Apparatus for the Long-Term Study of
Ingestive Behavior and Taste in the Rat
and Mouse

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Understanding changes in the ingestive behavior or taste in the rat as a function
of the aging process requires more than mere measurement of the daily intakes of
food and liquid. We modified a standard rat cage to allow for the description of
detailed patterns of ingestion for nearly 24 hr/day for the lifetime of the rat. In
front of each of the three ingestion ports (the two fluid containers and the one food
container), an infrared beam emitter was placed. When the rat licked on one of the
fluid tubes or entered the food bin, the infrared beam was broken, and a signal was
sent through an infrared detector board to a microcomputer. The accumulating
signals were stored in consecutive 6-sec time bins for 23 hr (or 13,800 6-sec bins).
At the end of a day’s run, the data were stored on a floppy disk. Analysis software
allowed for printing a daily strip chart of ingestive patterns over the testing pe-
riod. The eating and drinking “bouts” were quantified, showing the number of
daytime and nighttime ingestion bouts (bout number), the bout durations (bins),
the number of licks per bout (counts), and the interbout intervals. For example,
data were collected over a 23-hr period from one rat’s ingestion of 0.25 M sucrose.
The rat made 11,665 licks, 11,635 of which were within drinking bouts. The
criteria for a drinking bout were set for this analysis as follows: Three licks within
a 6-sec bin initiated a drinking bout. The bout was considered terminated if 300
sec elapsed with no licking. Bouts with less than 30 licks were discarded. There
were 7 bouts before the lights went off, 20 while it was dark, and 1 more when the
lights went on again. The average length of the bouts was 57.4 bins or 3.74 min.
The average interbout interval was 35.79 min. From data such as these, dependent
measures such as the rate of licking during each bout can be calculated. This
measure, which has been shown to correlate well with electrophysiological data
over a two-log-unit range of sucrose concentrations, is probably a good behavioral
measure of taste. And, because the rat drinks in distinct bouts, the detailed
analysis of patterns of drinking allows one to precisely count the number of
drinking bouts that occur during the lights-on and lights-off periods. The rat is
nocturnal, and most eating and drinking occurs during the dark hours. In contrast,
when sucrose is present, the number of bouts of drinking during the lights-on
period increases. We have found that this increase is highly correlated with the
concentration of the sucrose, allowing for a second behavioral measure of taste.

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