Artificial Insemination of Pigeons and Doves

By Ray D. Owen, Dep't of Genetics

University of Wisconsin, Madison, WI (Reprinted from Poultry Science 20: 428-431, 1941)

Since the development by Quinn and Burrows (1936) of a simple method of obtaining semen from and inseminating gallinaceous (chicken-like) birds, artificial insemination has made possible a number of studies on the physiology of reproduction and hybridization of these birds. An extension of the technique to the smaller birds, particularly to the pigeons and doves, holds promise as a tool for more extended work along the same lines.

The pigeons and doves include a wide variety of species, many of them separated by psychological and size barriers preventing normal copulation. Barriers of this sort can be surmounted by artificial insemination. In their physiology of reproduction, these birds offer the same problems as those already studied by means of the insemination technique in gallinaceous birds, and in addition problems concerned with the specific and regular ovarian cycle not encountered in the Galena. Furthermore, certain types of pigeons (for example, featherless, rumpless) cannot copulate normally, and artificial insemination provides a possibility of reproducing these types.

Bonadonna (1939) includes male pigeons, finches, and canaries in a list of birds, which have been ejaculated successfully in his laboratory by the "American method of pressing the semen from the bulbous ducts." He does not describe any modification in detail necessitated by the extension of the technique from large to small birds, and he does not record successful insemination of these small birds. His method of obtaining semen is undoubtedly the same as that to be described in this paper. It may nevertheless be considered worthwhile to place on record the details of the technique in its extension to small birds, and to describe a successful method of insemination in these species.

I. Obtaining semen:

The technique to be described is essentially that of Burrows and Quinn, modified in those details which are affected by the differences between large and small birds. The beginner will find it advantageous to work at first with relatively tame male pigeons of fairly large size. Later, when the technique is acquired, wild, (and) small birds can be trained to ejaculate. It is usually wise to keep males to be used for ejaculation in separate cages. Males kept together in large pens, or even males which are mated, can often be ejaculated regularly; in general, however, the yield of semen from these males is small.

A male to be ejaculated is held in the left hand, with his head toward the operator's left. The hand is extended along the bird's back with the fingers towards the tail and with the little finger hooked under the front of the right wing. The thumb and index finger are pressed against the opposite sides of the dorsal (top) surface of the pygostyle (the tail end of the vertebral column - the fleshy swelling to which the tail feathers are attached).

The thumb and second finger of the right hand are pressed behind the tail and against the sides of the base of the cloacal projection, while the third finger of the right hand is pressed deeply between the pubic bones, immediately below the vent. If the position of the fingers is correct, by
pressing the hands toward each other the vent can be made to appear, not as horizontal slit or as a small round hole, but as a wide opening in which the two ventral fleshy folds of the cloaca are exposed.

The tail of the bird is now made to spread and fold alternately by a rhythmic pinching pressure of the thumb and index finger of the left hand on the dorsal surface of the pygostyle. With the same rhythm, the fingers of the right hand "milk" the cloacal area. The vigor of the massage necessary varies with the male in use; some males require a quick, rough pressure while others yield better to slower, more gentle treatment. The manipulation should begin as soon as possible after the bird is caught, since delay decreases the probability of success. It will be found helpful to pluck clean of feathers, an area an inch or so in diameter around the vent, a day or two before attempting to obtain semen.

A small, truncated cone into which the head, wings, and thorax, can be pushed has been found useful in holding large pigeons and small doves. The technique of the massage is not changed when the birds are held in this fashion. Usually after a second or two of massage a small drop of clean milk-white semen will appear on the ventral (lower) surface of the cloaca. The yield of semen can frequently be increased by continuing the stripping motion for a second or two after the first semen appears. Meanwhile, the thumb and forefinger of the left hand, which have been operating on the dorsal surface of the pygostyle, are slipped around the pygostyle and pressed deeply against the sides of the vent, holding the vent open and the drop of semen where it is easily seen and reached.

This frees the right hand for the operation of an eyedropper, which can be used to collect the semen. In pigeons the quantity of semen averages from 0.01 to 0.02 cc per collection; the average collection contains about five to six million sperm. In domestic pigeons, the quantity of semen does not appear to vary as a function of size of bird. Among species, however, smaller species are consistent in producing smaller quantities of semen per ejaculate. Most male pigeons can be ejaculated several times a day; if semen is collected from a male regularly more than once a day, however, that bird often become aspermic (without sperm).

Occasionally, a male is found to be so susceptible to manual stimulation that after a brief massage, the fleshy folds of his cloaca erect and the bird goes through the twitching motion of copulation, the erected folds being thrown well beyond the margin of the vent to form a pointed copulatory organ. Ordinarily, however, the male is quite passive and exhibits no copulatory reflex. Males of the latter sort require somewhat longer massage than do the more susceptible ones. If semen does not appear after 15 seconds of massage of any male he may as well be returned to his cage and tried again after an interval of not less than 15 minutes, with some variation in the technique or vigor of massage. In no case has a male pigeon or dove ejaculated with sufficient force to cause the drop of semen to lose its contact with the organ.

Occasional contamination of the semen with urine or feces may be expected, particularly with untrained males. Frequently ciliates (microscopic organisms) appear upon microscopic examination of the apparently clean ejaculate. Granted the presence of large numbers of motile spermatozoa, however, these ciliates do not appear to affect fertility. Blood cells, probably the result of rupture of capillaries (tiny blood vessels) in the wall of the cloaca, are also occasionally found in the ejaculate.

II. Inseminating
The semen collected can be introduced with the eyedropper directly into the oviduct of a laying female. It is neither necessary nor usually feasible to protrude the oviduct of the female as is commonly done with hens, turkeys, and guineas. The oviduct opens on the left side of the cloaca; by probing the eye-dropper to the left and somewhat dorsally, the opening of the oviduct can be discovered, the pipette pushed gently an inch or so into the oviduct, and the semen deposited there. While undiluted semen is effective in insemination, dilution of the collection with a drop or two of warm bird saline or Ringer's solution has proved productive of a greater percentage of fertile clutches.

Female pigeons and doves do not ordinarily lay when they are isolated. Two methods have been successful in surmounting this obstacle; the first, which is most easily accomplished, is least efficient in its use of cage space. If a male and a female of the same species are put in adjacent cages where they can see and hear each other well (and there seems to be added stimulus to the female if the male can touch her through the bars or mesh of the partition), the female will usually lay regularly.

The second method requires more attention. Two females placed in the same cage will often lay regularly. However, in this case the cycles of the two females soon approach coincidence, and in order to establish the maternity of the eggs, the birds must be separated the day before the first egg of each is laid. A third method, which has not yet been tried, but which might be an improvement, would be to mate females for insemination with vasectomized males.

Usually a female stimulated to lay by any of the methods mentioned above will incubate her eggs and rear the squabs. In the interest of more efficient use of females for insemination studies, however, it is often advisable to remove clutches as soon as they are complete. Eggs to be used for fertility determination or embryonic study may be transferred to an incubator and incubated until the desired stage is reached. Eggs which are to be hatched and the squabs raised may be transferred to foster parents.

It is, of course necessary that the foster parents be in the proper stage of their reproductive cycle, so that when the fostered young hatch they will be fed and cared for by parents whose crop glands are prepared to provide nourishment of the correct sort for the young. In order to insure this, the foster parents should be scheduled for hatching within a day or two of the date on which the fostered eggs are due to hatch.

Fertility has been obtained from a single insemination as much as eight days and as little as one day before the first egg of a clutch was laid. In the latter case, only the second egg of the clutch was fertile. Our experiments indicate that the period included from the third to the sixth day before laying of the first egg is the period during which a single insemination is most likely to produce fertility. Multiple inseminations (for instance, inseminations on the third, fourth, and fifth days before the first egg of the clutch is laid) practically insure fertility in most intra-specific matings. The regularity of the ovarian cycle in pigeons and doves makes it possible to predict within narrow limits the date upon which an egg will be laid.

The amount of semen required to produce fertility in pigeons and doves is considerably less than that recommended in gallinaceous birds. Thus, while Burrows and Quinn (1939) indicate that 0.1 cc of semen injected once a week will produce 80-95 percent fertility in most chicken matings, 0.01 c.c. diluted to 0.03 c.c. with warm bird saline has produced fertile clutches in 62 percent of our trials with pigeons when the insemination occurred on the third to the sixth day before the first egg of the clutch appeared.
References


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