HUMAN BODY SIMULANTS FOR MILITARY AND FORENSIC RESEARCH

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Abstract*: A perfect simulant of the human tissues offers the same behavior as the real material during field tests. Since ballistic gelatine has important issues to overcome, an alternative would be the use of gelatine-polymer composites. A key factor is the insertion of biocompatible and biodegradable materials, which replicate accurately the human tissues in terms of mechanical performances.*

Keywords*: similarity with human tissues, rheological properties, polymer composites.*

1. Introduction

A good simulant of the human tissues must present the following technical characteristics:

- similarity in the projectile deceleration between the simulant and the live tissue for which the simulant has been validated;
- similarity in the projectile deformation pattern;
- similarity in terms of dissipated kinetic energy;
- accurate measurement of the kinetic energy dissipation;
- elastic behavior, similar to the live tissue, with the observation and measurement of the temporal cavity and tissue compression.

There is a wide range of controversies versus the type of simulant to be used for ballistic tests. Without fathoming this debate, an important issue is

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almost completely neglected: the control of the ballistic gelatine preparation process is entirely at the hand of the researcher. Any kind of gelatine may be produced in the view of simulating almost any kind of biological system. Any kind of real or simulated organ may be integrated. The standard simulants and their testing are directly proportional with the results and can facilitate the their analysis versus other researches.

2. Context of the research

The ballistic gelatine is a particular type of gelatine used for the terminal performance simulation, the wounds profile and the projectile wounding potential. Gelatine is a very well-known tissue simulant, obtained from collagen extracted from animal tissue. Among other available alternatives, gelatine and other hydrogel-based architectures present biocompatibility and biodegradability, those being studied further.

The materials used in the present study are polymer composites mainly used in biomedical applications such as: polydimethylsiloxane, polyvinyl alcohol, ethyl acrylate, polyhydroxyethyl methacrylate, due to their special properties that can be varied versus synthesis conditions, solvent used, reaction period, etc., which solve many of the existent problems in the field.

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