*Bulletin of the Psychonomic Society*
*1979, 13 (4), 261-262*

# Delta-9-tetrahydrocannabinol induced response suppression in pigeons

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Response suppression following acute injections of Delta-9-tetrahydrocannabinol (9-THC) was compared between groups of White King or Silver King pigeons. Daily keypeck training continued until subjects' responses were stable for 3 days. The day following criterion performance, each subject was injected with .250 mg/kg 9-THC, .125 mg/kg 9-THC, or the drug vehicle alone. Responses emitted during the ensuing session were cast into a ratio with the preceding criterion baseline to provide a proportion of response suppression attributable to 9-THC. Daily training continued after testing through a 12-day "washout" period, after which subjects were reeligible to attain criterion performance and be retested. All subjects were tested in each condition, with random assignment of injection sequences to subjects. Analysis of the results indicate that higher doses of 9-THC increased response suppression among both groups. This effect was more pronounced among Silver King pigeons, who as a group, differed significantly from the White Kings.

Pharmacological agents interact with a cluster of organismic and environmental variables. These include ongoing behavioral controls, ingestion route, age, history, and species membership (see Ferraro, Gluck, Fetterhoff, & Marriott, in press, for a review). Since a drug's eventual effect is determined by such interactions, it is surprising to find reports describing the behavior of "experimentally naive adult pigeons," without specifying the type of strain (Lyons, Klipec, & Steinsultz, 1973; McMillan, Harris, Frankenheim, & Kennedy, 1970). While the assumption "a pigeon is a pigeon" may hold true in some cases, it remains generally untested in the domain of behavioral pharmacology.

The present investigation identified differential effects following acute administrations of Delta-9-tetrahydrocannabinol (9-THC) to groups composed solely of White King pigeons or of Silver King pigeons. Response suppression following drug ingestion was used to assess the relationships between 9-THC dosage and strain identity in pigeons.

## METHOD

### Subjects

Eight experimentally naive king pigeons were used as subjects. Four were White Kings; the remainder were Silver Kings. All pigeons were obtained from the Palmetto Pigeon Plant, and ranged from 4 to 6 years of age.

### Apparatus

The experimental apparatus consisted of two single-key operant pigeon chambers, and associated relay-type automatic programming and recording equipment located in an adjacent room. Sound-attenuating insulation and masking noise were provided for each chamber. Mixed grain, presented for 3-sec intervals, served as reinforcement.

The 9-THC (Batch SSC 81895, provided by U.S. Department of Health, Education, and Welfare) was first separated from its alcohol base by aspiration. It was then mixed in a vehicle containing 96% isotonic saline and 4% tween-80 surfactant. Serial dilutions with this vehicle were performed to obtain concentrations of .125 and .250 mg/cc.

### Procedure

Upon arrival at the laboratory, all subjects were individually caged and allowed free access to food and water until a stable weight was obtained. Each subject was then reduced, by total food deprivation, to 70%-80% of its free-feeding weight and maintained within that range throughout the study.

On Day 1, subjects were shaped and allowed to earn 50 continuous reinforcements (CRFs) for keypecking. On Days 2 and 3, 50 CRFs were earned as well. The reinforcement schedule was gradually leaned out, so that on Day 8, formal baseline training had begun, with each subject receiving daily 30-min sessions with a variable interval (VI) 1-min schedule in effect. A minimum of 15 sessions ensued before any subject was eligible to attain criterion performance. The stability criterion required each subject to respond for 3 days at a rate such that no single day's responding fell outside a range of ±10% of the mean for those 3 days.

Two hours before training on the day following criterion performance, each subject received an intramuscular injection of .250 mg/kg 9-THC, .125 mg/kg 9-THC, or the drug vehicle alone. Training sessions following drug injections were identical to those in baseline. For each subject, the total number of responses under each drug condition was cast into a ratio with the mean of the preceding 3 criterion baseline days serving as the denominator. This proportion provides a direct measure of response suppression associated with each subject and dosage.

Following the first test, all subjects were given a minimum of 12 days "washout" before becoming reeligible to attain criterion performance and be retested at a different dosage. This train-test probe-retrain procedure continued until all subjects had received each of the three injections in a random sequence.

## RESULTS

Individual suppression ratios were summed within dosage levels within each group and then submitted to

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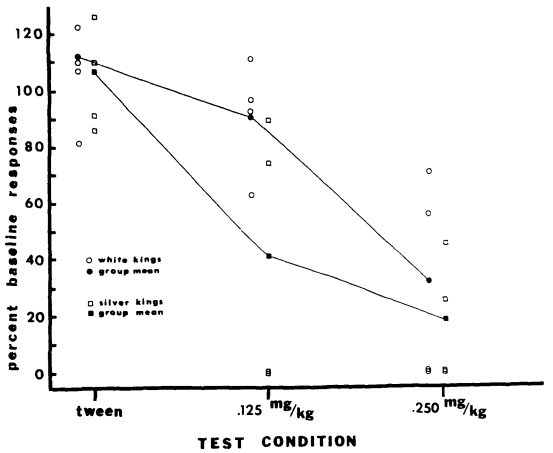


Figure 1.

a two-way analysis of variance (2 strains by 3 dosages repeated measures). Collapsing across groups, a significant dosage effect was obtained [$F(2,12) = 11.6$, $p < .01$], which showed that 9-THC produces greater response suppression at higher dosages. A significant strain effect [$F(1,6) = 6.6$, $p < .05$] indicated that White King and Silver King pigeons represent separate populations with respect to tolerance to acute ingestion of 9-THC. The direction of this difference identifies White King pigeons as more resistant to acute 9-THC than Silver Kings. Individual and group response rates are depicted for each condition in Figure 1.

## DISCUSSION

These findings indicate the need for pharmacological researchers to reevaluate any studies using acute exposure to 9-THC with mixed strains of pigeons. The applicability of these findings using chronic regimes, other drugs, or other species remains to be tested, but the present results suggest that the assumption of strain equivalence may be inappropriate in these cases as well.

Current theoretical trends have recognized the importance of species differences in interpreting results and forming generalizations about learning and performance phenomena (Seligman & Haber, 1972). The present study indicates that the case for analyses of species differences (Bolles, 1970) needs to be carried to an even finer distinction, that is, strain identity.

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(Received for publication January 3, 1979.)