**Reply to Richard W. Thompson's
"Comments on Ksir, C. 'Scopolamine does
not reduce tonic immobility in chickens'"**

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Thompson's (1979) comment points out four areas of difficulty in interpreting my results (Ksir, 1978). The first, that strain differences in TI duration might have masked the effects of scopolamine, is a possible explanation of the difference in results between our two studies. However, the saline and methylscopolamine durations reported in my paper were quite similar to the durations reported for their birds under similar drug conditions. Thus, strain differences in scopolamine action, rather than in baseline TI duration, would have to be invoked to explain the different results. I do not know of studies reporting strain differences in scopolamine action among chickens.

Their fourth point, that I referred to activity effects as changes in "open-field" activity when both experiments were done in fairly small activity chambers points out a careless choice of words on my part, but since there were no substantive differences in the results of our two experiments, this is a minor point.

Their third point, that I used an "unusual" testing procedure in my second experiment, is irrelevant. In my paper, under the bold heading "EXPERIMENT 1," is the statement, "Experiment 1 was an attempt to replicate as nearly as possible . . ." The second experiment had a different purpose entirely, that of separating induction effects from duration of TI once induced. That this analytic procedure had not been published before is true, and in that sense it was "unusual."

The most substantive failure of my experiment to replicate theirs was apparently my failure to use three successive inductions rather than a single induction. I had wished to avoid the possible difficulty of nonindependence of repeated tests with the same bird within a short period of time. I used 12 chickens per group rather than their 10, hoping to offset somewhat the loss of statistical power. The Thompson et al. (1974) report had stated that "examination of the data indicated that there were no consistent changes across trials within a session, so the mean duration of TI for each bird for each session was used for analysis." This pooling no doubt had the effect of reducing variance. Thompson's letter states that analysis of the data from the first trial only showed no significant effect of scopolamine, which he says is similar to my result. However, if their data showed no consistent changes across trials, then

we must assume that data from the first trial looked like the mean data, that is, there would have appeared to be a dose-related decrease in TI duration, but the variability of the first-trial-only data resulted in non-significance. Had I actually obtained such results, that is, data that sort of looked like theirs but didn't reach significance due to variability, I would not have submitted them for publication. The reason for publishing my results was that the means for the drug and control groups did not vary much and were remarkably consistent (and similar to their control values). In other words, one can fail to find an effect either because the effect is there but one did not try hard enough (too few subjects or observations, sloppy procedures increasing variability, etc.) or because the effect is not there. One can never use statistics to "prove the null hypothesis," but when, as in my Experiment 1, group means do not change in the expected dose-related way and, as in Experiment 2, results from the drug and control groups are essentially identical, this does indicate that the drug did not produce the expected effect.

With regard to data from other published reports, they actually represent a rather confusing array of outcomes. Atropine, another anticholinergic which is generally regarded to have effects similar to those of scopolamine, was reported by Maser et al. (1975) to have no effect on TI duration in chickens. Woodruff, Hatton, Frankl, and Meyer (1976) found decreased TI duration in ducks, but increased TI duration in guinea pigs and rabbits, using scopolamine. Hicks (1976) reported that scopolamine reduced TI duration in chicks but atropine did not. Gagliardi and Thompson (1977) also report decreased TI duration in chickens with scopolamine. Since scopolamine and atropine are both antimuscarinics with most of their effects in common (Innes & Nickerson, 1975), differences in effect between these drugs in this system would be somewhat surprising. Differences between avian and mammalian species in the effect of scopolamine on TI would also be of interest, if such differences are found consistently. It is not possible at this time to reconcile all these reports, but the possibility that nonpharmacological factors may have influenced some of the outcomes should not be ignored in attempts to clarify the confusion, and future studies should employ blind procedures.

An additional area of concern in interpreting the Thompson et al. (1974) results is that they found large differences between scopolamine and methylscopolamine effects. Methylscopolamine does not readily cross the blood-brain barrier, but Spooner and Winters (1965) have reported evidence that the blood-brain barrier is not fully developed in chickens until the age of 3 or 4 weeks. Thompson et al. tested

their chickens at 12 and 19 days. Previous reports of immature blood-brain barriers have been with respect to monoamines, not methylscopolamine, and it may well be that the barrier is effective at 2 weeks for this drug. This is another question which should not be ignored in future studies on this behavior.

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(Received for publication April 1979;
accepted October 1979.)