



Bodgering the Badgers
by **Joanne Green**

The culling of badgers *Meles meles* has recommenced after it was suspended pending further investigation into an alternative and viable solution to agricultural cows acquiring tuberculosis. So why are the cows becoming infected if it is not *Meles meles* transferring it to the cattle? Is it the badger itself or a parasite of the badger?

Badgers are known for being wildlife reservoirs of TB (University of Durham) as are other animals such as the White-tailed deer. The white-tailed deer in the UK include non-native species and which too are culled because of the damage they do (BBC Nature, 2013). Will culling one wildlife reservoir prevent the spread of TB?

TB is an infection caused by Mycobacterium which is transferred by air and which infects the lungs of people and cows. New cases of TB are increasing year upon year in developed countries, whereas previously it was in undeveloped countries. Is the change a result of population net migration? Or is it because the immune system of people is suppressed and reduced and can the same be accredited to cows?

Farmers have mentioned on numerous occasions and for many decades that the cost of cattle upkeep is expensive and impacts upon their profits. The eradication of TB is estimated to have cost tax payers £500,000 000 so far (Farming UK, 2013), if that's the cost to tax payers- what has the cost been to farmers? The culling is forecasting to prevent farmers from having to spend £27, 000 000 over the next decade (Farming UK, 2013). Last year alone 28,000 cattle were slaughtered who had bovine TB. The amount of veterinary and other work involved in cows as an agricultural product can be seen each week on the BBC's Countryfile show. These examples illustrate action is required and one offering Value For Money.

TB is not a solitary issue for *Meles Meles*. Similar to dogs and cats *Meles meles* has a flea specific to it,

raceras melis

and which does not like to be separated from its host. Upon being separated

Paraceras melis

jumps up and down in search of its host to such an extent that it voids the contents of its gut, after which

Paraceras melis

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settles down out of the sun (Cox, Stewart , & Macdonald, 1999). Larvae breathe by way of spiracles (holes) just as caterpillars do and to an extent fleas breathe in a similar way though slightly different as their holes do not go the entire length of the body (Micrographia, 2013).

Meles meles also has lice, *Trichodectes melis*, which will crawl on to the body of the badger from the nest bedding where the badger sleeps in its sett. Fleas too lay their eggs in this bedding so that their young can crawl on to *Meles*
meles
for like the flea they too require blood meals from
Meles meles (Cox, Stewart & Macdonald, 1999).

So does *Meles meles* ever try to avoid these blood-sucking parasites? Yes it does, it has a couple of setts and moves from one to the other. A result of this action on
Trichodectes melis
is that it dies after three days yet
Meles meles
does not return for six days. Unfortunately for
Meles meles
its specific flea,
Paraceras melis
can live for eighty-nine days without its host and
Paraceras melis
left in the den will move towards the entrance by following the sunlight.
Paraceras melis
actively seeks out Carbon Dioxide (CO₂) and moves by jumping to where CO₂ is (Cox, Stewart , & Macdonald, 1999). Therefore one possible solution to the culling could be that seemingly abandoned badger setts could be sprayed with CO₂ so as to entice away from the sett?
Adaptation to the spraying of CO₂ is unlikely given that this is how the flea locates its food source. This sounds very simplistic and it is, too simplistic. CO₂ is a Green House Gas and is regulated under the Climate Change Act 2008 to reduce CO₂ emissions in the UK by, '2050 is at least 80% lower than the 1990 baseline.' (National Archives- Legislation, 2008).
To achieve this The Forestry Commission has been planting new trees to remove CO₂ from the atmosphere (Forestry Commission, 2013) as have other organisations.

Greater Manchester launched its energy plan in 2012 in which it, 'outlines the region's energy priorities and has been created by a partnership of local authorities, businesses, academics and key figures from the energy sector. It also outlines how the region's approach to energy will help to meet Greater Manchester's ambitious target of a 48% cut in CO2 emissions by 2020' (Association of Greater Manchester Authorities, 2013).

This isn't all doom and gloom, there is the a European Green House Gas trading scheme Directive 2003/87/EC in which unwanted CO2 emission vouchers can be purchased from other CO2 emitters but who have not used all of their allowance. Eligibilities to the Directive 2003/87/EC trading scheme are activities from energy, Ferrous metals production and processing, mineral industries and production of pulp from timber/fibrous material and paper and board over 20 tonnes per day (Official Journal of the European Union, 2003). This does not directly include *Paraceras melis* eradication, or does it?

I suppose it depends upon where *Meles meles* is located and who owns the land where *Meles meles* is a resident and also the procurement and contraction of industry. *Meles meles* lives in woodlands, so if the management company is able to become eligible to Directive 2003/87/EC it is they may be able to apply to the permitted scheme.

But how would CO₂ impact upon the soil and its deposition into the atmosphere? CO₂ has a Global Warming Potential of 1 year in the atmosphere (Eurostat, 2013) by comparison methane (CH₄) has 21 and nitrous oxide 310 (Eurostat, 2013) therefore has the potential to cause more damage to the atmosphere per million metric tonnes of carbon dioxide equivalents. Trees uptake CO₂ in respiration and turn it into glucose therefore what is not taken up by plants within the soil horizons is likely to be absorbed by the local microclimate and create balance rather than disruption. However it must be noted that research in Rome found that CO₂ sequestration reduces in cooler weather (Gratani & Varone, 2006). This means that spraying with CO₂ would need to occur during the day, on warm days and to abandoned setts and of course, under license. Badgers and their setts are protected under Protection of Badgers Act 1992, and it is illegal to interfere with their setts unless that person 'shows that his action was necessary for the purpose of preventing serious damage to land, crops, poultry or any other form of property' (National Archives Legislation, 1992).

CO₂ is able to create ionic bonds when in solute and this is one of the reasons that it is regulated- for it can impact upon climate. It can also help to make acid soils more acidic. The melting point of CO₂ is -78°C and the boiling point is -57°C therefore any temperature above -57°C and the state of CO₂ is gas. It has a mass of 44.1g/mol and because it is soluble in water it makes ionic compounds when combines with water (H₂O) and other molecules and compounds.

The Badger and Habitat Survey of Ireland found badgers favour hedgerows, treeline and woodland as its optimal habitat (Smal, 1995). Soil in the habitat of *Meles meles* is close to hedgerows, treeline and in woodland and so is brown earth, and which has a neutral pH. It is well documented that hedgerows have been reduced over the last century; therefore the niche of the badger habitat has been removed. Could plantation of this over time encourage the badgers to move away from cattle? And can this plantation come from the Forestry Commission and others, so as to improve and recreate hedgerows? This could help foxes too who have been recorded as living within badger setts. If foxes were living within badger setts, CO₂ could not be used as a means of controlling fleas and lice. Typically woodland soil does not contain Silicon (Si) and has a high Cation Exchange Capacity meaning that the soil is able to accept and diffuse a relatively high amount of contaminants without the soil becoming ionic and substandard for

Meles meles

or other residents. It is the clay within the soil that holds onto water in soil profiles E and B and it is here that ionic bonds will be formed and which could pose a serious issue to all of the life forms within that ecosystem if the pH balance is not retained. Other soil profile includes O- fresh leaf litter, A fermentation of the litter and the humus layer with some minerals, E and B which is where clay will be, C and also the underlying bedrock (University of Hawai'i at Manoa, 2013).

Retention is maintained by soil horizons being created and combined and aerated by worms and by nematodes eating pests which live among soil horizons. *Meles meles* eat worms. Therefore part of the management for good soil status will be to provide worms. The nematodes would eat the killed fleas and larva.

So to summarise, there is a solution and one that could provide owners of *Meles meles* with an income and a soil management plan. A bonus to providing *Meles meles* with hedgerow habitat is that the badger legislation will also provide additional protection to birds residing in hedgerows. However the question I ought to be asking is are these organisations prepared to invest in such things as PEFC paper so that they can save the badger?

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