The big burn theory

Spontaneous combustion is a macabre phenomenon that many people dismiss as a myth or put down to alcoholism. But **Brian J. Ford** thinks he may have found an answer – by getting incombustible pork belly to burn like a firework

PEOPLE explode. One minute they may be relaxing in a chair, the next they erupt into a fireball. Jets of blue fire shoot from their bodies like flames from a blowtorch, and within half an hour they are reduced to a pile of ash. Typically, the legs remain unscathed, sticking out grotesquely from the smoking cinders. Nearby objects (a pile of newspapers on the armrest, for example) are untouched. Greasy fat lies on the floor. For centuries, this gruesome way of death has been debated, with many people discounting it as a myth. But spontaneous human combustion is real and we think we can show how it happens.

The first accounts date from 1641, when Danish doctor and mathematician Thomas Bartholin described the death of Polonus Vorstius – who drank wine at home in Milan, Italy, one evening in 1470 before bursting into flames. In 1663, Bartholin wrote of a Parisian woman who burned, leaving the mattress on which she lay unscathed. And in the *Philosophical Transactions* of 1745, Paul Rolli told how 62-year-old Countess Cornelia Bandi of Ceséna, Italy, said she felt "dull and heavy" after dining and went to bed. Next morning, her maid found a pile of ash with her legs protruding from the smouldering remains.

The first monograph on the subject was *Essai sur les Combustions Humaines, produits par un long abus des liqueurs spiritueuses* by French writer Pierre Aimé Lair in 1800. This set a moralistic tone that others followed, and alcoholism became accepted as the cause of combustion. In 1853, the Victorian magazine *Notes and Queries* included a summary of 19 cases between 1692 and 1829 by a Dr Lindsley, who wrote that those who had died of the condition were "habitually drunken" or "frequently indulged" in alcohol.

The first scientist to investigate spontaneous human combustion was German chemist Justus von Liebig, who examined the records of some 50 cases. He pointed out that even though anatomical specimens are stored in 70 per cent alcohol, they will not burn. He injected rats with ethanol and still could never make them catch light. This essentially disproved the causal link between alcoholism and combustion, but the belief persisted.

Recent cases are well documented. On 1 July 1951, Mary Reeser was visited at her home in St Petersburg, Florida, by her son, but when a telegram arrived next day, the doorknob of Reeser's apartment was found to be hot. When police broke in, all they found was a mound of smoking ash with a leg protruding and charred liver attached to the spine.

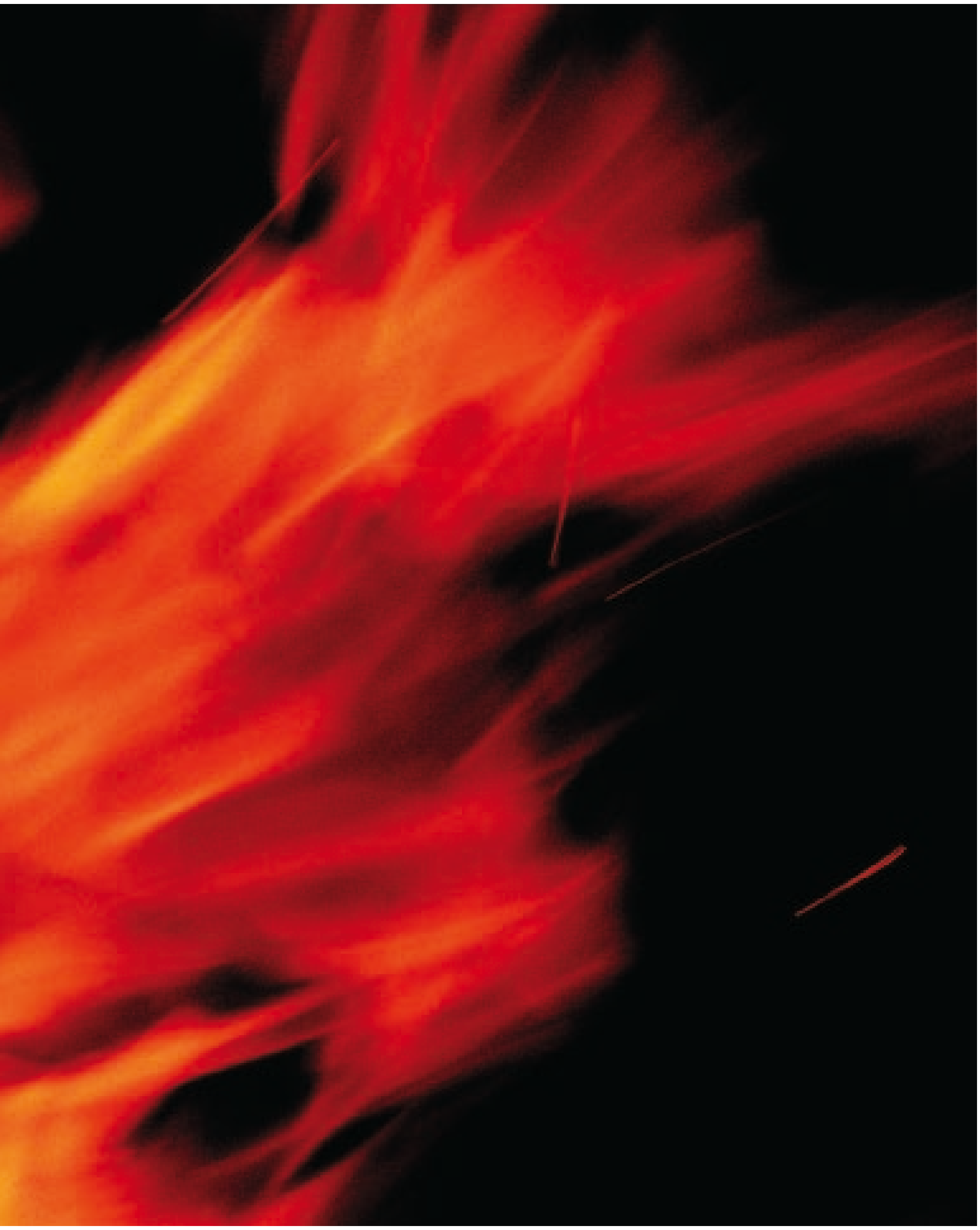
The remains of John Irving Bentley of Coudersport, Pennsylvania, were found by a meter reader who let himself in on 5 December 1966. A pile of ash and half a leg was what remained. And the most recent case was 76-year-old Michael Faherty who died on 22 December 2010. West Galway coroner Ciaran McLoughlin recorded the cause of death as spontaneous human combustion.

In 1961, London coroner Gavin Thurston published a paper, "Preternatural combustibility of the human body", in the *Medico-Legal Journal*. He described a potential mechanism for such combustion: the "wick effect". Human fat burns at about 250 °C, but if melted it will combust on a wick at room temperatures. He experimented with a roll of fat wrapped in gauze, and showed that the heat of the flame could melt body fat and produce continuous combustion like a candle.

In January 1986, a BBC *Newsnight* programme demonstrated the wick effect. The following year, Nigel Cruttenden of the Kent Police Force used the wick effect to explain the death on 28 December 1987 of Barry

"When police broke in, they found a mound of smoking ash with a leg protruding"

PROFILE
Brian J. Ford is a research biologist and author of more than 30 books, most about cell biology and microscopy. He lectures worldwide, and broadcasts on radio and television. This article is based on his recent paper in *The Microscope* (vol 60, p 63).



MARIAN WILHELM/PLAINPICTURE

After the fire: the human remains after spontaneous combustion are very distinctive

Soudain, a handyman from Folkestone, UK. Soudain's charred remains were found in his largely undamaged flat. Cruttenden surmised that fat in the body had liquefied in the conflagration and fuelled the fire. The wick effect was becoming the accepted explanation. Yet clothing soon burns away, leaving no wick; combustion lasts 12 hours or more, and the corpse is not destroyed. Spontaneous human combustion is a very different matter.

A decade on, in August 1998, the BBC set out to show in an episode of its *QED* series entitled "The Burning Question" that spontaneous human combustion was explained by conventional means. Among the experts was Dougal Drysdale, from the University of Edinburgh, who heated a piece of pig bone to 500 °C in a muffle furnace. After 6 hours, he assured his audience, the bone would be reduced to ash. Drysdale inspected the bone after 8 hours, but it was still intact.

Stan Ames of the Fire Research Station, a British research unit, also appeared – to demonstrate how easy it was for a wooden-framed armchair to be destroyed by fire. The commentary said that the burning could reduce a body to ash, or, in this case, an armchair to its springs. The chair was left to burn for 6 hours in an experimental chamber, at the end of which it was largely intact. Part of the back and the armrest were charred. Setting fire to a combustible armchair is hardly comparable to burning a moist human body, and we failed to see the relevance; still the BBC proclaimed that its programme meant that the "mystery" of spontaneous combustion was "finally solved".

I felt it was time to test the realities, so we marinated pork abdominal tissue in ethanol for a week. Even when cloaked in gauze moistened with alcohol, it would not burn. Alcohol is not normally present in our tissues, but there is one flammable constituent of the body that can greatly increase in concentration. Triacylglycerol lipids cleave to form fatty acid chains and glycerol. The fatty acids can be used as an alternative source of energy through beta-oxidation, giving rise to the key metabolic molecule acetyl-CoA. This helps drive the energy-producing Krebs cycle within the mitochondria of cells.

If the body's cells are starved (which can occur during chronic illness and even during a workout at the gym), acetyl-CoA in the liver is converted into acetoacetate, which can decarboxylate into acetone. And acetone is highly flammable. A range of conditions can produce ketosis, in which acetone is formed, including alcoholism, fat-free dieting, diabetes and even teething. So we marinaded pork tissue in acetone, rather than ethanol.

This was used to make scale models of humans, which we clothed and set alight. They burned to ash within half an hour. The remains – a pile of smoking cinders with protruding limbs – were exactly like the photographs of human victims. The legs remain, we think, because there is too little fat for much acetone to accumulate. For the first time a feasible cause of human combustion has been experimentally demonstrated.

So does this mean that victims of ketosis are likely to spontaneously combust? Hardly – there are only about 120 cases on record throughout history, so it is vanishingly rare. On the other hand, there would be an argument against people with ketosis wearing synthetic fibres on dry days, and a new argument to give up smoking.

Meanwhile, I sympathise with teenagers whose parents have repeatedly been told that the odour of solvent on a child's breath is a sure sign of glue-sniffing. It isn't of course: they were probably dieting or just unwell.