THE EVOLUTION OF SYRINGES AND NEEDLES

By Heather Smith-Thomas

There are a multitude of options today when selecting syringes for vaccinating or medicating cattle—many more options than were available 50 years ago. The dose guns, disposable syringes and pistol-grip multi-dose syringes are standard tools that we now take for granted, but they are relatively new inventions.

The basic idea of injecting substances into the body (human or animal) is not new, however. The word “syringe” comes from the Greek word “syrinx” which means tube. A syringe is simply a cylindrical tube fitted with a plunger that is tight enough to keep air or water from getting past it, so that when the plunger is pulled or pushed it can draw or push a liquid or gas through the opening at the other end of the tube.

The first syringes were simply hollow reeds, used by the Romans in 1st century A.D. to treat medical conditions in people by using the “tube” to deliver medication. In the 9th century A.D. an Egyptian surgeon created an actual syringe using a hollow glass tube and suction. Early syringes down through the centuries were used primarily for giving enemas or as “pus pullers” to clean out infected wounds. Larger ones were used for flushing/irrigating wounds and abscesses. Many of these had long cannulas attached.

Brass syringes were in use during the 1400’s, and many syringes in 17th century England were made of pewter or silver (the latter having some antimicrobial properties). The earliest needles (1600’s) were hollow goose quills. By the mid-19th century smaller syringes with screw attachments could release a single drop.

Then Francis Rynd, an Irish physician, invented a hollow needle and made the first recorded subcutaneous injections in 1844. In 1853 Alexander Wood, a Scottish doctor, developed a medical hypodermic syringe with a needle small enough and sharp enough to more effectively pierce the skin. Wood had created an all-glass syringe in 1851 that allowed a better estimate of dosage because a person could observe the level of the liquid within it. He experimented with injected morphine to treat nerve conditions, and ended up addicted to morphine.

Enema syringes and stomach pumps were in popular use all through the 1800s. A medical catalog in 1868 offered 39 varieties of syringes just for giving enemas. Some of the smaller syringes had a rubber or twine-bound plunger. In 1897 the first all glass Luer syringe was in use. In 1899 Letitia Mumford Geer of New York patented a syringe that allowed the user to operate it with one hand.

In 1946 the Chance Brothers in England created the first all-glass syringe with an interchangeable barrel and plunger that allowed mass sterilization of all components without needing to re-match the individual parts. Then in 1949 Australian inventor Charles Rothauser created the first plastic disposable syringe (made of polyethylene). These syringes had to be chemically sterilized before being packaged for sale, however—rather than sterilized with heat because they softened if heated—and this made them more expensive. Two years later he changed to polypropylene which is a plastic that can withstand heat. In 1956 and 1961 two other inventors were granted patents for disposable plastic syringes. In this country, Phil Brooks received a U.S. patent for disposable syringes in 1974.

Modern Veterinary Syringes

Dr. Dave Barz, (Northwest Veterinary and Supply, Parkston, South Dakota) says the first multi-dose syringes that many people used for livestock were the old glass-barreled syringes with the little roller spool to set the dose. “That’s where we all started. The biggest problem with those was control of the dosage. If you had a 20 or 30 cc syringe it was about a foot long or longer, and to run the plunger and the barrel itself required two hands, so it was a slow process. Proper placement for the injection was also a little challenging. Another drawback was that those barrels broke easily,” he says.

“Back in the days of administering hog cholera vaccine, we also had what was called a shackles bag. It was basically a pouch that hung on the chest of the person using it. There was a hose coming out of
the bottom, attached to one of those dose guns with a plunger on it. A person could do multiple injections with this, and when we were doing hogs we did a lot of them that way. For hog cholera we were giving serum, which required a fairly large volume,” says Barz.

The pistol grip guns were an improvement, and came into popular use about 50 years ago. These gave better control, with one-hand usage, more accurate dosage and were easier to handle. “Originally those were German made, like the Roux and Hauptner. In that transition time, a lot of people had just one or maybe two of those pistol grip guns and were utilizing other syringes for the rest of the vaccines. They’d decide which product/dosage was the most critical to be the most accurate and use the pistol grip syringe for that one. Eventually everyone had those; American companies like Ideal came out with some of them,” he says.

With these a person could set the dosage for a 1, 2, 5 or 10 cc shot. They were calibrated, and did a pretty good job of shooting the exact dosage. At that time they syringe guns were all glass barrels, with most of them protected by a metal casing--which made the syringe fairly heavy.

“Then Hauptner came out with a plastic barrel, for less breakage. The glass ones were relatively thin glass and if you bumped them into the side of the chute the barrel might crack or break. So they used plastic to try to make them more durable,” he says.

“Then they came up with the draw syringes, where you basically have a pouch and hang the bottle on the chute or on your person, with a tube that runs to the gun. Those are relatively inexpensive now, compared to the price of a pistol grip. The latter run about $50, on average (with the more expensive ones about $90), and the dose syringe is only about $7 to $12. We use a lot of these and they handle BQA standards a little bit better in that you are never tempted to place a dirty needle into the bottle to draw out the product. You never contaminate your bottle. You hang the bottle on the chute, and the syringe constantly draws out of it, through the tube. When you need a new bottle you just change it out,” he says.

“The biggest drawback to these is that some people will go all day without changing the needle, and needles need to be changed every 10 to 15 head. These syringes are small, short, and easier to get into the chute because they don’t have a long barrel. So ease of placement is much better, and we like these a lot. They are inexpensive, so when they wear out they can be readily replaced,” he says.

There is some risk for freezing up the tubing in really cold weather. “A lot of the animals being vaccinated around here are in a feedlot, however, and we often put up our own propane heaters. There are some companies that make a heated pouch, and you can also use an in-line heater to keep the line from freezing. If you are giving a nasal product in cold weather, you might hang the bottle on your torso, run the tube down your arm, and maintain the gun in your hand. Your body heat would keep it from freezing. We’d be reluctant to do that, however, if it’s a syringe with a needle on the end of it, because that wouldn’t be as safe,” he says.

“The vaccines are probably a little easier to handle in cool weather than some of the more viscous products like antibiotics. They may not freeze, but they may become thicker and harder to force through the needle,” says Barz.

“Several companies have made modifications on pistol grip syringes. Allflex has one that is all plastic and the barrel doesn’t break as readily. There have been some improvements made, over time,” he says.

“About 10 years ago one drug company was offering syringes that didn’t use needles, forcing the vaccine into the skin with air pressure. The syringes may still be out there but the drug companies let their contract go and pulled them off the market. These syringes were relatively expensive, but worked very well. There was no chance of contamination (of vaccine, or between animals). It worked nicely for any producer who was on an eradication or disease control program for a disease that could be transferred from one animal to another via needles. With this gun you didn’t have to change needles between each animal; compressed air forced the vaccine into the skin,” he says.

“Vaccine in the skin or right under the skin stimulates good immunity. One of the earliest horse vaccines, for equine encephalomyelitis (sleeping sickness) was injected intra-dermally, between the layers
of the skin, to create a bubble of vaccine that would absorb slowly. The body response to this type of vaccine very well. Strangely enough, with cattle, we ended up poking needles clear into them for every kind of vaccine. The air gun is a great alternative, especially when vaccinating a lot of cattle, but it fell out of vogue, possibly because they were so expensive,” says Barz.

Some syringes have the vaccine bottle attached to the top of the syringe, which eliminates drawing vaccine out with a needle. “These work best for small doses, such as giving only 1 cc to each little pig in a pen or a litter, and you basically hold those pigs while you give the injection. For me, to use it for cattle, having the bottle on the syringe is just that much more to pass through the bars of the chute, with a chance for breaking the bottle or bumping it off the top of the syringe. To refill these, the bottle has to be upright. If you lay it on its side and release the trigger for it to refill, it may just refill with air. The refill is more difficult on these,” he says.

“People doing AI often use this type of syringe when they are setting cows up, giving a small dose of hormone. Dairy people also use them when treating cows they are trying to force to cycle. Those syringes are handiest for giving something that is very low dose—like 1 or 2 cc,” says Barz.

“Many people who are using these syringes for vaccinating are using them on small calves, rather than for cows in a chute. This type of syringe with bottle on top works well for vaccinating calves at branding or turnout time, with the calf flanked and stretched out on the ground, or restrained on a calf table. These syringes are really handy in this situation because you can’t have the bottle hanging somewhere; it’s always right there on the syringe. But feedlots use mostly draw guns with tubing,” he explains.

The draw guns are also best when giving large volume doses like a dewormer or delousing product that might be 15 cc. The modifications on the draw guns have improved, especially the ones with needles for giving injections. “Also, when using these, the important thing is a place to hang or guard that syringe and needle so it is not exposed to everyone who is working next to the chute. You can’t just let them dangle when you are not using them,” he says.

“Micotil now provides a guarded needle gun with safety features on it, so that theoretically it is impossible to inject yourself. They have worked on safety features and have put a lot of thought and time into them—just to make them safer and more BQA friendly for everyone,” says Barz.

“We have come a long way in syringes, and there have been some good changes. Some people think the beef industry hasn’t made any changes in the past 50 years, but we have,” he says. Everyone has their own preference regarding syringes, depending on their facility, what they are accustomed to, and what their crew is used to.

“We still have a few people using a plastic syringe or disposable syringe if they don’t have very many animals to do. But for efficiency (the best vaccination in the least amount of time), proper placement, etc. many people are using a draw gun (with tubing). The disadvantage to the draw gun is if you are giving a 2 cc dose, it takes about 10 doses to fill the hose, before you get to the metered amount that will go through the syringe. So if you are not going to be vaccinating very many animals, this won’t be very efficient. You’d need to be doing at least 50 head to make this practical and efficient,” he explains. Otherwise the pistol grip gun is better.

“When we go out on a job as veterinarians, we carry all kinds of syringes so we will have the appropriate tools for whatever we might be doing. We’ll have draw guns, pistol grips, plastic disposable syringes, etc. but we no longer use any of the old ones with the roller spools. It is good to have a selection and good to have a spare,” says Barz.

A person also needs needles of proper length and size for what you are dealing with (18 gauge for smaller calves, 16 gauge for larger animals), and to change needles often if you are vaccinating a lot of animals. “The ironic thing about the way needles are marketed is that the larger the number the smaller the bore (a 14 gauge needle is huge and a 20 gauge needle is tiny).” Unless a person is aware of this, it can be confusing.

“Our beef industry needs to pat ourselves on the back for what BQA has done, what it’s made us aware of, and how we have changed, to produce a better product. Trim is down, abscesses are down; there
are fewer problems encountered on carcasses today. The days of excessive trim, finding needles in meat, etc. are pretty well past. We are doing a good job of producing a quality product now. We just need to keep it up, doing whatever we can to make it better."

This means choosing the appropriate tools for the job, keeping syringes clean (with proper cleaning after use), changing needles often, and following BQA recommendations for proper administration and injection sites.