Cummings, M.R. and B. Ganetzky. University of Illinois at Chicago Circle, Chicago, Illinois. Carbohydrate content of adp^{fs} females of D. melanogaster.

In both alleles of the second chromosomal mutant, adipose (2-83.4) of D. melanogaster, the female corpus allatum is hypertrophied and histological observations on the fat body indicate that lipid is accumulated at the expense of glycogen. Carbohydrate analysis indicates that at eclosion, females homozygous for the adp^{60} allele have total body carbohydrate levels only slightly below those of wild type, while eight days later, such females have carbohydrate levels far below wild type (Doane, 1963 DIS 37:73). In addition to excess fat body lipid accumulation, females homozygous for adp^{fs} lay defective eggs, indicating that carbohydrate metabolism might also be affected in this mutant.

To investigate this possibility, total body carbohydrate levels for +/+ (Oregon R) and $+/adp^{fs}$ and adp^{fs}/adp^{fs} isogenic for the Oregon R residual genome were carried out on flies raised on axenic killed yeast medium (David, 1962 DIS 36:128) in a 12:12 hour light-dark cycle. Females from each genotype, ranging in age from eclosion to 7 days were assayed. To eliminate variability caused by food in the gut, flies were starved for 18 hours prior to testing. For each series, groups of four females of each genotype were weighed and homogenized in 10% cold PCA, and the total carbohydrate of the supernatant of the homogenate determined at 625 mu using the anthrone reaction of Scott and Melvin (Analyt. Chem. 25:1656-1661, 1953) with glucose as a standard. Results for day 1 and day 7 are presented in the table as ug/fly.

		Carbohydrate content (ug/fly)		
Genotype		+/+	$+/adp^{fs}$	adp^{fs}/adp^{fs}
	Series 1	17.5±3.53	29.0±1.41	16.5±3.53
Age: 1 day	Series 2	15.0±1.41	21.0±9.89	18.0±2.82
	Mean	16.2±2.63	25.0±7.39	17.2±2.75
	Series 1	32.2±1.06	10.8±0.30	9.8±1.06
Age: 7 day	Series 1	35.2±1.06	11.0±0.00	11.2±5.30
	Mean	33.8±1.93	10.8±0.25	10.5±3.24

From the data presented in the table, it is apparent that adp^{fs}/adp^{fs} and probably $adp^{fs}/+$ females begin adult life with the same total carbohydrate levels as +/+ flies. At 7 days after eclosion, the carbohydrate levels in the +/+ flies has increased significantly, while in the $adp^{fs}/+$ and adp^{fs}/adp^{fs} females, the levels are far below those of +/+ flies. In addition, the $adp^{fs}/+$ and adp^{fs}/adp^{fs} values are lower on day 7 than on day 1. Data not included in the table show that on day 3, the carbohydrate levels in +/+ flies begins to increase, while those of $+/adp^{fs}$ and adp^{fs}/adp^{fs} flies begin to decrease.

The abdomens of newly emerged female Drosophila contain two different types of adipose tissue: larval fat body which is present during larval and pupal stages and the first 2 days of adult life, and the adult fat body, which arises during metamorphosis. After eclosion, the adult fat body increases in volume through the accumulation of large deposits of glycogen, while the larval fat body degenerates and usually disappears by the third day of adult life (Butterworth and King, 1964 DIS 39:82). Since the differences between +/+ and adp^{fs} flies become apparent at the same time as the switchover from larval to adult fat body, one of the defects associated with the adp^{fs} mutant might be the inability of the adult fat body to synthesize and/or store carbohydrates, causing instead, the accumulation of lipids characteristically seen in these mutants.

In adp^{60}, a semifertile allele of adp^{fs}, Doane (1963 DIS 37:73) found that at 8 days after eclosion, adp^{60}/adp^{60} females contained significantly lower amounts of carbohydrate than +/+ flies. However, several differences between adp^{60} and adp^{fs} should be noted:

1) carbohydrate values for 7 day adp^{fs}/adp^{fs} females are much lower than those of 8 day adp^{60}/adp^{60} flies;

2) in 7 day $adp^{fs}/+$ flies, the carbohydrate values are in the same range as adp^{fs}/adp^{fs}, while 8 day $adp^{60}/+$ values are essentially the same as +/+;

3) 8 day adp^{60}/adp^{60} females contain approximately the same amount of carbohydrate as newly emerged +/+ flies, while 7 day adp^{fs}/adp^{fs} values are much lower than newly emerged +/+ flies. Perhaps the causes of some of these differences can be explained by analysis of the amounts of specific carbohydrates in whole flies and selected organs such as ovaries.