

Embryo Transfer as a General Practice Activity

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I. Introduction

It is with some reluctance that I begin to write a paper about embryo transfer. Every three months, I receive the International Embryo Transfer Society Newsletter with a bibliography of new embryo transfer articles that usually runs for 30 or more pages. One wonders if anyone can benefit from yet another article. Yet my assignment is to comment on embryo transfer as part of a general practice activity and there may be a useful purpose served here. My perspective is that of a dairy practitioner in a mixed animal practice. My concerns are that embryo transfer services contribute to my practice life and economics, and that embryo transfer services contribute to my client's dairy herd reproduction programs.

II. Implications for Practice Life and Economics

I am not a transfer station blueblood. At any given moment, I am as likely to be found manipulating a retained placenta as I am an early blastocyst. I have reviewed my embryo transfer activities of the past calendar year in terms of practice time, number of clients, results, costs and income.

A. Practice time

Seventy-six cows were superovulated and collected on 41 working days. This represents about 17% of my professional time.

B. Client activity

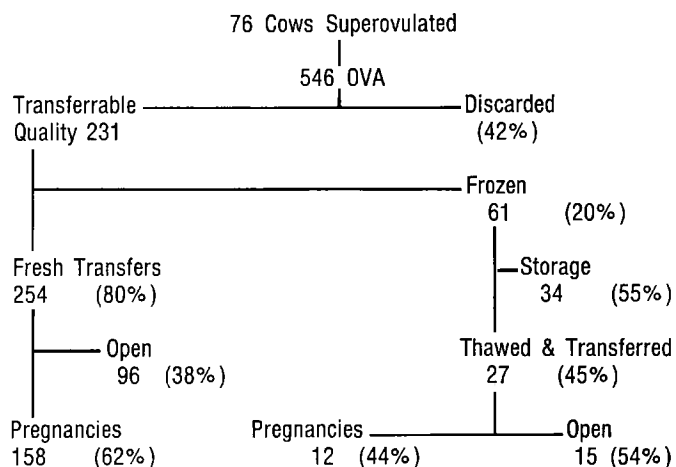
This work was done for 20 different clients. Fifteen of these clients were long time clients of my practice and were purchasers of other services. Five were new embryo transfer clients only. The distribution of superovulations was as follows:

Superovulations per client	Number of Clients
1	8
2	4
3	1
4	1
5	2
6	2
9	1
22	1

It is worth noting that about half of the embryo transfer services were purchased by 4 clients. The average distance traveled to perform these transfers was 76 miles one way.

C. Results

The embryo disposition that resulted is summarized in chart form below:



D. Costs

The costs of embryo transfer services include transportation, direct cost of drugs and materials, technician salaries, general practice overhead, and veterinarian salary.

I have kept detailed records of costs of drugs, materials, and technician salaries in embryo transfer services. It has cost an average of \$122 for drugs and materials for each superovulated cow. This includes everything from Betadine soap and plastic sleeves to embryo filters and hospital sterilization fees.

Technician costs are based upon three factors in our system. There is the direct time involved in assistance during collection and the embryo search and processing and has averaged \$42 per cow. There is time involved in cleaning of catheters, glassware, and equipment, as well as maintaining an inventory of supplies. I estimate approximately \$154 per cow here. And we pay a bonus of \$8 per pregnancy to the technician. I estimate technician costs at \$75 per cow.

Transportation cost were estimated at \$.25 per mile, and cost \$37.50 per cow.

I have not attempted to prorate clinic overhead.

The total direct costs average \$232.50 per superovulated cow.

E. Income

Charges for embryo transfer services have been based as follows:

- Travel: \$0.25 per mile round trip
- Superovulation, collection, and transfer:
 - \$250 for 1st cow each day
 - \$150 for each additional cow that day
- Pregnancy fee:
 - \$180 per pregnancy for 1 to 4 pregnancies that day
 - \$165 per pregnancy if 5 to 7 pregnancies that day
 - \$150 per pregnancy if 8 or more pregnancies that day
 - \$250 per frozen embryo pregnancy

Direct income from embryo transfer services averaged \$583 per superovulated cow. There were 34 embryos in storage which should yield about \$4000 in income, or about \$50 per cow. Average gross income has averaged \$635 per superovulated cow.

This should produce about \$400 per superovulated cow to cover clinic overhead and the veterinarians salary.

Comments:

Embryo transfer services demand time. With the typical long distances traveled and the time to complete the process, a collection and transfer usually ties up a veterinarian and technician for a day. However, multiple cows can be flushed and transferred with relatively small increases in total time.

Once again, embryo transfer services demand time. It seems that the transfers come in bunches and the yields are unpredictable. Colleagues and spouses need to be tolerant of unpredictable schedules and missed meals. It is an inherent part of the business.

Embryo transfer services demand meticulous inventory controls. There are many items that are unique to superovulation, collections, and transfers and there are usually no substitutions. Inventories of drugs and supplies must be monitored well in advance of the transfer dates and checklists of needed supplies are essential considering the typical distances to the work.

There is little economic justification for expensive commercial embryo freezing units with activity levels like mine. The above chart shows 61 embryos frozen in a one year period. Many embryo freezers cost \$5,000 and up. It becomes very hard to justify this expense if we try to apply it against 25 or 30 pregnancies that may be produced with the freezer each year. Yet relatively inexpensive freezers can be made. They take some ingenuity and calibration, but are very dependable and yield comparable pregnancy results. Dr. Ed Robertson of Tennessee demonstrated the use of this type of freezer in a preconvention seminar of the annual convention of the American Association of Bovine

Practitioners. I assembled my freezing unit for about \$600.

I believe that it is a very positive practice to pay technicians a bonus on the basis of pregnancies produced. Embryo searching is a tedious business, especially when four or five cows are done on a single day. Sometimes mucus must be rolled and shredded and teased and a bonus can aid in motivating technicians to produce excellent work throughout very long and demanding days.

Practitioners who attempt to develop embryo transfer skills take some risk. While success does enhance professional reputation with our clients, no one becomes skilled without paying their dues. There are procedures to be mastered, mistakes to be made, and techniques that need practice. Too often, everyone becomes disillusioned before success arrives and professional reputations would have been better if the process had never been attempted. Be careful.

III. Implications for Client Production Programs

Just as embryo transfer has economic and management implications for the practice, it has economic and management implications for the dairyman. I reviewed the transfer activities of my clients in terms of results and costs.

A. Embryo Response per Superovulation

The response to superovulation remains highly unpredictable. In reviewing our records, we have found the following distribution of total embryos collected per superovulation:

Total Embryos per Superovulation	Incidence
0	5%
1	4%
2	5%
3	5%
4	14%
5	8%
6	7%
7	14%
8	8%
9	3%
10	7%
11	5%
12	3%
13	1%
14	1%
15	4%
16	3%
22	1%
32	1%

Of the total embryos collected, 58% were evaluated as being of sufficient quality to transfer or freeze. While these cows averaged 4.1 transferrable quality embryos per superovulation, the distribution of response was highly variable.

Transferrable Embryos per Superovulation	Incidence
0	20%
1	8%
2	16%
3	7%
4	12%
5	11%
6	5%
7	4%
8	5%
9	1%
10	4%
11	5%
12	1%
22	1%

This variability of response makes it difficult to prepare appropriate numbers of recipients. However, the incidence column indicates that we will have 8 or less embryos to transfer 88% of the time.

I recommend that we try to have 8 recipients synchronized properly for a superovulated cow. This does not mean however that we start with 8 recipients. In my experience, about 75% of all recipients synchronized with a double injection prostaglandin schedule will be synchronized acceptably for use so 11 would be an appropriate number to start with.

If several donors are superovulated simultaneously, the number of recipients per donor can be reduced. The more donors that are done, the more likely we are to reach an average collection. In such cases, 5 properly synchronized recipients per donor is reasonable, so starting with 7 per donor usually works out well.

B. Pregnancy Response per Superovulation

While embryo response has implications on recipient management, the pregnancies produced have dramatic effects upon the economics of the procedure. The distribution of pregnancies per superovulation ran as follows:

Distribution of Pregnancies per Superovulation	
Pregnancies	Incidence
0	18%
1	17%
2	15%
3	14%
4	10%
5	12%
6	5%
7	2%
8	5%
9	2%

C. Costs of Embryo Transfer on a Pregnancy per Superovulation Basis

There are significant fixed costs in embryo transfer that have dramatic effects on the economics of the process. For

purposes of this discussion, I will make the following assumptions:

1. Blood typing costs will be done for breed associations at \$30 per animal.
2. Synchronization of 11 recipients will cost \$10 each and will total \$110.
3. Semen will cost \$60 a unit and two units will be used to service the donor cow.
4. Mileage fees will cost \$50 for the embryo transfer service.
5. Drug, flush, and transfer will cost \$250.
6. Pregnancy fee will be fixed at \$180 per pregnancy.

With these assumptions, let's look at the out of pocket expenses as pregnancy results change.

Pregnancies	Total Cost	Costs per pregnancy
0	560	
1	740	740
2	920	460
3	1100	367
4	1280	320
5	1460	292
6	1640	273
7	1820	260
8	2000	250
9	2180	242
10	2360	236

While not calculated in this example, the cost of delayed breeding or increased days open of recipient animals is another important cost. If calculated, it will exaggerate the trends shown above. It becomes very obvious that the most expensive part of embryo transfer is few or no pregnancies.

Comments

I have seen a sorting out of embryo transfer users. The owners of very high production registered herds seem to be using embryo transfer on a more regular basis. There is a distinct trend toward superovulating the top cows at about 60 days in milk and then rebreeding. I see fewer and fewer cows being pulled from the herd to be superovulated repeatedly for a one or two year period.

I am also seeing a trend toward younger and younger donor cows. It used to be that almost all of the donor cows were 10 years old and had no other productive life than embryo production. The breeders who are becoming my major clients are picking younger cows and are making embryo transfer a regular part of the breeding program of the high indexing 3 to 7 year old cows.

With this trend toward younger cows has been a trend toward better responses in embryos and pregnancies. In turn, the cost per pregnancy to the dairyman drops dramatically as indicated above.

Some comments need to be made about the cost of days open. As veterinarians, we may have been practicing a double standard. If we were involved in reproductive programs, calving intervals were critical. But when we wanted embryo transfer work, recipients were critical and

the calving intervals could go where they may! I used to see dairymen hold up breeding of heifers and recipient cows until a donor could be superovulated. I now see dairymen delaying the superovulation of donor cows to mesh with a later group of recipients. If we try to minimize the cost of days open, this is clearly the proper direction.

There has been a definite trend toward using cows as recipients. During the first years, it seemed that everyone thought heifers, yet an occasional dystocia and death paired with good conception rates on mature recipient cows have moved the choice toward cows.

When heifers are used, it is always wise to review the heifer rations in detail. Many heifers are grown on very unbalanced rations and conception rates will be increased by proper balancing. Other aspects of recipient management such as parasite control and immunization are obvious.

With experience, there has been a change in attitudes towards freezing. There is a popular conception that the frozen embryo is going to be very practical. Many dairymen see it as a way of dealing with the missed heat-observed blood situation. No need to synchronize! Simply mark the calendar six days later and have the veterinarian place an embryo. Get better calves from poorer heat detection!

The current reality of embryo freezing is very different. First, there are substantial increases in time and costs paired with substantial decreases in pregnancy results. For

example, if 5 embryos are transferred fresh, we would expect 3 pregnancies to result. If frozen, we would expect 2 pregnancies to result. Using the fee schedule described above, the frozen pregnancies will cost \$530 each while the fresh embryo pregnancies will cost \$367 each.

The reality of embryo freezing for the veterinarian is that it nearly doubles the professional time involved in producing a pregnancy. There is additional embryo processing time, freezing time, thawing time, more processing time, and additional travel time.

The other reality that contrasts with the popular misconception is the idea of spotting the heifer in heat and marking her down for an embryo in a week. It is extremely disappointing to thaw an embryo, process it, and bring it to a heifer whose cervix is impassable. We need to have a synchronized alternative!

In spite of my complaints, embryo freezing is a wonderful process. It has been very useful for dealing with the unpredictability of superovulation. It gives us a way to deal efficiently with both extreme failure and extreme success. On farms where embryo transfer has become an ongoing program, we prepare moderate numbers of recipients. If there are more embryos than recipients, we freeze. If there are more recipients than fresh embryos, we thaw and maximize the use of synchronized recipients.