# MULTIPLE INSEMINATION

F. X. OGASAWARA • J. P

**Dilution of turkey** semen to make it more fluid and easier to work with is practiced in some segments of the turkey breeding industry since fertility is not adversely affected and, in some cases, is enhanced. Dilution of semen also offers an economic advantage. The number of toms in a breeding flock, costing $30 each for the season, can be decreased. The potential savings to California turkey breeders from this reduction would amount to approximately $1.5 million for the turkey breeding season.

Although the timing of insemination has been dealt with experimentally, the technique of multiple insemination of turkey hens has not, and it has an economic benefit of potential importance. Multiple insemination, as applied in the following experiments, means the insemination of hens once a day for two or three consecutive days. In these studies the hens were inseminated according to the schedules as shown in tables 1 and 2. Each insemination experiment is discussed separately.

TABLE 1. MULTIPLE INSEMINATION OF TURKEY HENS

| Group* | Weeks following insemination | | | | | | | Duration of fertility days |
|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
| | % Fertility | | | | | | | |
| 1X | 68.0 | 70.0 | 61.0 | 59.0 | 39.0 | 34.0 | 32.0 | 24.7a |
| 2X | 83.0 | 92.0 | 85.0 | 82.0 | 90.0 | 55.0 | 26.0 | 35.1b |
| 3X | 90.0 | 95.0 | 97.0 | 91.0 | 84.0 | 61.0 | 28.0 | 39.9b |

*12 hens/group: 1X = one insemination, dose, 0.03 ml
2X = two inseminations, dose, 0.03 ml
3X = three inseminations, dose, 0.03 ml

Inseminations on one-, two-, three-consecutive days.

Numbers followed by the same subscript are not statistically different from each other

TABLE 2. DOUBLE INSEMINATION OF TURKEY HENS

| | Group* | Weeks following insemination | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| % Fertile | 1 | 100.0 | 98.3 | 98.4 | 100.0 | 93.2 | 79.8 | 49.5 |
| | 2 | 92.6 | 95.4 | 100.0 | 99.2 | 90.7 | 74.0 | 37.0 |
| | 3 | 97.0 | 98.4 | 99.2 | 99.1 | 93.8 | 76.6 | 34.3 |
| % Early Dead Embryo | 1 | 15.5 | 7.1 | 8.3 | 9.9 | 10.0 | 13.2 | 31.5 |
| | 2 | 4.0 | 5.8 | 7.3 | 12.0 | 8.2 | 13.0 | 43.2 |
| | 3 | 8.3 | 5.0 | 5.1 | 11.5 | 5.7 | 10.6 | 24.3 |
| % Hatch | 1 | 67.0 | 76.1 | 76.9 | 79.3 | 74.5 | 73.6 | 55.6 |
| | 2 | 83.0 | 77.7 | 80.0 | 75.2 | 81.6 | 72.7 | 48.6 |
| | 3 | 70.8 | 83.5 | 83.1 | 79.6 | 79.0 | 75.3 | 54.1 |

*20 hens/group: 1 = undiluted control, semen insemination dose, 0.03 ml
2 = diluted (1-1), semen insemination dose, 0.03 ml
3 = diluted (1-1), semen insemination dose, 0.06 ml

Inseminations on two consecutive days.

### Multiple insemination of turkey hens

In this study 36 hens were randomly distributed into three groups and held in individual cages at the University of California poultry experimental farm at Davis. The single insemination group acted as the control. The semen was obtained from males held in a large floor pen and only that amount of semen as needed was collected for that day. Semen was monitored for volume, concentration and viability (live-dead staining) and was of the highest quality as determined from these tests. Insemination was performed using the method of careful and fairly deep insertion (8 cm) of the semen-containing plastic tube into the oviduct.

The semen was not diluted and the semen dose per insemination was 0.03 ml; hence, the total semen inseminated into the hens by group was 0.03, 0.06, and 0.09 ml. In terms of sperm number, 0.03 ml would represent an introduced sperm population of roughly 270 million sperm, whereas 0.09 ml contains about 810 million sperm. Eggs, color-coded for hen group, were gathered daily, stored in a standard egg room, and only normal eggs were set weekly in a Jamesway forced-draft incubator. Eggs were candled at 10 days to remove the infertiles and early-dead embryos, transferred to hatching baskets at 25 days, and day-old

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poults were removed after 28 days of incubation. Incubation data as to percentage of early dead embryos, pips, and dead-in-shell embryos were recorded; no differences existed among the treatment groups.

The most revealing and significant differences among the groups were the percentage of decline in fertility and duration of fertility (table 1). With a single insemination, fertility level began to decline by the fourth week and duration of fertility was 24.7 days. With a double insemination, the fertility level did not decline until the sixth week and duration of fertility was 35.1 days. With a triple insemination, decline in fertility was similar to that following a double insemination and duration of fertility was 39.9 days, which was statistically different from the single insemination but not from the double insemination.

### Double insemination of turkey hens

From the data in table 1 it was inferred that a double insemination was sufficient to insure a high level of fertility in turkey hens. Accordingly, a double-insemination experiment was devised following the procedures used in the first experiment.

### Test differences

The main difference between the two tests was that the double insemination experiment was conducted as a field trial with a prominent California turkey breeder. The hens were housed in identical cages and egg management was similar to that used at Davis. The eggs were gathered daily, stored in a conventional egg room, and shipped weekly by air to Sacramento. Incubation and hatching of the eggs occurred at the U.C. Davis Department of Avian Science.

Another difference involved the dilution of the semen. Three subgroups, of 20 hens each, were inseminated with semen treated as follows: (1) no dilution, insemination dose of 0.03 ml; (2) diluted 1:1 with Lake's diluent, insemination dose of 0.03 ml; and (3) diluted 1:1, insemination dose of 0.06 ml. In a comparison among the three treated semen dosages, sperm number was identical in group 1 and 3, whereas sperm number in group 2 was reduced by half.

From table 2 it is evident that fertility level in all groups did not decline until the 6th week postinsemination. There were no differences among the groups in terms of early embryo mortality or percentage of eggs hatched over a 6-week period.

Optimal results were achieved in both of these multiple insemination experiments because entry into the sperm storage sites in the lower oviduct is crucial for a long survival of spermatozoa in the avian oviduct. Good insemination technique is essential to achieve this objective. Since sperm number is a critical factor, multiple inseminations insure that adequate numbers of spermatozoa will be introduced into the primary storage glands of the lower oviduct. With the optimal filling of these lower host glands, an adequate and constant supply of spermatozoa are available for the upper host glands of the oviduct where the important function of fertilization of the ovulated ovum occurs. The second experiment also demonstrated the benefits from dilution of semen, provided that sperm number was not diminished below a critical level. The beneficial effects of dilution are attributed to the enhancement of sperm motility and increased metabolic activity of the spermatozoa.

On the basis of the data from these experiments, it is recommended that turkey hens be inseminated on two consecutive days (double insemination) with at least 0.03 ml of high quality semen to obtain high levels of fertility and hatchability. This objective can be accomplished with hens housed in cages. Diluting semen does not adversely affect fertility and hatchability in turkey hens if dilution remains at a 1:1 ratio.

*F. X. Ogasawara is Professor, Avian Sciences Department, UC Davis; J. P. Schroeder is Area Farm Advisor in Turkeys, Cooperative Extension, Kearney Field Station, Reedley; and L. S. Mercia is Extension Poultryman, University of Vermont, Burlington, Vermont.*