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Editorial Open Access

Detection of Human Activity after a Natural Disaster

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A natural disaster is the effect of a natural hazard such as flood, tornado, hurricane, volcanic eruption, earthquake, heat wave, or landslide on human beings. The aftermath of a major natural disaster leads to financial, environmental or human losses. Buildings collapse and people become trapped under collapsed structures when natural calamities such as earthquakes strike. This is especially true in urban settings where large number of people reside in tall and closed structures. Earthquakes by themselves rarely kill people or wildlife. It is usually the secondary events that they trigger, such as building collapse, fires, tsunamis, and volcanoes that actually result in human disaster. Building collapses occur owing to a number of hazards that are either natural (earthquakes and avalanches), man-made (structural deficiencies and gas explosions) or intentional (bombing and terrorist attacks) [3].

Prompt and appropriate information is especially crucial in search and rescue of people trapped in the rubble of collapsed buildings [4,5]. There is a high probability of survival of an uninjured healthy individual with a supply of fresh air if they are recovered within 72 h of becoming trapped. Survival rates decline after 72 h of being trapped under a collapsed building, and without access to water most victims are unlikely to survive longer than 120 h. The first rescue attempts are usually made by the survivors at the scene [6] followed by large scale search-and-rescue efforts by the local, national, and international rescue teams. The success of the whole search-and-rescue mission eventually depends on accurate and rapid location of survivors within the collapsed structures. There are primarily three mainstream search methods for locating survivors of a major disaster [3]: Physical search consisting of both visual and vocal approach, Canine search using sniffer dogs, and Electronic search using various electronic devices.

Two kinds of electronic equipment are currently being used, acoustic and viewing. Acoustic devices consist of a number of seismic sensors placed at various positions in the rubble so as to detect any sound or noise coming from the rubble. Sounds (voices, heartbeat, breathing) coming from potentially trapped persons are separated from other background noises and their source is located using special software. DELSAR life locator is one such acoustic system used in various emergencies. Viewing devices on the other hand include vision systems based on fiber optics, small monitors mounted on flexible mechanisms, or infrared imaging. Most of this equipment generally enhances rescuers' capabilities (vision, hearing and smell) to identify and locate signs of life beneath the rubble. An approach that is of increasing interest nowadays is the use of robots for USAR (Urban Search and Rescue) [7-9].

Recently, a "trapped human experiment" was conducted to provide a representative metabolite profile of humans trapped within a space inside a simulated collapsed building [10]. The objective of the tests conducted in this study was to identify, demonstrate and validate a range of analytes which could be used as markers for the signs of life within collapsed buildings after natural disasters. Various detection devices and instruments were evaluated in a controlled environment and the data generated is currently being used to develop detection algorithms and portable sensors. The study examined flumes of air originating from the participants to create a preliminary profile of molecules that could indicate human activity in a disaster zone. Molecules in the breath, sweat and skin of the participants were used to detect humans in a simulation of a collapsed building. Measurements on NH_3 indicated that skin-based metabolite releases may be significant factors in designing survivor detection systems. A device based on metabolite profile of human beings could be used in the disaster zone without any support from the distant laboratory and save valuable time. It could detect and monitor people trapped in the rubble for extended periods and be deployed in large numbers, in contrast to other physical and canine approaches. In future, more studies similar to "trapped human experiment" in different climatic conditions, water levels, durations and building materials should be undertaken for an efficient and successful search-and-rescue effort after a natural calamity. I am confident that the "Journal of Geography and Natural Disasters" from OMICS Group will play a pivotal role in this regard.

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