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Stopping Power: Myths, Legends, and Realities

When it comes to claims about the effectiveness of handgun ammo, don't believe the hype.

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January 16, 2013 | by Sydney Vail, MD



Photo courtesy of Sydney Vail

As a trauma surgeon and a tactical medical specialist, I am often asked by law enforcement officers what caliber and type of handgun ammunition offers the most stopping power. I can't answer that question. Let me explain why.

The ammunition most commonly carried by law enforcement officers is a hollow-point configuration or expanding full metal jacket bullet, typically in one of five calibers, including .38/.357, 9mm, .357 SIG, .40 S&W, and .45 ACP. Other calibers are used in some departments. But for the sake of this discussion, let's stick with the most common rounds. These handgun rounds perform very differently based on a number of key factors that I'd like to discuss.

At most agencies it is typical for either the rangemaster or lead firearms trainer to choose specific ammunition (caliber and/or bullet type) based on the results of ammunition being run through a series of ballistic tests, most commonly the FBI's ballistic laboratory testing. Marketing by ammunition companies also influences how agencies choose the specific ammunition for front line officers to carry.

Unfortunately, the information that agencies are using to choose the ammo for their officers is generally based on hype as well as the flawed standardized testing using ballistic gel and measurements of the depth of penetration into ballistic gel, degree of bullet expansion, and other factors. Usually, actual data on human body wound ballistics is not available to agencies when they are choosing ammo for their officers.

What is most unfortunate is that the testing of modern bullets does not give a complete picture of what a particular ammunition configuration will do in the human body to incapacitate it in a timely fashion, in other words, stopping power. The testing results "infer" or "simulate" what is believed to happen in the human body, but I can tell you that from my experience operating on gunshot patients that this just is not the case.

So back to the question at hand about determining stopping power. If you are expecting me to tell you



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which brand and which bullet caliber and type to use for the best or most reliable stopping power, you are going to be disappointed. But I will tell you about the factors that determine stopping power.

Kinetic Energy

Most officers think that a larger bullet and higher velocity equal more "kinetic" energy, yielding more stopping power than a smaller bullet with the same velocity. Here's the reality:

We know that the equation for kinetic energy is $KE = \frac{1}{2}mv^2$ (KE is kinetic energy, m is mass of object, and v² is velocity squared). This equation tells us how much energy will be derived from a combination of bullet grain weight and muzzle velocity.

Now we need to go back a step and define stopping power. Is it the ability of a particular ammunition to:

1. Immediately incapacitate a threat?
2. Eventually incapacitate a threat?
3. Slow down a threat?
4. Render a person less able to remain a threat?
5. Knock the threat to the ground?

I believe the definition of stopping power should be a particular ammunition's effectiveness to render a person unable to offer resistance or remain a threat to the officer, an intended victim, or self.

So how does ammunition accomplish this? You have two options. You can use a really large round at very high velocity like the 30mm cannon rounds from an Apache helicopter's M230 Chain Gun, which produces substantial kinetic energy, or you can place your shot where it has the most effect. Obviously, shot placement is the only realistic option for a law enforcement officer.

A .40 caliber bullet shot into the shirtless torso of a person causes a degree of injury due to the body absorbing the bullet's energy and dispersing it in front of and around the path of the bullet. The projectile also tears through the tissue. This means that the kinetic energy of this typically low-velocity (less than 1,500 feet per second) bullet will create both a permanent cavity and to a much lesser extent a temporary cavity.

But does this ammunition have acceptable stopping power? Only if it hits a vital structure that would "stop" the target from continuing the fight.

The Target Variable

Consider that the same ammunition shot into the torso of an officer wearing a ballistic vest involves the same forces, but they are dispersed over a greater surface area in order to dissipate those forces, which, hopefully, prevents penetration of the body and allows the officer to continue in the fight.

So is the stopping power the same or different for these two scenarios? The kinetic energy is the same, the tissue injury is different.

Another way to look at this is to think about a bowling ball as a projectile and how it might perform in two different scenarios. If someone shoots it out of a cannon into a brick wall, the large mass and high velocity will likely result in a significant hole in that wall. But if the same bowling ball is shot out of a cannon into a strong net made of Kevlar, it will likely have all of its energy taken up by the net and not allow penetration. It has the same energy to lose in its intended target but different targets yield different results. A bowling ball fired from a cannon has high kinetic energy and excellent stopping power that far exceeds any ammo you could carry on duty, but the effect it has on the target is still determined by shot placement and the nature of the target.

Real Gunshot Wounds

The point here is that no single ammunition that is typically used by law enforcement officers today can reliably claim to have superior stopping power.

I have seen a .22 caliber bullet completely incapacitate someone and a .45 ACP fail to achieve that result. People and animals shot with 10mm rounds and .357 SIG rounds have continued to run from the police. I have been on scene as a tactical medical provider when a suicidal person shot himself in the head with a .45 Colt round resulting in instant death. And I have seen the same results in suicides that used smaller calibers, including .22, .25, and .32. I have also seen people hit with 9mm, .40, and .45 without so much as staggering or slowing their verbal or physical activities.

So we come back to the original question: Which ammunition has the best stopping power? I can't answer that question. What I can say is that you should look for ammunition that reliably lives up to its claims of penetration and expansion but don't believe that these two factors alone are related to stopping power.

The ultimate stopping power rests with your training with your weapon system. Accurate hits in any reasonable caliber will "stop" a person if that person has experienced enough brain or spinal cord damage to interrupt regular neurologic impulses from reaching vital areas of the body or the person has

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hemorrhaged enough blood to lower his or her blood pressure where the brain no longer is able to function well. You can also stop a person if a major bone shatters after a bullet injures it, but does that stop the fight?

Stopping power is a marketing tool and should be dropped from our discussions of ballistic performance until such time as ammunition effectiveness is measured by more means than just the results of gelatin and barrier tests. When ammunition companies or regulatory agencies begin to use computer simulations, simulant, animal models, autopsy results, and trauma surgeon operation reports with hospital summaries to determine the effectiveness of their products, then we will know which ammunition can be labeled as having the "best stopping power." And this claim will be based on scientific data rather than incomplete ballistic testing.

Until then, shot placement with any commercially available ammunition will offer you the best chance of maximizing your duty ammunition's stopping power.

Sydney Vail MD, FACS, is an associate professor of surgery on the trauma faculty at Penn State Milton S. Hershey Medical Center and Penn State College of Medicine in Hershey, Pa. He also serves as director of tactical medicine programs for the Arizona Department of Public Safety and Maricopa County (Ariz.) Sheriff's Office SWAT teams.

Tags: Ammunition, Ballistics, FBI, Tactical Medicine

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David Shay @ 1/17/2013 12:51 PM

I believe that is in the hands of the shooter and his or her shot placement. Just because you have 17 rounds in your mag does not mean you can stop anyone. The key is practise and be 100% sure of your first shot, that is the one that matters.

Doc @ 1/18/2013 1:22 AM

I use lighter & faster hollow points that expand well and tear up more tissue. Multiple hits are better and as long as you are hitting the target, just keep shooting. I test my ammo and I also check any autopsy info on my ammo, and I talk with ER Doctors that have seen the damage that has been done and can provide info. The FBI testing does provide some good info about barriers, but that is not nearly enough. The FBI is also known for deciding that the 147 grain 9mm was the best round to use, and Agents got killed. The FBI only tested the Sub-sonic 9mm ammo for accuracy, and I always wondered about that. Then another point that should be noted is that the mental condition of your target can be another factor.

I'm sure that some of you have fought with subjects, where they don't seem to feel any pain, and nothing seems to be working. I bent a steel baton on one subject, with 5 or 6 good solid strikes, that with other subjects only One strike was needed. The same kind of deal can happen in shootings, even with multiple lethal hits. That's why I teach officers to get rapid follow up shots, and if they go into a Hot situation, that a patrol rifle or shotgun should be deployed as they hit much harder.

D-Ray @ 1/18/2013 6:28 AM

While I agree with a lot of what Dr. Vail is saying here, I think he's leaving out some vital information. It is true that shot placement is a huge part of the "stopping" process. It is also true that a proper small caliber projectile (bullet) in the right place can be very effective. However, one must factor in the likelihood of a projectile of any caliber's ability to penetrate far enough, and expand enough to do maximum damage to organs that will achieve the goal of "stopping" an adversary. While a .22lr to the heart may very well be fatal, it has to get there first. Even if it does, will it do enough extensive damage to stop the fight quickly? Does anyone doubt that a modern .45acp shot into the same place would accomplish this goal more efficiently? I for one would welcome the ability to factor in the other variables that Dr. Vail has suggested, but what's the chance we'll ever be able to do that? Until then, the testing we have now is our best choice, and still has value in picking out defensive/duty ammunition. Just remember though, only a fool takes a handgun to engage an active shooter. That's what rifles are for. Stay safe.

Rob @ 1/18/2013 6:35 AM

Great article.

Mark @ 1/18/2013 6:43 AM

I was always taught that 9mm is the best because unless you are hitting the target, the type of round doesn't matter. Often times the officer does not hit the target with the first round. Recoil then starts preventing a faster sight acquisition than in the 9mm. 9mm allows faster sight acquisition due less recoil and more rounds of ammunition. .40 offers slower sight acquisition due to recoil and an officer can carry less rounds. .45 is such a low velocity round that it sometimes cannot even penetrate a window or jean jacket (I haven't seen a jean jacket in a long while) and offer significantly less round quantity. Thank you, that is all! :)

John @ 1/18/2013 7:46 AM

Mark - I find it hard to believe that a .45 fails to penetrate glass and clothing unless it is a defective round. I'd have to see that to believe it. I once investigated an officer-involved shooting where a .45 hydra-shok hit the suspect in the spine and then struck a lung and the heart before ending up just below the skin on the chest. It was certainly an adequate round in that situation.

Dr. Vail - Thank you for a very informative article.

General comments: I carried a variety of weapons during my police career. Initially, it was a .38 special revolver but over the years, I carried a 9 mm S & W, a .45 Sig and finally a Glock .40 cal My favorite was the Glock because I found that the trigger pull was consistent and that the magazine capacity was exceptional. I never had to fire at anyone but found that I could score 100 % in tactical training. The Sig was my least favorite because of the long and heavy trigger pull on the first round. It was virtually a throw-away. Since the second and subsequent rounds were from a cocked hammer, placement was much better. My point is that a combination of an effective round, a weapon that can deliver it accurately and good shot placement all contribute to effectively incapacitating a suspect. That's my two-cents worth.

Thomas Horowitz @ 1/18/2013 9:48 AM

As a physican and a reserve officer, I think this IS the truth! One should have a "good" round, however: to put an end to the fight you must have a well placed round. We should not blame the bullet for an indifferent shot placement.

Greg Horton @ 1/18/2013 10:48 AM

Great comments and a very interesting topic. One of the things I think is important is the fact that most of the departments mandate what ammo you can carry on duty (and many off duty too). That means that the ammo discussion is a moot point and you had better work on your shot placement! Good marksmanship is, and always be one of the key issues. Get your gun and practice, practice, practice!!! Stay safe all.

Uncle Dave @ 1/19/2013 4:56 PM

I will not deny that shot placement helps. It is wrong to blame it on marksmanship. Often there is just too much stuff happening too fast to get the square range shot.

The next thing for the lack of better terms is that stopping power is directly inverse to the amount of "evil" some people have in them. The more evil, the more stopping power needed.

Thomas @ 1/21/2013 6:42 AM

Use bonded ammunition in your duty pistol and a heavy bullet for that caliber (more consistent penetration to the FBI standard of 12"-18"). Shot placement is king. If you can, bring a long gun and your friends with long guns to a gunfight!

Bob Aldridge @ 1/21/2013 3:53 PM

Sorry, just another in a long line of confusing "stopping power" articles that try to equate technology and training. Bullet terminal performance is a technology issue; whereas shot placement is in the training arena. They are independent. One does not affect the other. Think about it.

romansten9 @ 1/22/2013 8:38 AM

This why I have never believed the 45 ACP hype. No caliber is a guaranteed when it comes to stopping power. Some treat a 45 like a magic bullet but I mostly see bravado and "mine is bigger than yours" instead of actual evidence. Most handgun calibers are very similar when you compare them to something like a rifle. For me a caliber like 9 mm allows me to have acceptable recoil, plenty of magazine capacity and ammo that is low cost and available nearly everywhere. For most people it's cheaper to practice more and easier to return to the target after firing.

John Carp @ 1/22/2013 10:48 AM

It would appear that most modern controlled expansion Law Enforcement ammunition, is up to the task for stopping goblins from anti social behavior. This was not ALWAYS the case. Today's top shelf ammunition is better than ever. Such as The CCI/Speer Gold Dot, The Federal HST, The Winchester Ranger "T" ect. Some calibers are more ammunition sensitive than others. Not every 9mm Luger JHP will expand in soft targets, and not every .45 ACP. But those bullets that do; perform spectacularly! The only real stand out as an iffy proposition, are the heavy for caliber 147 gr. JHP's in 9mm. After all, these were made for a very specific niche role! They were originally loaded for United States Special Operations forces, to be used out of suppressed submachine guns. In that role, they excell!

I believe it was a case of, "If it's good enough for * insert high speed low drag unit of your choice * then it's good enough for anytown Police Department!" When...it wasn't. The latest crop of 147 Gr. ammunition is way better than even five years ago. But...a new barrier to projectile performance has made an entry to the LE arena.

The micro off-duty pistol. Most ammunition is loaded with a specific barrel length in mind. Typically at least four inches. The propellant charge and burn rate is optimized, then for that length. If you shorten the barrel, then you shorten the burn time for propellant and loose potential velocity. It is possible to turn the super goblin zapper that works well out of a duty sized weapon, in to a less effective round, out of the

micro off duty pistol. There are a couple of exceptions in the Speer Gold Dot Short Barrel loads and Hornady Critical Defense ammunition. Having said that...I must however agree whole heartedly that it all boils down to bullet placement. If the goblin is not stuck in a critical area, he or she may continue anti social behavior.

Most respectfully
john

captjsharp @ 1/24/2013 11:13 AM

One important point that I believe should be made here is that when selecting your weapon and the ammunition you will use, consideration should be given to the nature and elements of your duty or assignment. If you spend most of your shift in a vehicle working traffic, will your weapon caliber and the ammunition you are using allow you to effectively shoot through your windshield if you make a traffic stop and the suspect jumps out, runs to the front of your vehicle armed with a weapon and fires or prepares to fire at you? Do you spend time executing warrants or serving papers in apartment buildings or government built housing projects? If so, and you must fire your weapon, is your shot likely to over-penetrate, putting people in adjacent apartments at risk? If you work in rural county where wooded areas are prevalent, is your weapon and ammo suitable if you're in a gunfight where trees and bushes provide cover, or will a twig likely deflect your shot? When selecting a weapon and ammunition, proper consideration must include not only the "stopping power" of the weapon and ammo, but also the ability/tendency of the weapon caliber and ammo to penetrate or deflect off of the type of obstacles you are likely to encounter during your shift. Your weapon caliber and your ammo selection may provide you with excellent stopping power, but if it will go "through and through" your suspect, and 3 apartment walls when your duty assignment regularly puts you in such environments, or if it won't penetrate a car windshield, whether someone is trying to run over you or kill you before you can get out of your vehicle, you need to re-think your choice. Use what is best for what you do, even if it's not the latest, greatest, baddest man-stopper available; this week.

Pastor Rick @ 1/29/2013 12:32 AM

THANK YOU

Things I have been telling people for a few years. It's nice to a Dr. a professional on the same page.

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Chuck Haggard @ 2/11/2013 11:26 AM

I am saddened that this article has been published since it is part of the very problem that it states.

There is quite a bit of misinformation in this article, most especially the parts dealing with the validity of FBI ballistic gelatin testing. This has proven to be the very best indicator of how a bullet will perform in tissue. The validity of these tests has been well proven through the years by comparing to real world OIS and .mil shooting data and autopsies. The good doctor should be well aware of this information.

Chuck Haggard @ 2/11/2013 11:30 AM

I wanted to add that I STRONGLY agree with the doc that the term "stopping power" needs to be dropped from the vocabulary of all cops, especially police firearms instructors. There is no such thing and it gives our officers a false sense of what their bullets can and can not do.

We also need to dump the BS that any of the service caliber handgun rounds work any better than another. With equal placement, .38 +P, 9mm, .40, .45acp, .357, etc all work almost exactly the same.

Tedz @ 2/21/2013 8:48 AM

IIRC the 147 gr. jhp 9mm came about as a result of the failure of the Winchester 9mm 115 gr. silvertip to penetrate deep enough. The 115 gr. silvertips were used by some of the agents in the 1986 Miami shootout and one of these rounds stopped just short of Michael Platt's heart. (He was the robber armed with the mini 14 who caused most of the carnage). A shot penetrating the heart may have ended things quicker. The 9mm 147 gr. jhp was popular for many years due to the superior penetration of this 9mm loading. I believe is still used by some agencies using the 9mm. I am not LE just a student of small arms and ammunition.

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