

# Brass Fetcher Ballistic Testing

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**9x19mm JHP performance through Bone Simulant plates  
With Ballistic Gelatin backing**

**03 November 2011**

## Abstract

Six different brands of premium Defensive and Law Enforcement hollowpoints were evaluated in 9x19mm. Tested ammunition was Aguila 117gr JHP, Cor-Bon 115gr +P DPX, Cor-Bon 100gr +P Pow'R Ball, Federal 105gr Expanding Full Metal Jacket, Federal 124gr +P+ Hydra-Shok and Speer 124gr +P Gold Dot.

The ammunition was fired from a Glock 19 handgun, through a bone simulant plate backed by 10% ballistic gelatin blocks. Of the six brands tested, **four of the six ammunition types failed to expand** in the bone plate/gelatin target. The Cor-Bon 115gr +P DPX and Federal 105gr EFMJ projectiles performed effectively, by functioning similarly through the bone plate as they did in bare gelatin. The Aguila 117gr JHP jacket stripped off of the lead core in 66% of shots, after impacting the bone plate and failing to expand.

## Introduction

Ballistic gelatin is an industry-standard medium used for evaluating the terminal performance of hunting and self-defense ammunition. Gelatin blocks offer many advantages in this role – it is a highly viscous liquid, offering a density close to that of human body fluids and the low-velocity characteristics of muscle tissue. It is a highly consistent material, which makes it very useful for making accurate measurements of damage done to the gelatin by a bullet penetrating *soft tissue only*.

The critical areas of the body are generally protected in some manner by the presence of bone immediately behind the skin. The large percentage of the vital areas of the chest that are protected by the rib cage and sternum make it desirable to simulate bone and then the soft tissue behind the bone. A priority of this report was in choosing a caliber and ammunition that was relevant to both civilian law enforcement and civilian gun owners. We evaluated several popular 9x19mm JHPs from a common CCW firearm – a Glock 19 with 4.0" barrel length.

Bone simulation was effected by placing a bone simulant plate, produced by Synbone AG of Switzerland, in front of blocks of 10% ballistic gelatin (Figure 1.) Tested plates were 6mm (  $\frac{1}{4}$ " ) thick and covered by a rubberized 'skin' layer. Product number of these plates is PR0114.G. Density for the tested samples came out to be 814 kg/m<sup>3</sup> and the failure mode for these was 'brittle' failure, similar to bone.

Six different brands of premium Law Enforcement and Defensive hollowpoints were evaluated in 9x19mm Luger. Tested ammunition was Aguila 117gr JHP, Cor-Bon 115gr +P DPX, Cor-Bon 100gr +P Pow'R Ball, Federal 105gr Expanding Full Metal Jacket, Federal 124gr +P+ Hydra-Shok and Speer 124gr +P Gold Dot.

**Figure 1.** Bone simulant plate and ballistic gelatin block



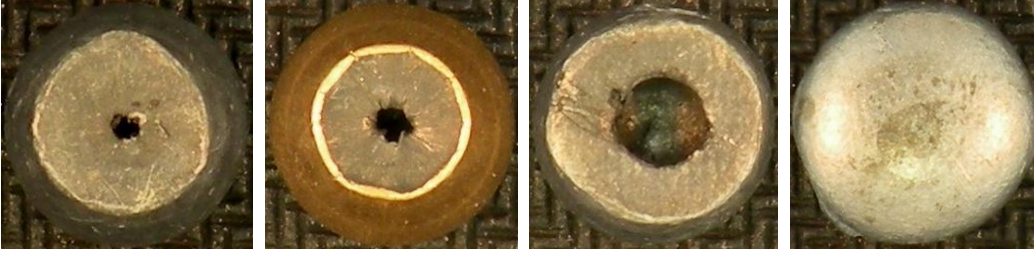
**Figure 2.** Bone simulant plate



## Results

### ***Aguila 117gr JHP***

**Figure 3-6.** Aguila 117gr JHP recovered bullets (Shots 1-3 through bone; Shot 4 bare gelatin)



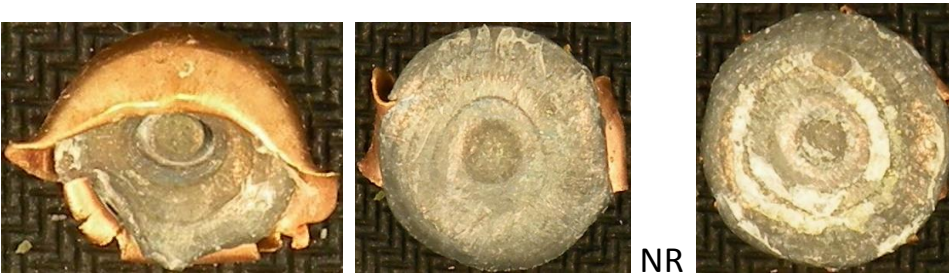
### ***Cor-Bon 115gr +P DPX***

**Figure 7-11.** Cor-Bon 115gr +P DPX recovered bullets (Shots 1-4 through bone; Shot 5 bare gelatin)



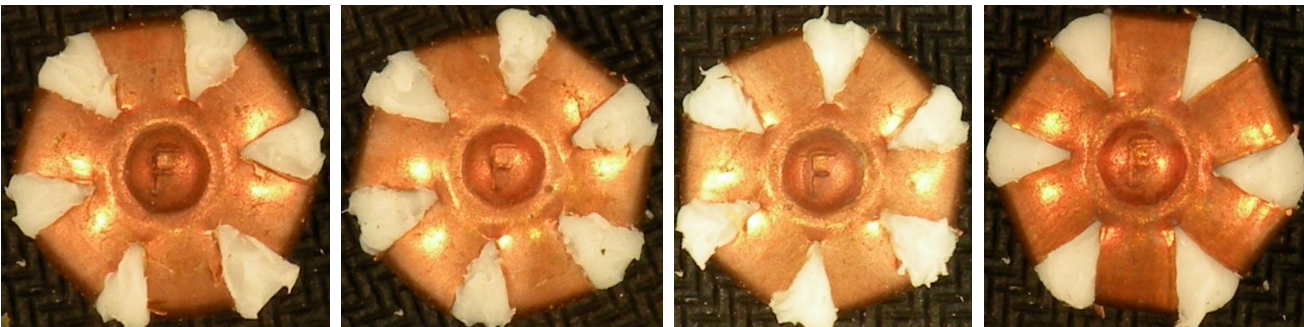
### ***Cor-Bon 100gr +P Pow'R Ball***

**Figure 12-15.** Cor-Bon 100gr +P Pow'R Ball recovered bullets (Shots 1-3 through bone; Shot 4 bare gelatin)



### ***Federal 105gr Expanding Full Metal Jacket***

**Figure 16-19.** Federal 105gr Expanding Full Metal Jacket recovered bullets (Shots 1-3 through bone; Shot 4 bare gelatin)



**Federal 124gr +P+ Hydra-Shok**

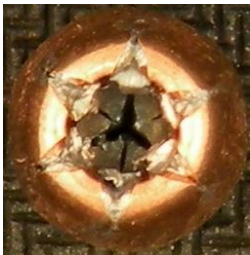
**Figure 20-23.** Federal 124gr +P+ Hydra-Shok recovered bullets (Shots 1-3 through bone; Shot 4 bare gelatin)



NR NR NR

**Speer 124gr +P Gold Dot**

**Figure 24-27.** Speer 124gr +P Gold Dot recovered bullets (Shots 1-3 through bone; Shot 4 bare gelatin)



NR NR





## ***Relevance to the Tactical Situation***

**Figure 28.** Adult Male rib cage with circulatory system visible (0 degree obliquity)

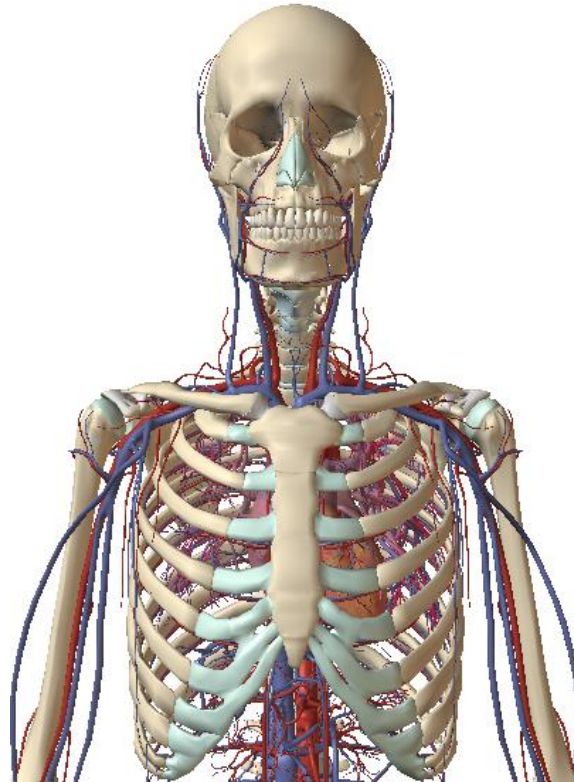


Figure 28 shows a 'head-on' view of the human weapon system. Note the size of heart relative to the rib cage and sternum.

**Figure 29.** Adult Male rib cage with circulatory system visible (30 degree obliquity)

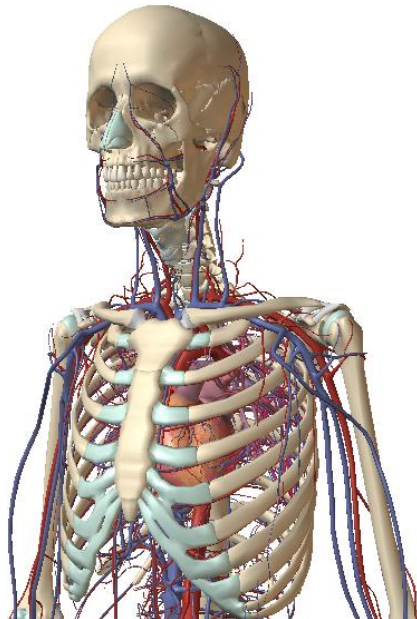
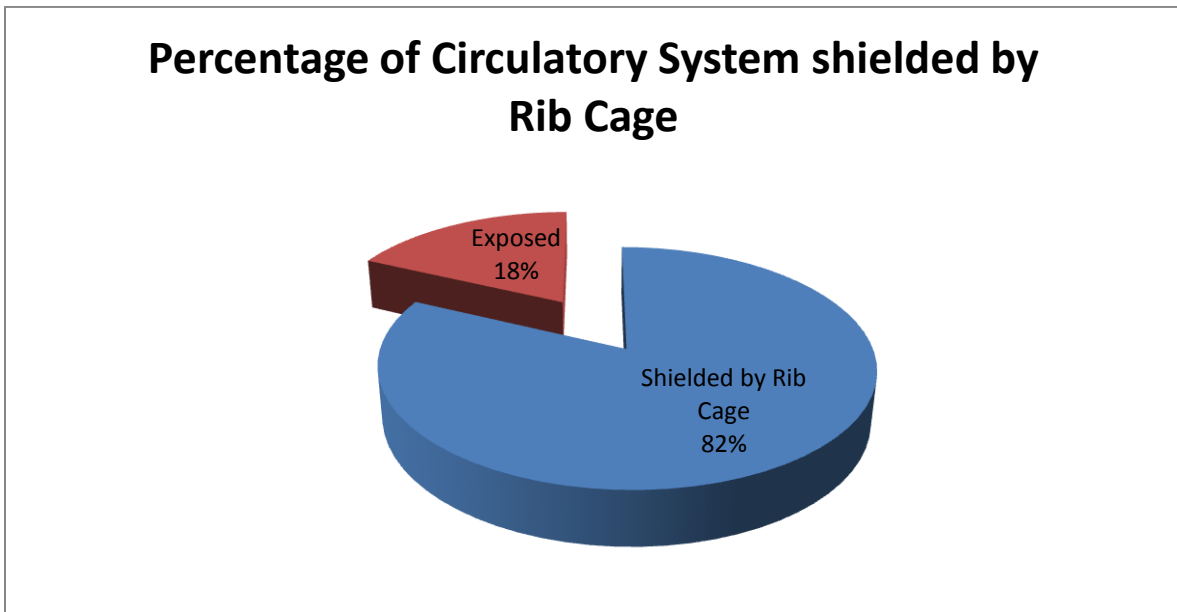
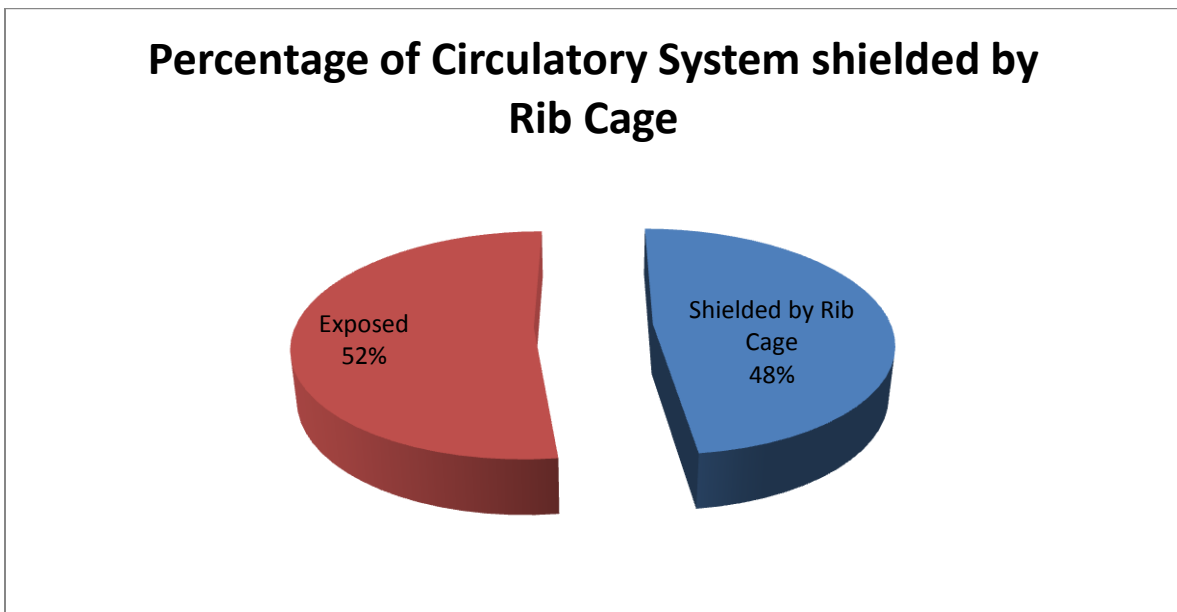


Figure 29 shows the adversary turned at a 30 degree angle to represent the Weaver shooting stance.

**Figure 30.** Percentage of Circulatory System shielded by rib cage (Adult Male, 0 degree obliquity)



**Figure 31.** Percentage of Circulatory System shielded by rib cage (Adult Male, Weaver stance)



We see that there is a good chance that a shot to the upper chest will encounter some bone prior to impacting with soft tissue. Given the 48% odds of engaging an attacker through bone if they have taken a fighting stance prior to the shot, it greatly benefits a shooter of jacketed hollowpoints if the JHP expands after contact with a bone.

**Table 1.**

Cartridge	Impact Velocity (ft/sec)	Surface Area (in <sup>2</sup> )	Penetration Depth in 10% gelatin (inch)
Aguila 117gr JHP	1261	0.095	16.0 +
Aguila 117gr JHP	1249	0.089	16.0 +
Aguila 117gr JHP	1281	0.099	16.0 +
Aguila 117gr JHP Bare Gelatin	1305	0.111	16.0 +
Cor-Bon 115gr +P DPX	1258	0.253	12.9
Cor-Bon 115gr +P DPX	1242	0.254	13.4
Cor-Bon 115gr +P DPX	1210	0.259	12.4
Cor-Bon 115gr +P DPX	1218	0.250	12.3
Cor-Bon 115gr +P DPX Bare Gelatin	1206	0.236	14.0
Cor-Bon 100gr +P Pow'R Ball	1459	0.189	16.0 +
Cor-Bon 100gr +P Pow'R Ball	1464	0.239	12.0
Cor-Bon 100gr +P Pow'R Ball	1454	NR	16.0 +
Cor-Bon 100gr +P Pow'R Ball Bare Gelatin	1497	0.291	11.8
Federal 105gr Expanding FMJ	1240	0.260	9.3
Federal 105gr Expanding FMJ	1235	0.274	9.6
Federal 105gr Expanding FMJ	1212	0.267	10.3
Federal 105gr Expanding FMJ Bare Gelatin	1237	0.290	9.5
Federal 124gr +P+ Hydra-Shok	1172	NR	16.0 +
Federal 124gr +P+ Hydra-Shok	1180	NR	16.0 +
Federal 124gr +P+ Hydra-Shok	1175	NR	16.0 +
Federal 124gr +P+ Hydra-Shok Bare Gelatin	1192	0.396	10.6
Speer 124gr +P Gold Dot	1224	0.098	16.0 +
Speer 124gr +P Gold Dot	1214	NR	16.0 +
Speer 124gr +P Gold Dot	1242	NR	16.0 +
Speer 124gr +P Gold Dot Bare Gelatin	1231	0.388	11.7



## Summary

Of the six brands tested, **four of the six ammunition types failed to expand** in the bone plate/gelatin target. The Cor-Bon 115gr +P DPX and Federal 105gr EFMJ projectiles performed effectively, by functioning similarly through the bone plate as they did in bare gelatin. Notably, the Aguila 117gr both failed to expand and stripped the jacket after impact with the bone plate. This effect was deleterious in that the lead core presented a smaller surface area than it would have if the jacket stayed in place, lowering the lethality below that of a conventional JHP that fails to expand.

The wounding mechanism of a jacketed hollowpoint is the crushing of tissue through bullet expansion. Failing this, the lethality of a JHP is oftentimes lower than a full metal jacket which wounds through tumbling. FMJ bullet shapes lend themselves more readily to tumbling than a JHP that failed to expand – though many of the unexpanded JHPs did tumble, it was far too deep into the track to have influenced the lethality of the bullet to any extent.

We recommend using the Cor-Bon 115gr +P DPX and Federal 105gr EFMJ if bullet expansion after a bone hit is a priority. It should be said that the human body consists of many different bones, with shapes other than flat, so these results should be considered as generally indicative of the performance that you can expect in an actual target. In any event, the bullets that failed in these tests will not perform better against living bone.