



## **INFLUENCE OF DIET ON FATTY-ACID COMPOSITION OF DEPOT FAT IN WESTERN SANDPIPERS (CALIDRIS MAURI)**

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## Erratum

OLIVER EGELER, DANA SEAMAN, AND TONY D. WILLIAMS

### INFLUENCE OF DIET ON FATTY-ACID COMPOSITION OF DEPOT FAT IN WESTERN SANDPIPERS (*CALIDRIS MAURI*)

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Due to a clerical error, a Greek character ( $\Delta$ ) that should have appeared in the text on page 343 in Egeler et al. (2003)*Auk* 120:337–345) was inadvertently dropped and replaced with a square symbol. On the following page, page 343 is reproduced with the correct character inserted.

10% tripalmitin-fish oil diet with the exception of slightly lower levels of oleate (18:1;  $F = 9.5$ ,  $df = 2$  and 17,  $P = 0.02$ ) with the 10% diet.

#### DISCUSSION

Manipulation of dietary fatty-acid composition had a marked (and relatively rapid) effect on the fatty-acid profiles of adipose tissue in captive Western Sandpipers. In general, birds showed increased storage of fatty acids that were predominant in the diet with a concurrent decrease in proportions of other fatty acids. However, not all fatty acids in the diet were deposited equally into adipose tissue; that is, the fatty-acid composition of depot fat was not simply a direct reflection of dietary fatty acids. The polyunsaturated fatty acid linoleate (18:2) was incorporated into fat stores until the proportion in adipose tissue exceeded that in the diet. In contrast, palmitate (16:0), although present in very large quantities in the diet, was not incorporated into adipose tissue, and the amount of oleic acid (18:1) in the diet did not affect the proportion of that fatty acid stored in adipose tissue. It therefore appears that, in Western Sandpipers, the effect of dietary fatty acids on adipose tissue composition was greatest for linoleate (18:2) and intermediate for palmitate (16:0), whereas oleate (18:1) levels were not sensitive to diet composition. That suggests that the effect of diet on adipose tissue fatty-acid composition is complex, but that C<sub>18</sub> essential fatty acids may be preferentially deposited or retained (see also Napolitano and Ackman 1990).

Several previous studies have shown a high congruence between dietary fatty acids and adipose tissue in migratory and wintering birds. For example, Moss and Lough (1968) showed that dietary fatty acids and depot lipids are closely matched in Willow Ptarmigan (*Lagopus lagopus*) and Rock Ptarmigan (*L. mutus*) throughout the year. Similarly, in wintering Canada Geese (*Branta canadensis*) annual differences in depot fat composition corresponded to changes in availability of those fatty acids in the birds' diet between years (Austin 1993). Morton and Liebman (1974) demonstrated that a decrease in linoleic acid (18:2) in the adipose tissues of White-crowned Sparrows (*Zonotrichia leucophrys*) at the onset of vernal migration coincided with a diet switch from seeds high in linoleic acid to insects low in linoleic acid.

Essential fatty acids in adipose tissue can only originate from dietary sources whereas other saturated and monounsaturated fatty acids can originate both from the diet as well as endogenous (*de novo*) synthesis. That predicts that fatty-acid composition of the diet would have the greatest influence on the levels of essential polyunsaturated fatty acids, whereas other fatty acids in the diet may only serve to supplement biosynthesis. Previous studies have reported selective retention of linoleic acid involving the action of monoacylglycerol acyltransferase (an enzyme involved in triglyceride synthesis) in migrating White-throated Sparrows (*Zonotrichia albicollis*; Mostafa et al. 1994) and hibernating marmots (*Marmota flaviventris*; Xia et al. 1993). Although we found evidence for selective uptake of linoleic acid from the diet, that fatty acid was not selectively retained at high levels in adipose tissue in the face of low dietary 18:2: the proportion of linoleate decreased from 35% to ~5% over a period of a few weeks of *ad libitum* feeding of the regular trout chow diet containing low levels of essential fatty acids. That is indicative of rapid fatty-acid turnover and illustrates the dynamic nature of fatty-acid composition of depot fat in Western Sandpipers. Fatty acids can also be enzymatically altered once ingested, which might further complicate any direct effect of diet on adipose tissue composition. For example, palmitate (16:0) can be elongated to stearate (18:0) which can be further desaturated to oleate (18:1). As a consequence, feeding of a high stearate diet to chickens (*Gallus gallus*) has been shown to cause a large increase in stored oleic acid whereas stearic acid levels increased only slightly (Bonanome et al. 1992). The enzyme  $\Delta^9$ -desaturase plays a key role in modification of the degree of saturation of fatty acids (Bonanome et al. 1992) and activity of that enzyme is correlated with plasma oleate levels (De Antueno et al. 1993). We have previously shown that the level of enzyme activity of  $\Delta^9$ -desaturase, and fatty acid synthase, increase during migration in Western Sandpipers (Egeler et al. 2000; although not during premigration). That supports the idea that, in this species, *de novo* synthesis of fatty acids—or postdigestion modification of dietary fatty acids—contributes to composition of depot fat and in that way modulates the effect of diet. In the present study, Western Sandpipers also demonstrated a trend towards increasing stearic acid (18:0)