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## Poultry Research Awards

## Prenatal Program for "High-Risk" Mares

The last eight years have witnessed the birth and rapid growth of equine neonatology, a new subspecialty in veterinary medicine focusing on the study of newborn foals.

In the spring of 1984, a neonatal intensive care unit (NICU) for foals was established at New Bolton Center. Equipped with piped-in oxygen, a temperature-controlled environment, padded floors, ventilators, infusion pumps, and a variety of monitoring devices, the NICU provided 24-hour-a-day nursing care for critically ill foals.

Initially, a dramatic improvement in foal survival rates accompanied development of the intensive care facility. But as the number of foals admitted to the unit increased, so did the severity of their illnesses. Neonatal survival rates began to plateau. Successful treatment of the more severely compromised foals was becoming increasingly more dependent on how quickly the problem was recognized and how rapidly and efficiently these foals were stabilized and transported to the NICU. It became apparent that hospitalization of the mare at risk of having an abnormal pregnancy or difficult delivery would allow earlier detection, treatment or possible prevention of disease in the newborn foal.

During 1988 and 1989 foaling seasons, clinicians from the sections of medicine, reproduction, surgery and anesthesia began to collaborate on a perinatal program designed to identify and manage mares with "high risk" pregnancies. Events having a profound effect on the newborn's health and survival include lack of oxygen before or during birth, infection caused by bacteria or viruses, and inadequate delivery of nutrition to the unborn fetus resulting in abnormal development.

Lack of oxygen can produce serious organ damage, as well as death, and is the primary cause of the "dummy foal" syndrome. Viral or bacterial infection can result in abortion, premature delivery of a sick foal, or death of a full-term foal within the first week of life. Inadequate in utero nutrition can occur when the dam is seriously ill or whenever the placenta is damaged or compromised. Possible outcomes include abortion, premature delivery, excessively long gestation length, or the birth of a small, growth-retarded foal.

Examples of "high-risk" pregnancies include broodmares experiencing severe systemic disease, endotoxemia, abdominal surgery and general anesthesia, abnormal vaginal discharge, high fevers, severe anemia, malnutrition, excessive drug administration, pelvic injuries resulting in fractures or neurologic deficits in the hindend, or long-distance transportation during their pregnancies. Premature detachment of the placenta during birth (i.e. "red bag") produces varying degrees of birth asphyxia (oxygen starvation) in the foal. Abnormal deliveries jeopardize foal survival and include premature labor, induction of labor, Cesarean section, and dystocia.

Dystocia is an abnormal delivery that can not proceed naturally due to the foal's large body size or the abnormal positioning of the foal within the birth canal (e.g. breech delivery, head or limbs twisted). Severe dystocias usually result in asphyxiation and death of the foal unless the fetus can be properly positioned or an emergency C-section performed. Birth trauma, twinning, congenital anomalies (i.e. birth defects), prematurity, and failure of the newborn to ingest enough food quality colostrum are other events that threaten the foal's survival.

Mares at risk for problem pregnancies are hospitalized and given a complete physical examination including rectal palpation. A vaginal exam is performed only if indicated. Routine analysis includes a complete blood count and measurement of creatinine and fibrinogen. The mare's vital signs



Dr. Ben Martin and Greg Staller deliver a foal via Cesarean section. The foal is suspended to allow excess fluid to drain from its lungs. The foal will be stabilized in an adjacent intensive care stall.



Dr. Jon Palmer examines a newborn foal following Cesarean section. The foal is resting on an air mattress atop a specially designed stainless steel hydraulic foal bed. A heat lamp provides additional warmth. An intravenous catheter has been inserted and connected to a bag of fluids suspended over the foal.

(temperature, pulse and respiration) are recorded daily. The concentrations of calcium and magnesium in her mammary gland secretions are monitored to help assess her readiness to foal. Daily paddock exercise is provided.

Mares wear a Breeder-Alert halter monitor that transmits a signal to remote pocket pagers whenever the mare lays down. Foaling stalls are equipped with closed-circuit television monitors. In addition to electronic surveillance mares are observed day and night by nurses and clinicians.

Fetal movement, clarity of fetal fluids, and fetal heart rate are evaluated every few days using trans-abdominal ultrasonography. Prolonged absence of fetal movement, abnormally cloudy fluids, or a slow, irregular fetal heart rate are signs of fetal distress. If these signs persist, induced delivery or Cesarean section can be considered to try and prevent death of the fetus.

Ultrasound-guided amniocentesis, a commonly used diagnostic aid in human obstetrics, is also being developed for use in pregnant mares. Uterine contraction monitoring devices, used to detect premature labor in women, are being investigated for use in mares at risk for delivering early.

All foalings are attended by veterinarians from the sections of medicine and reproduction. In cases of severe dystocia, the mare can be quickly anesthetized and a C-section performed. Foals asphyxiated during birth are resuscitated and given supplemental oxygen. Each foal receives a complete physical exam and has routine blood work submitted. If the foal shows signs of infection, blood cultures are submitted and antibiotic therapy initiated.

The quality of the mare's colostrum is evaluated by measuring the concentration of antibodies it contains. Within 18 hours of birth the antibody concentration in the foal's blood is measured to be



A Thoroughbred mare with her 24-hour old foal. This mare had a poor reproductive history that included losing several foals suffering from the "dummy foal" syndrome. She was admitted to New Bolton Center to foal out in 1988 and again in 1989. Both foals are alive and healthy.

certain enough colostral antibodies have been absorbed to provide protection against bacterial and viral infections. Critically ill foals are admitted to the NICU for continued treatment.

During the 1989 foaling season, 18 mares delivered while hospitalized. The deliveries included six Cesarean sections, three dystocias, and one induced delivery. Problems afflicting some of the mares included pelvic trauma, long bone fracture, uterine infection and neurologic disease. Two mares had histories of delivering sick and/or "dummy foals" during past pregnancies. As we continue to focus attention on the events surrounding the birth of abnormal foals and study the reproduction history of mares losing foals late in pregnancy, we hope to improve our ability to detect pregnancies in trouble.

Our goal is to continue to reduce perinatal foal mortality through early detection and intervention of problems before, during, as well as after birth.

Wendy E. Vaala, V.M.D.

## Poultry Research Awards

The Pennsylvania Department of Agriculture has funded a number of research projects pertaining to poultry. Drs. Charles E. Benson and Robert J. Eckroade received a \$65,350 one-year grant for their project "Evaluation of Treatment Regimes in the Resolution of *Salmonella enteritidis* Infections in Poultry." "DNA probe to Distinguish Pathotypes and Strains of Laryngotracheitis Virus" was funded for two years through a \$81,367 grant. The investigators are Drs. Linda Keller, Benson and Sherrill Davison.

Dr. Eckroade, Keller and Mariano Salem received a one-year grant for \$14,740 to study the "Epidemiology of Vertical Transmission of Reticulo-endotheliosis in Previously Exposed and Susceptible Turkey Hens." A two-year \$83,480 grant was awarded to Drs. Eckroade and Davison for the project "Control of *Mycoplasma gallisepticum* in Pennsylvania Poultry Flocks." Drs. Benson and Eckroade received a three-year \$168,241 grant for a study entitled "Characterization of *Salmonella enteritidis* Infection in Egg-Laying Hens."

Drs. Benson and Eckroade received a three-year \$300,000 grant from USDA to study "Transmission of *Salmonella enteritidis* in an Egg-Laying Flock." Dr. Keller received a one-year \$4,067 USDA grant for her study "Immune Mechanisms and Components of JMV-1 Culture Supernatant Protective against Poultry Diseases."