

By Sydney Vail, M.D.

CSI Of Wound Ballistics

Know what your ammo is capable of before pulling the trigger!

▶▶ A great deal of time and resources are invested in every tactical officer's training. How many of them attend a live autopsy of a shooting victim? How many are brought into the operating room with the trauma surgeon, determining actual injuries? The answer is simple: Not enough.

Time in the classroom and on a static or dynamic range is the beginning of the essential education about ballistics. Ballistics is the study of the science of the motion of a projectile in flight, or, understanding the of properties of a bullet's performance and actions before it hits its target.

Wound ballistics is the study of the projectile's action in tissue.

Are officers aware of what their duty ammunition can do to the human body? Are they aware that the bullet they are presently carrying and use to protect the public and themselves has no scientifically validated data to support its claim of human tissue performance? The information available for wound ballistics is enormous, confusing, sometimes accurate, other times not. The simple fact is that your duty ammunition has no scientific data on what injuries it will cause for any given area of the body hit or what is the potential for incapacitation. It is time to make up your own mind about stories you have been told, shootings you have witnessed and the failure to incapacitate, of which most of today's modern ammunition is guilty.

No Silver Bullet

There is one way to instantly incapacitate an intended target: This mechanism is to destroy the brainstem, which is the part of the brain just above the spinal cord that is the "master control" center for all body functions. It controls heart beat, breathing, responses, etc. This is the sniper's domain and would be considered the location of the instant "stop and drop." This small area is difficult to hit with a handgun for a variety of reasons and beyond

the scope of this article. The second way to quickly incapacitate is to have the body lose enough blood so that the brain is no longer capable of normal function due to loss of oxygen to the brain tissue. Destroying the heart, causing enough major blood vessels to open and leak the blood out of the arteries and veins are the means to this mechanism of incapacitation. Unfortunately, voluntary actions (a bad guy's gun shooting at you) can continue for up to 15 seconds after the heart is completely destroyed! This places the tactical officer

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at tremendous risk for injury if their target still is able to function.

Shot Placement is Crucial

There are a few golden rules to follow for incapacitation if you are to trust that your ammunition will serve its intended purpose. First, shot placement so that faster bleeding from more blood vessels can occur. One well placed shot though a major blood vessel will do a lot better job of incapacitating than an entire magazine of bullets hitting nothing but thigh muscle tissue. Second, find autopsy or trauma-surgeon data that lets you know the *true* bullet performance in living tissue of your duty ammunition. Depth of penetration, expansion, fragmentation are all important, but does your bullet design do that reliably in living tissue compared to the way it was tested in ballistic gelatin? All "usual" commercially marketed bullets were tested in 10% ballistic gelatin, a simulant to thigh muscle. Most people are not shot in the thigh. Most



An injury to a major blood vessel can cause significant hemorrhaging. About 1% of extremity injuries will end in death unless rapid treatment to control bleeding is applied.



The common LE 9mm round to the arm of a criminal won't necessarily be enough to keep him from attacking or fleeing. Proper shot placement is critical.

people have skin, fat, muscle, other tissues, bones, nerves, blood vessels and organs that have markedly different properties than ballistic gelatin. Your ammunition was chosen on its ballistic performance in gelatin, not living tissue. Are you willing to trust your life to this type of testing? Just because you hit your target doesn't mean the bullet performed as advertised; If your threat is still there, your ammunition failed you.

Know Your Ammo's Capability

The International School of Tactical Medicine educates officers and medics on the real-life effects of bullets on bodies. As a practicing trauma surgeon, I see and therefore can teach on wound ballistics from a perspective of living tissue injury from bullets.

Dr. Martin Fackler's editorial comment to an article on wound ballistics in *Journal of the International Wound Ballistics Association* makes this point:

"What Gene Wolberg has done here is what every clear thinking LE agency should be doing. Skepticism and meaningful comparison are the essence of common sense and all scientific thought... don't believe that your tissue simulant is a good predictor just because an Army lab or the FBI uses it and says so—check it out for yourself. (Wolberg, E.J. *Wound Ballistics Review*, Winter 1991;10-13.)

Bottom line is, you must understand what your ammunition can and does do in living tissue in order to perform your tasks as tactical medics and officers of the law.

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