Clinical Report:

Intramammary Vaccination and Hyper-immunized Colostrum as a Prevention for Scours Caused by an Antibiotic Resistant *E. Coli*

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A problem had developed on a purebred Charolais herd in central Virginia where calves delivered in or around cattle holding or handling facilities would develop peracute fatal scours that were uncontrollable by conventional therapy.

A herd history of this ranch showed an increasing periodic problem with antibiotic-resistant calf scours over the last four years. At approximately 18½-month intervals, the herd would be hit with a wave of scours that was increasingly difficult to control by antibiotic and fluid therapy. The last disease wave was stopped only by oral administration of 100 mg of Gentamycin (Gentocin-R-Schering) solution b.i.d. for three treatments supplemented by oral electrolyte t.i.d. (Ion Aid-R-Diamond) for maintenance and I.V.-balanced electrolytes in the beginning.

Bacterial sensitivities done on *E. Coli* isolates from tissues of calves dying from scours showed an increasing amount of antibiotic resistance until in the last outbreak only Gentamycin was effective *in vitro* and *in vivo.*

No particular problem with scours was occurring with calves born out in pasture. Cows brought in to the corral or barns to be assisted in their delivery were losing their calves to severe peracute scours within 1-3 days after birth. It seemed these calves were becoming infected in the handling areas which also had been used for several years for treatment areas for all kinds of infectious disease problems.

Since only one antibiotic seemed to be left that would control the resistant *E. Coli,* a search was started to try to find a way to battle this problem immunologically. Moving the present facilities to an uncontaminated area was economically unfeasible. Disinfection of the natural soil surfaces of the barns and pens also was a physical and chemical impracticality if not impossibility.

Liver tissue of a calf dying from peracute scours was cultured and found to be loaded with *E. Coli,* resistant to all antibiotics except Gentamycin. Ten colonies were picked off the culture plate and inoculated into broth cultures and identified by an assigned colony number.

A four-day-old baby bull calf born out on pasture and clinically normal in appearance was selected for intestinal loop inoculation to try and single out the most pathogenic serotypes for hyperimmunizing of colostrum to the virulent *E. Coli.*

This calf was deprived of milk for twenty-four hours and then prepared for a right side laparotomy. Induction for surgery was accomplished with surital I.V. and the patient was maintained on halothane inhalation anesthesia by intubation for the remainder of the surgical procedure.

The jejunum was exposed by aseptic surgical procedure and, starting on the cranial end, 2.5 cm sections of jejunum were tied off with autoclaved Vetafil®. A blank was left on each end of the series of intestinal sections that were tied off. Every other loop was inoculated with 1 cc of a 24-hour broth culture of one of the ten colonies of *E. Coli* isolated from the dead calf by sterile needle and syringe. The response that was being checked for was the intestinal and circulatory damaging effect that might be exerted by the various serotypes of *E. Coli.* Ten 2.5-cm loops of jejunum were inoculated. An uninoculated control loop was left in between each inoculated loop. The laparotomy incision was closed and the calf allowed to recover from the anesthetic.

The calf was not fed the following day. It was showing very obvious signs of intestinal pain and depression twenty-four hours later when it was sacrificed.

The part of the jejunum that was tied off into sections showed much pathological change such as adhesions, reddening and distension with blood-tinged fluid. The control loops that were not inoculated with the twenty-four-hour *E. Coli* broth culture had a serosanguineous fluid content ranging from 1.5 to 5 cc. The inoculated loops had a fluid content ranging from 7.5 cc to 24 cc of fluid with a color range from a light bloody tinge to a very hemorrhagic content.

The four loops out of the ten that were inoculated and which contained the largest amount of the most severely hemorrhagic fluid were identified by se-

quence in inoculation procedure back to their respective cultures. These four cultures were reinoculated into several broth tubes each and incubated for twenty-four hours. They were then combined into a common flask and killed by adding 0.2% formalin by total volume. One hundred cc of this killed-*E. Coli* bacterin were placed into a brown glass vial and stoppered for later use by intramammary infusion. Another 60 cc of the formalin-killed twenty-four-hour *E. Coli* broth culture were combined with 40 cc of Fruends incomplete adjuvant (Diffco Labs) and thoroughly mixed by flushing in and out of an injection vial with needle and syringe for ten minutes. When thoroughly mixed, the bacterin with adjuvant assumed the color and consistency of raw cream.

Three adult Brown Swiss cows that had a history of being fair milk producers and having no history of mastitis were selected for producing the hyperimmunized colostrum. All three were due to calve in three to four weeks.

Three weeks prior to calving, the three cows' udders were examined and the teats were washed and scrubbed with alcohol. A 5-cc dose of the formalin-killed *E. Coli* bacterin was infused into each quarter and the teats were dipped with chlorhexidine. At the same time each cow was inoculated subcutaneously with 5 cc of the bacterin with adjuvant.

Following the intramammary killed-bacterin infusion, a transient swelling was noticed in the udder which subsided by the fifth day.

This same process was repeated in two weeks which was approximately one week prior to their calving.

All three cows calved normally and had normal appearing colostrum. The colostrum from these cows was collected in half-gallon waxed paper milk cartons obtained from a local dairy plant, and frozen. Each milking was labeled on the carton so that it could be used up sequentially on each calf in the order that it was collected and frozen. The colostrum was collected and frozen for three days, i.e., six milkings.

The frozen colostrum from the hyperimmunized cows was put into use immediately after the first milking was available, and was used for the first three feedings on all the calves delivered in the contaminated area for the next two months. This was continued for the remainder of the calving season. Out of the next eleven calves born into this contaminated area the rest of this particular calving season, only one was lost due to scours. This particular calf was delivered one night at 2:00 a.m. by the herdsman and it did not receive the hyperimmunized colostrum until the next morning.

In this particular field situation, the idea of giving newborn calves three half-gallon feedings of colostrum from cows that were hyperimmunized against specific enteropathogenic serotypes of *E. Coli*, immunized by systemic and intramammary routes, seems to have been a very productive and life-saving procedure.

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For Your Library

Embryo Transfer with Particular Reference to Cattle

Published by the British Veterinary Association, BVA Editorial Services, 7, Mansfield Street, London, WIM OAT, England. £5 (five pounds) per copy including mail.

This publication is a review of several methods which may be employed in obtaining a supply of fertilized cattle eggs and discusses a few of the factors relevant to the recovery, storage and evaluation of these eggs; it also examines some methods currently available for synchronising donor and recipient cattle and looks at various aspects of the transfer procedure itself.

The authors contend that superovulation as a method of obtaining a supply of eggs still leaves much to be desired and is a major problem in exploiting embryo transfer and increasing the number of progeny from genetically superior cattle. There is a lack of reassuring information in the literature on the pregnancy rates that follow single embryo transfers using the Cambridge transfer technique.

The report also states: "It is the Subcommittee's view that to safeguard the welfare of donor and recipient animals and to protect the health status of the National Herd that statutory control of embryo transfer, modelled on the present artificial insemination (AI) legislation is required, but the extent of control should not be such as to jeopardise Britain's competitive position in this area of international interest."