

# Effectiveness of Meat Tenderizer in Removal of Blood from Fabric

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## Abstract

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A technique involving bromelain-based, powdered meat tenderizer was used to remove stains caused by human blood from three common fabrics. Groups of fabric samples were stained with blood and treated with a meat tenderizer mixture for different amounts of time and compared to a control group treated with water alone. The results of this process suggested that meat tenderizer could be used to remove blood stains and that longer amounts of time were favorable for this method. Additionally, it was found that this technique differs from treatment with water alone by breaking down and transferring the stains from the fabric rather than just diluting them to reduce their appearance.

*Key Words:* Meat tenderizer, Bromelain, Blood, Fabric

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Powdered meat tenderizer is a product that can be found in many grocery stores. It is commonly used as a low effort alternative to meat mallets and other hand powered tenderizing devices. It comes in seasoned and unseasoned varieties and often contains salt and plant-based enzymes that function as the tenderizing agents (Gourmet Sleuth, n.d.).

One enzyme traditionally used in powdered meat tenderizer is bromelain, which is a natural protease derived from pineapples (Bekhit et al. 2014). It functions by hydrolyzing the proteins found in the muscle tissue, breaking their peptide bonds and reducing them to free amino acids. (Dickson 1991). However, this function is not limited only to the proteins found in muscle tissue. It has been observed that bromelain possesses the ability to bind to many different substrates (Corzo et al. 2012). This allows it a variety of applications across various industries such as textiles, baking,

agriculture, dentistry, and cosmetics (Arshad et al. 2014). One particular study measured the impact of bromelain as a stain remover. Results of this study indicated that it was effective in the removal of stains and whitening of teeth (Kalyana et al. 2011). Additionally, bromelain has been shown to react with components of blood. It can successfully use hemoglobin as a substrate (Corzo et al. 2012) and can help reduce the appearance of bruising after cosmetic surgery (Mackay and Miller 2003). It is also regarded as an anticoagulant as it reduces platelet aggregation in the blood (Orsini 2006). Another ingredient in meat tenderizer that can have an impact on blood is salt. Globulins, proteins that make up about 40% of the proteins found in blood, are soluble by solutions containing salt (Davila et al. 2007).

Despite these properties of the ingredients found in meat tenderizer, there is not much information about their impact on blood stains specifically. While many online

sources do suggest the use of meat tenderizer as a “life hack” for removing tough stains, not many scientific studies have been conducted on this topic (Jones n.d.). Therefore, powdered meat tenderizer containing bromelain was chosen for this experiment. The goal of this study was to test the effectiveness of powdered meat tenderizer in the removal of blood stains from various common fabrics. Cotton, denim, and canvas were used as samples because they are materials that make up some of the most common shoes and clothing items.

### **Materials and Methods**

Samples of three fabrics, cotton, denim, and canvas were collected and cut into three 6 cm squares. The squares were separated into three groups each containing one sample of each type of fabric. Then a lancing device was used to collect three drops of blood in the center of each sample square. The samples were allowed to dry for 24 hours. Once this time had passed each group of squares was placed on its own plate and photographed. In an empty container 15g of Adolph’s original, unseasoned meat tenderizer (Lawry’s Foods LLC, Sparks, MD) was mixed with 5 mL of water. Once combined, 6 ml of the mixture was transferred to each square on one plate. The squares were scrubbed with the mixture for 30 seconds, after which they were transferred to a paper towel to soak. This group was labeled Group 1. These steps were repeated for the squares on the second plate, and this group was labeled Group 2. The third plate received the same treatment; however, the 15g of meat tenderizer was replaced with 15 mL of water. This group served as the control and was labeled Control.

Group 1 was allowed to soak for 1 hour. Once this time had passed, the squares were removed from the paper towel and rinsed with warm water until clean of the meat tenderizer mixture. The squares were

then hung to dry for 24 hours. Group 2 was allowed to soak for 2 hours, after which the squares were also rinsed and hung to dry. The control group soaked for 2 hours as well and was rinsed and hung to dry. Each paper towel used to soak the sample groups were observed, photographed, and disposed. Once dry each group was placed on its own plate and photographed as well.

### **Results**

Before soaking for the allotted times, each sample group was scrubbed for 30 seconds. In the control group, this treatment spread the stains across each square. The blood stains became larger, but lighter in color. Groups 1 and 2 did not undergo these changes. When scrubbed with the meat tenderizer mixture, the stains in these groups remained unchanged. However, once these groups had soaked and were removed from their paper towels, they left behind diluted blood stains where they had been soaking. The control paper towel did not receive any stains from the control samples. It was slightly damp but remained white in color as shown in Fig. 1.



**Fig. 1.** Paper towels used to soak the fabric samples in Groups 1 (left) 2 (middle) and Control (right) after the samples had been removed for rinsing.

Once dry, Group 1 displayed the most vibrant remaining stains. The blood stains on all three fabrics retained their

original size and shape but changed in color. The cotton and denim stains became much lighter in color but were still slightly visible. The canvas stain also became lighter in color but remained clearly visible and defined as pictured in Fig. 2.



**Fig. 2.** Group 1 after having undergone the stain removal treatment and dried with the cotton fabric on the top, denim in the middle, and canvas on the bottom.

Similar to Group 1, all of the remaining stains in Group 2 kept their sized size and shape throughout the experiment. However, the stains on the cotton and denim in Group 2 were no longer visible after they had dried. The canvas stain was still slightly visible but became less defined and light gray in color as seen in Fig. 3.



**Fig. 3.** Group 2 after having undergone the stain removal treatment and dried with the cotton fabric on the top, denim in the middle, and canvas on the bottom.

The stains in the control group did not retain their shape or size. The change observed during the scrubbing treatment continued as the samples soaked. Once dry, the remaining stains on the control samples were much lighter in color but much larger. The cotton and canvas stains were only slightly visible but not clearly defined. The denim stain was no longer visible. This is shown in Fig. 4.



**Fig. 4.** Control group after having undergone the stain removal treatment and dried with the cotton fabric on the top, denim in the middle, and canvas on the bottom.

## Discussion

The results of this experiment indicate that powdered meat tenderizer, if given the proper amount of time, can be effective in the removal of blood stains from fabric. Group 2, which was allowed to soak in the mixture for two hours produced significantly more positive results than those of Group 1, which only soaked for one hour. The control group, which also soaked for two hours, also produced more positive results than those seen in Group 1. This indicates that time is a key factor in the meat tenderizer effectiveness on stains. Groups 1 and 2 displayed some results that differed significantly from the control. In the control group, water alone seemed to spread and dilute the stains rather than remove them. While this did greatly reduce the stains' vibrancy, it left behind a much larger, faintly colored spot. However, the stains in Groups 1 and 2 did not spread when exposed to the meat tenderizer mixture. Instead, much of the blood was transferred to the paper towels on which they were placed, a result that was not observed in the control. While water alone spread and diluted the stains, the meat tenderizer transferred the blood stain out of the fabric leaving it to be absorbed by the paper towel. This suggests that meat tenderizer could be more effective than pure water at removing blood stains. This method of stain removal can be beneficial not only in a household setting but can also give further insight into the applications and properties of bromelain which continues to be a topic of interest in food science and medical communities. Logical next steps for this research would be to test this method of blood

removal against common blood detection techniques such as those used by law enforcement.

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