The relative importance of vasoactive intestinal peptide and peptide histidine isoleucine as physiological regulators of prolactin in the domestic turkey

Ronit S. Kulick a, Yupaporn Chaiseha b, Seong W. Kang a, Israel Rozenboim c, Mohamed E. El Halawani a,∗

a Department of Animal Science, University of Minnesota, St. Paul, MN, USA
b School of Biology, Institute of Science, Suranaree University of Technology, Nakhon Ratchasima, Thailand
c Department of Animal Science, Faculty of Agriculture, The Hebrew University of Jerusalem, Rehovot, Israel

Received 3 September 2004; revised 1 December 2004; accepted 3 December 2004
Available online 1 April 2005

Abstract

In mammals, prolactin (PRL) secretion is regulated by vasoactive intestinal peptide (VIP) and peptide histidine isoleucine (PHI). In birds, however, VIP is considered a PRL-releasing factor (PRF), while the role of PHI is unknown. The purpose of this study was to compare the effects of turkey PHI (tPHI) and turkey VIP (tVIP) on PRL secretion in vitro, and to study their physiological significance in vivo through active immunization against tPHI and tVIP. In vitro studies were conducted using pituitary cell cultures from female turkeys. In the in vivo study, female turkeys were immunized with keyhole limpet hemocyanin (KLH; control), synthetic tPHI conjugate (KLH–tPHI), or synthetic tVIP conjugate (KLH–tVIP). Both tVIP and tPHI stimulated PRL secretion from anterior pituitary cells in a dose response manner. However, tPHI was 100-fold less potent than tVIP in stimulating maximum PRL secretion in vitro. In addition, the highest dose (10−4 M) of tPHI inhibited its own PRL-releasing activity as well as that of VIP-stimulated PRL release. Whereas, circulating PRL levels and nesting activity remained low and unchanged during the photo-induced reproductive cycle (i.e., experimental period) in tVIP-immunized birds, control and tPHI-immunized turkeys showed a significant increase in plasma PRL levels and in the incidence of incubation behavior over time following photostimulation. These findings, taken together with earlier results, indicate that VIP is the sole physiological PRF in the turkey (avian species).

Keywords: Avian; Immunization; Peptide histidine isoleucine; Prolactin; Turkey; Vasoactive intestinal peptide

1. Introduction

The prepro-vasoactive intestinal peptide (VIP) gene also encodes a VIP-related peptide (48% homology), 27 amino acid peptide histidine isoleucine amide (PHI) in turkeys (You et al., 1995) and in rats (Nishizawa et al., 1985) or peptide histidine methionine (PHM) in humans (Itoh et al., 1983). The sequences encoding VIP and PHI are contained in two separate exons in mammals (Bodner et al., 1985; Gozes et al., 1986; Lamperti et al., 1991). In rats, PHI and VIP have an equally potent stimulatory effect on prolactin (PRL) secretion (Kaji et al., 1984; Ohta et al., 1985; Samson et al., 1983; Werner et al., 1983). PHI/PHM distribution is identical to that of VIP, is found in many organs, and co-exists in the same neural elements (Christofides et al., 1982, 1984; Fahrenkrug and Pedersen, 1986; Fahrenkrug, 1987). PHI exhibits preferential binding to VIP receptors in rat tissues, indicating that VIP and PHI mediate their physiological