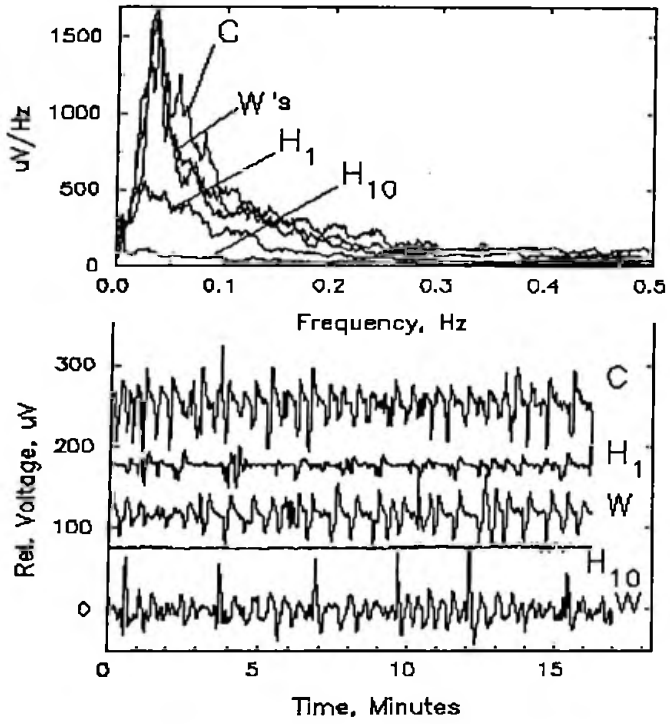
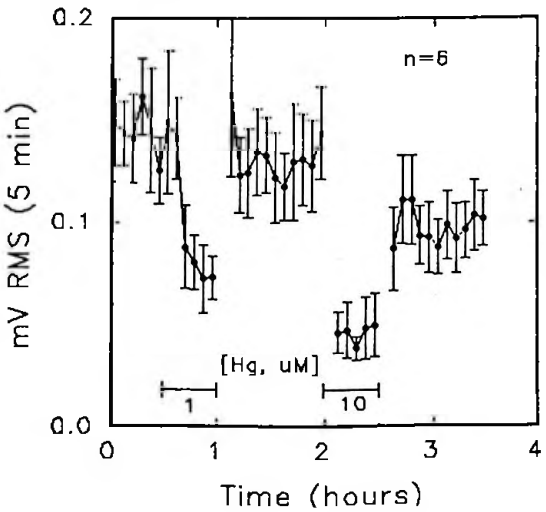
ELECTROMYOGRAPHIC DETERMINATION OF MERCURY TOXICITY IN MYTILIS EDULUS

George W. Kidder III[1] and Antoine A. McCoy[2]
[1]Dept. of Biological Sciences, Illinois State Univ., Normal, IL 61761
[2]Brown University, Providence, RI 02912

Electrical signals from mussels were recorded from two electrodes (Ag|AgCl, 0.3 mm thick) inserted between the valves of a 1-2 g mussel in artificial sea water (ASW) at 12°. The electrodes were connected through a high-gain amplifier to an analog to digital converter in a microcomputer, and recorded (1/sec) on magnetic disk for analysis. Animals were recorded for 30 minutes in ASW (period "C"), at which time 1 uM $HgCl_2$ was added ("H_1"). After 30 minutes of exposure, the solution was renewed ("W", two washes) and incubated for an hour. Then 10 uM $HgCl_2$ was added ("H_{10}") for 30 minutes, followed by an hour of recovery ("W"). The last 15 minutes of each of the periods in one mussel is shown in the bottom panel to the left. The top of this figure shows a Fourier transform of these data. Note that the major peak (about 0.04 Hz or 2.4 cycles per minute) is reversibly decreased in both intensity and frequency with Hg inhibition.



The data can also be analyzed with a program which calculates the root-mean-square (RMS) voltage, which allows comparison and averaging of different animals (mean ± SE, N = 6). 10 uM $HgCl_2$ rapidly (>5 min to 90%) inhibits activity to system noise level; 1 uM $HgCl_2$ requires 20 minutes to achieve a lesser inhibition. These results parallel qualitative observations of the degree of visible motor activity in a similar set of mussels without electrical recording, showing the correlation between EMG and behavior.



This method 1) allows quantitation of muscle activity in bivalves, 2) supports numerical manipulations (e.g., RMS and Fourier transformation), and 3) demonstrates the high sensitivity of this species to $HgCl_2$.

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