. Referring to the supposed

continuity of the system, Mr Comrie said: "The aim was from farm to fork. It is likely to be from farm to more shit."[135] In a letter to the Meat Trades Journal in October 2004, Stephen Lomax of the Association of Independent Meat Suppliers went even further:

"There are those in government that are not blind to the failure of the MHS and the farce of the OVS. Likewise, I have never encountered a body which is held in such low esteem by its own employees as the MHS."[136]

For further information on the slaughter of farmed animals, see Viva!'s Sentenced to Death and Going for the Kill reports.

Part Four: Meat Production From Plant To Plate

Although meat is still sold in the old fashioned way, as a cut from a butcher's to be prepared and cooked at home, in the 21st century, it mostly ends up on our plates (or in our 'buckets', kebabs or cartons) in a very processed form. In both cases, our 'meat' comes with a few extras.

Chicken and Turkey

There are many ways in which the animal known as a chicken becomes the product known as 'chicken'. 'Tumbling' is the process by which frozen, sometimes salted, meat has water added to it by being tumbled in water like clothes in a washing machine. A solution of additives may be used instead or in addition to mechanical tumbling to help the water stay in the chicken, boosting its weight and thus the price that can be charged for it. Additives that may be injected into chicken include phosphates and hydrolysed proteins - rendered animal protein, as described in the previous section. One investigation discovered chicken pieces actually contained pork and some samples were only 54 per cent chicken.[55] Beef proteins are also used, despite the risks of BSE.

Producers and retailers love "value-added" products - in other words, basic meats enhanced in a way which allows them to be sold for a higher price at a higher profit. Enhancement may take the form of dressing up a 'quality' cut with spices or, more commonly, rendering an essentially unpalatable product attractive. Chicken nuggets are wrapped in breadcrumbs for a reason - they are essentially just chicken MRM mixed with gums, flavourings, polyphosphates and soya for extra bulk. Sugars may even be added and the resulting camouflaged paste is sold as a fun food, mostly to children.

Red Meat

Processed red meat in the form of - among much else - corned beef, spam and, of course, sausages, has been around for a long time. These kind of products have always been the perfect endpoint for meat from 'low quality' animals - such as breeding sows and exhausted dairy cows - and also for low quality meat from 'high quality' animals. Today, the law permits the use of over 400 additives in meat processing and the range of products is even larger. Few people would be surprised to find that cheap and cheerful food like beefburgers rely on preservatives - one survey found that 31 out of 37 products tested contained preservatives [137] - but meat is increasingly presented to us in the form of ready meals, many of which are far from cheap. Pre-cooked on an industrial scale, with its flavour frequently masked by spices or sauces, this form of meat is usually accompanied by a range of distinctly non-agricultural ingredients such as sodium triphosphate, sodium ascorbate, mono-glycerides of fatty acids and so on. Even 'traditional' products, such as bacon may be produced on an industrial scale in very untraditional ways. Pork cuts can be injected with salt water and often monosodium glutamate and where curing used to be done by smoking, it is now often achieved by simply painting the meat with chemical dyes.

When we think of 'meat' we think of cuts consisting of muscle but the legal definition for food purposes includes "fat, skin, rind, gristle and sinew" [138] - all of which can be easily disguised as an ingredient in a

processed product. Although MRM has now to be labelled on retail products, most consumers don't look at labels closely and - as we shall see - when meat is bought from catering establishments, they have no information about its origin at all. Nor does buying a fresh-looking cut of meat guarantee that it comes 'pure'. Trading Standards officers recently discovered cuts of raw pork which had been injected with water being sold in supermarkets. Displayed alongside unadulterated cuts, this meat was even sold at a premium price.[139]

Illegal Meat

Like every other commodity, there is an illegal trade in meat. But while a pirate DVD won't kill you, illegal meat might. There is a significant trade in selling meat that is unfit for human consumption to shops and caterers nationwide. In March 2001 more than two tonnes of meat were seized by police at Denby Poultry Products, Ripley, Derbyshire along with other premises across the UK. The unfit meat was supposed to be used for pet food but instead was being sold for human consumption. In April 2001, 40 tons of unfit chicken meat were seized in Liverpool - destined for supermarkets, restaurants, schools and hospitals. The dangerous meat was being sold as meat paste, chicken burgers and had also been packaged as leg and breast portions and distributed across Britain.

Further, in June 2001 a report by the European Commission stated that British consumers could not be sure of the safety of "British meat and other raw materials in mince, sausages, pies and other processed products".[140] The report says that the "overall situation on meat products gives rise to serious concern" and checks on raw materials for food were "weak or even non-existent". As recently as September 2004, an undercover investigation for the *Dispatches* TV programme found meat suppliers selling diseased carcases, offering to procure false health certificates and claiming to supply illegal "smokies" - lamb and goat carcases seared with blow torches.[141]

A related and growing problem is the illegal importation of meat into the UK. The problem has existed for many years but has only recently started to be taken seriously by the Government. It is now estimated that between 4,400 and 29,000 tonnes of meat are illegally imported into the UK each year.[142] Much of this meat is transported in suitcases and other baggage and is not even refrigerated, vastly increasing the risk of bacterial multiplication. This enormous quantity of potentially-contaminated meat is subject to no hygiene or health checks whatsoever and carries the risk of importing new kinds of infections into the country. The deadly ebola virus, for instance, is thought to be contracted through people eating contaminated 'bush meat' - wild animals killed in Africa. Bush meat is known to be imported into the UK.

Taking a Butchers

Damian Bird

For those who place their faith in traditional sources of meat, the sad news is that butchers' stripy overalls and skill with a knife are no guarantee of food safety. In a survey carried out on behalf of the Food Standards Agency in 2003, some remarkable shortcomings in standards in butcher's shops were exposed.[143] The researchers sent a questionnaire to butchers asking them specific information and requesting that they performed a "self audit" on their practices. They followed up the questionnaire with external audits of some premises. 16 per cent of questionnaires were returned, presumably by butchers who felt confident that they would not embarrass themselves.

Questions testing the butchers knowledge of aspects of food safety management were answered correctly on just 70 per cent of occasions - meaning that they were answered incorrectly nearly a third of the time. The correct response to individual questions ranged from 96 per cent to as low as 7 per cent indicating, as the report blandly put it, "knowledge gaps/misunderstanding in some areas." One example of such a "knowledge gap" was that only 47 per cent of butchers agreed that "campylobacter bacteria are often associated with poultry" - a link anyone who has simply skimmed this report could almost certainly identify.

A striking characteristic of the survey was over-confidence: 43 per cent of butchers thought cross contamination "could not occur" in their shop - even though 58 per cent admitted common surfaces for cooked and raw meat and only 36 per cent said that utensils for raw meat were kept completely separate from cooked meat. The physical audit identified basic problems such as failing to check the cleanliness of delivery vehicles and, most fundamentally, hand hygiene. The researchers concluded that "considerable potential for cross-contamination" existed in many shops.

The researchers also did some basic microbiological tests. ATP levels (an indicator of organic debris, ie dirt) were "overall, too high" and when they counted bacteria themselves, they concluded that "overall many counts were too high, especially enterobacterial counts" (enterobacterial means bacteria from animals' digestive systems). Only 50 per cent of display surfaces for ready to eat foods were classified as "clean" in the survey - clean being defined as "free from soil or food and/or chemicals and/or when the numbers and type of micro-organisms (microbial load) is at an acceptable level for use."

"Even though self-audit probably provided an optimistic view of butchers' shops, data… indicated that there was still considerable opportunity for cross contamination to occur."
University of Wales [143]

Amazingly, when the FSA released the findings of the study it trumpeted them as evidence of an improvement in standards since butchers became

licenced in 2000.[144] What is of greatest concern here is that knowledge is the key to microbiological safety. The court case resulting from the fatal *E. coli 0157* outbreak in Scotland in 1996 concluded that the butcher responsible had a genuine commitment to cleanliness - he just didn't have the knowledge to prevent contamination occurring.

Dining Out

It is thought that about half of all cases of food poisoning are contracted outside the home.[145] Generalising about the catering industry is difficult, however. From the local kebab shop through staff canteens to gourmet restaurants, different standards and business priorities apply. Nevertheless, when the Food Standards Agency investigated hygiene standards in catering establishments in 2002, they uncovered some facts that should keep us all in our own kitchens.[146] Their survey questioned workers and managers in small, independent catering establishments and found:

There were nearly 180,000 violations of food regulations recorded in 2001, arising in over 40 per cent of premises inspected
Food Standards Agency [150]

- 39 per cent of catering workers don't wash their hands after going to the toilet
- less than half of workers wash their hands before preparing food
- only 32 per cent of managers believe that good food hygiene practices are "important to their business".

One potential reason for this frighteningly poor performance is that only 3 per cent of managers considered retaining skilled, trained staff important to their business. Essentially, the hands-on side of food preparation and delivery is performed by short-term workers whose investment in the interests of the business which employs them is likely to be as low as the business' investment in them: no wonder so many of those hands are dirty .

These problems are compounded by the sourcing of foods for catering. Food bought in restaurants carries no label describing content or country of origin and sourcing cheap raw ingredients is clearly advantageous for a very high proportion of catering businesses. The consequence is a reliance on cheap, factory-farmed and often imported meat. The tumbled chicken containing beef and pork referred to above was all supplied for use in catering - some 60,000 tonnes of it.[147]

Would you like salmonella with that?

Fast food outlets are frequent targets of suspicion about standards of food preparation and hygiene - and larger chains such as McDonalds are vigorous defenders of their reputations and standards. While their facilities often appear clean, the basic foodstuffs used in fast food outlets tend to be 'high risk' chicken and minced beef products (mince is a particular problem because the mincing process spreads any existing infection throughout the meat). The standardisation of food products - a Holy Grail for the larger chains - leads to the mixing of meats in order to obtain, for instance, uniform fat content, further increasing the risk of contamination. An environmental health officer called to give evidence in the famous McLibel trial of the 1990s, described McDonalds' standards on kitchen cleanliness as "necessary… not only to maintain "hygiene" but to overcome defects in an *inherently unhygienic and fragile business*"[148] (emphasis added). As recently as

summer 2004, the multinational - which prides itself on 'global' standards - has had its knuckles rapped by authorities in Norway over poor hygiene in a number of restaurants.[149]

Food Standard Agency figures for 2001 indicate that only 70 per cent of food premises in the UK were ever inspected and half of all resulting prosecutions were of restaurants - almost always for food hygiene violations.[150] The FSA did express concern, however, that a falling number of prosecutions reflected not improved standards but the unwillingness of local authorities to prosecute, presumably due to expense.[150]

"In my view, the standards presented in McDonald's outlets in the UK represent a graphic example of the use of visible 'hygiene' as a marketing tool, and do not represent real hygienic standards."
Dr Richard North, Environmental Health Officer [148]

The problems associated with restaurants, fast food outlets and food premises of all kinds reflect those at every stage in the process of meat production. It is abundantly clear that the problems of neglect, poor standards and inadequate regulation that bedevil the meat industry from farm through slaughterhouse to processing are still present up until the very moment it appears on the plate.

Conclusion

This report has confined its assessment of the human implications of meat consumption to the health problems arising from infection alone. It has not considered the well-documented association between a meat-based diet and illnesses such as heart disease, strokes, hypertension, diabetes and some forms of cancer. Nor has it addressed the new theory that meat is implicated in Alzheimer's disease. Even without the reinforcement provided by this information, however, this report has still documented and illustrated the simple fact that meat is a dangerous substance.

Humans have eaten dirty and diseased meat since we first scavenged for carrion and clubbed down the weakest member of the herd, hundreds of thousands of years ago. While we imagine our ancestors feasting on mighty animals, nobly killed after a brave chase, the reality is that humans - like all predators - have always taken the sick, the weak, and the vulnerable. But although humans are predators, we are not carnivores and the consumption of meat comes at a price for us. When the flesh of dead animals was just an occasional supplement to our essentially vegan diet, we could afford to pay that price - but that is no longer the case. Modern farming techniques have brought meat to our tables every day and have, at the same time, magnified its risks immeasurably. We still consume the weak and sick animals: the difference is, we consume them in huge and unnatural quantities, and it is us who made them sick in the first place.

Today, our diet is based upon the systematic exploitation of animals in their billions. It is based on principles which by their very nature make animals vulnerable and diseased. The pursuit of productivity and profit has distorted their bodies and made them dependent upon drugs and human intervention to survive the brief period we permit them to live. The drive to minimise cost has led to husbandry techniques which place them at even greater risk of disease. And all this makes sense because for an animal to become meat, all that is required is that it is worth more when it is dead than it cost to keep it alive.

It is for this reason that 100,000 chickens die on farms every day and millions of animals were shot and burned on pyres during the foot-and-mouth epidemic. It is for this reason that the overwhelming majority of the animals we consume are lame at slaughter. It is for this reason that we face the probability that BSE is still infecting human beings across the world with a fatal illness and for this reason that we risk the possibility of a single mutation in avian flu killing tens and perhaps hundreds of millions of people.

We cannot rely on the businesses which rear farmed animals to protect us from the risks of dirty meat: it is they who have largely created the problem. Nor can we rely on those who slaughter, process, butcher, prepare and sell our food to us to protect us, because they profit from our ignorance. Nor, last of all, can we rely on governments to protect us, as the evidence shows. Instead, the solution to this problem is in our hands.

Meat is the unhealthy product of an unhealthy system. Intuitively, we all know that. When we heard during the BSE crisis about cattle being fed the brains of other cattle, we knew it was wrong - even though the farmers and the retailers and the government tried to tell us it wasn't. When we are forced to think about the factory farm, the abattoir and the processing plant, we feel revulsion. When we consider animals suffering, as

they do in their millions every day so that we may eat them, we feel compassion and outrage. Indeed, often when we simply see or smell a carcase in a butcher's window, we feel repulsion. The meat we eat is overwhelmingly likely to have come from a diseased, stressed and suffering animal and the truth is, we only continue to buy and eat it because we keep the knowledge of where it came from out of sight and out of mind. Meat has a dirty secret: it isn't wholesome, it isn't natural and in the final analysis, it isn't safe. When humans started eating dirty meat, we had the luxury of ignorance: in the twenty-first century we can't afford that luxury anymore.

Damian Bird

Further Reading

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Viva! *Sentenced to Death: A Viva! Report on the Slaughter of Farmed Animals in the UK*
http://www.viva.org.uk/campaigns/slaughter/sentencedtodeathreport.htm

Viva! *Ducks out of Water: A Viva! Report on the UK Duck Industry*
http://www.viva.org.uk/campaigns/ducks/report01.html

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