Techniques For Rearing Cesarean Section Derived Colostrum Free Piglets

J. A. Coalson, C. V. Maxwell, J. C. Hillier, and E. C. Nelson

Story in Brief

Ninety-one colostrum free piglets (5 replicates) were obtained by cesearean section on the 113 day of gestation, placed into individual sterile incubators and fed 5 times daily a fortified milk diet to 3 weeks of age. Eighty-one piglets were successfully reared to 3 weeks of age for an average survival rate of 90 percent. Average dietary intake at 7, 14, and 21 days were 17, 38 and 49 oz., respectively. Average weight gain for the 3 week period was 9.68 lb. Conversion of dry matter to gain ranged from 0.76 to 1.15 for individual replicates. These results indicate that colostrum free piglets can routinely be obtained and reared by this technique and, as such, make excellent models for studying the nutritional requirements of the young pig.

Introduction

Estimates from various surveys have shown that an appalling percentage (up to 30 percent) of the pigs born alive do not survive until weaning. Most of these deaths occur within the first few days of life, and a large part of the death loss is from weaker pigs which are unable to compete with the larger, stronger pigs in a large litter. It is possible that this high mortality can be decreased by the non-conventional rearing of pigs form birth in a system which would decrease competition among littermates and minimize the possibility of contamination with pathogenic organisms. This type system would also provide excellent facilities to study the effect of both nutritional and environmental factors related to the survival of the baby pig. Furthermore, a system of this type could be used for the routine production of specific pathogen free pigs.

The purpose of this paper is to describe the facilities and techniques used to routinely rear cesarean section derived colostrum free pigs to 3 weeks of age.

Materials and Methods

Ninety-one neonatal piglets (5 replicates), obtained from Hampshire

and Yorkshire sows, were used to develop techniques for rearing cesarean section derived pigs to 21 days of age. Each sow was transported to the Clinical Research Laboratory of Veterinary Medicine on the 113th day of gestation and scrubbed with soap and disinfectant. The sow was then physically restrained, indused and anesthesized with halothane, using a partial rebreathing system and face mask.

Standard surgical procedures were followed with every possible precaution taken to reduce contamination of piglets. The pig handlers, in addition to the surgeons, wore sterile gowns, gloves, caps and masks during the surgery and resuscitation period. Upon removal from the uterus, the piglets were placed on sterile towels, membranes removed, mucous cleaned from the mouth and resuscitated by body massage. Mucous was cleaned from the airway by supporting the head of the piglet and swinging in a downward motion. When the piglets were breathing satisfactorily, 2 to 6 min., they were placed directly into a sterile pig isolator for transport to the swine nutrition laboratory. Total time elapsed from removal of the first piglet from the uterus to placing of the piglets in individual isolators was never more than an hour.

Incubator facilities.

The incubators were contained in a room the entrance of which consisted of an air barrier anteroom. The anteroom prrovided facilities to prepare the feeding apparatus and provided an air barrier to reduce outside contamination. Individual disposable cardboard incubators (Figure 1), designed to provide each piglet with dry, heated, filtered and sterilized air, were used to hold the pigs for the 21-day period. The air entering the incubator was sterilized and dehumidified, forced over thermostatically controlled heaters and passed through cotton filters. The air passing out of the incubators into the room was exhausted from the building and was not recycled. The temperature of each incubator was maintained at 95°F for 72 hours, then gradually decreased to 82°F by 2 weeks. A grill platform of wire mesh, covered with diamond shaped rubber matting, was 2.08 inches above the bottom of the incubator and kept the piglet free of its urine and feces (Figure 2). The cardboard incubator including feed trays, wire mesh bottoms and rubber mats, were sterilized in an autoclave (250°F for 30 min.) before being placed in the incubator room.

Diet.

The liquid diet fed the pigs to 21 days of age consisted of fresh whole milk fortified with dried whole milk, minerals and vitamins (Table 1). All ingredients were mixed together, homogenized at a cylinder pressure of 1750 psi, pasturized and stored in milk containers until need-

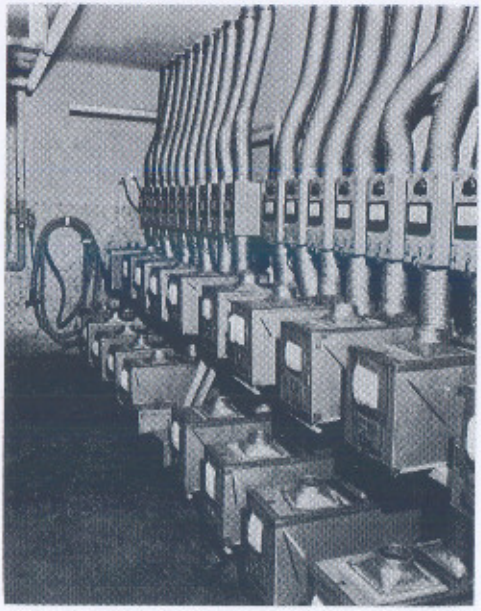

Figure 1. Partial view of incubator room with incubators in place.

Table 1. Comparison of Fortified Milk Diet and Sow's Milk

Percent	Fortified milk diet[1]	Sow's milk[2]
Total solids	21.6	21.2
Protein	6.4	6.1
Fat	5.9	9.6
Carbohydrate	8.0	4.6
Ash	1.3	0.9
Caloric Distribution		
Protein	23	22
Fat	48	59
Carbohydrate	29	19

[1] Prepared by adding to 1 gallon of fresh milk: 1.4 lb. dried whole milk, 5.0 g citric acid, 16.0 mg niacin, 3.0 mg vitamin K, 80 I.U. vitamin D, 7.5 I.U. vitamin E, 272 mg $ZnSO_4 \cdot 7H_2O$, 521 mg $FeSO_4 \cdot 7H_2O$, 120 mg $MnCl_2 \cdot 4H_2O$, 62 $CuSO_4 \cdot 4H_2O$, 2 g $MgSO_4 \cdot 7H_2O$.

[2] From Perrin's data (1954).

ed. The liquid diet was very similar to sow's milk with respect to caloric density and protein content (Table 1).

Feeding regime.

To minimize contamination the technician, upon entering the anteroom, put on a lab coat, rubber boots and sterile surgical gloves before

preparing the diet. The liquid diet was stored at 36°F and was heated to 98°F for feeding. Pigs were fed initially within 3 hours of birth and thereafter, at 4 hour intervals, starting at 6:00 a.m. and ending at 10:00 p.m. To feed piglets, the diet contained in a sterile syringe with a 12 gauge needle was injected through a rubber stopper into the metal feeding tray (Figure 2). Each pig was given approximately 1 oz. of diet the first feeding and usually consumed that quantity without any difficulty. The volume fed each pig was increased at each feeding if the previous feeding had been consumed. By this technique, the feeding of pigs appeared to be esstentially on an *ad libitum* basis.

Results and Discussion

Average survival for all 5 replicates was 90 percent and ranged from 83 to 100 percent for each individual replicate (Table 2). Betts, Lamont and Littlewort (1960) reared colostrum deprived hysterectomy pigs under similar hand feeding conditions and reported an overall survival rate of 82.3 percent. A necropsy was performed on each pig that died during the

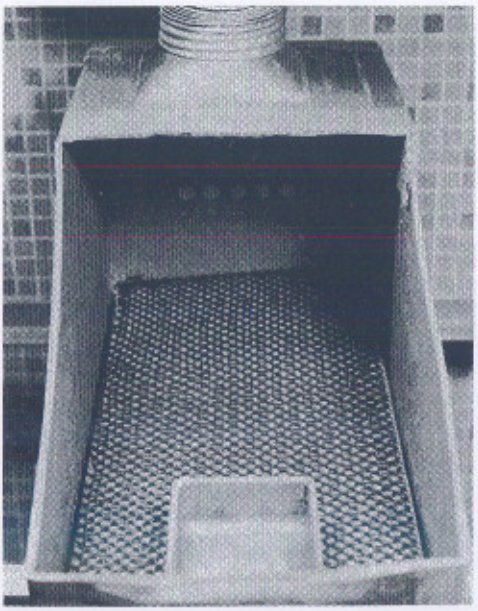

Figure 2. A cut-a-way of an incubator showing feeding tray and wire grill covered with protective matting. (Inside dimensions: 21.5 x 10.5 x 8.3 inches)

Table 2. Survival, Weights and Dietary Efficiency of Colostrum Free Pigs to 21 Days of Age

Replicate No.	No. Pigs	% Survival	Initial Weight (lb)	Final Weight (lb)	lb D.M. / lb gain	Diet Intake 21 days (oz.)
1	24	92	2.86	11.66	0.76	456
2	29	83	2.64	11.44	0.77	466
3	13	100	2.64	13.42	1.00	747
4	11	90	2.64	12.32	0.94	629
5	14	86	2.86	13.64	1.15	852

21 day period and colibacillosis was the usual diagnosis. Most of these deaths occurred during the first 4 days. These survival rates and low bacterial infection rates are unusual in that the feeding trays were not removed or cleaned during the 21 day period. Procedures reported by Young and Underdahl (1953) and Betts, Lamont and Littlewort (1960) involved the use of two sets of feeding trays, one set was soaked in disinfectant and while the second set was used for feeding.

Average dietary intakes for the five replicates of pigs were 17, 38 and 49 oz. at 7, 14 and 21 days, respectively. These volumes roughly indicate how much the young piglet can safely consume under hand feeding conditions. The volumes consumed on the seventh day were below those reported by Lecce (1969) where pigs fed hourly on an automatic feeding device received 25 oz. Dietary intakes on the 14th day were similar to those of Lecce's automatic feeder indicating that maximum dietary intake is greater when fed hourly instead of five times daily, particularly during the first week. Dietary intakes at 14 days were almost twice that reported by Betts, Lamont and Littlewort (1960) where hysterectomy obtained pigs were hand fed 3 times daily.

Total gains for the 21 day period ranged from 8.8 lb. for replicates I and II to 10.78 lb. for replicates III and V (Table 2). This demonstrates the considerable variation obtained when using a hand feeding system. The average gain for the five replicates was 9.68 pounds. These gains are superior to those reported for naturally suckled pigs cited in the literature. This suggest that not only can survival rate be increased by a system of this type but pig weight at 3 weeks can also be increased.

Literature Cited

Betts, A. O., P. H. Lamont and M. C. Littlewort. 1960. The production by hysterectomy of pathogen-gree, colostrum-derived pigs and the foundation of a minimal-disease herd. Vet. Rec. 72:461.

Lecce, J. G. 1969. Rearing colostrum-free pigs in an automatic feeding device. J. Anim. Sci. 28:27.
Perrin, D. R. 1954. The composition of sow's milk during the course of lactation. J. Dairy Sci. 21:55.
Young, G. A. and N. R. Underdahl. 1953. Isolation units for growing pigs without colostrum. Am M. Vet. Res. 52:571.

Sheep

Adaptation of Lambs to Biuret as a Nitrogen Source When Fed High Concentrate Rations

R. R. Johnson and E. T. Clemens

Story in Brief

It had previously been shown in this laboratory that rumen microorganisms in both sheep and cattle required considerable periods of time varying from 20 to 40 days of exposure to biuret in the feed before significant ability to utilize biuret as a source of nitrogen could be shown.

In the experiment reported here, the ability of the microorganisms to adapt to biuret when the animals were fed high concentrate rations was studied. In contrast to the relatively long adaption period required when biuret was fed with high roughage rations, with rations containing 60 percent concentrate, adaptation was complete by 10 days after the start of biuret feeding. Similar to the results with high roughage rations, however, when biuret was removed from the high concentrate ration the biuretolytic activity was lost by 4 days after removal.

Introduction

Biuret is being tested as a source of supplemental nitrogen to ruminants, primarily in relation to protein supplements being fed to ruminants