FEEDING AND GROWTH OF JAPANESE QUAIL (COTURNIX C. JAPONICA) CHICKS WITH UNPREDICTABLE FOOD ACCESS

by

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ABSTRACT

We investigated the effect of unpredictable feeding times on feeding activity and body mass gain in fast growing Japanese quail (Coturnix c. japonica) from 7 to 31 d of age. Quail chicks were subjected to a long day length (18L:6D) with ad libitum food during (1) 17.5 h of the light period, starting 0.5 h after lights-on (group A, n = 14), (2) 6 h of the light period, starting 0.5 h after lights-on (group B, n = 14), and (3) 6 h of the light period, starting pseudorandomly either 0.5, 6, or 11.5 h after lights-on (group C, n = 12). We examined the effects on locomotor, feeding and drinking activity, body mass, and food intake. Treatment did not affect daily locomotor, feeding, or drinking activity. Distribution of activity over the light period was affected: group B and C showed more activity above the feeder and water container outside the feeding time, and showed a large bout of locomotor and feeding activity at the start of this period. Both overall weight gain and gross energy intake (GEI) were highest in group A and lowest in group C. Distribution of food intake throughout the daily feeding period was affected: group B and C consumed more food during the first part of the feeding period than group A. Daily GEI in group C was influenced by fasting duration prior to feeding and by time of food availability. We suggest that young quail adjust their feeding behaviour in response to their instantaneous energy needs. This effect is modulated by time of food availability: food arriving later in the day led to higher intake levels.

KEY WORDS: Coturnix c. japonica, unpredictable feeding, growth, behaviour.

INTRODUCTION

Exposure to food restriction, by either reducing the daily amount of food offered or limiting the time during which feeding can occur, is known to have detrimental effects on body mass gain in juvenile birds (BLANK et al., 1991; BARASH et al., 1992; GEBHARDT-HENRICH & MARKS, 1993; PALO et al., 1995; LEILI et al., 1997). When subjected to such a condition, chicks can adopt different strategies to maximise weight gain.

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They may reduce 24-h energy expenditure by decreasing activity during the time no food is present. In this way more energy will be available for body mass increase. When food restriction is imposed by reducing the time during which food is available, birds can also try to improve weight gain by increasing food intake rates. This may be achieved by enlarging (external or internal) hoarding (POWERS, 1991; BARTNESS & CLEIN, 1994; BASCO et al., 1996; WOOD & BARTNESS, 1996). In most experiments where food restriction is imposed via time limitation, food arrives daily at the same time. From these studies it is difficult to understand what controls feeding motivation during food restriction. Experiments that combine food restriction with a fixed daily scheduling of food availability, do not distinguish between a number of possible mechanisms that may control food intake rates: (a) the instantaneous energy deficit as built up by a prior fast, (b) the learnt anticipation of the subsequent fasting interval, and/or (c) the circadian time at which food is expected. To start unravelling some of these potential factors in feeding motivation, we studied the effects of daily predictability of feeding in growing birds. Exposing adult birds to unpredictable feeding regimes has shown that they are able to regulate their internal and external energy reserves in response to recent experience or in anticipation of requirements (DAWSON & MARSH, 1986; JENNI & JENNI-EIERMANN, 1987; BEDNEKOFF & KREBS, 1995). In Great tits (Parus major) body mass increase in response to unpredictable feeding conditions was shown to be an adjustment to the feeding circumstances as experienced in the previous few days (BEDNEKOFF & KREBS, 1995). In both mammals and birds it is known that the circadian system plays an important role in the anticipation of feeding schedules (BOULOS et al., 1980; COLEMAN et al., 1982; MISTLBERGER, 1993; PHILLIPS et al., 1993; ONO et al., 1996). When in rats feeding is restricted to a single meal scheduled at a fixed time, the animals show increased locomotor activity before feeding time (BOULOS et al., 1980; HONMA et al., 1987; MISTLBERGER & MARCHANT, 1995; ONO et al., 1996). This prefeeding activity in rats occurs only when food is offered at intervals near 24 h (ASCHOFF, 1986).

In most studies that addressed the effect of unpredictable feeding conditions on food intake and body mass in adult birds, animals were not food restricted: birds were given the choice of either increasing (by enlarging fat reserves) or maintaining their body mass (EKMAN & HAKE, 1990; HURLY, 1992; BEDNEKOFF & KREBS, 1995; GOSLER et al., 1995; WITTER et al., 1995). It is not known how animals respond to unpredictable feeding regimes when subjected to food restriction. We therefore studied the effect of unpredictable and restricted feeding conditions on body mass and feeding behaviour in growing Japanese quail (Coturnix c. japonica). Japanese quail has the fastest growth rate in the family Phasianidae.