Influence of Gonadal Hormones on Behaviour of Pigeons in Home and Alien Cages

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Abstract In the present study we observed the behavioural responses of male pigeon in its home and alien cages. How hormonal interplay governs the above situation also constitutes another important facet of our work. The salient features of our findings are as follows: (1) A pigeon defending its territory always wins the fight. (2) Recognition of male and female in pigeon is through various signalling. (3) Both courtship and territorial behaviour of a male are testosterone dependent. (4) Territorial behaviour is absent in female.

Among the domestic avian species the pigeon (Columba livia) has been the most popular model for studying the different aspects of avian behaviour when caged (Fibricius and Jansson 1963, Murton et al. 1969, Murton and Westwood 1975). A careful scrutiny of these papers reveals that although fairly exhaustive information exists on the courtship behaviour of the pigeon; less is known about the intermale competitive interaction which is often observed during the development of position of dominance in breeding individuals as seen in laboratory study (Ghosh and Banerjee 1983). The latter behaviour presumably reflects the territorial disputes among the males. Such investigation has only been reported recently by Ramenofsky (1984) in a phasianid bird. In view of this in the present communication we emphasized on two hitherto unreported points on behaviour of a Columbidae bird, pigeon.

(1) Male to male behavioural interaction (side by side the courtship behaviour has also been studied for a comparison).

(2) Influence of home and alien cages in modulating the behavioural responses of gonadectomised pigeons with or without replacement therapy with sex steroids.

Materials and Methods

Sixty six healthy young adult pigeons were taken. All birds were sexed by laparotomy. Only those birds having fully developed gonads were taken. Each bird was kept in a cage and was visually separated from one another by an opaque partition between two cages. The birds were divided into following groups:

1) Control male (20),
2) Control female (10),
3) Castrated male (6),
4) Spayed female (6),
5) Castrated male (6) injected with testosterone** (im),
6) Spayed female (6) injected with estradiol** (im),

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** 0.1 mg in 0.1 ml ground-nut oil/bird/day for seven days (im).
7) Spayed female (6) injected with testosterone** (im),
8) Castrated male (6) injected with estradiol** (im).

For the first three weeks, the birds were not disturbed except for giving food and water. After the initial three weeks isolation, the behaviour of each bird was observed in the following schedule. At each test, a bird (intruder) was introduced into another bird's cage (alien cage). Fifteen minutes time was given to see the reaction of the two birds. If there was no reaction the bird was taken out and placed in its own cage.

Each bird was used alternatively in its own cage as a host and alien cage as an intruder. The differences in their behaviour in two cages (if any) were also observed. These observations were carried out over a period of eight weeks. After each 'test' day, the birds were given rest for two days. Then again the test was conducted with the same bird.

Results

Control

Behaviour of the control male pigeon with another male: When a male was placed in the cage of another male during the breeding season, the first reaction observed was repulsion from one another for a few second. Then the resident bird started a typical vocal sound and attacked the intruder bird. This latent period prior to initiating attack was recorded in all the fights and found to vary from five to six seconds in all pairs. In such cases where physical contact did not take place, the initiation of chasing was recorded. The intensity of fight depended on the response of the intruder bird. Three types of fight may be categorised.

1) High intensity fight where the fight is continuous and severe.
2) Medium intensity fight where the fight is intermittent (stop and start basis).
3) Low intensity fight where the physical contact is absent.

In all the cases the resident bird dominates the fighting. Details of the fights have been summarized in Table 1.

Behaviour of a control male pigeon with a female: If the intruder bird is a mature female, the male resident bird started its vocal sound and approached or sometimes chased

| Winner: In all three cases winner of the fight is the host (owner of the cage). |

Table 1. Categories of fight in control males.

<table>
<thead>
<tr>
<th>High intensity (25%)</th>
<th>Medium (65%)</th>
<th>Low (10%)*</th>
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</thead>
<tbody>
<tr>
<td>Chase and strut by resident bird accompanied with threat posture.</td>
<td>Strut by resident bird.</td>
<td>Chase by resident bird.</td>
</tr>
<tr>
<td>Attack by resident bird.</td>
<td>Attack by resident bird.</td>
<td>Strut by resident bird.</td>
</tr>
<tr>
<td>Body peck by both (head region, wing and body joint).</td>
<td>Body peck.</td>
<td>Escape by intruder.</td>
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<tr>
<td>Head grab.</td>
<td>Head grab.</td>
<td>Squat (rarely) by intruder.</td>
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<tr>
<td>Beak to beak combat.</td>
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<tr>
<td>Panting by intruder.</td>
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</table>
The differences in behaviour of the experimentally manipulated birds in their home and alien cages have been presented in Table 2.

![Table 2](image)

**Experimental**

The differences in behaviour of the experimentally manipulated birds in their home and alien cages have been presented in Table 2.

**Discussion**

In the present set of experiments, the individualistic behaviour of pigeon towards another pigeon has been observed. When a bird of either sex is introduced into the cage of a male bird, the host approaches the intruder and starts a typical sound probably...
signalling its possession of the territory. The next reaction of the host depends upon the signal given by the intruder bird. If the intruder bird is a male, the reaction is 'fight or flight'. But if the intruder bird is a female, the latter signals by nodding her head or sometime by crouching down (probably as a sign of acceptance). It acts as a stimulus to male. The male bird starts courting the female by some typical courtship movements [as detailed out by Fabricius and Jansson (1963)]. That sign stimuli play an essential role in all aspects of behaviour of bird has been reported (Nice 1943, Hinde 1961). In case of male to male interaction, the host bird does not find any sign of specific signal for acceptance from the intruder which presumably trigger the host to fight.

In these experiments, an interesting revelation regarding the territorial behaviour has been observed. The intermale reaction always lead to a fight. The winner of the fight is always the host bird (Tinbergen 1960). This behaviour of the caged male pigeon can be very well compared with the territorial behaviour of the birds of other species in nature (Nice 1943, Ramenofsky 1985).

In our present investigation it has been found that castrated males are treated as a female by the normal male birds. The male host bird tries to court the castrated male which instead of giving any signal to the male becomes restless. This engenders frustration in them. As a result, the male starts pecking the intruder bird. This emphasises that recognition of male and female in pigeon is through sign stimuli as mentioned earlier.

In the present experiment we observed that both courtship and territorial behaviour of a male (a form of aggressive behaviour which includes chasing and fighting) are mediated through testosterone since both behaviours are lost in castrated birds. It is restored following testosterone injection. Testosterone is reported to increase aggressiveness in a number of avian species (Murton et al. 1969, Hutchison 1970, Archer 1976, Adkins and Priewski 1978, Bottoni et al. 1985, Ramenofsky 1985). Interestingly, when testosterone injection is discontinued in castrated birds, both the above mentioned behavioural patterns are lost. The castrated bird is seen to be seated at the corner of the cage with its plumage puffed up so that it looks much larger than its real size. It is interesting to note that latter behaviour (supposedly a defensive behaviour) is not under androgenic control.

To conclude, our findings emphasize the importance of testosterone in both courtship and territorial behaviour in male pigeon. Territorial behaviour is however completely absent in female pigeon.

Acknowledgements

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References


自己および他個体の籠内でのドバトの行動に及ぼす生殖腺ホルモンの影響

本研究では、自己および他の個体の籠におけるドバトの雄の行動について観察した。また、この際ホルモンのどのような相互作用が働くかを調べた。主な結果は次のようにある。

1. なわばりをもつ個体は常に争いに勝った。
2. 雌雄の認知はいろいろな動作が信号となる。
3. 雄の求愛となわばり行動は共にテストステロンに依存している。
4. 雌ではなわばり行動はしない（編者訳）。