New innovations in modern pig production seem to come at an alarmingly fast pace, and one of the most exciting to watch has been the development of portable ultrasonic equipment for diagnosing pregnancy in swine. The diversity and ingenuity in adapting the sophisticated equipment for practical use in modern hog barns has been nothing short of amazing.

In the summer of 2005, Pig International and the University of Illinois teamed up to perform a field test of the ultrasound equipment on display at the at the World Pork Expo (WPX) in Des Moines Iowa. The intent was to provide producers a comparative guide that could help them to select the right piece of equipment to suit their needs. We tested seven portable machines under identical conditions in a modern swine confinement barn. The machines were supplied to us either by the manufacturer or by one of the distributors. All except one of the machines were 2-dimensional display, real-time B mode ultrasound units. The remaining machine was an A-mode ultrasound unit with no display screen.

We evaluated the equipment for ease of use, practicality, comfort, ability to diagnose open and pregnant females in crates and in loose pens. We generated pictures of each piece of equipment during field use under standard photography conditions to assist producers with machine comparison. We did not evaluate other aspects of the machine such as the additional features, speed and accuracy of imaging, equipment durability, battery life, or service.

In our field test, all of the equipment tested superbly, but as expected, each had its own unique features and we identified individual machine pluses and minuses. We took some time to become familiar with each machine in set up, battery charging, and operation of the equipment from the brief guidelines in the manual. The machines had many different features, but the features we keyed on were those that would facilitate rapid pregnancy diagnosis involving gain, brightness, contrast, imaging depth, and magnification.

After becoming familiar with the equipment after use one or two animals, getting readings for each of the remaining animals was fast (pregnant or not pregnant) and required 2-10 seconds after application of the transducer for each female. In some cases it was possible to ultrasound sows while lying down, but for practical comparison all animals were coaxed to stand in their stalls or pens. All of the machines were used on an identical group of 6 gilts and 12 sows that were ~25-30 days post insemination, 4 sows that were 40-47 days following mating, and 5 cull sows that had failed to conceive. The day 25-30 pregnant sows were visualized to determine the ease and accuracy of diagnosing the placental fluids of pregnancy when it is at maximal diameter and volume. The testing of sows at days 40-47 was performed because fluid volume is lowest and fetal components are increasing, leading to a greater challenge in
accurate diagnosis with ultrasound. The non-pregnant females served as negative controls.

Machine Tests

Machine set up and features
The TRINGA, by Pie Medical and supplied to us by Veterinary Sales and Service Inc., Stuart, FL was very easily to set up and use. It is the only model with a unique light weight design to be worn on the wrist. The machine comes with two external batteries that were easy to charge. The machine is firmly attached and secured to the arm using a heavy duty wrist cloth with a velcro strap. Two cords are attached to the wrist unit, one for power from a small battery worn in a back pocket, and the other cord for the hand held transducer. This machine has a 5 MHz mechanical transducer and the resulting image can be magnified multiple times. The image is good, and can easily be adjusted with controls on the face of the machine. However, to get a clear image during use, the wearer must learn to rotate the wrist to get the proper angle for imaging. The Tringa was fantastic in its portability and there was no fatigue to either hands or arm. It was necessary and practical to hold the bottle of lubricant in the same hand as the machine to quickly lubricate the transducer in the opposite hand. There was inevitably, some neck strain in viewing the screen while bent over the animal, but this could be alleviated by where the machine was held. To change arms or to get at the opposite side of the animal was not an easy task and this required removing the machine to switch arms. This took some time and some getting used to with the opposite arm. This machine had cords that were easily caught on metal protruding into the alleyway, and in some cases pulled out the power cord out. Some method for keeping the cords together and close to the body or by running cords through clothing could help. Cleaning the machine involved washing the glove (washing machine), transducer, machine and cords.

The DRAMINSKI ANIMAL SCANNER, by Draminski
This machine is relatively new to the US market. It came with two batteries that were simple to charge. One of the batteries was then attached to the back of the machine. There were two cords, one for the battery and one for the transducer. The set up of the machine was easy and the machine was positioned to be worn around the chest using a chest and neck harness. It was necessary to refer back to the manual for how to change machine settings, since the system used a numerical combination to change gain and contrast/brightness. The machine had many additional features, but many were not essential for pregnancy diagnosis. The machine portability was only fair, because although the machine was not large, it was heavy and uncomfortable around the neck. The addition of the battery on the back of the machine increased the weight considerably. The weight issue and comfort could be improved by using a pocket battery system and an improved harness system. This machine had the largest screen and superior picture quality compared to all of the machines tested. The design made switching hands or sides of the animal for observation easy to perform. The hanging cords caused problems by stepping on them when bent over and getting them caught on stalls. The machine also wobbled when imaging in different positions. Neck strain was also a problem, since the user had to look down or sideways for the image in addition to dealing with the sheer weight of the machine. The cords, weight, and wobble, made it difficult to step over crates with
Cleaning of the equipment was simple but would require cleaning the machine, transducer, harness, and battery.

The AGRISCAN A-7, by ECM, and distributed by Cotran Portsmouth RI is a relatively new entry to the US market. The machine was surprisingly lightweight for its lunch-box shaped size and appearance. It had only one cord, and that was for the transducer, because it contained a built-in battery. The machine was very easy to set up, but when it came to how to wear the machine, there were no instructions or pictures in the manual. We wore the machine around the chest using the supplied harness. The clips for attaching the chest straps to the machine were awkward, of poor quality, and were difficult to clip on the machine. This could be greatly improved with a better quality harness system. The machine itself was easy to use, and changing settings was simple with the press of buttons on the face of the machine. The machine produced an impressive quality picture. The machine was very lightweight and in practical use, it was not difficult to switch hands or sides of the animal for observation. However, because of the location on the chest, it did produce some neck strain in order to visualize the screen when bending over the animal. In addition, the straps were slightly uncomfortable. The machine had only one hanging cord so this could be prevented from getting caught by keeping it close to the body. For cleaning, the clip for latching the straps to the machine made the process more difficult. The clips may not survive repeated use. Cleaning was not difficult, but both the machine as well as the transducer got dirty.

The BANTAM, by E.I. Medical, Loveland CO is a greatly improved version of one of the original portable ultrasound machines that has been in use for the last 10 years. This machine is unique in that it is the only one that uses goggles for a heads up display. Battery charging was simple and it came with two batteries. The machine is worn in a pouch on a belt. There were three cords, one for battery supply, one for control, and one for the transducer. This was one of the most comfortable units to wear and to maneuver around with when performing ultrasound. Setting up the machine was not difficult and required only a brief familiarization with the equipment and a quick read through of some parts of the manual. The machine uses a 3.5 MHz transducer and produces a good quality image. Changing the image settings was very easy with a separate hand held image control. Lubricant was carried in the opposite hand, and the transducer in the other. It was very comfortable to use and produced no hand, arm or neck strain. If the user needed to switch hands and sides of the animal to scan, this was no problem. There was only one cord hanging out but it did get tangled on the crates. For this machine, cleaning the harness, machine and transducer could be necessary.

The VETCO, by NOVEKO, Lachine, Quebec
The machine is new to the US market. It is a small lunch box shaped machine that is worn with a chest harness. The set up of the machine is somewhat awkward as the battery is charged out of the machine and then reassembled into the back. The charger had three parts, an adapter, charger and the battery itself, and these did not appear very structured. It was difficult to get the machine to fit well into the harness because it was too tight over the transducer cord and came too close to cropping the screen. There were no pictures or instructions in the manual to show the user how to wear the machine comfortably with the harness.
When inserted into the harness it was lightweight and comfortable and had only a single cord for attachment to the transducer. The machine was easy to use but there was always some delay in waiting for the machine to respond to a settings changes made by pushing buttons on the face of the machine. The image was surprisingly very good and the machine had only one hanging cord. This could get caught but could be remedied with changing the cord location. The location of the machine on the chest using the harness caused neck strain, but switching sides and hands was not problematic. Cleaning was not problematic and involved the probe and machine.

The PREGTONE, by Renco Inc.,
This machine has been around for over 10 years and has proven itself reliable and useful. Unlike the other machines tested, it is an A-mode machine. It is the smallest of all the machines and by far the lightest and most portable. It has an internal battery that is charged by plugging it into the wall. The machine can be worn by clipping it in on a pocket or belt, but it does not comes with one. It has only one cord for the transducer and has no settings to change. It is easy to set up and use. The indicator for this machine is an audible beep. Intermittent beeps indicate not pregnant and long steady beeps indicate pregnant. The machine allowed for fast and accurate readings of all pregnant females and open sows. However, the machine did allow one misread of an open animal as pregnant. This can often occur due to urine in the bladder, or fluid accumulation in the peritoneal cavity, but is not associated with fluid from pregnancy in the uterus. The sound and type of signal (continuous or intermittent) was sometimes difficult to hear in the noisy room and with vocal animals. It had only one hanging cord but this could sometimes get caught on the crates. Interestingly, the signal at day 40-50 was strong and clear, whereas with all of the B-modes, the ultrasound image was usually unclear. The machine and transducer were easy and simple to clean.

INSIGHT by Classic Medical, Tequesta FL
This machine was the most intriguing and surprising of the group, based on its unique design, self-contained transducer, and orange and black screen colors. The batteries were removable rechargeable small cell batteries which were inserted into a small compartment. The machine was lightweight, easy to hold, and was secured around the wrist with a single loose strap. The machine was easy to set up and use. It had only one gain control that could be changed for imaging on the face of the machine. The image was dependent upon the correct gain intensity but once this was set, the image was not difficult to visualize. There appeared to be different ways to hold the machine based on user preference. It was only possible for one observer to view the image at a time due to the screen location at the point of the flank and no image freeze capability. There was no neck strain with this machine. However, there was some strain with the arm muscles, since imaging required machine angle and contact adjustment. This strain increased with continued use and it became necessary to switch arms. It was easy to switch hands to switch hands and sides of the animals, but did take time to get used to. It was somewhat more challenging to get the machine down to the flank of all sows, due to the size of the machine and need to get it on the flank of sows in narrow crates. The lubricant was held in one hand and the machine was held in the other. Some place to hang or hold the machine using a belt clip would have been helpful. Cleaning was very easy and only the unit itself needed to be cleaned.
Table 1.

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* MORE stars indicates LOWER cost (categories were: <$500; $500-$2500; >$2500-$5000; >$5000-$7500; >$7500).
PICTURE FORMAT

In crate close up

As worn

In use in loose pen

In crate in use
Tringa
Bantam EI Medical
Vetco-Noveko
Draminski Animal Scanner
Pregtone-Renco
Insight-Classic Medical