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The physiological responses of Guinea fowl, muscovy ducks and Japanese quail to high-fat diets

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ABSTRACT

Animal fats and vegetable oils are often added to poultry diets to improve growth performance or to modify the lipid profiles and overall lipid content of the edible bird tissues to be consumed by humans. Effects of these high-fat diets (HFD) on the health status of birds during production are rarely investigated and most research involving current poultry production practices is performed in chickens and extrapolated to alternative poultry species. The current research investigated the effects of HFD feeding on the overall health status and tissue lipid profiles of some alternative poultry species which are becoming popular as table birds. Briefly, Guinea fowl (*Numida meleagris*), Muscovy ducks (*Cairina moschata*) and Japanese quail (*Coturnix coturnix japonica*) were fed a HFD rich in saturated fatty acids (Guinea fowl and Muscovy ducks) or HFDs of varying fatty acid profiles (Japanese quail) or a standard diet for a period of between four and twelve weeks. Oral glucose tolerance test parameters, erythrocyte osmotic fragility indices and serum metabolic health markers were used to assess the overall health status of the birds, following the HFD feeding. Liver lipid content, caecal microflora, organ masses, intestine lengths, the mass, length and relative density of the femurs, as well as the liver, breast muscle and thigh muscle lipid profiles were also assessed in the majority of the birds. The HFDs were well-tolerated by the birds, with no obvious adverse effects observed with respect to the health status of the birds. Dietary fatty acids were successfully transferred to the edible tissues of the Japanese quail and despite the very high level of lipid supplementation, the overall lipid content of the edible tissues remained within normal ranges. Thus if necessary, in terms of the modification of the edible tissue lipid profiles of poultry birds, HFDs of this nature can be used during poultry production without any adverse health implications for the birds. The birds should remain healthy during the feeding period, avoiding any additional production costs related to the maintenance of the birds' health status. In terms of potentially increasing the overall lipid content of the edible bird tissues as a means of increasing the total amount of lipids ingested by humans, the significantly increased level of lipid inclusion used in the present study was unsuccessful in doing so. Thus, it seems that regardless of the increased lipid inclusion, the overall lipid content of the edible bird tissues is somewhat regulated within a certain range. Future studies should focus on the mechanisms responsible for the resilience of these birds to the HFD feeding and the mechanisms involved in the regulation of the overall content of lipid deposition within the edible bird tissues.