

INTERNAL COMBUSTION

J. D. WHITBY, M.A., M.B., F.F.A.R.C.S.*

THE INFLAMMABILITY of gastric and intestinal gases was demonstrated in the seventeenth century by Andrew Vulvarious, the Professor of Anatomy in Bologna.¹ Surgical interest in this phenomenon was stimulated by the introduction of endoscopic instruments and the electric cautery. The main gases incriminated are hydrogen and methane and their production is increased by a leguminous diet.^{2,3,4,5}

Several years ago a non-medical magazine recorded the case of an anaesthetist who suffered a fatal internal explosion when he pressed a faulty lift button. The catastrophe was attributed to the exhalation of some of the cyclopropane that he was presumed to have inhaled while administering this agent in the operating theatre that he had just left. An eructation of inflammable gas would also be a possible explanation. Bird described the case of a man suffering from pyloric stenosis with gross gastric retention who exploded when an unfortunately timed belch coincided with an attempt to light a cigarette,⁶ and in a recent court case it was suggested that the inadvertent ingestion of iron filings had exposed the individual concerned to a similar risk.⁷ Another patient suffered a fatal explosion during the induction of anaesthesia in spite of the fact that no inflammable agents other than oxygen were being used. The main force of the explosion was directed down the alimentary tract and the accident was thought to be due to a static spark igniting inflammable gases regurgitated from the stomach, possibly when the oesophagus relaxed under the action of an injection of gallamine.^{6,8}

In the eighteenth century, Bianchini, the Prebendary of Verona, described the curious case of the Countess of Cesena.¹ Feeling heavy one evening, she had retired to bed and there conversed with her maid for three hours before falling asleep. The next morning her charred remains were found lying on the floor four feet from the bed. The legs, with the stockings still on them, were untouched by fire. Between them lay three blackened fingers and the head and brains, with the whole chin and half the back part of the skull burnt to ashes. The rest of the body had been reduced to a heap of greasy ashes that gave off a sulphurous smell. The room was full of a floating soot, which covered the floor and the furniture and had even penetrated into the drawers. Of the two candles on the table, the tallow was gone, but the cotton remained. A small lamp on the floor was covered with ashes, but had no oil in it. There was no mention of any fire in the grate. The bed was undamaged, but the blankets and sheets were raised on one side only, as when one gets out of bed. The writer concluded that the Countess had been on her way to the window for some air when the disaster occurred.

Bianchini dismissed the possibility of a visitation by the Devil, which would

*Anaesthetist, Department of Neurosurgery, Newcastle General Hospital, Newcastle-on-Tyne, England.

have been the popular diagnosis in an earlier age. He admits that the Countess was in the habit of bathing her whole body with camphorated spirit of wine when she felt indisposed, but rejects this as an explanation because the legs were untouched. His conclusion is that the fire was caused in her entrails by the inflamed effluvia of her blood, by juices and fermentations in her stomach, by the many combustible matters abundant in living bodies for the uses of life, and by the fiery evaporations which exhale from the settlings of spirit of wine, brandies, etc. in the tunica villosa of the stomach and other fat membranes, engendering there, as chemists observe, a kind of camphor, which in sleep, by a full breathing and respiration, are put in a stronger motion and are consequently more apt to be set on fire.

To back up this theory, he quotes a report by Sturmius that in the northmost countries flames evaporated from the stomachs of those who drank strong liquors plentifully. When three noblemen of Courland indulged in a bout of drinking by emulation, two of them died scorched and suffocated by a flame forcing itself up from the stomach.

Bianchini also quotes many instances of static phenomena that seemed harmless, but which he considered were only so for the lack of the proper fuel. John Fabri had noticed sparkles of light flashing out from the head of a woman while she was combing her hair. The head of a Carmelite monk continued for thirteen years to flash out sparkles every time he tossed his cowl on his shoulders. Lord Bacon had seen a woman's belly sparkling like fire. Friction of the hands and body of the father of Theodoricus produced those fires known as *ignes lambentes*. The skin of the Countess Cassandra of Verona flamed with a bright light when she rubbed her hands with a cambric handkerchief. Andrew Cianfio, a bookseller, shone all over with a great brightness when he shifted. Lastly, the wife of Dr. Freilas sent forth naturally by perspiration a fiery matter of such a nature that if the roller that she wore over her shift was taken from her and exposed to the cold air, it immediately kindled and shot forth like grains of gunpowder.

To illustrate the ability of the human body to continue burning once kindled, he mentions the case of John Hitchell of Southampton, whose body, having been fired by lightning, continued to burn for three days without any outward appearance of fire except for a kind of smoke. Another case was that of Grace Pett, a fisherman's wife of Ipswich, who went down to her kitchen one night when half undressed and was found the next morning lying dead on the floor and hearth, her body burning like a block of wood with a glowing fire, but without flame. There was no fire in the grate and the candle had burnt down to its socket. Children's clothes and a paper screen on either side of her were untouched.

To conclude, a fire in the belly may be more than a mere descriptive cliché and, if Bianchini's assertions can be believed, it would seem that an excessive indulgence in strong liquors carries with it a risk of fire in this world as well as the next.

SUMMARY

The inflammability of intestinal gases was demonstrated by Vulparious in the

seventeenth century. The main gases incriminated are methane and hydrogen and their production is increased by a leguminous diet or by excessive fermentation in cases of pyloric stenosis with gross gastric stasis.

The passive or active regurgitation of these gases can, if it coincides with exposure to a near-by flame or static spark, result in an internal explosion.

The curious case of the Countess of Cesena in the eighteenth century is described. The writer, Bianchini, the Prebendary of Verona, attributed her death to a spontaneous internal combustion following a heavy intake of spirits and quoted many recorded phenomena to support his contention.

RÉSUMÉ

Au XVII^e siècle, Vulparious a démontré l'inflammabilité des gaz intestinaux. Les principaux gaz mis en cause sont le méthane et l'hydrogène, et leur production augmente à la suite d'une diète à base de légumes, ou à cause d'une fermentation excessive dans les cas de sténose du pylore avec stase gastrique énorme.

A proximité d'une flamme ou d'une étincelle statique, la régurgitation passive ou active de ces gaz peut déclencher une explosion interne.

On raconte l'étrange histoire de la comtesse de Cesena au XVIII^e siècle. L'écrivain Bianchini, prébendé de Vérone, attribue la cause de la mort de la comtesse à une combustion interne spontanée, après qu'elle eut absorbé une grande quantité d'alcool. Il rapporte plusieurs phénomènes dûment constatés à l'appui de son assertion.

REFERENCES

1. BIANCHINI, J. An Account of the Death of the Countess Baudi of Cesena. *Medical Museum* 2: 31 (1781).
2. FRIES, S. A. Intestinal Gases of Man. *Am. J. Physiol.* 16: 468 (1906).
3. LIEBERMAN, W. Inflammable Physiologic Gases in Rectum and Colon. *Rev. Gastroent.* N.Y. 11: 259 (1944).
4. BECKER, G. L. The Prevention of Gas Explosions in the Bowel during Electro-surgery. *Surg., Gynec. & Obstet.* 97: 463 (1953).
5. CAWKWELL, W. I. The Prevention of Explosions during Diathermy of Rectal Growths. *N.Z. Med. J.*, 55: 152 (1956).
6. BIRD, J. D. H. Explosion during Anaesthetic. *Brit. Med. J.* 1: 1083 (1952).
7. *Daily Express* (Jan. 24, 1962).
8. *Medico-legal Correspondent.* Explosion during Anaesthetic. *Brit. Med. J.* 1: 168 (1952).