

FROM: Injury Biomechanics Researcher: Chris Van Ee, PhD
TO: The Honorable Court
SUBJECT: Dynamic Biomechanical Findings on SBS-LMF
DATE: March 3, 2008

1. Accepted Findings Will Assist Court:

The purpose of this document is to assist the Court with its understanding of two injury causation mechanisms that have caused significant disputes within the medico-legal communities.

These injury mechanisms are SBS (Shaken Baby Syndrome) and LMF (lethal [-6'] minor falls with severe head impact). Impact and injury biomechanics is the study of the mechanics of how injury occurs. In that respect, biomechanics is in a unique position to aid in the understanding of how falls or shaking can result in serious or fatal head injury.

While many in the medico-legal communities have debated these injury causation mechanisms, the Court is advised that most medical doctors are not trained in our scientific discipline and do not access our databases nor study our peer-reviewed research.

Indeed, as our findings show, there is no credible debate in our discipline over certain "Inconvenient Truths", truths that some have ignored or distorted.

This is not to say that all the answers are in, for they most assuredly are not. There is a great deal of study ongoing regarding the understanding of infant and adolescent head injury. However, the studies to date have allowed for great advances in the understanding of head injury and the development of state of the art safety devices and interventions. Indeed their success is predicated on an accurate understanding of head injury. Some of the applications of the work of injury biomechanics include automotive child safety seats, helmets, advanced airbags, playground surface materials, and crib design. In the development of products or safety interventions it is important to understand how injury takes place and identify the governing factors. The intervention can then be designed to affect the governing factors as to eliminate or mitigate the resulting injury. Based on the reliable scientific data that is currently available and used for the understanding of pediatric head injury in other applications the following statements can be made.

2. **SBS/LMF Findings From Biomechanical Tests and Studies:**


- (A) Scientific testing has shown that head acceleration levels from anterior/posterior human shaking of a normal 0- to 2-year-old child in the sagittal plane results in head acceleration and force levels that are much lower than those which are associated with traumatic head injury. Repeated testing of this hypothetical has shown that the head accelerations associated with shaking are far below the level associated with injury and there is no quality data to support the SBS brain injury mechanism. Thus shaking, even if done in a fit of anger, is not expected to result in head dynamics sufficient to cause direct intracerebral trauma.
- (B) Human shaking (*id.*) may cause lethal brain stem and cervical spine injuries in a 0-to 2-year-old child, as the forces necessary for these injuries are *well below* the level needed for fatal brain injuries and are consistent with the forces that can be produced in shaking. Put another way, these neck injuries would be expected in any hypothetical-superhuman-strength case of SBS where superhuman dynamics resulted in head accelerations leading to intercerebral trauma (if SBS were valid, which it is not).
- (C) If a 0- to 2-year-old child accidentally falls from a height of six feet and impacts head-first on a hard surface such as carpeted cement, the sudden impact has the potential to generate sufficient head accelerations to cause fatal intracerebral injuries. Whether any given fall *is* fatal depends on a host of variables and the fall mechanics which are different in each accident, but the potential head dynamics that result from a 6 foot high fall could far exceed the tolerance associated with fatal head injury.
- (D) Intentionally impacting a 0- to 2-year-old child's head against a hard surface could easily cause fatal brain injuries that would mimic those of a fall and today's science cannot distinguish accidental from non-accidental impacts of falls of similar magnitude, barring extraordinary signs, *e.g.*, grip marks or eye-witness accounts.
- (E) The foregoing findings are based on principles universally accepted within my field and concern scientific subject matters that I am willing to testify on in this case. The findings are overwhelmingly supported by the following reference list of biomechanical tests and studies.

3. **References of Scientific Validation:**

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