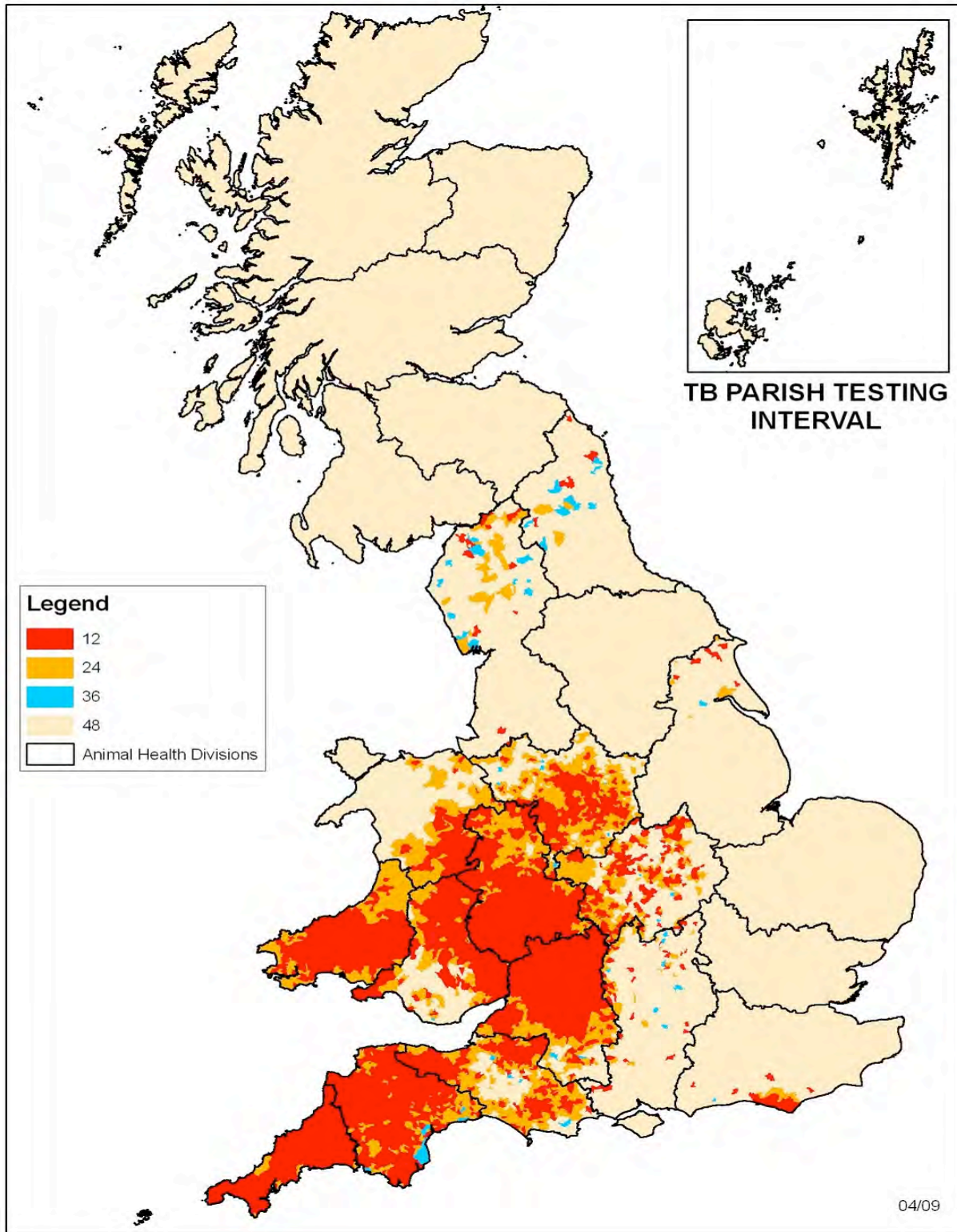


Information on TB in cattle, badgers and camelids.

April 2009 - Map of TB testing intervals - **Red** shows where there have been TB reactors.



1996 Confirmed breakdowns



1986 Confirmed breakdowns.



Tuberculosis - why bother?

* **TB** (tubercle bacillus) is the oldest documented¹ infectious disease and “TB complex” (5 strains of TB) remains the greatest killer of humans in the world (2 million a year die, a third of the world’s population, 2 billion, carry the disease, and the infection is spreading at the rate of 1 person every second)². One strain, *Mycobacterium tuberculosis*, is now specific to humans only (although found in the remains of a bison 18,000 years old). What appears to be a later descendent of “ancestral progenitor TB”, spreading across many species, including humans, (and therefore is a zoonosis) was named *Mycobacterium bovis* or bovine TB only because infected cattle happened to be the first animals to hand when it was being isolated. Pre-1950, out of 7.3 million UK cattle, 30% of all cattle and 40% of the dairy cattle were infected. 50,000 Britons a year became infected and had to be treated for bTB and 2,500 a year of them died. Since the 1950s all cattle are regularly tested for bTB and reactors removed. This work reduced the 30% of infected reactor cattle down to 0.005% by 1986, (638 on 89 farms out of the total which had increased to 12.648 million cattle). This regular testing and the back-up of pasteurisation of milk means that there is very little likelihood now of catching bTB from food or from cattle. However it is increasing being demonstrated that both humans, and cattle, are now much more likely to catch bTB from “environmental sources” and that such bTB is usually localised to one spoligotype of bTB known to be circulating in each particular area. Such infection sources are: (i) contact with surfaces on which the urine, sputum, pus dripped from wounds, and faeces of badgers have been deposited (and in the case of cattle, by aerosol of badger urine) (ii) from pets which have become infected and (iii) from camelids (llamas and alpacas), which recently have revealed they are highly susceptible to TB and (like badgers) carry a much higher infectivity than other animals.

* Hazard level.

bTB is categorised by the UK Health & Safety Executive and by the EU as a type 3 pathogen – the same contact hazard as typhus, Yellow Fever, e coli 157, CJD, SARS and Hepatitis B, C, D, E and G. bTB when caught externally by children by contact infection from environmental sources causes Scrofula - TB of the neck. Scrofula has been known to afflict people since antiquity, and during the Middle Ages was known as ‘king’s evil’ (a king's touch was thought to cure it). Recent press research has exposed that 453 people in the UK developed bTB in the 13 years between 1994 and 2007. Worryingly, adults who catch either TB or bTB often only reveal that infection many years later, whereas children may show symptoms sooner.

* bTB in Children

Within the last few years, several children have been found to have bTB and developed slow to heal ulcers from abscesses on their necks, suspected to be bTB from badger urine in gardens and on their playing fields.

In 2005 a four-year-old girl developed two lumps on her neck which doctors at first believe were caused by a glandular problem. The lumps burst and a consultant paediatrician later diagnosed the girl as suffering from “*atypical TB*” (the description given when treatment of the wound has killed the bacteria

¹ Phthisis (Greek for consumption) was quoted by Hippocrates as being the most widespread disease in 460 BC and almost always fatal. Pre-historic human skeletal remains which are 7,000 years old have been found to have had TB.

² World Health Organisation: <http://www.who.int/tb/hiv/faq/en/> Other sources quote 3 million a year dying of TB of whom 2.9 million are also infected with HIV.

and prevents serological testing). The four year old child was in a primary school at Dolfor in Powys and it is understood that other schoolchildren at Dolfor and at the nearby Kerry primary school were also treated for bTB.

Earlier, in July 2000 BBC News - Wales had reported that *"GPs are being asked to be vigilant after 40 cases of tuberculosis were found in the Rhondda and Taff-Ely areas of south Wales in just over a year."*

In March 2001 the BBC in Wales reported that *"The growing problem of tuberculosis in young people has been highlighted by a south Wales health authority, which has detected 50 cases.... Three people have died, including one child..... Most of the cases in south Wales have developed in clusters and are among children who have never left the UK."*

One problem has been ensuring that diagnosed Tb sufferers took the full 6 month course of the various antibiotics to cure them. Without the full course, at least one-third of people with TB will die from the disease, and another third remain chronically ill.

Another problem has been the development of resistance [of the TB bacteria] to antibiotics.

The BBC News Wales then reported in May 2001 *"In April 1,100 pupils at Duffryn High school in Newport, South Wales, were tested for TB following positive test results in eight pupils.... Two cases were found in a school at Porth, Rhondda..... A Cardiff school child is 'no longer infectious' after prolonged antibiotic treatment"*.

From the area, various 'interested parties' including the FUW, health officials, vets and local people have provided updated information on this very serious situation, as follows:-

** Such lesions may be operable, but any post-mortem material is usually dunked in formalin prior to basic slide examination. DNA for strain typing is then more difficult to extract. Some lesions may involve the pituitary gland. Treatment is with an antibiotic or cocktail of antibiotics, one of which has particularly nasty side effects.*

** The strain or spoligotype of this particular tuberculosis is of 'non human origin'.*

**The strain may be a mutation between an ethnic (non UK) m. tuberculosis bacteria, which is now hosted by badgers. * It's original source could have been from raw or partially treated infected human sewage, to which badgers gained access. * Many dead badgers have been seen in the area. * Although there are no setts on the school playing fields, badgers have latrines there which are accessible to the children. * Local councils fear exposure of the problems would lead to the closure of the schools, one of which has around 40 pupils.*

The Leek local newspaper reported that a two year old child in Staffordshire caught bTB from a badger sett at the end of her garden. (A Worcestershire vet alerted the child's mother and doctor to the possibility of unhealed neck lesions as being from bTB infection from that source).

Children who become infected internally by bTB can develop grossly distorted hip and knee joints. In GB in 1937, bTB was responsible for 25% of tuberculosis meningitis and 20% of bone and joint TB.

*** bTB in adults.**

Because bTB is a very slow multiplying bacteria and can remain dormant for years, a number of the 453 persons identified with bTB since 1994 may be the result of earlier exposure to infection. Equally it is suspected that persons infected recently with bTB will not suffer from that recent infection for years.³ However where the burden of infection is high, adults will show symptoms sooner. It would seem from recent disclosures that high levels of infection come from badgers and camelids as all of the following appear to have a link to those two species.

The most recent case reported in 2009 is of a Government researcher who is suspected of contracting TB from badgers at the Food and Environment Research Agency (FERA), (previously called the Central Science Laboratory), Woodchester Park, Gloucestershire.

³ Unfortunately, no vaccine is available that provides reliable protection for adults.

In 2008/09, a Swedish vet on loan to Bristol Veterinary School, who was spat at while treating a sick alpaca cria caught bTB from it and was similarly put on a 6 month course of severe and unpleasant antibiotics.

According to a 2008 edition of the scientific British Medical Journal (BMJ), *Thorax*, a 42 year old Cornish woman with “general malaise and a mucopurulent cough” was found to have bTB disease which was typed as TLA genotype 12:a - which was the spoligotype being found in the local population of badgers, a family of which had a sett at the end of her garden. She had been a veterinary nurse 3 years before, and in 2004 she had picked up a road-accident injured badger and transported it to the veterinary surgery for treatment. However it is more probable that the infection came from her garden badgers, as her 12 year old daughter was found to be positive to the Mantoux test and to blood tests for bTB. Four months later the family’s dog was noticed to have a persistent cough and, after further deterioration, was euthanized and found also to have type VLA type 12:a bTB in its throat, lungs, and lymph nodes. The BMJ, while reporting this case, quoted other scientists who postulated that “*inhalation rather than ingestion may now represent the predominant mode of M bovis transmission from animals to humans*”.

In 2005 a woman vet (specialising in alpacas) working in North Devon, contracted bTB by pricking her thumb while examining an infected alpaca, and carrying out a post-mortem. The disease later manifested itself as a bTB lesion which grew down to the bone of her thumb. It was thought that her thumb might have to be amputated but it was successfully saved after reconstructive surgery.

The Lancet reported in 2006 that six young men contracted bTB in a Birmingham outbreak, one of whom later died that year. It reported that once a person is infected, bTB appears to spread from human-to-human. Four of the patients had weakened immune systems through either HIV infection, diabetes or misuse of alcohol or steroids, which may have made them more susceptible to the infection. A Health Protection Agency (HPA) investigation was launched after the first case was reported in 2004, four in 2005 and one at the beginning of 2006. The bTB spoligotype was found to be the same as that in the local badger population. The reports said that those involved were connected by a “*complex social web*” within Birmingham bars and nightclubs and that “*the environment of clubs and bars is good for spreading airborne bugs - prolonged and repeated contact in a confined space with poor ventilation, noise resulting in shouting and smoke that makes people cough*”. The report concluded that bovine TB was an under-appreciated cause of disease and death in humans. <http://news.bbc.co.uk/1/hi/health/6547973.stm>

* **Failure to control bTB**

The beginning of this note refers to the regular skin testing of cattle and removal of reactors reducing TB in cattle in the UK from 30% down to below 0.005% in the 1970s and ‘80s. However this testing could not overcome the repeating re-infection found in small areas of the country, particularly at the Western end of the Cotswolds and at West Penwith in Cornwall. bTB was found in badgers in these areas. Only when badgers were culled in response to persistent cattle re-infections in 1971 to 1974 did levels of bTB in the cattle start to fall⁴.

⁴ Roger Muirhead: <http://www.defra.gov.uk/gvs/publications/gvj/pdf/60thannivers.pdf> page 18.

In the early 1970's before badger removal was started, a particularly obsessive Scottish SVS vet, William Tait, instituted a draconian regime on bTB incidents in SW Cornwall in an ineffectual attempt to wipe out infection in cattle alone. He instigated synchronised TB testing of neighbouring farms, ever more frequent TB testing, he applied severe interpretation to all TB tests, cohort slaughter of a group of cattle if one reactor was found and whole herd de-population in many cases. Cattle movements were severely limited throughout Cornwall. Many of these ideas were put forward all over again last year by John Bourne and others as a solution to

The failure to control this infection, and an overcrowded badger population, has resulted in the enormous spread shown in the difference in the three maps on pages 1, 2 and 3. In the 'Legend' in the first map '12' denotes 12 month testing frequency parishes where TB has been found, and the 36 and 48 month testing frequency areas are where bTB has not yet been found. Regular testing for TB (in the intervals shown on the map) is carried out by Defra on every farm in the country and an ever increasing number of farmers find themselves under restriction because of this repeated re-infection.

Anyone under TB restriction is unable to sell any cattle alive and is subject to repeated TB testing with the outcome being subject to severe interpretation (a skin lump bigger than 2 mm) instead of standard interpretation (over 3 mm lump).

*** Personal experience.**

In the case of the writer of this note, TB testing takes up 4 days every 60 days – and in summer an extra 2 days moving cattle about. We have had repeated re-infection from badgers and have been in and out of TB movement restriction 11 times in the past 16 years. Before that the whole area had been clear of bTB for 30 years. It was suspected by the State Veterinary Service (SVS) vets that “animal rights” extremists had moved badgers in cages from dairy farms in Chagford near Dartmoor to Exmoor in about 1991 as the SVS had been trapping infected badgers there to try to stop the spread of the disease, and had had cages removed with evidence of badgers having been in them. It was also found that the spoligotype of the bTB given to our badgers (and then our cattle) was VLA type 11 – the same as that isolated (then) at Chagford.

Three times MAFF/Defra have come and removed our badgers and, after each of the first two occasions, we were then clear for a few years. We again went clear in June 2009 – the result of being in the pro-active Krebs trial area. The first time badgers were removed was in 1993 when 40 out of our 47 badgers in 4 setts were found to have bTB (85%), 7 with open lesions. (A further 100 badgers were killed and post-mortem-tested for TB and all were found to be free of bTB). (The statistics that were derived from this culling gave out that 21% were infected when, in reality, it was 85% in 4 setts and nil in the rest.) In all of those 11 winters of being under restriction, after finding a few reactors each Autumn, neither the SVS or ourselves have ever been able to identify cattle-to-cattle transmission as being the cause. Yet 230 of our sucklers live in low roofed kennel type buildings and are shut in in muggy conditions while we scrape the outside self-feed silo areas – ideal conditions for TB spread. Successive TB tests have always had reactors reducing to nil. The very few, often one reactor out of 1,100 cattle, indicate that these have become infected singly. Others have seen badgers, when confronted by curious cattle (often young stock), to turn and spray urine in the face of the inquisitive bullock. It is considered that this does explain the reason why 85% of farms (as well as ours) have less than three reactor cattle at any one test, and 60%+ of cases only have one reactor.⁵

*** Localised spoligotypes and the Pathman project.**

Apart from the personal experience over 16 years quoted above, the main fact which shows that TB has been spread up to now by badgers, not cattle, is that there are different bTB spoligotypes across England and Wales which remain localized although they are expanding at about 10 miles a year. This is a spread of disease proportionate to the inter-fighting of badgers spreading TB to other badgers, and to cattle –

riding TB from cattle. However none of these measures reduced the numbers of reactors or affected the disease in West Cornwall - because of the maintenance reservoir in the badger population.

⁵ <http://www.publications.parliament.uk/pa/cm200708/cmselect/cmenvfru/130/130we11.htm>

almost 40,000 in 2008. The maps on the later pages show the separation of different spoligotypes. The fierceness and the manner of badgers fighting each other are vividly shown in the video link at the end of this note. (It also shows the ability of badgers to open clipped down dustbins and climb higher than young cattle can even reach – negating the argument that all farmers should prevent badgers accessing water and feed troughs). If there was substantial cow to cow infection the spoligotypes would be very mixed (because cattle come from all parts of the country as replacement dairy or beef cows and ‘store’ cattle move to arable farms for fattening. TB reactor cattle in normal health have a very low number of bacteria inside them (usually in calcified or walled off lesions) and have a very low rate of infectivity. In October 2000 £2.8 million was spent by Government on the Pathman project (Pathogenesis and diagnosis of tuberculosis in cattle) in an attempt to transmit bTB from cattle to cattle. Although 1,543 nasal mucosal samples were taken, not a single one showed onward transmission of bTB. The summary stated: “*M.bovis* was not detected by bacteria culture in any of the nasal mucus samples... The results suggest that large concentrations of *M.bovis* are not present in the nasal passages, and the shedding of *M.bovis*, if it occurs, is rare in naturally infected GB cattle”.

* bTB Infectivity.

By contrast to the low infectivity in cattle quoted above, infectious badgers can have as many as 300,000 colony forming units (cfu) per millilitre in their urine and mark their territory by urinating at gateways etc (about 30 ml at a time). 70 cfu have been found to cause TB, so inhalation of as little as 0.03 ml from sprayed urine can result in infection. (Badger faeces normally contain only 75 tuberculosis bacilli per milligram and badger pus up to 200,000 per millilitre.) Overcrowding of badgers in damp cold dark setts, a resulting food shortage and the stress of fighting and rejection from the home sett can trigger TB breakdown in animals which otherwise are infected but not infectious. Like humans and cattle, badgers can tolerate mild levels of TB and can wall off internal lesions until they are old, cold and hungry.⁶ The sicker infectious badgers tend to be driven out of their family setts, and travel and fight with badger in other social groups. (They tend to suffer bTB most in their lungs, kidneys and bite wounds.) Badgers that get infected by bite wounds spread infection more rapidly and die sooner.⁷ The maps at the start of this note show the increase in infection – now spreading at about 10 miles a year in the badger population. This population has expanded from the last survey in the 1980s of about 300,000 to 800,000 to 1 million now.

Annual testing of cattle becomes obligatory when one farm in a parish is confirmed to have had reactors and is under TB movement restriction. In 1986 there were just 89 farms under restriction on which 686 cattle had to be slaughtered. In 2008 the figures were 7,928 farms under restriction and 39,973 cattle slaughtered (up 42% on 2007) in England and Wales.

⁶ Tuberculous lesions in badgers differ from those of humans and cattle in that there is little cellular reaction but massive numbers of tubercle bacilli are present that can contaminate the surroundings. Infected lactating sows are known to pass infection to their cubs, and this may be a major means of spreading infection within the sett. **(Stuart F.A., and Wilesmith J.W. 1988. Tb in badgers: a review. Rev. Sci. Tech, Off.int.Epiz.,7(4),929-935.)**

⁷ March 2004: Parliamentary answer by Ben Bradshaw Minister of State Defra:- "badgers excreting *M. bovis* are potential sources of infection for other badgers and cattle. The term 'super excreter' is used for research purposes to identify a sub-group of infected badgers from which *M.Bovis* has been isolated from several different clinical samples. These animals are thought to be in an advanced stage of disease progression and survival analyses have shown that they exhibit a higher rate of mortality than uninfected animals. Research conducted by the Central Science Laboratory has identified behavioural differences between badgers excreting *M bovis*, and uninfected ones. Badgers excreting *M.bovis* had larger home ranges and were more likely to visit farm buildings.

* Krebs trial.

A Randomised Badger Culling Trial (RBCT) to see if culling badgers reduced infection was proposed by Professor Krebs but carried out in a much more limited way by John Bourne ((i) cage trapping only 8 nights a year and (ii) with disruption and theft of traps by activists who were told where the traps were and (iii) the 2001 FMD debacle, only became moderately effective in its last two years. The statement by Bourne (relied on since by H Benn) that the RBC trial did not prove that badger culling was of use, has been superseded by the continuing analysis of herd results in the 10 proactive RBCT areas by Helen Jenkins and Prof Crystl Donnelly of Imperial College, London, and the same team of analysts. The post dispersement / perturbation results are:

	Reduction of herds with new outbreaks of bTB	
First year of post-trial period	-48.7%	-65.6 to -23.2% over 10 sites
Second year of post-trial period	-60.8%	-80.7 to -20.5

For the final report see <http://www.clearstats.co.uk/docs/piis1201971208000787.pdf>

Thus the Krebs RBCT has finally proved that culling badgers in infected setts and areas has a huge benefit is reducing the spread of TB. For strange reasons the Secretary of State appears to have closed his eyes and ears to this good news and continued to allow the disease to spread to more and more healthy badgers and to more and more sentinel herds. The comments made by Paul Caruana, Higher Scientific Officer of the Defra Wildlife Unit carrying out the Krebs trial, are essential reading for any consideration of that work.⁸

Costs to Defra alone of bTB

We know already that the cost to Government (before costs to farmers) of bTB in England and Wales is about £100 million this year. In February Defra released the division of costs to the taxpayer as:-

Year	Cattle Testing	Compensation	RBCT	Surveillance activity By the VLA	Other Research	HQ and Overheads	Totals
2007/08	32.6	29.7	0.03	7.9	8.5	1.2	79.93

This shows that Defra's veterinary costs of TB testing still exceed the compulsory purchase of reactors.

If TB disease continues to spread, and as more than 50% of TB restricted farms remain year after year under restriction by repeat re-infection, this is in line to grow to £200 million within three years long before vaccination can possibly have any effect. This increase is highly unlikely to be additionally funded by the Treasury and will have to be funded by cutting other Defra work. At 25% annual increase the cost will be £477 million in the 2015 year. At 40% it will be £1,050 million; (the number of cattle compulsorily purchased and slaughtered by Defra in 2008 was 42% worse than in 2007)⁹. Research for vaccination which may start in 2015 and take many future years to have an effect is being proposed at a

⁸ <http://www.publications.parliament.uk/pa/cm200506/cmselect/cmenvfru/905/905iiw32.htm>

⁹ There is some better news in that the number of reactors from 1st January to 31st May '09 was 16,884 compared to 16,244 in the same period of 2008 and, because a greater number were tested in 2009, this is a small reduction - from 0.52% to 0.49%. However Defra particularly point out that it is important that even year on year "comparisons are not made in isolation but in the context of the wider disease picture".

cost of a further £20 million; this money will be being paid out at a time when the cost of TB ‘control’ in cattle may become unaffordable – yet there is a statutory duty on Government to eradicate it.

A particularly use source of information on many aspects of bTB is the website:-

<http://www.clearstats.co.uk/badgersandbovinetb.php>

*** Alpacas and Llamas (camelids).**

Cattle are now merely the surface sentinel animals which reveal the extent and coverage of TB infection in the badgers below. We are slowly learning that those badgers can easily also become infected by alpacas or llamas being moved into any area without being either TB tested or recorded. A new problem over bTB is that there is increasing worry that alpacas and llamas appear to be more susceptible to bTB than other animals, carry a far higher burden of bTB bacteria and spread bTB faster – inter-herd, back into the environment and to humans.

Currently there is no legal power for Defra to inspect or test camelids – which appear to be far more likely than cattle to spread bTB into healthy badger populations – and to people. There are 26,000 alpacas owned by 800 people plus 200 owners who have about 5,000 llamas. The National Beef Association (NBA) and many camelid owners are pressing Defra that camelids should be added to the TB control list for England (as already done by the Welsh Assembly). Latest figures from Defra indicate that almost half the premises on which at least one camelid had confirmed TB, have ‘refused entry’ for any other animals to be tested. Defra have no knowledge of camelid movements around the country. The TB infection in camelids is much greater in the SW, and the lack of any knowledge of where infected camelids are being move to, is alarming the NBA.

A small survey of 2 llama owners (out of 200) and 9 alpaca owners (out of 800) reveal that in 2008 and to the 31st July this year 69 animals died of bTB. This contrasts with the officially published numbers recorded across Great Britain by Defra for alpacas as being 13 infected with bTB in 2008 and 17 in 2009 to 30th June, making 30 in all, and 9 and 0 for llamas. This difference between a small survey of 11 owners (out of the 1,000 camelid owners in Great Britain) with the Defra figures, appears very strange.

The EIG (England Implementation Group) and BCVA (British Cattle Veterinary Association) acknowledge that camelids appear to be highly susceptible to bTB. They know now that there are a lot of camelid movements within the UK. They are aware that there are no pre or post movement tests or standstills for camelids and that there is no enforced recording or licensing of movements. For more information see:

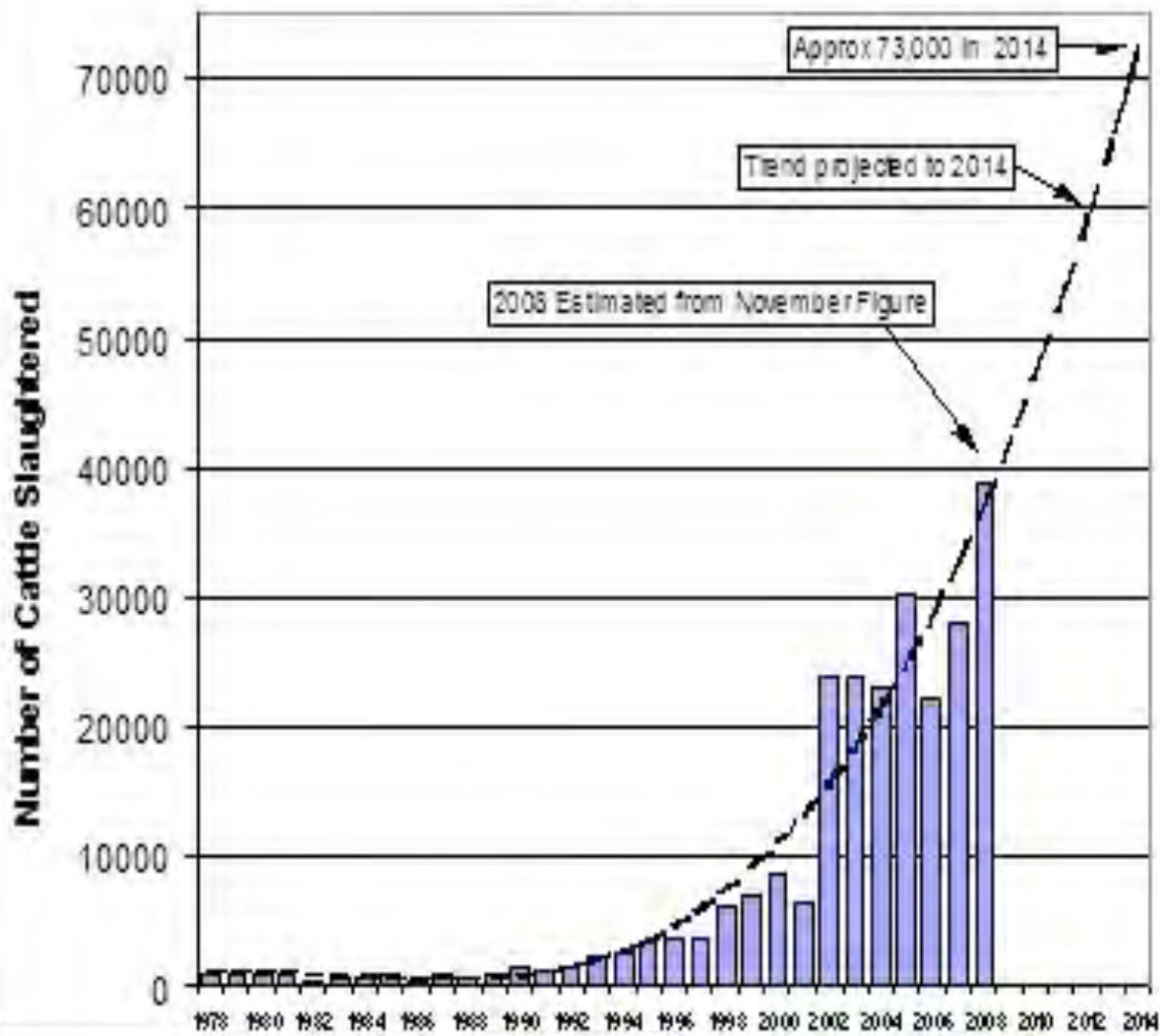
<http://www.llama.co.uk/resources/Conference%202008%20M%20bovis%20in%20camelids.doc>

In 2008, Scotland recorded 13,854 herds on its VetNet database of which 70 had experienced a TB restriction during the year (0.5 percent).

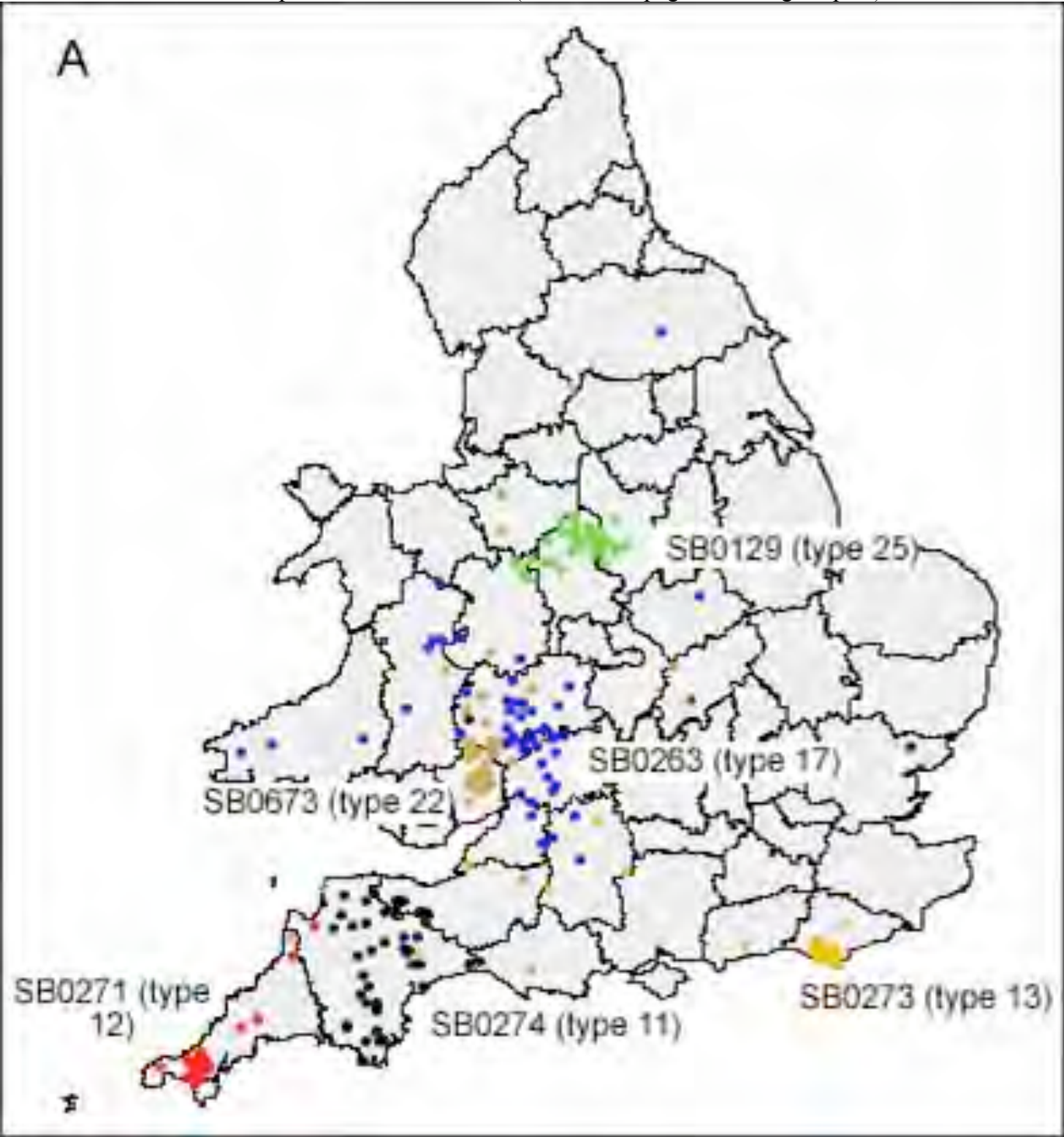
Outside of Scotland the rest of GB had 9.3 percent of its herds under TB restriction at some time during 2008. Throughout the 1970s and 1980s the figures were below 0.1% and the number of cattle slaughtered in those years for TB was also very low – as shown on the next page.

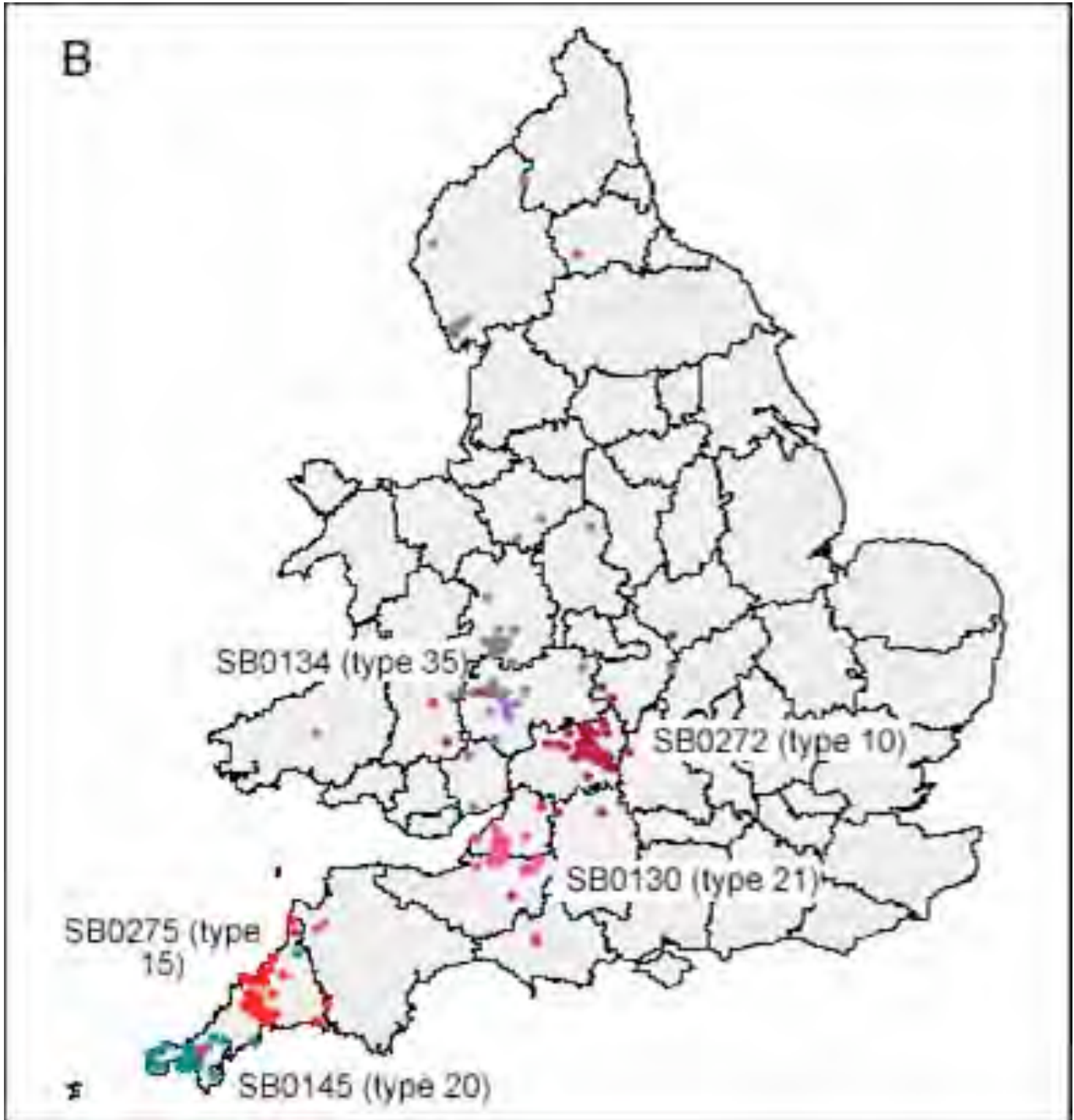
Bovine Tuberculosis - GB

Total Cattle Slaughtered - Projected Trend to 2014



Two maps showing bTB spoligotypes remain localised – indicating an absence of bTB spread by cattle. Cattle are moved widely around the country and bTB transmission by cattle movements would result in a kaleidoscope of scattered strains. (See note on page following Map B.)





<http://www.mbovis.org/spoligodatabase/Gbmetadata/maps/maps%20england%20and%20wales.htm>

The two maps on the two preceding pages show the startling geographical clustering of different types of bTB. Most of the cattle and badgers (and other species – pigs, deer, wild boar, cats etc.) in an area share the same spoligotype. This would not be the case if cattle movement was the cause of the spread of the disease. If this happened, a non-clustered random pattern would show the map as grey by being a kaleidoscope of scattered strains (about half of all cattle are moved at least once). The maps preceding and the one following all bear out the evidence that the relatively non-mobile badger population are the source.

A report SID 5 / Project code SE3020, delved into the spoligotype map. The results of this geographic spoligotyping exercise on reactor cattle show that the eleven main spoligotypes have remained in their geographical areas. The results of survey concludes:

“In general the spoligotype and VNTR patterns obtained from badger isolates between 1972 – 1976 were the same as those observed in the same geographical areas today. This suggests that the geographical clustering of strains has not changed since the first isolation of M.bovis from badgers over thirty years ago.”

Type 9 isolated in 44% Cornwall/Devon 20% Dyfed

Type 17 “ 66% Here /Worcs / Glos.

Type 21 “ 74% Somerset / Avon

Type 35 “ 77% Here / Worcs /Shrops.

Type 10 “ 79% Glos.

Type 25 “ 79% Staffs / Derbys.

Type 22 “ 84% Gwent / Here / Worcs.

Type 15 “ 89% Cornwall

Type 11 “ 93% Devon / Somerset

Type 12 “ 94% Cornwall

Type 20 “ 95% Cornwall

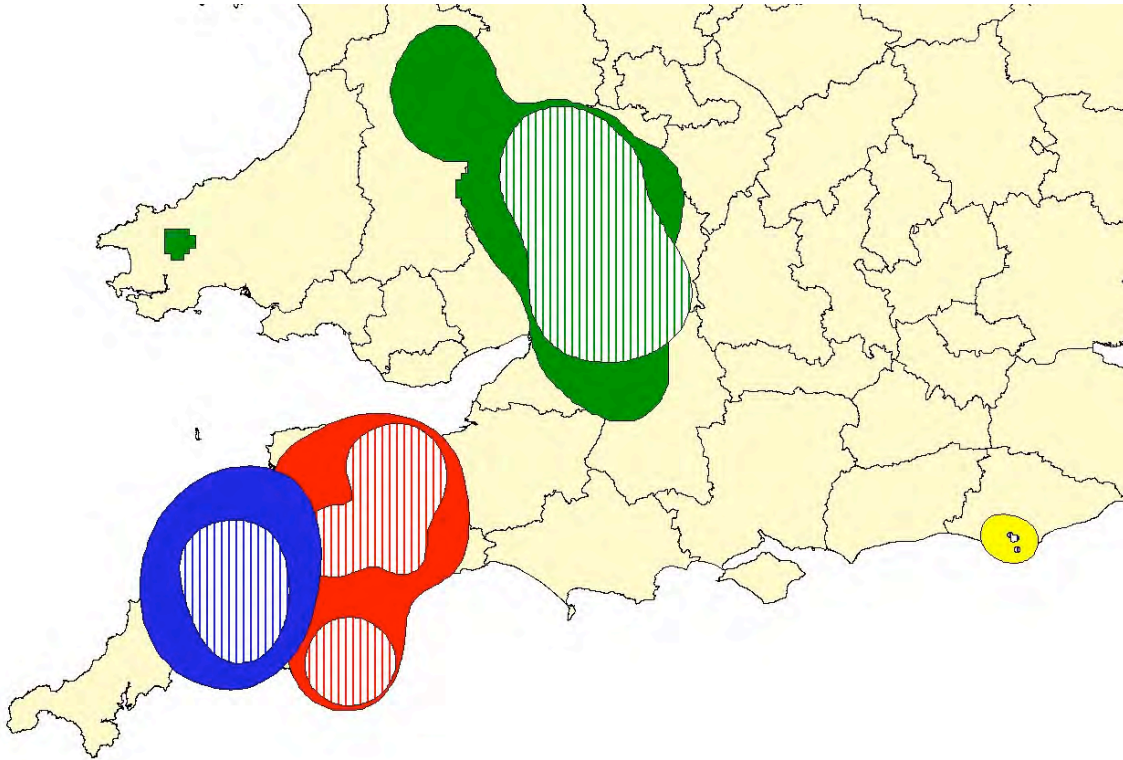
This shows that more than 66% and up to 95% of bTB spoligotypes identified in reactor cattle, are identical to the strains identified and persisting for over thirty years in badgers indigenous to the same geographical area.

For illustration of this, the locality of three badger spoligotypes are shown on the next page, demonstrating that the type of TB suffered by badgers year after year underground is increasingly found in the cattle above them when they are tested for TB. The difference in the treatment of the two species is that cattle that react to the TB test are removed – and we know that, as a repeated herd test, the TB skin test is very reliable and has successfully eradicated TB in other counties around the world. In these three areas on the SW map between 40% and 85% of badgers have been found to have TB. Elsewhere in infected areas the average is 25%. The percentage of cattle found with TB usually ranges from 1 in 1,000 (0.1%) to less than 5% on any one farm with a reactor (and 60% have only one reactor at each test). During 2008 in Great Britain 37,012 out of 8.87 million cattle reacted to the TB and 632 (out of 4 million slaughtered) were found at the slaughterhouse to have TB – a total of 0.424%. Given that the reactor cattle did not have TB at the previous test 60 days, 6 months or a year earlier, the percentage of TB in cattle, comparable to badgers, must be under 0.1%.

Cattle in the red area had all been clear of TB from the 1960s until 1993 and in the red and green areas cattle in a very few parishes were found to be repeatedly re-infected in the years from the start of the TB eradication

scheme of the 1950s. Thus the direction of infection can be proven to be badger to cattle rather than cattle to badger.

This map shows three SW regions with the spoligotypes of *M. bovis* (bTB) from cattle (filled areas) overlaid with the areas of the same spoligotypes from badgers (areas with vertical bars). Green is type 17, red is type 11, and blue is type 15.



This map was first published in the Farmers Guardian 29th June 2007
<http://www.farmersguardian.com/are-cattle-really-the-cause-of-bovine-tb-spreading-across-the-country/?/10145.article>

See also [Video of a badger gaining access to a bin when searching for food](#) and the link there to fighting between two badgers on a domestic patio. Note the bite wounds and the blood being spread on the domestic backyard, and consider the implications of children playing there the following day if the one or both of the fighting badgers are infectious with bTB.