Morrison, W.J. 1999. Demonstration of the heat shock response by means of ADH activity in a transformed line of *Drosophila melanogaster*. Dros. Inf. Serv. 82: 131.

Demonstration of the heat shock response by means of ADH activity in a transformed line of *Drosophila melanogaster*.

Morrison, W.J. Shippensburg University, Shippensburg, Pennsylvania. [reprinted from DIS 66: 178, 1987].

For the past three years my undergraduate genetics students have conducted a simple experiment that demonstrates both the heat shock response and an enzyme deficiency. The experiment employs a construct in which the coding region of the alcohol dehydrogenase gene (*Adh*) has been joined to the promotor region of the hs70 heat shock protein gene (Bonner *et al*., 1984). This heat shock-sensitive *Adh* gene has been introduced into the genome of a strain homozygous for a null *Adh* allele by germline transformation at 61C on chromosome 3. When such flies, identified as Adh^{hs61c}, are maintained at 25°C and are heat shocked by exposure to 37°C for one hour followed by a recovery period of 24 hr, they synthesize ADH in nearly all tissues (Bonner *et al*., 1984). Heat shocked Adh^{hs61c} flies are compared in ADH activity to wild type, null strain, and non-heat shocked Adh^{hs61c} flies by a simple, direct test. The basis of the test is that flies possessing ADH activity convert pentynol to a toxic compound that causes paralysis and eventual death.

Five to ten adult flies of each strain/treatment category are placed in empty shell vials (25 mm × 95 mm) plugged with cotton. In a fume hood, two drops of 5% (v/v) pentynol (1-pentyne-3-ol; Pfalz & Bauer, Inc., 172 East Aurora St., Waterbury, CT 06708) are absorbed into a square (2 cm × 2 cm) of thick filter paper (Schleicher & Scheull, grade 470), which is inserted into a shell vial containing the flies to be tested. The vial then is immediately sealed with Parafilm, and the student closely observes the condition of the flies while noting the elapsed time. The wild type and the heat shocked Adh^{hs61c} flies begin to exhibit paralysis after about five minutes, whereas neither the null mutant nor the non-heat shocked Adh^{hs61c} flies show any early response to the pentynol. (However, after several minutes, all flies succumb to this treatment.)

The experiment may be done conveniently and effectively as a lecture demonstration by inserting the pentynol-moistened paper squares into vials containing flies whose silhouettes are projected onto a screen with an overhead projector. This experiment sparks the interest of students by vividly indicating a heretofore unseen difference in the flies. Furthermore, it involves the students with a project of recombinant DNA technology.

References: Bonner, J.J., *et al.*, 1984, Cell 37: 979-991; O'Donnell, J. 1975, Genetics 79: 73-83.