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NBC Sets the Bar for Biosecurity and Equine Medicine

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NBC Sets
the Bar for
Biosecurity
and Equine
Medicine



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about the cover:

New Bolton Center's new James M. Moran, Jr. Critical Care Center, slated to open in June, sets the bar in biosecurity. Inset: The 2004 *Salmonella* outbreak at New Bolton Center and lessons learned during its cleanup, set the groundwork and standard of care for the new Moran Center facility.

NBC SETS THE BAR FOR BIOSECURITY

Lessons learned from a Salmonella outbreak set the scene for drastic, state-of-the-art improvements and peace of mind

BY MARGARET E. GUTHRIE

Six years ago, Penn Vet's New Bolton Center faced a daunting challenge.

In 2004, a *Salmonella* outbreak had devastating effects in the George D. Widener Hospital for Large Animals. It was one of the most severe setbacks of New Bolton Center's proud, 52-year history, and, while the effects of this catastrophe were well documented, less well known are the tireless efforts of the hospital's faculty and staff to correct the problem and prevent a recurrence.

The hospital re-opened after 10 weeks of extensive remediation, which included intense scrubbing and disinfection to removal and replacement of drains, floors and surfaces in the physical plant. At the same time the hospital's care delivery procedures underwent the closest possible scrutiny. The result? A dramatic reorganization of clinical personnel, greatly heightened infection surveillance measures and the implementation of rigorous biosecurity protocols.

"Rather than housing patients according to the condition with which they presented, they were now housed according to the level of risk of infection their illness or injury warranted," said Dr. Helen Aceto, who was named director of Biosecurity at New Bolton Center in 2004. Simply put, the protection of our patients from infectious diseases was – and remains – a preeminent priority.

The six-year culmination of these ever-evolving efforts comes to fruition this summer with the dedication of the James M. Moran, Jr. Critical Care Center. This state-of-the-art facility follows in the strong tradition of other groundbreaking New Bolton Center innovations in equine/large animal veterinary medicine such as the Jeffords Treadmill, the Connelly Intensive Care Unit, the Graham French Neonatal Section, the Scott Equine Sports Medicine Building and of course, the original George D. Widener Hospital for Large

Animals. This campus has long been a model for other large animal veterinary facilities, particularly in terms of the care provided critically ill patients, especially those with colic or infectious diseases requiring isolation.

Dr. Aceto explained that New Bolton Center sees some of the most seriously ill large animals in the mid-Atlantic region, and in numbers that few other hospitals can accommodate. The hospital's patient case load is one of the largest in North America and for many it is a last resort. So it has been especially vulnerable in terms of one of the late 20th and early 21st century health care menaces: hospital-acquired (nosocomial) infections.

The Horse – A Social Animal

A key factor in equine infectious disease vulnerability is the extraordinary degree to which horses travel and interact with other horses.

"Next to humans, horses may have the most social interactions of any mammal, certainly in terms of being exposed to other horses outside their immediate social group," said Dr. Aceto. "Racehorses commute between tracks; show, event, dressage horses and polo ponies travel to and from competitions; and backyard pleasure horses do trail-rides. This travel consistently exposes horses to with whole new populations of horses and people."

Travel creates stress for the horse, as does competition. New surroundings, strange schedules and possibly different food and water contribute to the likelihood of problems for the horse's immune system. A weakened immune system leaves a horse vulnerable to infection.

As a referral center New Bolton sees many patients whose immune systems may be compromised. In a recent paper



The 2004 *Salmonella* outbreak at New Bolton Center has devastating effects. The cleanup required a complete close-down of the hospital during which time staff came together to scrub down the entire facility.

co-authored by Dr. Aceto with Josie Traub-Dargatz, Paul Morley and Nathan Slovis, they write: “The very fact of hospitalization makes these animals different from the general population in that they are more likely to shed or acquire an infectious agent because they are more likely to be under stress, may be less able to respond immunologically, have altered nutrition, have disturbances in their normal flora, may be receiving antimicrobials, are concentrated in close proximity to other animals that have similar risk factors.” Additionally, those patients coming into a hospital provide an opportunity to introduce infectious organisms to naïve (uninfected) individuals that may be hospitalized at the same time.

The paper adds, “Those hospitals that accept referrals, emergencies and treat critical patients must seriously consider the need for a dedicated isolation unit sized for their caseload.”

In 2004, in its direct response to the *Salmonella* infection, New Bolton Center began categorizing incoming patients as high-, medium- and low-risk and dedicated the freestanding C. Mahlon Kline orthopedic building to housing a specific group of high risk patients – equine colics. Although numerous modifications were made to the C. Mahlon Kline building to ensure that it could fulfill that function as effectively as possible, it was not completely ideal in terms of infection control for the high-risk colic patient.

While the Widener Hospital has always had a facility dedicated to critically ill patients that require isolation, for today’s much greater and more complex patient caseload the current building is too small, lacks certain features necessary for state-of-the-art critical care and is inadequate from a biosecurity perspective. The Moran building addresses all three crucial issues: capacity, patient care and infection control. An added advantage of the eagerly anticipated opening is that the C. Mahlon Kline building will be able to return to its original intended use as a dedicated orthopedic facility with an adjacent procedures room; thereby also relieving pressure on other very busy clinical spaces in the Widener Hospital.

Not a Unique Challenge

The problem of hospital-acquired infections is certainly not limited to New Bolton Center. A paper published in the September 1, 2008* issue of the *Journal of the American Veterinary Medical Association* described a survey conducted

between July 2006 and July 2007 by researchers that included Dr. Paul Morley, director of Biosecurity for the James L. Voss veterinary teaching hospital at Colorado State University. The survey found that in the preceding five years, 31 of the 38 veterinary hospitals surveyed had experienced outbreaks of nosocomial infection. Twenty-two of the hospitals had to restrict admission at some time during the five-year survey period and 12 had to shut down completely for a period of time. Both the institutions that restricted admission and the ones forced to close for a period reported that the leading cause of nosocomial outbreaks was *Salmonella* followed by MRSA (Methicillin-resistant *Staphylococcus aureus*).

Less than 1 percent of healthy horses shed *Salmonella* while 10 – 12 percent of horses admitted with colic will shed the organism in their manure. That is why it is imperative to separate horses that are admitted with colic from the rest of the hospital population and why it is then important to have the ability to further isolate horses with colic that start to shed *Salmonella* from other colic patients.

According to Dr. Aceto, horses that require surgery to relieve the colic are three to five times more likely to shed *Salmonella* than horses with colic that respond to medical treatment. Published studies from the University of Florida’s equine hospital also revealed that colics requiring surgical intervention are at higher risk and that 10 percent of all horses admitted with colic were found to be *Salmonella* positive, a figure that is similar to reports from other veterinary treatment centers. In addition to changes in patient management and facilities, efforts have been made to improve testing so that *Salmonella*-positive patients can be detected at a higher level of sensitivity and with greater speed than was previously possible using conventional culture techniques. To this end, scientists at New Bolton Center validated and implemented a real-time PCR test that is both more sensitive than conventional culture, is capable of providing results overnight as opposed to three to five days later, and allows prompt initiation of containment and isolation measures.

These are the critical considerations that mandate a separate building, dedicated to the care of the highest risk patients, and built to the highest of standards of patient care and biosecurity, as an absolute necessity for any modern veterinary hospital, and why the doctors and nurses at New Bolton Center are so anxious to see the Moran Critical Care Center in use.



The new James M. Moran, Jr. Critical Care Center is a necessary, state-of-the-art addition to the New Bolton Center campus, which will ensure top-tier care for equine patients.

The Design

Containment and control are vital to stop the spread of infectious organisms. Controlling potential spread of infection at a large veterinary teaching hospital like Penn Vet's New Bolton Center requires enormous expenditures of effort, time and money when dealing with outdated facilities. And that is why New Bolton has moved aggressively to open new, thoughtfully designed isolation and critical care units. These new facilities incorporate important design elements essential to providing the



very best of care while maintaining as pristine an environment as possible. "The way that animals are moved, the way veterinary hospital stalls are cleaned, the way staff move from stall to stall, even the way air circulates all contribute to the ease with which infectious organisms can move about hospital wards (barns)," said Dr. Aceto.

The James M. Moran, Jr. Critical Care Center prevents direct interactions between patients. All stalls are completely self-contained with individual access from the outside. Each patient enters its stall by one door and exits the same way. Patients do not cross another's path; bedding is brought into each stall individually from the exterior and cleaned out the same way. Once removed, used bedding is immediately taken to a dedicated, semi-enclosed area located at the end of the building. This area is accessed on one side from the colic wing and from a different side by isolation. Waste material is deposited in a receptacle that is for the Moran Center and none other. The danger of contamination of other horses through the everyday maintenance of each patient's stall is greatly minimized. The center aisle of the facility is reserved for the use of medical staff and clean equipment only. Any clean equipment that enters a stall must be removed through the exterior door and returned to the clean corridor only after it has passed through the laundry and cleaning area (a "clean-to-dirty" movement pattern that is not reversed unless items have been re-cleaned).

Air circulation is a critical element in a high risk health care facility and has certainly been addressed in the Moran Center. The entire facility is environmentally controlled to provide the maximum in cleanliness and comfort. A particularly important feature is air pressurization of the central corridors relative to the stalls which ensures that all air transfers are from the clean hallways through the stall, to the exterior of the facility; when a stall door to the clean corridor is opened, instead of air rushing into the rest of the building from the stall, the air moves from the center hall into the stall, thereby maintaining integrity of the clean corridor. Each stall is independently ventilated. Air exchange ducts are located away from stall floors and are lined.

Stalls in the isolation wing incorporate additional biosecurity features that speak to the high risk nature of their patients in

that each has an antechamber between the central corridor and the stall. The antechamber is for storage of dedicated equipment and limited supplies for that particular patient. It also permits the removal and disposal of each caregiver's barrier garments before re-entering the clean corridor. Both the wall of the antechamber and the stall are equipped with a Plexiglas® window so that staff can observe the patients without intruding into the stall or disturbing the horse if it is not necessary. The stalls in the colic wing are also equipped with a Plexiglas® window for observation.

As well as key structural design, services fundamental to the type of sophisticated care that critically ill high risk patients require will be provided by the Moran Critical Care Center. For example, oxygen is directly delivered through a dedicated system to an outlet in each stall, a significant advancement over current housing for colics and isolated patients. Each stall has at least one camera to enable staff to view patients from a central nursing station, without entering the area. The mare-and-foal stalls have two cameras to ensure complete coverage of the area. Specialized system software will also allow clinicians to check on their patients from home or after hours via internet connection, significantly reinforcing the care of the on-site staff.

Both wings have procedure rooms with special dedicated adjacent storage, a vital necessity in a building housing such sick patients. In addition, each wing has a fluid storage area; sufficient capacity, a design whereby fluids can be delivered directly to the building by the palette-load, proximity and easy access are imperative for patients that may need between 20 to 60 liters of fluids in a 24-hour period.

The Moran building has 12 regular colic stalls plus two mare-and-foal colic stalls to accommodate the 425+/- cases of colic that come in each year. The isolation wing has four mare-and-foal stalls, and six regular stalls, each with its own antechamber. The mare-and-foal stalls are specially designed to permit safe separation of mares and foals if necessary, greatly improving the



level of patient care. Two of the four mare-and-foal stalls in the Center's isolation wing are equipped with ceiling-supported motorized hoists, as is one of the mare-and-foal stalls in the colic wing, which will allow sling support for compromised patients when needed; another important benefit not available in the current isolation building.

MORAN CENTER HIGHLIGHTS AND SCHEDULED TOURS

Because of the need to maintain a clean environment, both the isolation and colic wings of the Moran Center have changing rooms and nurses' stations. The changing rooms include toilet and shower facilities. Both wings also have their own pharmacies in addition to laundry and cleaning rooms. Hay and straw sufficient for each day are stored in a special enclosed area at the end of each wing and both have an area dedicated to the storage of specialty feeds adjacent to each nurses' station. In addition to changing rooms, in the common area of the Center there is a staff lounge and a conference room. Provision of personnel facilities is designed to provide an optimum working environment for the individuals involved in the care of cases that are amongst the most critical, and to minimize personnel traffic between the Center and the rest of the hospital.

Construction materials for the Center were critically evaluated to provide maximum clean-ability, environmental safety and efficient operation. Solid, non-porous, highly durable surface materials were selected along with proper sealing agents for block walls. Even the door handles on the stall doors were carefully selected for safety, security and ability to be disinfected.

The Personnel

As important to maximum effectiveness as the building's careful design is thorough biosecurity training of staff. In the survey paper referred to previously, only 16 of the 38 hospitals surveyed require staff to complete a biosecurity training program, somewhat less than half the hospitals surveyed. Not only are New Bolton Center staff rigorously trained in biosecurity protocols, all sectors of the hospital (from barn crews to faculty) are represented on, and contribute to, the workings of the hospital Biosecurity Committee. Dr. Aceto describes current procedures for teaching students. "Students must attend several lectures that focus on biosecurity and organisms that are important causes of hospital-acquired infections," she said. "In addition, they receive biosecurity orientations both here (New Bolton) and at the small animal hospital in Philadelphia. Overall, the need for attention to infection control throughout the hospital and during the conduct of all procedures, not just in surgery where it has always been emphasized, has been stressed and is absolutely part of our culture."

The entire staff of New Bolton looks forward to the opening of the James M. Moran, Jr. Critical Care Center as a way to offer improved care to their patients. The building was a huge undertaking but is an impressive manifestation of the vision inherent in the support given to Penn Vet by the Commonwealth of Pennsylvania and its understanding of the need to provide outstanding health care facilities to a key component of its vital agriculture industry. The building is named for Mrs. J. Maxwell Moran's (Betty Moran) late son, James. Mrs. Moran with characteristic generosity and foresight made a magnificent gift to close the gap between what the State had pledged, what had come in from other donors and what was needed for the building's construction. Her support to New Bolton Center and Penn Vet over the years is legendary


This state-of-the-art critical care center sets the bar for other equine care centers in the nation. With advanced equipment, utilities and infrastructure designed to meet the standards of 21st century equine veterinary medicine, the Moran Center ensures the first-class care and level of excellence to which NBC clients are accustomed. Some of the highlights of this facility include:

- Two wings – an isolation wing and a colic wing
- 12 regular colic stalls plus two mare-and-foal stalls
- Four mare-and-foal stalls in the isolation wing and six regular stalls, each with its own antechamber
- Self-contained stalls with individual outside access
- Environmentally controlled air circulation that flows from the center of the facility outwards
- Individual stall antechambers for storage and dedicated patient supplies
- Plexiglas windows on the walls of the antechamber and stall for observation
- Cameras in each stall that provide remote observation capabilities for nurses and veterinarians. Each mare and foal stall includes two cameras for complete coverage area
- Specialized software system that allows remote observation access for off-site veterinarians
- Procedure rooms in each wing with dedicated storage space and a fluid storage area
- Changing rooms, nurses' stations, pharmacies, laundry and cleaning areas in each wing

Interested in seeing the final product first-hand? A limited number of tours will be given to the public on Saturday, June 5. Please reserve your place by calling Patricia Hall, development coordinator for New Bolton Center, at 610.925.6181 or email her at phall@vet.upenn.edu.

and this particular gift helped launch a new era of specialized, sophisticated health care delivery for the horse.

A special dedication is planned for the first week in June, when these visionary donors and legislators will see for themselves the invaluable addition to advanced veterinary services now available at one of the mid-Atlantic region's premier equine clinics.

"We are all anxious for the building's opening," said Dr. Aceto. "It is satisfying to see six years of hard work and diligent and tenacious planning come to fruition. The opening of the Moran Critical Care facility is truly a turning point – for both Penn Vet as well as for equine care throughout the nation." 

Dr. Helen Aceto, Dr. Ray Sweeney and Jane Simone contributed to this story.

Architects: Paul Steege & Associates
Engineers: Precis Engineering, Inc.
General Contractor: Bancroft Construction Company

*JAVMA, Vol. 233, No. 5, September 1, 2008 pp. 767-773