

Commentary on: Levi-Faict TW, Quatrehomme G. So-called spontaneous human combustion. *J Forensic Sci* 2011;56(5):1334–9.

Sir,

It is interesting that Levi-Faict and Quatrehomme discussed human combustion the same month that an Irish coroner declared a fire death to be the result of “SHC.” It seems that myth-busting is a never-ending process. The authors did dispel most of that mythology, but it was unfortunate that they chose to emphasize the word spontaneous throughout their paper—the only correct term is sustained. While the physical evidence of the actual ignition source is sometimes destroyed in a fire, the ignition is never spontaneous (i.e., in the absence of an external ignition source and driven by exothermic chemical reactions). To their credit, they do qualify it as “So-called,” but in their closing, they claim it as a “reality in forensic practice.” From a fire dynamics standpoint, to achieve significant consumption of the muscles and major soft tissues requires a sustained fire but not necessarily a large fire. Tests by this author have demonstrated that a human cadaver dressed in cotton clothes and covered with a cotton blanket ignited only by direct flame and allowed to burn to completion can sustain combustion for 6 to 7 h resulting in 75–80% consumption by weight leaving only largely skeletal remains (1,2). During that time, the combustion is sustained largely by subcutaneous body fat (with a heat of combustion of 32–34 kJ/g) rendering out and burning off from a porous wick (charred clothing, bedding, carpet, or bare wood) (3). During this time, the heat release rate (size) of the fire is very small (less than that of an office wastebasket fire). Such a fire needs only a modest air supply (even a closed door allows sufficient air leakage in most residential rooms). The fire is limited to the immediate surroundings of the body where the rendered fat can be ignited. Unless there are combustibles immediately adjacent to the small flames, the fire will not spread or grow very large. It is because it remains small that it may go undetected for hours. Larger fires fueled by synthetic upholstery in modern furnishings are more readily detected by outsiders who call in the fire service to extinguish the fire before extensive damage can be done to the mass of the body. (The fires described in Duband and Pécoc’h’s Letter to the Editor [4] do not appear to have been sustained, and the fire damage to the bodies appeared to have been largely cutaneous and fueled by combustible clothing items or adjacent furniture upholstery. These would appear to be “normal” accidental fire deaths).

Fire and medico-legal investigators must be aware of heat, fire, and combustion mechanisms. Despite references to three of my

papers, it appears that the basic concept of a limited size fire with very limited heat transfer has not been well understood. A fire consuming a body is limited to the best fuel available (subcutaneous fat) and is limited in its size and ability to ignite nearby fuels. The body fat does not (normally) burn as a pool fire but needs a porous wick to continuously deliver a suitable fuel supply. The nature of the clothing, bedding, or upholstery in contact with the body is critical to the process. Synthetic fabrics and materials are easily ignited but tend to melt as they burn and do not create a porous matrix to sustain the capillary flow of the melted fat. Natural fibers, such as cotton and wool, char to leave a rigid, porous matrix ideal for the wick effect. Where the wicking material ends (such as at cuffs or sleeves) or there is insufficient fuel (fat) (such as on hands, feet, and ankles), the combustion self-limits. This can sometimes result in the unusual appearance of tissues of the torso, arms, and upper legs being heavily consumed leaving behind the head, hands, and feet still intact.

While the actual ignition source may be concealed (or consumed) by the fire or its suppression, or even some distance away from the final location of the body (as the still conscious victim attempts to extinguish the fire before collapsing), we must all note that such ignitions are never spontaneous. There are no identifiable chemical or biological mechanisms sufficient to ignite the relatively benign components of a human body. To cite “historical” cases and those in fictional novels as support for such mechanisms is a serious scientific error. I trust the scientific findings of this century help clarify the reality.

References

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2. DeHaan JD, Icove DJ. *Kirk’s fire investigation*, 7th edn. Upper Saddle River, NJ: Prentice Hall, Inc., 2012;619–25.
3. DeHaan JD, Nurbakhsh S. Sustained combustion of an animal carcass and its implications for the consumption of human bodies in fires. *J Forensic Sci* 2001;46(5):1076–81.
4. Duband S, Pécoc’h M. Commentary on the so-called spontaneous human combustion phenomenon. *J Forensic Sci* 2011;56(5):1390–3.

John D. DeHaan,¹ Ph.D.

¹Investigation and Reconstruction of Fires and Explosions, Case Review, Quality Assurance, and Training, 3505 Sonoma Blvd, Suite 20, Vallejo, CA. Fire-Ex Forensics, Inc., 3505 Sonoma Blvd., #20-314, Vallejo, CA 94590.
E-mail: jddehaan@fire-exforensics.com