

# Preventing Injuries from Glass Ampoule Shards

ADVANCES IN GLASS AMPOULE BREAKERS

by Ron Stoker

In 1886, the French pharmacist Stanislaus Limousin (1831-1887) invented a container that was used for storing sterile solutions for hypodermic use. The glass container was named an “ampoule.” The typical ampoule has a cylindrical body, a substantially conical tip, and a narrow neck joining the tip to the body. The tip is hermetically sealed after the ampoule is filled. Although there have been many different variations of the ampoules over the years, the original concept has changed very little from Limousin’s original design.

Glass ampoules are used to store injectable medications and other liquid pharmaceuticals. Ampoules are preferred to store liquid that could have a chemical change when used with glycerin and rubber stoppers. Ampoules hold an exact dose of a medication and help to prevent under/over dosing errors by healthcare workers. The ampoule also assures sterility of the medication if it is used for only one patient.

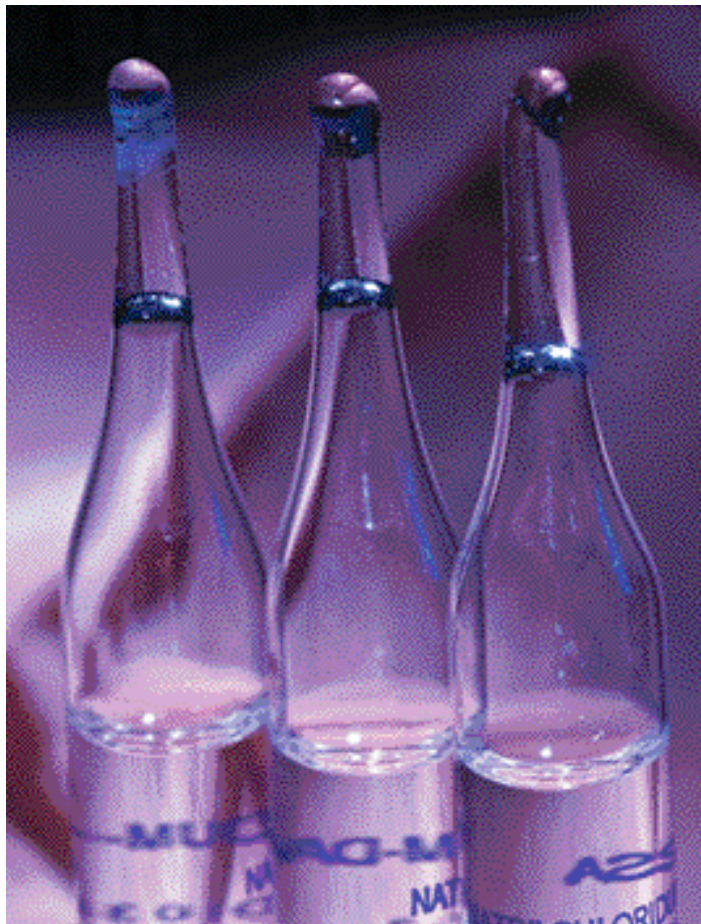
Most glass ampoules are pre-scored around the neck by the manufacturer. The ampoule is typically opened by holding the body of the ampoule in one hand and snapping the tip off the body with the other hand.

Pre-scored ampoules cannot have a deep, narrow score; as such scoring would make the ampoule too delicate to withstand shipping and handling. Placing appropriate scoring into glass ampoules is difficult. The glass at the bottom of a deep, narrow score tends to remold slightly if more than a few minutes pass between scoring and breaking. The result is that pre-scored ampoules by their nature are difficult to break.

## Complications of Glass Ampoule Breakage Contamination of Pharmaceutical Products

Because of the manufacturing difficulties noted above, the broken edges of a pre-scored ampoule tend to be jagged and/or sharp. In one study it was determined that the opening of glass ampoules left glass spikes 51.7 percent of the time which shows the extent of potential injury.<sup>1</sup>

It is common for glass shards to fall to the bottom of the ampoule when the neck is broken. With the broken glass in the bottom of the ampoule it is impossible to use the last few drops of the medication. This means for a 1 mL glass ampoule, as much as one-eighth of the medication may have to be discarded due to shards of glass. If the exact dosage is important and the ampoule only contains an individual dose, an additional ampoule must be opened to complete the dose. This means, expensive medication is wasted and with it any benefits of having a pre-measured, individual dose.



The sharp, jagged edges formed when the ampoule neck breaks incompletely pose a serious danger to medical professionals.

### Broken Glass Injuries

Glass chips often fly off in various directions when the ampoule is broken. Care must be taken to snap the ampoule neck away from the eyes. Glass chips may also fall into the medication. Flying glass chips are an obvious danger to health workers and patients. Glass chips are small and transparent and difficult to locate and remove from bedding, clothing and other surfaces. Glass chips can cause uncomfortable cuts and scratches, even hours later.

### Lacerations to Healthcare Workers and Patients

The sharp, jagged edges formed when the ampoule neck breaks incompletely pose a serious danger to medical professionals. Fingers and hands can be cut from the sharp jagged edge formed where the neck breaks. Ampoule related injuries are frequent and dangerous.

Okay, readers, all those who have had a laceration from a glass ampoule shard—raise your hand! I am raising both of mine—are you? I believe that almost everyone in healthcare has had one or more of these injuries sometime in their career.

In fact, healthcare workers have been subjected to the danger of laceration since the creation of the glass ampoule. In the discussion of prior art patents issued as early as 1916 recognized the danger of receiving injuries from the “splinters of glass” when opening the ampoules.<sup>2</sup> In a study by M. R. J. Parker, hand lacerations due to broken glass were 6 percent.<sup>3</sup> The prevalence of visible old hand lacerations was 26 percent of the sessions studied in another.<sup>4</sup> In an article in *The Journal of Medicine and Biomedical Research* one study found the number of ampoule injuries was similar to the needlestick injury rate.<sup>5</sup>

These injuries can be small or they can be large and dangerous. The unintended contact with the glass during the procedure could cause potentially irreversible damage to tendons and nerves in the hand. Many injuries from broken glass ampoules have been documented.<sup>6</sup> Lacerations from glass drug ampoules ranked fourth as a cause of accidents/injuries among health workers. Physicians had a significantly higher incidence than nurses for cuts from drug ampoules.<sup>7</sup>

### How Do Healthcare Workers Protect Their Hands from Glass Cuts?

Many healthcare workers protect themselves from ampoule related injuries by wrapping a paper towel around the glass. However, the paper towel makes it difficult to view the ampoule. The paper towel method is more time consuming and can make it difficult to manipulate the ampoule. By trading control for safety, the risk of injury actually grows. When using a paper towel, the small glass top cannot be seen and is difficult to feel. It can be easily dropped and may be difficult to find and dispose of properly.

Other clinicians prefer to use a small sterile gauze pad wrapped around the neck of the glass ampoule to protect fingers as the ampoule is opened. This method has similar problems to the paper towel technique and in addition, fibers from the gauze pad can contaminate the medicine and the ampoule.

### New Safety Ampoule Breaker

A new product is available to help protect clinicians from glass shard injuries from glass ampoules. The Starr System Disposable Ampoule Breaker (DAB) is a single-use disposable ampoule breaker. Unlike other products used to break glass ampoules, the DAB entraps the top of the ampoule at the conclusion of the procedure.



The single-use Disposable Ampoule Breaker entraps the top of the ampoule at the conclusion of the procedure.

A number of large medical facilities have adopted the Starr Systems DAB to protect its workers. It is convenient, inexpensive and easy to use. Just SNAP, CLOSE and DISPOSE.

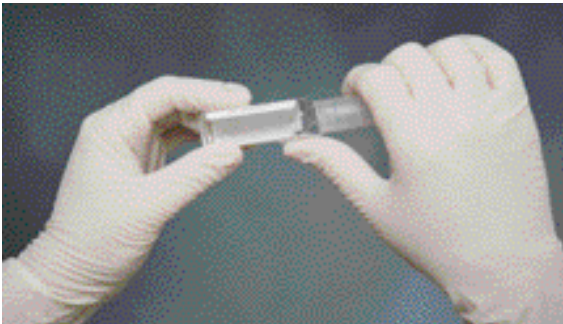
The DAB has ribs which create a better gripping surface for latex gloves. A vision sight glass and translucent color of the DAB allows medical workers to see if any liquid is trapped in the tip prior to breaking. The internal design assists with the clean snap at the neckline. The thumb tab provides an area to place the thumb while applying pressure to snap the top off.

The thumb tab then serves as a closing lid to retain the glass tip securely inside of the DAB.

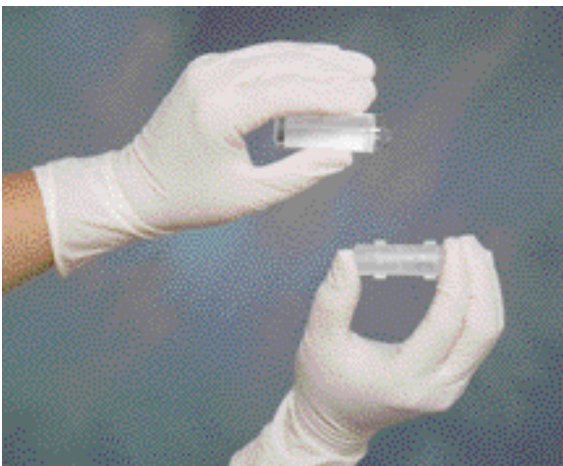
The DAB eliminates need for additional protective materials such as gauze or paper towels. By securely cradling the ampoule during use, the DAB provides protection against accidental laceration.



**Figure 1. Insert glass ampoule onto the Disposable Ampoule Breaker.**



**Figure 2. After folding DAB over ampoule, squeeze until closed.**



**Figure 3. Pull DAB down, snapping tip off of ampoule.**

To use the Starr Disposable Ampoule Breaker simply:

- ▶ Place the DAB in hand with the thumb tab facing down.
- ▶ Lay the top portion of the ampoule onto the DAB with the neck of the ampoule cradled into the groove at the base of the thumb tab. (See Figure 1.)
- ▶ Fold the top section of the DAB over the ampoule and gently squeeze until the DAB is securely closed. (See Figure 2.)
- ▶ Holding the DAB upright, check to ensure all liquid has been removed from the tip of the ampoule.
- ▶ Holding the base of the ampoule securely in one hand, gently grip the DAB in the other with your thumb on the thumb tab.
- ▶ Gently pull the DAB downward, snapping off the tip of the ampoule. (See Figure 3.)
- ▶ With the tip of the ampoule inside the DAB, snap the thumb tab shut, and dispose of properly. After use, the unit can be securely sealed to provide a safe, clean, convenient means of disposal.

DABs are available in three sizes. 1-4 ML, 5-10 ml, and 11-20 ml. They come in both 1,000 part boxes and 10 bags of 100 in a box.

Use of the DAB to break off the tip of glass ampoules gives clinicians the means to prevent sharps injuries by protecting fingers and hands from glass cuts. The DAB is hygienic and reduces contamination from bloodborne pathogens. For more information on the Disposable Ampoule Breaker contact Starr Systems at 620.242.2377 or send an e-mail to [lstarr@starrsystemsllc.com](mailto:lstarr@starrsystemsllc.com). †

## References

1. Palmer J, Ball D. Opening propofol ampoules. *Anaesthesia* 1998 ; 53: 416-7.
2. Patent 1,166,761—January 14, 1916.
3. Parker M. R. J.; *Anaesthesia*, 1995, vol. 50(8); 726-729.
4. *Journal of Medicine and Biomedical Research* VOL. 3, NUM. 1, 2004, PP. 59-66.
5. *Journal of Medicine and Biomedical Research* VOL. 3, NUM. 1, 2004, PP. 59-66.
6. G. Chandan: Propofol ampoule: Take care while opening. *The Internet Journal of Anesthesiology*. 2007 Volume 12 Number 2.
7. Guo YL, Shiao J, Chuang YC and Huang KY. Needle stick and sharp injuries among health care workers in Taiwan. *Epidemiol Infect* 1999; 122(2): 259-265.

*Ron Stoker is the founder and executive director of ISIPS, the International Sharps Injury Prevention Society, and is a frequent contributor to Managing Infection Control magazine. He speaks frequently at national and international meetings on sharps safety, hand hygiene and infection control issues. He is coauthor of the "Compendium of Infection Control Technologies." For more information on the Compendium, please send an e-mail to [info@isips.org](mailto:info@isips.org). Mr. Stoker is providing a number of webinars focusing on a variety of sharps injury prevention. The Academy of Safety Excellence for hospitals will be starting in October. For more information on the Academy, go to [www.isips.org/hospitalacademy.php](http://www.isips.org/hospitalacademy.php).*