

SHORT REPORT

Spontaneous human combustion: a sometimes incomprehensible phenomenon

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SUMMARY. Several cases of human combustion, the cause of which was not evident, have been described over the last few centuries. There are three intriguing elements to such cases. Firstly, although the body is destroyed, the immediate surroundings are left almost intact. Secondly, there is often no visible source of heat that might have started the fire. Thirdly, sometimes bodies are not completely destroyed, certain parts being perfectly preserved, adjacent to others that are reduced to a state of ashes. © APS/Harcourt Publishers Ltd 2000

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Several hypotheses have been advanced over the years, the earliest of which seem untenable today. Even though a number of such deaths are still not fully explained, medicolegal experts should be well aware of this phenomenon as it can have vital importance in cases that may involve homicide made to look like an accident.

In the last 12 years in the west of France, there have been five cases of human combustion, the cause of which was not determined.

DESCRIPTION OF THE BODIES

Four of the victims were female and there was a source of heat (although no flame) near the body. The fifth case involved a man, and the closest source of heat was a water-heater, situated more than 6 m from the remains of the deceased. In the male victim, who had previously had a hip replacement, the prosthesis was found intact amidst the ashes of the pelvis. In one of the women, the missing body parts were the head and neck, the subject being found with the head end of the body in the hearth of a fireplace.

None of the bodies were completely destroyed. Certain parts were perfectly preserved and identifiable, whereas others, including teeth in some cases, were totally reduced to a state of ashes.

In four of the five cases, the destroyed part was located between the thorax and the knees (abdomen, pelvis and genital area), which corresponds generally to the predominant localization of fat in the body, particularly in women. In four of the cases, the cadavers were wearing clothes that were intact distally and destroyed around the carbonized zone of the body. Three of the women were stocky with a thick layer of subcutaneous fat. Unfortunately, there was no centre equipped to weigh the bodies at the time of discovery.

Autopsies established that the soft tissues and viscera situated near the zones that had disappeared had retracted or had burst.

The male victim had no trace of soot in the trachea and the blood contained no carboxyhemoglobin. Thus, one may infer that the combustion occurred after death, which had been caused by stroke.

The levels of carbon monoxide in the blood from the other corpses were 17, 23 and 77%.

No tissue or blood samples were collected. In one case, the skin was bright red, there was cerebral oedema and pulmonary oedema, with blackish deposits in the trachea.

No alcohol was found in the blood of three of the victims, in contrast with the typical findings of the literature concerning such cases.

In one case, only an external examination was performed without an autopsy (a blood sample has been taken).

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These reports of this rare and interesting phenomenon prompted us to carry out the following analysis of other reports of unexplained human combustion in the literature. We discuss the potential mechanisms involved and the medicolegal aspects of such cases.

STUDY OF THE PHENOMENON

The first description of so-called spontaneous human combustion dates back to the 17th century, after which scores of other cases were recorded.

In the early 19th century, there was a flurry of cases, more than half of which occurred in France.¹ However, a struggle among rival schools of thought dampened the frequency of these reports until the two last decades. In contrast, researchers in other countries investigated this phenomenon, carrying out experimental studies and publishing descriptions of it.^{2,3}

The observations reported have a number of similarities.

Common Features

The descriptions repeat almost word for word a certain number of features:

- the intensity of combustion, which was in many cases limited to only certain parts of the body
- the outflow of liquefied body fat⁴
- the proximity of a heat source of low intensity⁵
- the preservation of the surroundings in marked contrast with the intensity of the combustion of the body.

The final common characteristic is that no one has ever witnessed one of the bodies in question catching fire, although certain literary authors of the 19th century, including Maryaam, Dickens and Zola wrote very detailed descriptions of such incidents.⁶ In some cases, noise was heard, or smell noticed by people nearby.

MECHANISMS OF ACTION

While certain features of the descriptions of human combustion given over the last two centuries have marked similarities, there are also great contradictions between explanations of various authors with equivalent scientific experience.

Often the principles and ideas were in line with the scientific trends of the day, and the interpretations of observed or reported facts were often lacking in objectivity.

Until the end of 17th century, fires of unknown origin that involved people were always assumed to be supernatural. Whether such fire came from the hand of God or that of the devil, it was considered to be a punishment. Descartes asserted that only three elements existed, one of which was fire, which he maintained could occur anywhere, provided that certain conditions were satisfied.

The discovery of phosphorus, which could be extracted from human excrements or bones, gave rise to the belief that fire appeared to be a characteristic of mankind, coming from the very 'interior' of the body. Fire was thus thought to be caused by abnormal practices such as abuse of alcohol by women (but not by men). This was said to ignite the body as it became saturated with phosphorus. These interpretations failed to mention the toxic nature of this element.

It is perhaps understandably considering the moralist and punitive dimension concerning women who succumbed to the 'fire of alcohol'.

Simple calculation shows that, even with a blood-alcohol content as high as 4 g per L, a person weighing 75 kg could contain no more than 300 g of pure alcohol, which would be unlikely to contribute to combustion.

As a result of the influence of Lavoisier at the end of 17th century, the role of phosphorus gradually began to be doubted, and was progressively replaced by the notion of the 'phlogistic' capacity of elements, until the discovery of the role of oxygen brought fire back down to the status of a simple natural phenomenon.

The belief in the incombustibility of the human body considerably obstructed objective interpretation, by implying that the human body could not burn alone, and that a huge quantity of fuel was necessary to incinerate it. Despite this, some men of medical science, such as Dupuytren in 1830, recognized the prominent role of body fat in this type of combustion.

In 1847, the countess of Goerlitz was discovered dead in her room, in which some of the furniture was found burning. The position of the body and various circumstances of the fire gave reason to believe that the burning furniture was not the actual cause of death. Had the countess been assassinated, and had the author of the crime tried to throw police off the track, or had she perished by spontaneous combustion? A violent debate broke out in connection with what for some, remained a dear case of spontaneous combustion, in spite of the resounding demonstration given by Liebig during the trial that followed this incident.^{7,8}

After a judicial investigation, lasting nearly 3 years, during which 12 famous doctors, surgeons and chemists were called upon to give their opinion, the hypothesis of spontaneous combustion, stringently attacked by Bischoff and Liebig, was generally abandoned. The direct consequence of this quarrel was the

absence of any publication on this subject for nearly a century.

The current theory

It is now accepted that under certain circumstances, a body can burn by combustion of its own fat with little or no damage to the close surroundings, and that such combustion is never 'spontaneous', but is instead ignited by an external source of flame. In some cases the body is found in the hearth of a chimney; in such instances, oxygenation is good and the draught of the conduit prevents the formation of smoke and particular circumstances cause combustion, not some unspecified extraordinary inflammability.

In order to test this theory, Gee designed an experimental model of spontaneous human combustion in 1965.² Around a test tube that ensured the integrity of the system, he wrapped a layer of human fat, then a layer of skin, and finally several thicknesses of light clothing. Lighted at one end with the flame of a Bunsen burner, this model continued to be slowly consumed producing a great amount of soot.

This made it possible to demonstrate the exothermic character of such combustion. A temperature of 250°C is necessary to ignite body fat; however, 'a cloth wick in liquid fat will burn, like a lamp, even when the temperature of the fat has fallen as low as 24°C. Although the source of the heat does not subsist, it continues 'burning', producing a temperature of 24°C, a slow and passive phenomenon that has been described as a 'candle effect'. The external source which started the fire may disappear during the combustion process, which explains the absence of heat source when the corpse is discovered.

Of what medicolegal relevance is the understanding of spontaneous human combustion?

The primary relevance relates to the determination of the cause of death of an individual.

It is important to bear in mind that the complete incineration (thus its disappearance) of part of a body is not necessarily the consequence of a purely external intervention.

Although the modern world has little use for candles and foot-warmers, many and, sometimes unexpected, sources of fire remain, as illustrated by a case reported in 1991,¹⁰ which involved an unconscious man who was transported to the emergency room of a hospital in Boston.

Just as he was placed on the examination table and before he could be undressed, the patient had a tonic-clonic seizure, beating the air with his arms and striking his thighs. Within seconds, the doctors were amazed to see a trail of smoke rising from the man's abdomen. Fortunately, the fire was quickly extinguished. It had quite simply started in a book of matches in one of the man's pockets that he struck during the seizure. Thus an incident was prevented that might otherwise have turned into a further case of 'spontaneous human combustion'.

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