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Special report Fracking poses risk to UK farm animals and food safety, experts warn

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US researchers behind a study that showed links between gas drilling and sickness in livestock say a moratorium should be imposed on fracking in the UK until its impact on food safety can be

assessed. Andrew Wasley reports

The painting, propped up hastily on the roadside, depicts an alarming scene: a menacing, dark-haired man about to inject a young woman with an unknown chemical. He has one hand around her neck, the other holds a bright red needle close to her face. The girl has an arm raised up in a last act of self defence – she's trying to protect her hair, pictured sweeping upwards into the brown trunk of a tree, and her dress, depicted as a vast, gushing river.

Above, by way of explanation, a crudely made banner reads: 'A Lethal Injection. Fracking injects toxic & carcinogenic chemicals into the earth. 50 - 70% of this toxic fluid remains in the ground & pollutes the area's water, soil and air.' Further along the road, a larger, vivid-yellow sign hangs between two trees. It says, simply, 'Stop The Fracking Traffic.' Smaller signs with similarly direct slogans have been dug into the ground all along the verge.

Off the road, through a fenceline and across a green field, lies a sizeable clump of woodland. There's oak, ash and yew trees, amongst others. A stream – almost dry at present – runs its way through the wood, straddled in parts by slippery, steep banks. Sheep graze on the nearby grassland, adjacent to a field of smaller, younger-looking trees, more recently planted. Just to the south, in older forest, lies what looks like a lake. In fact it's a large 'furnace' or 'hammer' pond, a left over relic from the 17th and 18th century iron industry which flourished here.

It's quiet – apart from the passing jets on their way to Heathrow or Gatwick. Yet this picturesque spot in the Sussex countryside, just outside Fernhurst, is about to become the new frontline in Britain's escalating conflict over hydraulic fracturing, otherwise known as fracking.

The controversial technique, which involves injecting, at high pressure, a mixture of water, sand and chemicals into the earth to release shale gas, has recently led to large, noisy protests in Balcombe, and – after David Cameron signalled his support for the technology – put the Government on a direct collision course with environmentalists.

Pioneered in the US, fracking's advocates say it is safe for people and the environment, and reduces reliance on imported gas, thus boosting energy security. But critics argue fracking involves an unacceptable level of water usage, contaminates water supplies and spills potentially toxic waste into the environment. They also say the process uses an unsavoury mix of chemicals – including known carcinogens – and is a cause of air pollution, traffic congestion, noise, and a host of other problems.

At Fernhurst, the gas industry wants to carry out exploratory drilling to test for reserves. If granted planning permission – a formal application is expected imminently – they will construct a drilling compound and access road, and carry out a number of test drills. If commercially viable deposits are identified, a separate application to undertake fracking itself will need to be made. Similar exploration is planned at a nearby site between the villages of Wisborough Green and Kirdford.

'This could change our lives forever'

Local people are worried. They've heard the horror stories from the US and elsewhere. And Fernhurst lies within the South Downs National Park – this is a lush, rural, beautiful part of the world. Some are particularly worried about the potential impact on the area's farms and agriculture: dairy cattle are housed near the proposed Wisborough Green site, say critics, and there's livestock adjacent to the site earmarked at Fernhurst.

One farmer, responding to an initial planning application submitted to the South Downs National Park Authority, said: 'My family has been farming adjoining land since the early 1960's, and has experienced difficult times over the years which has included the BSE crisis, foot and mouth and economic hardship. However we have endeavoured to adapt and change in order to continue to live a life which is reliant on and respects the countryside.'

'The impact of drilling and possible future fracking will change our lives forever, as it is known that this process both pollutes the land and causes serious health issues. There are 2 babies and 3 children under 10 living [nearby] – will you be responsible for their future health and well being if this goes ahead?'

Another farmer told *The Ecologist*, bluntly: 'We don't know enough about [fracking], nobody does. Not us or them. If they get it right, fine, but if it goes wrong and we end up with pollution and sick animals, it'll be us, not [the gas industry] that will suffer.'

In fact, the potential impact of fracking on Britain's farming – and food supplies – has hitherto received little, if any, attention despite the furore around the technique's wider footprint on the countryside. Yet alarming research carried out in the US has linked fracking to illnesses in livestock, raising fears about food safety.

Other findings have suggested that the arrival of fracking in some US areas has been the final nail in the coffin for beleaguered dairy farmers – one study found a direct correlation between declining cow numbers and dairy production in regions with higher drilling activity.

Now, in an extraordinarily outspoken warning, the US academics behind research linking fracking to sickness and reproductive problems in livestock – including failure to breed and stillbirths – have called on the UK authorities to halt fracking until further research has been carried out and the safety and health of farm animals can be guaranteed.

'Cattle fall sick and die'

Robert Oswald, a professor of molecular medicine at Cornell University, and Michelle Bamberger, a veterinarian, last year published the [first-peer reviewed research](#) suggesting links between fracking and sickness in farm animals. They compiled evidence from twenty four farmers in six different states – including Pennsylvania, Colorado and Texas – whose livestock suffered reproductive, gastrointestinal and neurological problems after exposure to fracking chemicals in the water or air.

Among the case studies uncovered were seventeen cows that died of suspected respiratory failure after exposure to spilled frack fluid in Louisiana, and around seventy cows in Pennsylvania that died after 140 animals were reportedly exposed to frack wastewater – of the surviving cows, less than a dozen produced calves, and only three survived. Another Pennsylvania herd recorded a 50% stillbirth rate after cows had grazed in fields contaminated by fracking chemicals spilling from a waste pit; the following year saw an abnormally skewed sex ratio, with ten female and two male calf births, as opposed to the typical 50:50 ratio.

Oswald told *The Ecologist* that if fracking goes ahead in the UK, 'farmers living in intensively drilled areas should be very concerned about potential exposures of their crops and herds to shale gas contaminants in the water, air and soil.'

He also said it was vital British farmers near to fracking sites are made aware of which chemicals are being used: 'Farmers have a right to know what their families and their herds are being exposed to. That is, the components of fracturing fluids and drilling muds to be used in a well near a farm should be reported in advance of drilling to the farmers – with no [exemptions] for proprietary information or trade secrets.'

'This would allow testing [of] air, water and soil prior to the commencement of drilling for those specific components. Complete [...] testing done before drilling operations begin, during and after drilling for the components of fracturing fluids, drilling muds and expected components released by the shale [gas],' he said.

In the US, the researchers found, it was difficult to obtain data on the links between fracking chemicals and health impacts on livestock because much of the information is the subject of non-disclosure agreements or proprietary exclusions.

Campaigners say an array of additives are added to frack fluid, including some linked to cancer. They claim that kerosene and diesel fuel, which can contain benzene, ethylbenzene, toluene, xylene, naphthalene – and other substances – are reportedly used, as are methanol and formaldehyde, ethylene glycol, hydrochloric acid and sodium hydroxide, among many others. Lead and crystalline silica have also been cited as ingredients in frack fluid.

Oswald and Bamberger believe fracking in the UK should be banned until research into the possible health effects of exposure to the chemicals used is undertaken: 'First, we need to know the identities of all the chemicals used in drilling and hydraulic fracturing fluids. We need to know the MCLs (Maximum Contaminant Level) for the chemical additives and wastewater constituents. We need to know the health effects of exposure to multiple toxicants because MCLs are set for exposures to one chemical only and not combinations of chemicals,' Oswald said.

'We are reporting short-term health changes, but no one knows what the long term health changes may be, especially those caused by low doses of chemicals.'

Although animals that have died on-farm shouldn't ordinarily be entering the human food chain, the academics believe it is possible that food safety could be compromised: 'It's important to remember that although only one of the herds we documented was quarantined, all the herds were exposed to affected air, water and or soil. This is a major concern to us because we documented cases where farms in areas with known exposures are still producing vegetable crops, meat, eggs and dairy products without testing of the plants, animals or the products,' said Oswald.

Contamination

Not everyone agrees. According to the gas industry and some academics Oswald and Bamberger's study is 'political' rather than scientific. They criticise the research and its reliance on un-named sources as 'unscientific', saying it allows no way for third parties to verify key evidence. Critics also say that the authors relied on events outside of their control and didn't test the effects of individual chemicals on cows directly. Oswald and Bamberger have acknowledged the criticisms but blame the use of anonymous sources on the widespread application of non-disclosure agreements which prevent identification of farmers.

Elizabeth Royte, the journalist who first broke the story in the mainstream press, said US farmers she interviewed expressed mixed levels of anxiety: 'Some were very worried, to the point of looking for land in other non-shale areas; others were taking a wait and see attitude – waiting on health and environment studies, waiting to see if contaminants showed up in water or food, waiting for tighter regulations on drilling and air emissions to kick in.'

'But as you might guess, most farmers don't want to hurt their businesses by expressing worries about the quality of what they're growing or producing,' she said. 'Farmers in New York State, where there is a moratorium on fracking, were the most vocal with me about the potential for harm. They worried about water contamination, land contamination, air emissions that would decrease the quality and quantity of forage they grow. They worried about the industrialisation of the landscape and the tourism that supplements their farm and winery income.'

Indeed, a growing number of farmers and producers in New York State and Pennsylvania – the latter being a major agricultural area with an estimated 63,000 farms, estimated to generate a net income of over \$1.3 billion – are rallying against fracking, with a number of opposition campaigns springing up in recent years.

Greg Boulos, from Blackberry Meadows Farm, a community supported agriculture scheme in Pittsburgh, was so concerned he commissioned a report by the University of Pittsburgh's School of Law to help inform farmers across the region about the risks of fracking, including the potential impacts on water and soil, and pollution from chemical spills. The report highlighted one case from Tioga County where waste from a storage pond leaked onto cow pasture, killing all the vegetation in an area thirty by forty foot, and alarming the authorities so much they quarantined the farm's cows.

Economic impacts

Fracking has also had an unexpected impact on dairy farming in parts of Pennsylvania: a study by Penn State's College of Agricultural Sciences found a correlation between the decline of cow numbers and dairy production in areas with higher drilling activity. Between 2007 and 2010, researchers found, in counties with 150 or more gas wells cow numbers decreased by 18.7 percent on average, compared with only an 1.2 percent decrease in counties with no fracking wells.

Whilst the precise reasons for such a decline are difficult to pin down, there's anecdotal evidence of some dairy farmers selling the often-lucrative rights to gas stored underneath their land to the shale industry before closing the farm down. Others have seen their land fragmented on an unprecedented scale by the detritus of gas drilling – frack pads, compounds, roads and pipelines – which, combined with challenging economics, low milk prices and high animal feeds, has proved to be the last straw.

Royte's reporting also highlighted the potentially disturbing health impacts of activities linked with gas and oil extraction on farmers themselves, focussing in particular on the case of Jacki Schilke, a cattle farmer from North Dakota. Schilke believes her health – and that of her cattle; five cows dropped dead – suffered after the onset of fracking at more than thirty gas and oil wells cited close to her ranch.

The farmer has suffered chronic pain in her lungs, back pain attributed to overworked kidneys as well as rashes that lasted for over a year. Air testing confirmed higher than normal levels of chemical compounds including benzene, butane and chloroform, all associated with fracking and drilling, and her well tested high for other compounds. 'I realised that this place is killing me and my cattle,' the farmer told Royte.

Activists in the US have been compiling cases of humans reportedly falling sick because of fracking and gas and oil extraction, yet most of these are self reported with no proven cause and effect. In some cases where legal action against energy companies has been initiated – and proved successful – plaintiffs have had to sign non-disclosure agreements, preventing them from discussing the details with the media.

Nethertheless, green groups are resolute: 'We are concerned about the risks to human health from air pollution, water contamination, soil contamination, safety issues like traffic accidents, light and noise pollution, stress, and more,' Amy Mall, senior policy analyst with the Natural Resources Defence Council (NRDC) told *The Ecologist*.

She said the group is also worried about the impacts of fracking on livestock health, and the potential knock on effects on food safety. 'Contaminated water, air, or soil can also impact crops. In addition, farmers with certifications such as organic may risk losing their certifications. Farmers may suffer financially,' Mall said.

Mall said the British authorities should be 'mandating the highest and best practices for operations, keeping sensitive areas completely off limits, providing adequate resources for very strict enforcement, and imposing high penalties for violations to discourage repeat offences.'

Global concern

Concern over the potential impact of fracking on farming and food safety has begun to spread beyond the US, as the technology itself has been embraced globally.

In Canada, the National Farmers Union (NFU), which represents thousands of family farms, has called for a moratorium on fracking which members believe is a 'danger to water, food and farmland'. Jan Slomp, a dairy farmer and coordinator for the organisation in Alberta, recently said: 'We are in the heart of Alberta's oil and gas country where our ability to produce good, wholesome food is at risk of being compromised by the widespread, virtually unregulated use of this dangerous process.' Farmers say there are documented cases of wells being contaminated by toxic chemicals linked to nearby fracking.

In Poland, farmers in Zurawlow, in the east of the country, have been blockading land earmarked for exploratory drilling since June this year - tractors have been parked at the entrances to a wheat field where gas executives want to begin test drilling. Local people have pledged to stay as long as necessary. *The Ecologist* previously [reported from Kashubia](#) - a semi-autonomous area in the country's north - where farming communities are also beginning to mobilise against fracking.

Poland's government has been championing the fracking cause enthusiastically in recent years. So far, just over a hundred exploratory concessions have been awarded to energy firms to drill and help ascertain for certain just how much gas is available. And recent reports indicated that the first actual fracking, at a particular site in the north, had taken place.

In Northern Ireland, where, as across the UK, energy companies are hoping to begin fracking imminently, more than 50 farmers recently highlighted their opposition to the plans by 'slow driving' a convey of tractors in protest during the G8 summit. The Ulster Farmers Union (UFU) itself has yet to officially oppose the technology, although it confirmed it was 'very concerned' and would like to see a public inquiry: 'there's so much stuff [about fracking] going backwards and forwards, we need some judicial oversight,' one official told *The Ecologist*.

Contamination risk

Another UFU official, John Sheridan, has been more vocal, recently stating that farmers had already dealt with BSE and foot and mouth and could not afford another crisis. 'The food and drink industry is worth 24 billion Euros in the South [of Ireland] and probably close to 30 billion North and South – and fracking could ruin that industry,' he said. Farmers believe that even one contamination incident from a chemical such as benzene could destroy the industry's image – and they don't want to take the risk.

In Scotland, farmers have expressed concern about the potential impact of gas drilling near Falkirk, where Australian company Dart Energy has already drilled 16 test wells, with more planned, as part of a major coal-bed methane development. Similar to fracking, coal-bed methane is extracted by de-pressurising underground seams through drilling vertically and horizontally and pumping out water to release gas. And, say campaigners, as with fracking itself, drilling chemicals can leach into the air, water and soil impacting on health and the environment.

Kate Sankey, an organic farmer based near Stirling, [told *The Ecologist* Film Unit](#) that although her smallholding was some way off from the development, she had concerns: 'It's all part of one big landscape system with the Trossachs Mountains to the north, Loch Lomond and the Trossachs National Park to the west, so it's difficult to separate out what's going on in Falkirk to it's wider landscape context.' Sankey sells organic beef from Highland cattle grazed on the 150 acre farm.

In Lancashire – where exploratory gas drilling was linked to several minor earthquakes, triggering large protests – campaigners say they believe the area's agricultural sector could be affected if fracking goes ahead: 'We have some big supplier contracts with supermarkets in this area; speciality tomatoes are grown for a major supermarket, so it's perception, if people associate Lancashire with shale gas [...] they are going to be wary about the produce from this area,' Eve Macnamara, from Ribble Estuary Against Fracking, said.

Such fears were heightened after reports that United Utilities, the water supplier, had held talks with Cuadrilla Resources, the company planning to frack in Lancashire, over the possibility of its land being used for fracking. Campaigners have criticised the water company and say some of the land involved is farmed and used for food production.

The UK National Farmers Union (NFU) hasn't – so far – expressed concerns over fracking's potential implications for the country's agriculture, although in an official briefing paper the body acknowledges worries over water contamination, earthquakes, water use, land take and traffic and infrastructure.

'The fracking industry does represent an additional water user which could increase water stress in times of shortages. The NFU responds to each water company's drought plan and we strongly argue that in times of water shortage agriculture must be a priority. We would also engage with local frackers to make them aware of times of high water use by agriculture, for example for irrigation of a particular crop that is grown in the area,' the briefing states.

Organic certification body the Soil Association (SA) said in a statement: 'We are not in favour of fracking, because the SA supports the UK's legal target to cut greenhouse gases by 80% by 2050. As the Government's Climate Change Committee has made clear, meeting this target will involve huge reductions in the use of fossil fuels, including gas.'

'With all environmental groups, we are clear that the priority is investment in renewable energy sources not new sources of fossil fuels like fracking, just as the priority in farming must be to move away from fossil-fuel based manufactured fertilisers to solar powered. The science around fracking is contested and controversial.'

Andrew Wasley is a journalist specialising in food and environmental issues, and a co-founder of the [Ecologist Film Unit](#)

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