

airplane, it has to land and take off more frequently for supplementing chemical. Besides, the price of a helicopter is somewhat higher than that of an airplane.

An attachment to applicator is a kit for dust, spray, or granule. An extremely concentrated spraying has recently been studied. This is to achieve an adequate control effect with the application rate of 0.1 gal/acre. There are suggested two types of sprayer: spin nozzle type and compressed air type. Both types are now manufactured for trial. If they are used in the field, a helicopter equipped with this sprayer will be so efficient as to take only about 30 minutes to apply chemical to about 150 acres in one flight.

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Early Weaning of Young Animals with the Use of Synthetic Milk

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Due to improvement of synthetic milk and formulated feeds, pigs raised in Japan now are put on the market in about six months after birth, compared to eight or nine months in the past.

With the use of synthetic milk, it became possible to wean pigs shortly after farrowing and, as a result, to reduce the labor of sows in suckling to pigs. As the mother can be rebred more quickly after birth, it is possible to farrow two and a half times in 12 months.

The main purpose of this paper is to summarize the study in Japan on early weaning of pigs with synthetic milk.

This paper is also concerned with the study on calf starter.

I Synthetic Milk for Pigs

The study of synthetic milk in Japan was started in 1951. As synthetic milk is used as a substitute for sow's milk, the study on

it was started from obtaining information on the constituents of sow's milk. As a result, the following information which could serve as guides to study of synthetic milk for early-weaned pigs were obtained.

Sow's milk contains high quality protein and much fat and lactose. It also contains calcium, phosphorus and other trace minerals. But sow's milk is low in iron and copper, so it has been said that pigs fed only sow's milk easily contract anemia. As vitamins, vitamin A, D and vitamin B-complex are contained in sow's milk.

The first synthetic milk prepared based on this information contained high quality protein, much fat, high quality carbohydrates as substitutes for lactose, vitamins and minerals. Together with these constituents antibiotics were added because it is known to promote fast growth and to prevent scouring.

There are two types of synthetic milk

used popularly in Japan. One is synthetic milk A used from weaning until about 30 days of age and the other type is synthetic milk B used as a follow-up feed to the synthetic milk A until about 60 days of age. These two types of synthetic milk are formulated with many ingredients according to the digestibility and nutritional allowances in growth stages. These synthetic milks do not contain constituents of cow's milk. From the economic point of view, it is significant especially in Japan to be able to raise pigs

with synthetic milk without constituents of cow's milk.

Due to being highly fortified with protein, minerals, vitamins and antibiotics, synthetic milks are expensive, but, with more experiments, satisfactory synthetic milks for early-weaned pigs will be composed with less expensive ingredients.

Chemical composition of synthetic milk A and B commonly used in Japan is shown in Table 1.

Table 1. Composition of Synthetic Milk A and B for Early-weaned Pigs

Synthetic milk	Moisture	Crude protein	Crude fat	NFE	Crude fiber	Crude ash
A	11.0%	27.2%	6.1%	48.4%	1.7%	5.6%
B	11.8	22.1	4.7	53.6	1.9	5.9

Methods of Feeding and Forms of Synthetic Milks

In early stage of the study synthetic milks were mixed with luke-warm water and fed to pigs several times a day, but this method of feeding required great effort and needed excellent management ability and facilities. Souring of the synthetic milk in the feeders was particularly troublesome when the pigs did not promptly clean up their feed. Consequently synthetic milks were not widely accepted. Digestibility of synthetic milks mixed with luke-warm water were low.

Then it was considered to use synthetic milks in a form of dry meal or pellet. A comparative raising test with two groups was conducted. Pigs of one group were weaned at 3 weeks of age and fed synthetic milks in pellet or powder, and the other group stayed with the sow until 60 days of age.

According to the result, pigs weaned early and fed synthetic milks performed more successfully than pigs suckling the sow's milk. No significant difference was found between pellet and powder.

Using pellet or powder cuts labor and requires less technique for raising early-weaned pigs. Also, viewed from digestibility,

these forms proved efficient. (Fig. 1).

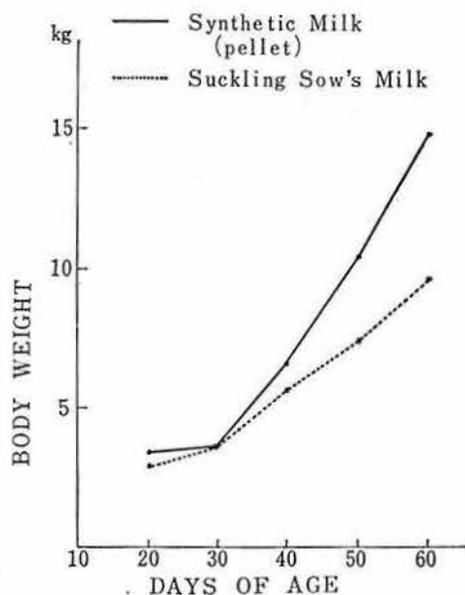


Fig. 1 Growth of pigs raised with synthetic milk or sow's milk.

Super-early-weaning of Pigs with Synthetic Milks

As the sow's milk secretion starts to decrease at about 3 weeks after farrowing, it will be highly efficient to wean baby pigs

at this age. But in the case of sow's death or going dry or becoming runts when sows have more pigs than they can adequately nurse, it is necessary to wean pigs earlier than 3 weeks of age. With the use of synthetic milk A it is possible to wean pigs at less than 10 days of age, but in order to wean safely at about 5 days of age, special synthetic milk is required. A raising test was conducted by using these synthetic milks. Pigs were weaned at 5—6 days of age, fed synthetic milk, Special A, switched to synthetic milk A at 15 days of age, and to synthetic milk B at 30 days of age.

The experimental results showed that pigs fed synthetic milks grew slowly at first but showed more gain at 60 days of age than suckling pigs at the same age.

The research development in synthetic milks will undoubtedly make it possible to cut the time the pig needs to stay with the sow. This result shows that, with superior nutrition and management, the performance of pigs weaned at less than 10 days of age can exceed that of pigs left with the sows.

Effects on Sows of Early Weaning of Pigs with Synthetic Milks

It is known early weaning of pigs brings economy of sow's feed, less weight loss during lactation and early return to breeding.

An experiment on the relation between suckling days and interval of reproductive period in sows was conducted.

In the case of suckling, interval from conception to next conception was 180 days but in the case of weaning pigs at 2—3 weeks of age it was reduced to about 140 days. Through the shortening of interval in reproductive cycle by early weaning it became possible to produce two and a half litters in a year. This will tend to eliminate the concept of the farrowing season and give the advantage of more uniform marketing.

Subsequent Fattening and Breeding Results of Early-weaned Pigs

It was found that pigs raised by synthetic

milks from weaning to 60 days of age reached market weight earlier than those raised by the conventional method. In the latter, about 7 months and a half was required to produce pigs from birth to 90 kg live weight, whereas the pigs early weaned and fed synthetic milk reached the same live weight in an average 178 days.

The difference of the carcass quality in those two raising methods before 60 days of age was not significant.

The breeding results of sows finished from those raised with synthetic milks were similar to those of sows from those suckling sow's milk.

Practical Methods of Raising Pigs with Synthetic Milks

In raising early-weaned pigs successfully, excellent management and know-how are required. Once the pigs are taken from the sow's care, the sow cannot cover up poor management practices.

Feed intake of the sow should be reduced a few days prior to the separation and limited to 1—1.5 kg on weaning day. An adequate supply of water should be readily available for sows to drink. It is important to separate pigs in the morning to teach them to eat synthetic milks in the daytime. The separation should be complete and final, preferable with no opportunity for the pigs to hear or see their mother again.

Before the pigs learn to eat, synthetic milks should be given in a feeder with

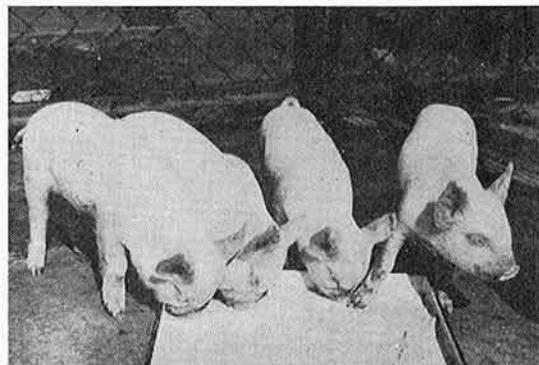


Fig. 2 Trough with shallow bottom used before pigs learn to eat synthetic milk

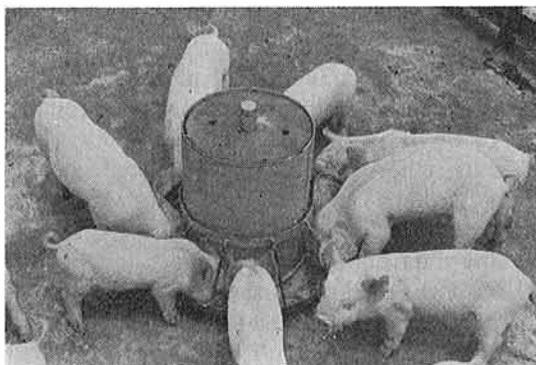


Fig. 3 Early-weaned pigs and self-feeder. Pigs weaned at 2-3 weeks of birth are reared with synthetic milk.

shallow bottom, but when they learn to eat adequately it is better to give ad libitum using a self-feeder (Fig. 2 and 3). To teach pigs to eat, show them where feed is located and put a little amount in their mouths. Placing synthetic milks before the pigs a few days while still with the sow and teaching them to eat is a good method of weaning. It especially helps big litters or poor-milking sows.

For the purpose of keeping pigs warm the pig brooder was devised. In winter the suspension of an infrared bulb (250-375W) from the ceiling of it is necessary.

When pigs are suffering from scours, it is important to reduce feed intake. Oral treatment with antibiotics cure many cases of scouring.

II Synthetic Milk for Dairy Calves

Table 2. Composition of Synthetic milk A and B for Early-weaned Calves

Synthetic milk	Moisture	Crude protein	Crude fat	NFE	Crude fiber	Crude ash
A	12.5%	26.2%	5.6%	48.1%	1.6%	6.0%
B	12.0	22.4	3.4	53.1	2.9	6.3

References

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The study of early weaning of dairy calves is also in progress. Calves are fed solid synthetic milk A and hay to eat from 1 week of age. Average weaning age is 7 weeks and about 90 kg of whole fresh milk or 20 kg of milk replacer is fed in an open pail from 1 to 7 weeks of age (Fig. 4). After 7 weeks of age only solid synthetic milk B and hay are fed.

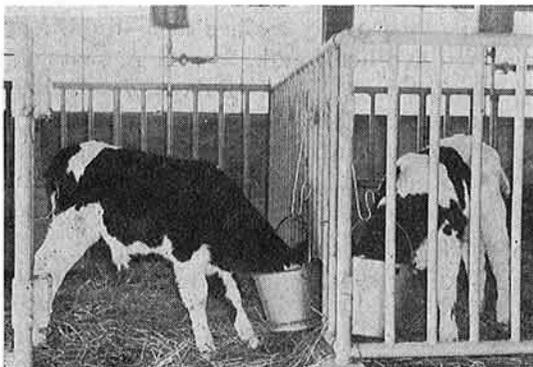


Fig. 4 Calves about 2 months of age. They were early weaned to be reared with synthetic milk by the same method as used with pigs.

The average growth rate of dairy calves is 0.6 kg per day from 1 to 13 weeks of age. By using the early weaning system, the raising cost is reduced.

There are two kinds of synthetic milk, synthetic milk A for pre-weaning and synthetic milk B for post-weaning. Chemical composition of these synthetic milks is shown in Table 2.

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