

# IS FACTORY FARMING MAKING US SICK?



A Guide to Animal Diseases and  
their Impact on Human Health

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Photo by Ethan Kent

# Introduction

The majority of farmed animals in the UK are reared intensively, inside crowded, filthy sheds which are the perfect environment for bacteria and viruses to flourish. Stressed by their surroundings and their inability to display natural behaviours, forced to live in their own excrement alongside sick and dying animals, it is not surprising that farmed animals are vulnerable to infection. Their immunity is further weakened by the industry breeding from just a few high-yielding strains, which has led to genetic erosion. This makes it easier for disease to sweep swiftly through a group of animals, who are likely to share near-identical genetics with little immunological resistance.

These 'factory farming' systems which deny animals a life worth living also threaten the health of the people who work on farms and in slaughterhouses, those who consume animal products, and even those who don't. Diseases can be spread from animals to people directly or via contact with contaminated water or slurry, or through eating meat, milk or eggs. Some diseases can then be passed from person to person. More than 60 per cent of the almost 1,500 known human pathogens - biological agents that cause disease - are thought to have originated in animals<sup>1</sup>, with three-quarters of emerging infectious diseases also coming from animals<sup>2</sup>.

In recent years, animal farming has brought us outbreaks of BSE, bovine TB, foot and mouth, bird flu, swine flu, campylobacter, salmonella and many more devastating diseases. No wonder the United Nations Food and Agriculture Organization has warned that global industrial meat production poses a serious threat to human health<sup>3</sup>.

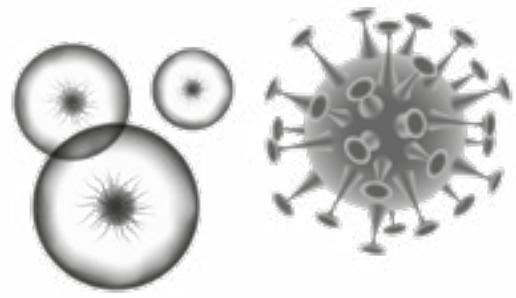
## CREATING ANTIBIOTIC RESISTANCE

Instead of protecting ourselves by changing how we treat animals and ending the factory farm conditions that make disease outbreaks inevitable, we administer antibiotics to the animals in an effort to keep them alive just long enough for them to be profitable. Antibiotics are administered so frequently that dangerous pathogens have now mutated and become resistant to them. Globally, more antibiotics are given to farmed animals than are used to treat people<sup>4</sup> and this over-use is deadly.



There were 61,000 antibiotic-resistant infections in England in 2018, a nine per cent rise from the previous year<sup>5</sup>. Globally, drug-resistant diseases cause at





least 700,000 deaths each year, including 230,000 deaths from multidrug-resistant tuberculosis. We are warned that this figure could increase to 10 million deaths per year by 2050 if no action is taken'<sup>6</sup>.

Dame Sally Davies, UK Special Envoy on Antimicrobial Resistance, said in a press interview in April 2019 that the threat of antibiotic resistance was as great as that from climate change, and advocated that it should be given as much attention from politicians and the public. Instead, it is largely ignored. Haileyesus Getahun, the director of the UN's Interagency Coordination Group on Antimicrobial Resistance (IACG), has described the threat of antimicrobial resistance as 'a silent tsunami'<sup>7</sup>.



## OUR TREATMENT OF ANIMALS IS MAKING US SICK

All over the world, our treatment of animals, both wild and farmed, is making us sick. Cutting down vast swathes of natural habitats - often to grow feed for farmed animals - stresses wild animals and brings them in ever closer contact with people.

Creatures who would never naturally meet, find themselves caged or killed in close proximity at 'wet' markets. Stressed live and newly killed animals cause the mixing of blood, saliva and faeces. Viruses jump from host to host, from wild to farmed animals, from animals to people.

Meanwhile, inside vast factory farm warehouses, stressed and sick animals are crammed snout to tail, standing or lying in their own excrement. Pathogens emerge, spread and grow more virulent. They can go on to infect and kill people.

The history of zoonotic diseases is long and devastating but one thing is certain: there will be many more future pandemics unless we radically change the way we treat animals and the planet.

# Avian Influenza (Bird Flu)

## What is it?

Avian influenza (bird flu) is a highly contagious viral disease affecting the respiratory, digestive and/or nervous systems of many species of birds. It is caused by a Type A influenza virus, which has many subtypes. New subtypes and strains arise when the virus undergoes genetic mutations. Some forms of the virus cause mild reactions in people while others, such as H5N1 and H7N9, can be fatal.

## History

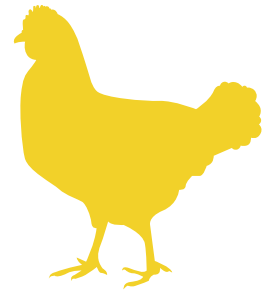
In its natural state, the virus has existed for millions of years as a harmless, intestinal infection of aquatic birds, such as ducks. It was first discovered among farmed poultry in Italy in the 1870s. Farms provide a perfect environment for viruses to mutate and, in an overview of avian influenza, researchers wrote in a Food and Agriculture Organization paper, 'intensive rearing of poultry has played a role in the emergence of highly pathogenic avian influenza viruses'<sup>8</sup>.

The H5N1 subtype first infected people in 1997 during an outbreak in Hong Kong. Since then, this highly pathogenic disease-causing strain of the virus has spread from Asia to Europe and Africa, resulting in millions of poultry infections and several hundred human cases, some of which were fatal.

While the UK sees multiple cases of bird flu on farms each year, most are the less serious low pathogenic strains<sup>9</sup>. The largest and most serious outbreak occurred at a Bernard Matthews farm in 2007, when 160,000 birds were gassed to death to try to prevent the H5N1 strain of disease from spreading. More than 2,000 of the company's birds died in one week inside one overcrowded shed<sup>10</sup>. Despite the birds' severe suffering, the first victims went unnoticed because the attrition rate in intensive poultry sheds is always so high. The industry acknowledges that some 100 viral, bacterial and musculoskeletal conditions commonly affect commercial poultry<sup>11</sup>.

The highly pathogenic H5 virus has not gone away. There were 24 outbreaks in domestic poultry in six European countries between 30 December 2019 and 18 January 2020.<sup>12</sup>





## Routes of transmission

Birds shed the virus in their saliva, nasal secretions and faeces. It can enter farmed poultry units through supplies, cages, clothes, delivery vehicles, mammals and even insects; and diseased material can leave the units in the same way<sup>13</sup>. People are most likely to pick up the bug through direct contact with secretions from infected birds, which means farmers and slaughterers are most at risk.

Following slaughter, the birds' internal organs are removed, during which process the intestines are often ripped. One study found that 42 birds who followed a ripped carcass of an infected bird on the line were cross infected<sup>14</sup>. Gerald Kuester, a United States Department of Agriculture microbiologist said: 'At the end of the line, the birds are no cleaner than if they had been dipped in the toilet.'<sup>15</sup>

While the H5N1 strain has a mortality rate of about 60 per cent, it cannot pass easily from one human to another<sup>16</sup>. As the virus mutates, however, the potential for human to human transmission increases, as does the potential for a pandemic.

## Symptoms in animals

The mild form of influenza produces symptoms, including respiratory problems, so inconspicuous that the outbreak may

go unnoticed. The severe form, however, may kill almost 100 per cent of infected birds within 48 hours. In 1997, a Hong Kong farmer described the symptoms of H5N1 in chickens: 'Their bodies began shaking as if they were suffocating and thick saliva started coming out of their mouths. The faces went dark green and black and then they died.' Pathologists have found that the virus had reduced the birds' internal organs to a bloody pulp<sup>17</sup>.

## Symptoms in people

Initial symptoms include a high fever and other influenza-like symptoms. Diarrhoea, vomiting, abdominal pain, chest pain and bleeding from the nose and gums have also been reported as early symptoms in some patients. The disease can progress and cause multiple organ failure and death<sup>18</sup>.

## Treatment

Hundreds of millions of chickens and ducks have been killed across South East Asia in an effort to prevent the virus spreading from birds to people. However, the widespread use of Amantadine in birds has rendered that drug useless for treating people with H5N1<sup>19</sup>. Resistance to Tamiflu (another antiviral drug) has also been detected in patients with the H7N9 strain<sup>20</sup>. However, antivirals are still administered to patients to help reduce the severity of the condition, prevent complications and improve their chances of survival<sup>21</sup>.

# Bovine TB

## What is it?

Bovine tuberculosis (bTB) is a disease arising from infection by a bacterium called *Mycobacterium bovis* (*M. bovis*), one of 120 species of mycobacteria. Cows, buffalo and bison are the natural hosts but nearly all warm-blooded animals - including people - are susceptible to the infection. In people, the majority of tuberculosis is caused by *M. tuberculosis*, although humans can also become infected with *M. bovis*.



## History

During the 1930s, at least 40 per cent of British cows were infected with bTB<sup>22</sup>. Many were kept near large cities to provide urban dwellers with fresh milk and most were closely confined in poorly ventilated sheds. Infected cows would shed *M. bovis* in their milk. While 20-30,000 people died annually from tuberculosis at that time<sup>23</sup>, around 2,500 of these deaths were due to infection with *M. bovis*, often caused by drinking infected raw milk<sup>24</sup>. With routine pasteurisation of cows' milk and the inspection of carcasses at slaughterhouses, this transmission largely came to an end.

## Routes of transmission

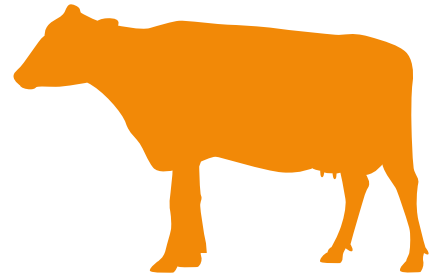
Bovine TB is spread primarily when bacteria are released into the air through coughing and sneezing. This transmission can occur

when animals are in close contact with each other. The intensification of the dairy industry and the move to permanently housed, zero grazed cows are, therefore, real causes for concern. Wild animals may also become infected.

In the UK, badgers were blamed for hosting the disease and for passing it back to cows. Despite a 10-year trial cull concluding that a badger cull could make 'no meaningful impact' on the epidemic in cows,<sup>25</sup> the government approved a mass cull of the previously protected wild species. Between 2013 and 2020, more than 100,000 badgers were killed.

In 2018, an independent review found that frequent trading of cows and poor biosecurity on farms was hampering





efforts to control the disease. By 2020, the government finally announced it would phase out the badger cull in favour of a vaccination programme<sup>26</sup>.

Bovine TB still infects people. It can be passed in droplets coughed and sneezed by animals, through drinking unpasteurised milk or through handling infected meat. Currently, less than one per cent of confirmed cases of TB in humans tested are due to infection with *M. bovis*<sup>27</sup>.

### **Symptoms in animals**

Lesions are common in the lungs, and these can cause a hard, dry short cough, which leads to more frequent coughing and laboured, painful breathing. The animals lose condition, later cough up blood and suffer from diarrhoea. Lesions can also develop in their udders with hard lumps appearing<sup>28</sup>. However, due to the slow progression of infection and the early age at which cows are slaughtered, the clinical signs of bTB are now rarely seen in cows in Britain. Bovine TB is rarely fatal, although government policy is to kill any cow found to test positive for the disease, and those in close proximity to her. More than 44,000 cows were slaughtered in England in 2018 due to bovine TB<sup>29</sup>.

### **Symptoms in people**

TB in humans produces the same

symptoms whether it is caused by *M. bovis* or the human pathogen *M. tuberculosis*: a persistent cough, coughing up blood, lack of appetite and weight loss, night sweats and fatigue. It can be fatal if left untreated<sup>30</sup>.

### **Treatment**

A long course of antibiotics is usually sufficient to treat TB in people although, in rare cases, the disease can be fatal, even with treatment<sup>31</sup>.

Similarly, cows can be treated but the cost of treatment and the fact that raw milk can only be exported if it comes from a TB-free herd makes treatment uneconomic for farmers.

Government policy, therefore, has been to control bTB within an affected herd through testing and slaughter, and to kill badgers. In 2020, the focus shifted with ministers stating that they would support work to improve the accuracy of the tests, and to develop a deployable cow vaccine. They also stated they would support calls by scientists to better manage the movement of cows<sup>32</sup>.

However, the underlying causes of bovine TB, and numerous other diseases that kill vastly greater numbers of cows every year, are the intensive and stressful conditions to which the animals are subjected.

# BSE



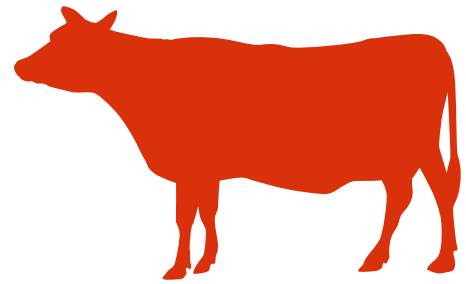
## What is it?

Bovine Spongiform Encephalopathy also known as 'mad cow disease' affects the central nervous systems of cows, and is caused by an abnormal infectious protein known as a prion. It has a long incubation period, which means that it typically takes four to six years for cows infected with BSE to show signs of the disease. Many cows are slaughtered or culled long before those signs appear.

## History

The first case of BSE was in a cow on a West Sussex farm in 1986. In total, 180,000 cows were affected and 4.4 million were slaughtered during the eradication programme<sup>33</sup>. It cost the UK economy between £740 million and £980 million<sup>34</sup>. The disease has now been found in at least 27 countries<sup>34</sup>.

In 1996, the government announced a probable link between BSE in cows and



variant Creutzfeldt-Jakob Disease (vCJD) in people - a disease with a 100 per cent mortality rate.

The epidemic reached a peak in 2000 with most reported cases developing through the consumption of contaminated beef. In three cases, the mode of transmission was thought to be through receipt of blood from an asymptomatic, infected donor<sup>36</sup>.

This is not a historic disease<sup>37</sup>. Scientists warn that more cases are still to emerge, even 30 years after the initial outbreak<sup>38</sup>. It has already killed all 178 people infected with it in the UK, and it is thought that one in 2,000 Britons could be carriers of the disease<sup>39</sup>.

### **Routes of transmission**

BSE is transmitted between cows through the ingestion of BSE prions, not through direct contact with infected animals. It became a huge and widespread disaster because cows, who are natural herbivores, were fed the remains of other sick cows<sup>40</sup>.

People who eat parts of infected animals can develop vCJD, a condition that is always fatal. The disease can also be transmitted via contaminated medical equipment and through blood transfusions.

### **Symptoms in animals**

BSE is a neurological condition that causes a spongy degeneration in the brains of cows. Infected animals may experience intense agitation or fear and try to hide from other cows or people. They may startle easily or become aggressive. They may experience abnormalities in their posture, such as stiffness or a lack of coordination, an increase in slipping and falling, and difficulty in rising. There may also be prolonged episodes of nose licking, snorting, coughing, head tossing and vigorous head rubbing that can cause lesions<sup>41</sup>.

### **Symptoms in people**

Anxiety and depression are often the first signs in people. Later symptoms include confusion, memory loss, loss of coordination and balance, problems with vision and hearing, muscle paralysis, speech loss and incontinence. As the condition progresses to its final stages, people become bedridden. The NHS says: 'Nothing can be done to prevent death in these circumstances.'<sup>42</sup>

### **Treatment**

There is no treatment for cows diagnosed with BSE or for people with vCJD, although medications are given to help with the symptoms<sup>43</sup>.

# Campylobacter

## What is it?

Campylobacter is a group of bacteria that are a major cause of diarrhoeal illness in humans and is generally regarded as the most common cause of bacterial food poisoning. Two species account for the majority of infections: *C. jejuni* and *C. coli*. Campylobacter is present in the intestines of farmed animals worldwide but, typically, they show no signs of illness.

In 2020, an international team of researchers led by the Universities of Bath and Sheffield, stated that intensive farming techniques could increase the likelihood of Campylobacter pathogens becoming a public health risk.<sup>44</sup>

## History

Campylobacter was first observed in stool samples taken from children with diarrhoea in 1886. By 1986, it was the most commonly reported gastrointestinal pathogen in the UK<sup>45</sup>.

A 2008 report found that the UK had the sixth highest prevalence of contaminated chicken carcasses in the EU at 86.3 per cent<sup>46</sup>. In that year, there were almost 50,000 laboratory reports of Campylobacter in England and Wales<sup>47</sup>. The Food Standards Agency worked to reduce this rate but in 2013 admitted: 'Despite significant effort and investment by both industry and government, monitoring data shows that no progress has yet been made in reducing

levels of Campylobacter in chicken.'<sup>48</sup>

By 2017, the number of laboratory reports of this infection had risen to 56,700,<sup>49</sup> with an estimated 3,500 hospital admissions the following year.<sup>50</sup>

More than half of all cases are attributed to the consumption and handling of chicken, while beef, offal, other meats and unpasteurised milk are also foods most likely to harbour the bacterium<sup>51</sup>.

Between 2017 and 2018, Public Health England tested 392 retail chicken samples and found a worrying level of antimicrobial resistance, including multi-drug resistance in 9 per cent of *C. coli* isolates and 2 per cent of *C. jejuni* isolates<sup>52</sup>.

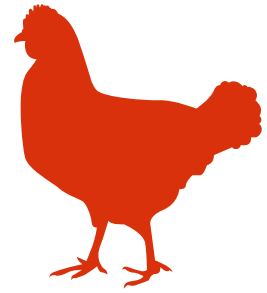
Research by Food Standards Agency economists in 2020 put the social and economic costs from Campylobacter at more than £712 million per year<sup>53</sup>.

## Routes of transmission

On farms, Campylobacter is easily transmitted between birds via a shared water source or through infected faeces. When an infected animal is slaughtered, the organisms can be transferred from the intestines to the meat<sup>54</sup>.

Between August 2016 and July 2017, more than half of all shop-bought chicken in the UK was contaminated with the bug<sup>55</sup>. It is not surprising, then, that between 50 and





80 per cent of campylobacteriosis can be attributed to chicken<sup>56</sup>.

Eating undercooked meat (especially poultry) is the main cause of illness. Other sources include contact with live poultry and drinking unpasteurised milk or untreated water.

### **Symptoms in animals**

The types most commonly found in people (*C. jejuni* and *C. coli*) are not generally associated with illness in animals, although *C. jejuni* can cause miscarriage in sheep<sup>57</sup>.

### **Symptoms in people**

Infection can cause a severe form of food poisoning marked by bloody diarrhoea, abdominal pain, fever, headache and vomiting. The symptoms typically last three to six days. Fatal outcomes usually occur only in the very young or elderly, or those with another serious disease. Long-term complications can include paralysis, arthritis, heart infection and septicaemia<sup>58</sup>.

### **Treatment**

Currently there is no efficient vaccine to reduce incidence of *Campylobacter* in farmed birds, although researchers are attempting to develop one<sup>59</sup>. Preventing its spread on farms is a matter of improving biosecurity and hygiene. Unfortunately, in 2013, the Food Standards Agency (FSA) expressed concern that chicken farmers did not abide by new biosecurity requirements ‘with sufficient consistency to be effective’<sup>60</sup>.

At slaughterhouses, hygiene practices may also reduce contamination of carcasses by faeces<sup>61</sup>. In some countries, chicken meat is disinfected with a chlorine wash. Chlorinated chicken has been banned in the EU since 1997<sup>62</sup> but could be sold in British shops in the future.

The only method presumed to eliminate *Campylobacter* from contaminated foods is heat treatment (cooking or pasteurisation) or irradiation.

In people, treatment is based on oral or intravenous rehydration, with antimicrobial treatment recommended in invasive cases (when bacteria invade intestinal cells and damage tissues)<sup>63</sup>.

# E.Coli (O157:H7)

## What is it?

Escherichia coli (E. coli) is a large and diverse group of bacteria, with more than 700 identified types. They are mainly harmless and inhabit the intestinal tracts of people and other warm-blooded animals, but a few strains including the notorious O157:H7, can be deadly. The increased number of human cases has been attributed to the intensification of farming practices and the consequent widespread use of antibiotics.

Studies in France<sup>64</sup>, Sweden<sup>65</sup> and Canada<sup>66</sup> have identified a positive correlation between the number of cows in an area and rates of human infection.

## History

E. coli O157:H7 was first described as an 'emerging foodborne zoonotic pathogen' (an illness that can be transmitted from animals to humans) in 1982 during an investigation into an outbreak of haemorrhagic colitis bloody diarrhoea, associated with the consumption of contaminated beef burgers in the US<sup>67</sup>.

The main reservoirs for infection are cows, sheep, goats and deer<sup>68</sup>.

The first community outbreak in the UK was in July 1985 when 49 people fell ill and 19 people were hospitalised<sup>69</sup>. Many more cases followed, including Britain's

deadliest human E. coli O157:H7 outbreak, which occurred in Scotland in 1996 when 21 people died after eating infected meat from a butcher in Lanarkshire. Another 500 were infected<sup>70</sup>.

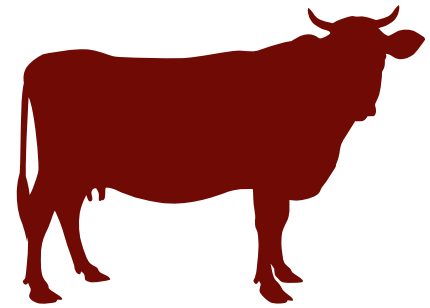
Since then, outbreaks have continued, with petting farms, meat and contaminated salad leaves all being implicated. In recent years, there has been a sharp rise in E. coli infections in the UK, with more than 43,000 cases recorded in England and Wales in 2018-19,<sup>71</sup> 600 of which were the deadly O157 strain<sup>72</sup>.

## Routes of transmission

Since the bacteria are excreted in faeces, there is a potential risk to anyone working with or visiting farmed animals and their environment. Slaughterhouses are an obvious place for contamination of meat. Operators are urged to ensure that the animals' skins are not covered in faeces and prevent the spillage of the digestive tract contents during and after evisceration (organ removal).

The main risk to the public comes from handling and eating infected foods. Raw or undercooked beef products are the most common source of infection for people, but raw milk, yoghurt, cheese and cold sliced meats are also sources of infection<sup>73</sup>.

In fact, any foodstuff (including raw



### **Symptoms in people**

*E. coli* O157:H7 can cause severe stomach cramps, vomiting, bloody diarrhoea and fever, although some infected people may have mild diarrhoea or no symptoms at all. In 5 to 10 per cent of patients, it can cause a kidney-related complication that can lead to renal failure, particularly in young children and the elderly<sup>76</sup>.

### **Treatment**

The prevalence of the disease could be reduced by ending intensive dairy cow farming<sup>77</sup>. Vaccines are available for use in cows and research suggests they could reduce the number of human cases by 85 per cent<sup>78</sup>. Since the cows do not get sick with O157, however, farmers are unlikely to pay for it<sup>79</sup>.

Most people infected with O157 recover without specific treatment, although rehydration is essential. Use of antibiotics may increase the risk of complications. In serious cases, transfusions of blood or blood clotting factors as well as kidney dialysis may be necessary.

vegetables and fruit products) that has been contaminated with faeces containing the bacteria can cause disease. This is most likely to be via contaminated water or animal (especially cow) manure at the farms, but cross contamination during food preparation can also lead to infection<sup>74</sup>. Infected people can pass the disease to others through the same oral-faecal route.

### **Symptoms in animals**

While certain strains of *E. coli* bacteria can be responsible for acute, painful and potentially fatal forms of mastitis<sup>75</sup>, the most dangerous strain to people - *E. coli* O157:H7 - does not adversely affect cows.

# Foot and Mouth Disease

## What is it?

Foot and Mouth Disease (FMD) is caused by a picornavirus, of which there are seven main types, each producing the same symptoms and being distinguishable only in the laboratory<sup>80</sup>. It affects cloven-hoofed animals, such as cows, sheep, pigs, goats, camels and deer. According to the government's Department for Environment, Food and Rural Affairs (Defra), 'FMD is probably more infectious than any other disease affecting man or animals and spreads rapidly if uncontrolled.'<sup>81</sup>

## History

FMD was first shown to be viral in 1897 by Friedrich Loeffler, and the disease is now widespread throughout the world. In 1967-

8, there were 2,364 confirmed outbreaks in Britain, resulting in the slaughter of almost 434,000 animals<sup>82</sup>.

In 2001, there was another devastating UK outbreak, which was first found in an Essex slaughterhouse. The virus was traced back to a swill farm in Northumberland, where pigs were fed plate scrapings and other foods of animal origin including pig meat, that were considered unfit for human consumption<sup>83</sup>. Around 6.5 million animals were slaughtered on 10,000 farms<sup>84</sup> and the countryside was brought to a standstill.

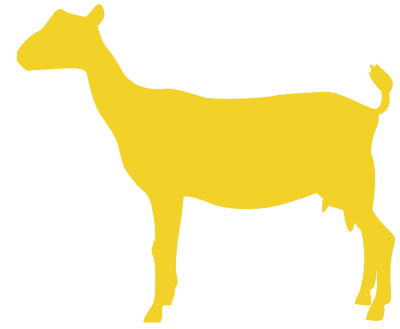
Most European countries, including Britain, have now been formally recognised as disease-free but its potential to spread rapidly still causes international concern.



## Routes of transmission

Infected animals secrete numerous viral particles that are capable of becoming airborne before clinical signs appear. Transmission can take place on the wind (in 1981 this occurred over 250 km when pigs in Brittany infected cattle on the Isle of Wight) and by the





movement of animals, people and vehicles that have been contaminated with the virus, and via animal products such as meat, milk and semen<sup>85</sup>.

Long-distance animal trading and dense populations of animals typical of modern farming practices help to facilitate the spread. The virus does not readily transmit to humans, but it is possible to spread to people through close contact with infected animals or drinking their raw milk but not through eating infected meat<sup>86</sup>.

### **Symptoms in animals**

Fever is followed by the development of blisters, chiefly in the mouth, or on the feet. FMD is rarely fatal, except in very young animals who may die without showing any symptoms. In dairy cows, there is a high incidence of miscarriage, chronic mastitis and lameness conditions that are already endemic in dairy herds<sup>87</sup>.

### **Symptoms in people**

FMD crosses the species barrier with difficulty but there have been a few recorded cases of humans getting sick<sup>88</sup>. Symptoms are flu-like with a fever and sore throat, although tingling blisters on the hands and feet and in the mouth have also been recorded<sup>89</sup>.

### **Treatment**

For animals, there is no 'cure' but affected animals will usually recover naturally in two to three weeks<sup>90</sup>. However, since those animals may lose productivity and the farmers, therefore, lose profit, it is policy in the UK to slaughter all affected animals and any others who have been exposed to the infection<sup>91</sup>. During the 2001 UK outbreak, the animals were shot with a captive bolt gun - a retractable metal bolt used to stun animals in slaughterhouses. Following this, their main arteries should have been cut or a metal rod inserted into the gun hole to destroy the brain stem (use of this rod is now illegal). However, there is evidence that for many during the cull, this wasn't the case. They recovered consciousness and experienced their own slow death piled up with their fellows<sup>92</sup>. Younger animals were killed by a painful and traumatic injection directly into the heart.

Vaccination is an alternative to culling. However, vaccination programmes can affect the ability to trade freely in animals and meat products and so they are often resisted.

The last recorded cases of FMD in people in the UK was in the 1960s. Those who got ill were quarantined until they recovered<sup>93</sup>.

# Johnne's Disease



## What is it?

Johnne's disease is an infectious wasting condition caused by *Mycobacterium avium* subspecies *paratuberculosis* (MAP). The bacterium causes a chronic and sometimes fatal infection in cows, sheep, goats and other ruminants. In infected flocks of sheep, the annual ewe mortality rate is estimated to be between 5 and 10 per cent<sup>94</sup>. Johnne's is endemic in the UK<sup>95</sup> but it is not known just how prevalent it is. One 2006 study estimated that around 35 per cent of herds are affected, while more recent small-scale

surveys suggest it is closer to 17.5 per cent<sup>96</sup>.

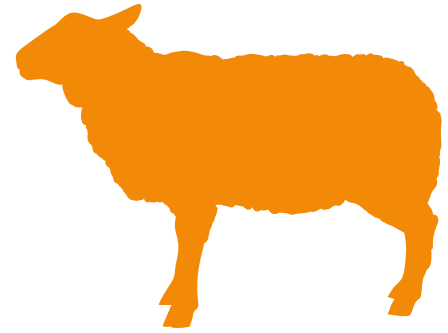
## History

Johnne's disease was first noted in 1826 but not officially recognised as an infectious disease until 1894<sup>97</sup>. The last 100 years have seen a steady increase in the number of infected animals within a species, the number of different species infected, and the number of countries in which it has taken root<sup>98</sup>.

## Routes of transmission

Infected animals shed the bacteria in manure, colostrum and milk. Infection is most commonly acquired in young animals through ingestion of contaminated milk from an infected cow or through the environment<sup>99</sup>. (Just one cow with diarrhoea could potentially thoroughly contaminate her surroundings<sup>100</sup>.) It can also be transmitted from an infected pregnant animal to her foetus.

Confining large numbers of animals in small areas helps to spread the disease and is one reason that it is such a growing threat<sup>101</sup>.



Subclinically infected animals display no symptoms but they can still shed the bacteria into the environment, giving MAP the opportunity to become entrenched in a herd before it is apparent that a problem even exists<sup>102</sup>. Every time animals are transported between farms; new herds may be infected.

Johne's disease can affect people, though experts state that 'due to important knowledge gaps in understanding its role and importance in the development or progression of human disease, its impact on public health cannot yet be quantified or described'<sup>103</sup>.

Increasingly, Johne's disease of ruminants and human Crohn's disease are regarded as the same infectious disease<sup>104</sup> as there are clinical similarities between the two<sup>105</sup>. However, if MAP is linked to Crohn's, transmission routes have not yet been established.

### **Symptoms in animals**

In cows, the main signs are diarrhoea and wasting. MAP symptoms are progressive, and so affected animals become increasingly emaciated and usually die as a result of dehydration and muscle loss. Sheep become emaciated but do not suffer diarrhoea. Signs are rarely evident until two or more years after the initial infection.

### **Symptoms in people**

Sufferers of Crohn's experience profuse, urgent diarrhoea, nausea, vomiting, fevers, severe joint pains, lack of energy and weight loss. The immune system starts attacking the lining of the gut, which becomes swollen and inflamed. This painful condition can affect any part of the digestive system from the mouth to the anus.

### **Treatment**

There is no cure for Johne's disease in animals<sup>106</sup>. Traditionally, it has been controlled through culling, segregating infected animals and stricter hygiene. There is a vaccine, but it is useful only in limited situations, and it interferes with the tuberculin test, which complicates the interpretation of bovine TB testing<sup>107</sup>.

Crohn's disease in people is traditionally treated with drugs, nutrition supplements and surgery. However, there is evidence that eating a plant-based diet can help with the symptoms associated with Crohn's disease<sup>108</sup>.

# Meningitis

## What is it?

The bacterium *Streptococcus suis* (*S. suis*) is a 'zoonotic agent causing severe infections to people in close contact with infected pigs or pork-derived products'<sup>109</sup>. It has been linked to various diseases, including meningitis, septicaemia, and endocarditis, in both pigs and people<sup>110</sup>.

The bacteria are carried in the tonsils and nasal cavities of apparently healthy pigs allowing infection to spread before symptoms are spotted<sup>111</sup>. It is most commonly found in 4-8-week-old piglets,<sup>112</sup> and particularly in intensive, indoor units<sup>113</sup>. The bacteria can be passed to people in whom meningitis can develop.

## History

*Streptococcus suis* has been a recognised zoonosis (infectious disease that can be transmitted from animals to humans) since 1968. An editorial in the *Journal of Infectious Diseases* described it as 'emerging as an important threat to human health'<sup>114</sup>.

The largest outbreak was in China in 2005, where 215 people were infected and 39 died<sup>115</sup>.

In 2017 there were just four reported cases in the UK<sup>116</sup> but it is a recognised occupational hazard to veterinary surgeons,

farmers and meat industry workers<sup>117</sup>.

## Routes of transmission

Among pigs, the bacteria can be spread by direct and indirect contact. It is present in the faeces and nasal secretions of carriers, and transmission may be through ingestion, inhalation or through nose-to-nose contact. The bacteria can survive on flies for at least five days<sup>118</sup> and, unsurprisingly, are more prevalent when pigs are crowded together<sup>119</sup>.

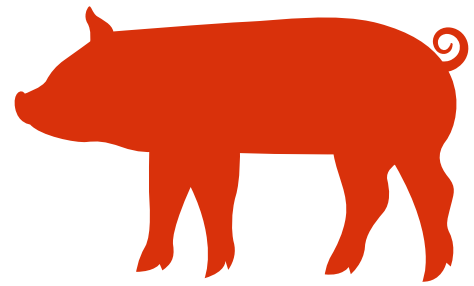


Human infection is usually through close contact with infected pigs or with raw or undercooked pig meat and is thought to occur through cuts or abrasions on the skin when handling infected pig carcasses<sup>120</sup>.

## Symptoms in animals

Typical symptoms include involuntary eye movement, convulsions, paddling, shivering, pain and discomfort, raised hair and grinding teeth<sup>121</sup>. In untreated pigs, the mortality rate is 20 per cent<sup>122</sup>.





## Symptoms in people

*S. suis* infection can cause meningitis, the symptoms of which include headache, fever and vomiting<sup>123</sup>. In serious cases, it can also lead to haemorrhages under the skin, gangrene, inflammation of the heart's inner lining, inflammation in the eyes and pyogenic (pus producing) arthritis<sup>124</sup>. Long-term deafness and loss of balance may occur in some patients. The fatality rate in adult humans is approximately 13 per cent while 39 per cent of people who recover have permanent hearing loss<sup>125</sup>.

## Treatment

Antibiotics are the preferred treatment for

meningitis in both animals and people, although resistance to the drugs has been reported<sup>126</sup>, which is perhaps not surprising given industry advice for preventing meningitis is to 'medicate continuously from day of weaning through to six weeks post-weaning'<sup>127</sup>.

Vaccines are administered to pigs even though they are not considered fully effective. Those who work with pigs are encouraged to take appropriate hygiene precautions and keep wounds covered.



# MRSA

## What is it?

MRSA (methicillin resistant *Staphylococcus aureus*) is any strain of the *Staphylococcus aureus* bacterium that has become resistant to a range of antibiotics. Healthy people may carry the bacterium without developing any symptoms at all but children, the elderly and those with weakened immune systems are all at a greater risk. One new variant - ST398 - has emerged in farmed animals and this can also spread to people. There is an increasing trend in zoonotic transmission in Europe<sup>128</sup>. Surveys conducted on retail beef, pig and poultry meat on sale in the UK have also detected MRSA<sup>129</sup>.

## History

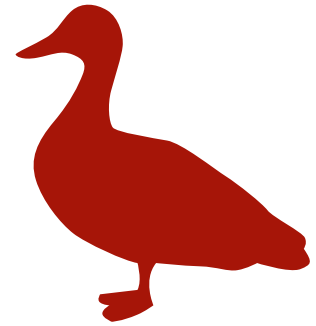
MRSA was discovered in the UK in 1961. In the late 1990s it became clear that community-acquired MRSA infections were caused by strains of MRSA that differed



from the older and better studied hospital-associated strains. In 2003, ST398 was found in pigs in the Netherlands and in British farmed animals in 2011. It was discovered in cows, their milk and also a number of people who, it is thought, were infected by contact with infected animals or by people who work with infected animals<sup>130</sup>.

MRSA has since been found in UK poultry<sup>131</sup> and pigs<sup>132</sup>. Researchers said that the idea it may have arisen due to overuse of antibiotics on farms was 'a credible hypothesis'<sup>133</sup>.

In 2007, it was reported that almost half of all Dutch pig farmers were infected with



MRSA<sup>134</sup>, while in 2013, research suggested that just living close to an intensive pig or poultry farm could lead to greater exposure to the bacteria<sup>135</sup>.

Monitoring of farmed animal-associated MRSA (LA-MRSA) is voluntary under current legislation. The UK does not participate<sup>136</sup>.

### **Routes of transmission**

The bacteria are carried on the skin and in the nasal passages of healthy people and animals and can be passed between species simply through direct contact or through sneezing, coughing or breathing. Infections can also develop when the bacteria enter the body through a wound.

It is commonly found in farmed animals (in 2012, 70 per cent of pigs at slaughter in Denmark were MRSA positive<sup>137</sup>) and can be passed from pigs to farm workers, and then onto other people<sup>138</sup>.

It has also been found in milk<sup>139</sup> and in meat in the UK<sup>140</sup>. Pasteurising milk should kill it, as should properly cooking meat but lapses in hygiene can allow the infection to take hold<sup>141</sup>.

### **Symptoms in animals**

MRSA infected farmed animals often show no symptoms.

### **Symptoms in people**

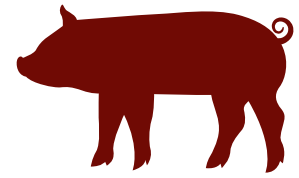
Infection can cause symptoms such as boils, abscesses, styes, carbuncles (large pus-filled lumps under the skin), cellulitis (infection of the deep layer of the skin, fat and tissues) or impetigo (highly contagious skin infection that causes blisters). If the bacteria get into the bloodstream, they can cause blood poisoning, septic shock (infection of blood that can lead to organ failure), septic arthritis (severe joint inflammation), osteomyelitis (bone infection), meningitis, pneumonia or endocarditis (infection of the heart lining)<sup>142</sup>.

### **Treatment**

While some MRSA strains are resistant to many important antibiotics, most are said to respond to an intensive course of antibiotics. People with invasive infections may be hospitalised and isolated to prevent spread<sup>143</sup>.



# Nipah



## What is it?

Nipah virus (NiV) is a newly emerging infectious disease. The virus lives harmlessly in fruit bats but started to threaten human lives when it jumped species into factory farmed animals<sup>144</sup>.

## History

The disease appeared without warning, killing large numbers of farmed pigs in Malaysia and Singapore in 1998 and 1999. Research showed that the virus had come from fruit bats. These wild mammals had been forced to feed at the orchards that stood near to pig farms in northwest Malaysia after the destruction of their own habitat for logging. Their saliva was on the half-eaten fruit they dropped, which was devoured by the pigs<sup>145</sup>.

Now, ten countries have reported outbreaks or are said to be at risk. Since the initial outbreak it has primarily affected humans in South and Southeast Asia (Malaysia, Singapore, Bangladesh and India) with devastating consequences<sup>146</sup>.

## Routes of transmission

It can be transmitted directly from animals to people, through contaminated meat and directly between people<sup>147</sup>.

During the original outbreak, most infections came from direct contact with sick pigs. During the later outbreaks in Bangladesh and India, Nipah virus spread

directly from human to human through close contact with people's secretions and excretions<sup>148</sup>.

In the Philippines, people became sick after eating meat from sick horses or participating in their slaughter<sup>149</sup>.

## Symptoms in animals

Pigs who become infected may exhibit no symptom at all, or they may suffer rapid laboured breathing, an explosive cough, convulsions, pneumonia and death.<sup>150</sup>

## Symptoms in people

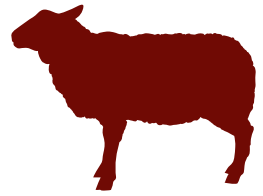
In people, the disease begins with fever and headache, followed by drowsiness and disorientation, which can rapidly progress to coma. Nipah is also associated with encephalitis - an inflammation of the brain<sup>151</sup>. The case fatality rate is estimated at 40 to 75 per cent. Approximately 20 per cent of patients are left with residual neurological consequences such as seizure disorder and personality changes. A small number of people who recover subsequently relapse or develop delayed onset encephalitis<sup>152</sup>. Of the 265 cases of acute encephalitis in people, 105 died.<sup>153</sup>

## Treatment

There is no treatment or vaccine available for either people or animals. The primary treatment for humans is supportive care<sup>154</sup>. Pigs are slaughtered and their bodies incinerated or buried<sup>155</sup>.



# Q Fever



## What is it?

Q (Query) fever – so-called because for many years its cause was unknown – is a highly infectious zoonosis (a disease that can be transmitted from animals to humans) caused by *Coxiella burnetii*. The bacterium can affect humans and other animals, including sheep, cows and goats. The low bacterial load required, the ease of its dispersal and ability to incapacitate people, has led several countries to develop *C. burnetii* for use as a biological weapon<sup>156</sup>.

## History

Q fever was first recognised in abattoir workers in Brisbane, Australia in 1937 and is now found globally<sup>157</sup>. While human cases of Q fever are rare in the UK, there was an outbreak in 2006, which affected 138 people and was associated with a slaughterhouse in Scotland<sup>158</sup>. Around 50-100 cases of Q fever are reported in the UK each year although, as many people develop only mild or no symptoms at all, the true incidence is unknown<sup>159</sup>.

## Routes of transmission

Infection results from inhalation of contaminated particles in the air, and from contact with the milk, urine, faeces, afterbirth and birth fluids of infected animals. As a result, human outbreaks are often associated with the farming birthing season<sup>160</sup>. It is also possible for people to become infected through drinking

unpasteurised milk or via skin abrasions<sup>161</sup>.

## Symptoms in animals

Signs of the disease are uncommon, but pregnant cows, sheep and goats may miscarry.

## Symptoms in people

Q fever usually causes strong, but treatable symptoms in humans, including fever and muscle pains. However, some people develop pneumonia, hepatitis or meningitis, and for others it develops into a chronic illness with symptoms persisting for more than six months<sup>162</sup>. Infection during pregnancy can have an adverse effect on the unborn child, including miscarriage<sup>163</sup>.

Only 1-2 per cent of people with acute fever die of the disease, but as many as 65 per cent with chronic versions may die<sup>164</sup>.

## Treatment

*C. burnetii* is resistant to heat, drying and many disinfectants, which means the organism can survive in the environment for many months<sup>165</sup>. It is difficult, therefore, to prevent farmed animals from becoming infected and there are no formal control programmes or vaccines available in Britain<sup>166</sup>.

In most people, Q fever requires no treatment and symptoms will clear up on their own. Antibiotics may be prescribed for some patients.

# Salmonella

## What is it?

Salmonella is a group of bacteria presenting one of the commonest causes of food poisoning in Great Britain. They can also cause typhoid and paratyphoid fevers. More than 2,500 different strains of Salmonella have been identified, most of which rarely cause disease. In humans, illness is caused by about 10 strains. The most important are *S. enteritidis* (which originates in infected poultry and eggs) and *S. typhimurium* (which occurs in cows, pigs and turkeys). Salmonella can contaminate meat, eggs, milk and other dairy products<sup>167</sup>.

## History

The Salmonella bacterium was first found in pigs in the late 1800s and outbreaks have occurred throughout the last 100 years.



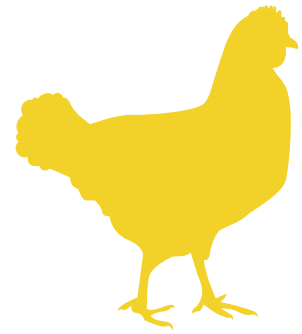
Between 1981 and 1991, the incidence of the non-typhoidal types of Salmonella increased by more than 170 per cent. The rate peaked in 1993<sup>168</sup>.

At that time, the Chief Medical Officer advised consumers to stop eating raw eggs and said that all vulnerable people should eat only eggs that had been thoroughly cooked<sup>169</sup>. Hundreds of thousands of birds were slaughtered, farmers were compensated and a programme of disinfection was introduced alongside a voluntary vaccination scheme<sup>170</sup>. The rate of infection in people declined until 2014 but has since been increasing again<sup>171</sup>.

There were more than 10,000 cases confirmed in England and Wales in 2018<sup>172</sup> and it is estimated that for every confirmed case, there are nearly five unreported cases, suggesting over 47,000 total cases in 2018<sup>173</sup>.

## Routes of transmission

The bacteria are shed in the faeces of infected animals<sup>174</sup> so it is simple for animals on farms to infect one another, particularly as chickens and pigs - the animals most commonly affected - are also the species most commonly intensively reared. Studies show that poor ventilation, high dust levels<sup>175</sup> and overcrowding<sup>176</sup> aid the spread of Salmonella among chickens, as does keeping sheds permanently



populated<sup>177</sup>.

Salmonella can be transmitted to people through eating contaminated foods, usually of animal origin; via faeces from an infected animal or person; and through direct contact with infected animals.

The most common sources of infection are poultry meat and eggs. In 2019, 25 egg-laying poultry flocks in the UK tested positive, seven of which were contaminated with the most serious strains<sup>178</sup>.

Salad vegetables, spices and herbs, which may have been cross-contaminated with animal faeces, have also been implicated in large outbreaks of the infection.

### Symptoms in animals

When farmed animals, particularly poultry and pigs, become infected, they frequently become carriers of the infection without showing signs of ill health. Nevertheless, infection in pigs can lead to pneumonia, coughing, bloody diarrhoea and death;<sup>179</sup> in chickens it can cause blood poisoning, diarrhoea, difficulties breathing and death<sup>180</sup>.



### Symptoms in people

Symptoms include diarrhoea, stomach cramps, vomiting and fever. Salmonella can also trigger an arthritic condition known as reactive arthritis, which causes painful and swollen joints<sup>181</sup>. In rare cases, infection can be fatal<sup>182</sup>.

### Treatment

Most commercial flocks of birds are now vaccinated<sup>183</sup>.

In people, symptoms usually clear up without medical intervention although, in severe cases, treatment may be required for dehydration. In some cases, antibiotics may be prescribed (although a number of Salmonella strains have been found to be resistant to antibiotics)<sup>184</sup>.

# Swine Flu

## What is it?

Swine influenza is a common respiratory illness in pigs caused by a strain of influenza A virus. The H1N1 strain responsible for the 2009 outbreak had been circulating undetected in the swine population for several years prior to its emergence in humans, causing only subclinical symptoms<sup>185</sup>. Despite the popular name 'swine flu' the virus is made up of genetic segments originating from avian, swine and human strains. In this case, the pig had acted as a mixing vessel for the virus to change its genetic form<sup>186</sup>.

## History

H1N1 swine flu is a descendant of the avian flu that killed at least 50 million people in the 1918 epidemic. After 1919, the virus continued to circulate and caused seasonal outbreaks in both people and pigs<sup>187</sup>. The virus was first confirmed in pigs in 1931 and in 1976, an H1N1 virus jumped from pigs to people, killing one person in the US. By 1977, it was circulating in people in China.

In 1998, the first hybrid virus - made from human, bird and pig viruses - was discovered in a North Carolina factory farm. It spread rapidly. Vaccines could not control it because the virus kept evolving<sup>188</sup>.

In March 2009, the first cases of a new type

of swine flu were reported in the US. By April, 900 cases of suspected swine flu were reported in Mexico and two months later, a pandemic was declared<sup>189</sup>. It is said to have started in La Gloria, Mexico, just five miles from a major concentration of large-scale pig factory farms<sup>190</sup>.

In all, 457 people in the UK died between April 2009 and March 2010 in a pandemic that cost the country £1.24 billion<sup>191</sup>. Worldwide, the pandemic is estimated to have killed between 151,700 and 575,400 people<sup>192</sup>.

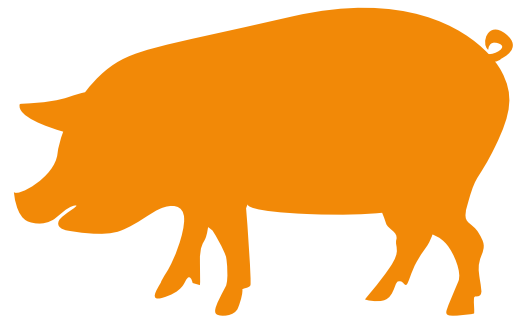
Today, this strain of influenza is not usually specifically tested for and it has joined the set of seasonal flu viruses that circulate each winter<sup>193</sup>.

## Routes of transmission

Influenza viruses can be transmitted between pigs, from pigs to people, from people to pigs, and between people<sup>194</sup>. Pigs can be infected by avian influenza and human influenza viruses as well as swine influenza viruses. When influenza viruses from different species infect pigs, the viruses can recombine and new viruses that are a mix of pig, bird and human viruses can emerge.

The virus is transmitted in the same way as seasonal flu, through tiny droplets emitted





when pigs or people cough or sneeze.

### **Symptoms in animals**

Swine flu viruses can cause high levels of illness yet low death rates in pigs. Symptoms include fever, depression, coughing (barking), discharge from the nose or eyes, and breathing difficulties.

### **Symptoms in people**

The symptoms are similar to seasonal flu. They include fever, a temperature, aching muscles, diarrhoea or vomiting. In vulnerable people, pneumonia can also develop<sup>195</sup>.

### **Treatment**

There is no effective treatment for pigs. Antibiotics may be used to reduce secondary bacterial infections, but this contributes to the overuse of antibiotics and the subsequent increase in resistant bacteria. Vaccination and strict movement controls are recommended, as is keeping animals free from stress, particularly due to crowding and dust<sup>196</sup>. This is impossible in most intensive pig farms.

There are antiviral drugs and vaccines available, respectively, to treat and prevent swine flu in people.





# Other zoonotic viral epidemics

## What are they?

While factory farming is a huge risk for the creation and spread of disease to people, there have also been many other significant viral disease outbreaks in the last 50 years that also stem from our poor treatment of - or inappropriate interaction with - animals. The deadliest of these has been caused by the HIV virus and AIDS.

## HIV and AIDS

HIV - Human Immunodeficiency Virus - developed from a virus in chimpanzees and most likely jumped species after wild chimps were hunted, killed and eaten<sup>197</sup>. The first verified case of HIV is from a blood sample taken in 1959 from a man living in what is now Kinshasa in the Democratic Republic of Congo. By the early 1980s, it had spread widely, and has now killed more than 35 million people globally since 1987<sup>198</sup>.

## Marburg Virus Disease

Marburg virus disease (MVD) is a highly virulent disease that causes haemorrhagic fever. Two large outbreaks that occurred simultaneously in Marburg and Frankfurt in Germany, and in Belgrade, Serbia, in 1967, led to the initial recognition of the disease. The outbreak was associated with laboratory research using African

green monkeys imported from Uganda<sup>199</sup>. It can also be found in bats, with the virus crossing to people who are bitten when they catch the bats to eat<sup>200</sup>.

MVD has a high fatality rate in people, with deaths typically occurring between 8 and 9 days after onset of symptoms.

## Ebola

Like Marburg virus disease, Ebola is a severe and often fatal haemorrhagic fever with a high fatality rate. It is thought that fruit bats are the natural hosts of this virus which also infects other wild animals including chimpanzees, gorillas, monkeys, forest antelope and porcupines<sup>201</sup>.

The West African Ebola virus epidemic between 2013-2016 caused 11,325 deaths<sup>202</sup>. It is thought that catching and eating wild animals was the cause<sup>203</sup>.

## Middle East Respiratory Syndrome (MERS)

This disease is caused by a novel coronavirus first identified in Saudi Arabia in 2012<sup>204</sup>.

Symptoms include fever, cough and shortness of breath. Pneumonia is common, but not always present.



While it does not pass easily from person to person, of those who do become infected, approximately 35 per cent die<sup>205</sup>. It is most commonly associated with camels,<sup>206</sup> and may be passed to people who work with, farm, or slaughter camels, or consume their meat or milk<sup>207</sup>.

## **Severe Acute Respiratory Syndrome (SARS)**

In late 2002, cases of a mystery pneumonia-like illness began occurring in Guangdong province, south-eastern China. The disease, dubbed severe acute respiratory syndrome (SARS), triggered a global emergency as it spread around the world in 2003, infecting thousands of people.

The virus's natural host is probably the horseshoe bat and from there it passed into civets - a wild cat that is farmed in China. Other animals sold at markets including red foxes and the Chinese ferret badger have also been observed with signs of SARS-CoV infection<sup>208</sup>. It is possible that one of these captured or farmed wild species acted as the intermediary host between bats and people.

Between November 2002 and July 2003, a total of 8,098 people worldwide became sick with the virus, and of these 774 died<sup>209</sup>.

## **COVID-19**

SARS-CoV-2 is a novel coronavirus which emerged in China in late 2019 and causes COVID-19. Its origins are still unclear, although early cases have been associated with the Huanan seafood market in Wuhan, where live animals are densely packed in unsanitary conditions, alongside newly killed animals.

The most likely explanation at this time is that the virus had passed from bats to pangolins, who were traded at the market. Pangolins are hunted and traded for their meat, and also for their scales which are used in Chinese medicine. Pangolins are said to be the world's most trafficked animal<sup>210</sup>.

Once the virus had transferred into people, it spread around the world in a matter of weeks, infecting millions and killing hundreds of thousands.

# We can change

There is a long and terrible history of human suffering and death as a result of the way we treat animals. When we intensively breed them, lock them up, deny them fresh air, steal away their young and force them to live in squalor - in short, when we fail to treat them like the sentient beings they are - we make them vulnerable to illness.

We did not understand that we are all connected. If we cut down forests to grow feed for farmed animals, we come into closer contact with wild species who harbour their own viruses. When we eat the bodies of bacteria-laden animals, we become sick, too.

Scientists are increasingly calling for a change in our behaviour. Says Dr Ariel Kraselnik: 'Flu pandemics will continue if we insist on stacking animals up for our consumption'.

Dr Neal Barnard says:

*'Getting animals off our collective plate would go a long way toward preventing future pandemics and would improve our health and our environment at the same time.'*

Dr Aysha Akhtar advises:

*'If we really want to protect ourselves, protect future generations, protect our kids, and protect our families, then we also need to look at protecting other animals and not treating them as commodities.'*

**The good news is we can change.**

And the best thing we can do to protect ourselves, and our families, friends and communities, is to adopt a plant-based diet. If farming, eating and exploiting animals has created wave after wave of pandemics, isn't it time we made the decision to stop doing that?



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