Post Rock Extension District Column
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Practice Good Habits to Ensure Safety When Handling Liquid Nitrogen Tanks

Breeding season is still a ways off but those that use artificial insemination may be busy delivering or picking up semen stored in a liquid nitrogen tank. Unfortunately, many of the people involved with moving these tanks may be unaware of the safety precautions they should be taking when doing so. Understanding more about liquid nitrogen and its properties will reduce complacency and help prevent accidents.

Nitrogen in a liquid form (liquid nitrogen, LN) is very cold and serves a cryogenic purpose in storing and preserving semen. To remain a liquid, it must be kept at very low temperatures. The semen tanks we use are well insulated and serve this purpose. As liquid nitrogen is exposed to warmer temperatures it changes to vapor and the resulting gas form now takes up 700 times the liquid's volume. When this happens the nitrogen gas displaces oxygen. In an enclosed area this can deplete the amount of oxygen to the point where there is not enough oxygen for life. The level of oxygen in clean outdoor air is 20.9% and supports life. A potentially dangerous environment is reached when oxygen levels decline to 19.5% or less. Humans are unable to detect the nitrogen in the air (no color or odor) so in an oxygen depleted environment an individual may feel dizzy, confused, or just slip into unconsciousness without any awareness of a possible issue before complete asphyxiation. ABS Global (ABS), located in DeForest, WI, produces and delivers semen all over the world. This organization has conducted studies that help us understand some of the safety issues with transporting LN in semen tanks. When they placed two newly filled tanks in the back seat of a crew cab pickup, it only took 3 minutes before the cab contained unsafe oxygen levels. At the end of 60 minutes, there was only 14.7% oxygen in the cab. If one of the tanks was allowed to tip on its side, it took less than one minute for oxygen to decline to 18.3%.

Liquid nitrogen tanks are designed to vent around the slots in the stoppers, because without this they would explode. Factors such as the age of the tank can further impact the likelihood of undetected leaks and the risk of hauling a semen tank inside the closed cab of a vehicle. The extra space in the pickup cab may seem like a convenient place to haul a tank, but not if it puts lives in danger. Rather, take the time to develop a plan to secure the tank in the bed of the pickup for transportation. The same oxygen depletion issues mentioned in the cab of a pickup could also occur if a tank was stored in a small unventilated area/closet. If a tank fails or develops a leak, the warming nitrogen vapor can quickly displace the oxygen. To keep the bottom of your LN tank from developing leaks do not store directly on concrete or drag or roll the tank across the concrete floor. For larger tanks, a base to hold the tank with rollers on the bottom is very helpful. Avoid actions that will result in denting the outside of the tank and subsequent damage to insulative properties. The stopper should not be inserted if it contains any moisture to prevent freezing in place and interfering with normal venting. Replace a damaged or dysfunctional stopper. Frost or ice anywhere around the lid or elsewhere is a sign of tank failure and immediate steps should be taken to transfer contents to a functioning tank. Make sure the tank is upright and secure in any storage location. Exposure of skin or other tissues to LN or

substances cooled by LN can result in severe burns. Wear eye protection and gloves when handling semen. A straw that explodes when it hits the thaw bath becomes a dangerous projectile. Use tweezers to move individual straws from canes to the thaw bath. While it is good to be focused on management to optimize cow response to AI and estrus synchronization, don't lose sight of the importance of all team members that help make that happen and their safety. Respecting the properties of liquid nitrogen by practicing safe handling from moving to storage and insemination is sure to benefit all.

Thanks to Sandy Johnson, Kansas State Extension Beef Specialist, for sharing information related to the safety of handling liquid nitrogen tanks during breeding season. For further information, contact me at any Post Rock Extension District Offices in Beloit, Lincoln, Mankato, Osborne, or Smith Center.

Post Rock Extension District of K-State Research and Extension serves Jewell, Lincoln, Mitchell, Osborne, and Smith counties. Blaire may be contacted at blairet@ksu.edu or by calling Beloit 738-3597, Smith Center, 282-6823, Lincoln 524-4432, Mankato 378-3174, or Osborne 346-2521. Join us on Facebook at "Post Rock Extension" and remember our website is ***www.postrock.ksu.edu***.