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dants (Surh and Packer 2005). Oxidative damage is caused by free radicals, which are produced by normal metabolic processes, and also specifically as a defence against microbes, and are harmful to DNA, proteins, and cell membranes (Surh and Packer 2005; Halliwell and Gutteridge 2007; Matata and Elahi 2007). Free-radical oxidation is one of the main mechanistic hypotheses of aging (Harman 1956; Beckman and Ames 1998), and it is involved in most diseases, either causally, or, more often, as an associated consequence (

disagreement with Erel (2004), an anonymous reviewer suggested that this test only measures the "nonenzymatic" antioxidant capacity.

Total oxidant status (TOS) of plasma was measured using a colorimetric assay, modified from Erel (2005). The assay measures the oxidation of (Fe^{2+}) ferrous ion-o-dianisidine complex by plasma oxidants to ferric ion (Fe^{3+}) that reacts with xylenol orange, changing colour from yellow to red. Hydrogen peroxide (H_2O_2) was used as a standard, and plasma values are expressed as μmol H_2O_2

$P < 0.01$ for both). Transformations (square root, ln, or $\log_{10}$) were not sufficient to attain normality, so nonparametric tests were used.

Anti-PHA and anti-LPS IgY were significantly correlated (Spearman's correlation: $r = 0.535$, $P < 0.05$). Neither anti-PHA (Kruskal–Wallis ANOVA by ranks: $H_{[3,60]} = 2.57$, $P = 0.463$) nor anti-LPS (Kruskal–Wallis ANOVA by ranks; $H_{[3,59]} = 4.12$, = 0.249) differed among the four genders. Regressions were not significant ($P > 0.05$). Variances did not differ between the two sexes or among the four genders (Levene's test, $P > 0.05$ for all tests).

Total antioxidant capacity and total oxidative stress

Response variables were tested for normality using Lilliefors test and morphs were compared using ANOVAs or Kruskal–Wallis tests, as appropriate. In all cases, before-, after-, and Δ- TAC and TOS did not differ significantly among the four genders (least-squares means—ΔTAC in mmol trolox equivalent/L: independents = 0.22, satellites = 0.27, faeders = −0.38, females = −0.12; ΔTOS in μmol H_2O_2 equivalent/L: independents = 0.024, satellites = 0.010, faeders = −0.020, females = −0.014). Also, there were no significant patterns with the genders on an ordinal scale (independent, satellite, faeder, female), as analysed with regression.

Innate immunity versus oxidative capacity (TAC) and oxidative stress (TOS)

Baseline TAC was not correlated with baseline agglutination titre, a measure of antibodies, but it was negatively correlated with baseline lysis titre ($r = -0.44$, $n = 24$, $P = 0.03$), which is a measure of antibodies and complement. However, the relationship between TAC and lysis titre neither differed among the four genders (ANOVA for homogeneity of slopes interaction effect: $F_{[3,17]} = 0.75$, $P = 0.5$) nor between the two sexes (ANCOVA main effects: $F_{[3,20]} = 1.23$, $P = 0.33$). No significant relationships occurred between oxidative stress and immunity, before or after the LPS injection.

females. Furthermore, the strength of the immune response is negatively related to subsequent survival in orange females, whereas it is positively related in yellow females (Svensson et al. 2001). Hence, the morph adapted to fast reproduction, i.e., the orange morph, has a more susceptible immune system and is less

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