Maternal nicotine exposure-induced collagen pulmonary changes in Balb/C mice offspring's

Mohammad Reza Nikravesh1, Mehdi Jalali1, Abbas Ali Moeen2, Shabnam Mohammadi1* and Mohammad Hasan Karimfar2

1Department of Anatomy, School of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran
2Department of Anatomy, School of Medicine, Zabol University of Medical Sciences, Zabol, Iran

Received 16 February 2011                                           Accepted 5 June 2011

Abstract

Nicotine is an alkaloid by high level of addictive property that can quickly assimilate from smoker’s lung. It passes from the placenta and gathers in the developing fetus. Our previous study showed that collagen type IV plays a critical role in basement membrane of different embryonic organs. In this study the effect of maternal nicotine was evaluated by collagen IV changes in lung of mice offspring during pre and postnatal period. Pregnant Balb/C mice were divided into 2 experimental and 2 control groups. Experimental group 1 received 3 mg/kg nicotine intrapritoneally from day 5 of gestation to last day of pregnancy. Experimental group 2 received the same amount of nicotine during the same gestational days as well as 2 first week after birth. The control groups received the same volume of normal saline during the same periods. At the end of exposure times, all newborns were anesthetized and their lungs were removed and immunohistochemical study for tracing collagen was carried out. Our results showed that collagen reaction in the bronchial basement membrane (BBM) and extra cellular matrix (ECM) of the lung parenchyma experienced a remarkable increase when compared to the control ones. Cell necrosis definition in lung parenchyma of the experimental group 2 was the other finding that our investigation revealed. These data indicate that maternal nicotine exposure may induce a noticeable collagen increase with a reasonable amount in BBM and ECM of respiratory system of next generation.

Keywords: respiratory system, nicotine, collagen IV, mouse

Introduction

Nicotine is an alkaloid obtainable from tobacco plant. It is one of the most important components of cigarette by high level of addictive property (Martin, 1970). Nicotine is a lucid liquid with an unpleasant odor that, when exposed to air, changes to brown (Catassi et al., 2008). Some of studies indicate that nicotine passes quickly from placenta and gets accumulated in the fetus and causes adverse effects on fetus development (Sung-HwaSohn et al., 2008; Harmanjatinder et al., 2002; Taylor and Wadsworth, 1987). On the other hand, other studies show that nicotine causes growth retardation and decreases birth weight (Wen et al., 1990; Cliver et al, 1995; Vogt, 2004).

By increasing cigarette smoking in society, especially in young woman, it is necessary to investigate the effects of maternal nicotine exposure during lung development of the offspring. Our previous results indicated that collagen IV expression plays an important role in formation of retina (Nikravesh et al., 2009). Another investigation also revealed that anterior epithelium development and matrix of the lens, especially its marginal zone, are dependent on this molecule (Nikravesh et al., 2009; Jalali et al, 2009). Also, our previous studies (Karimfar et al., 2009; Nikravesh et al., 2009) implicated that the appearance of the collagen type IV during tubule and glomeruli morphogenesis represents that this molecule contribute to nephrogenesis during urinary tract formation (Jalali et al., 2009; Moein et al, 2008). Also, its role in brain choroid plexus (BCP) development indicated that formation of vascular plexus is dependent on collagen type IV, main structural component of the BM (Nikravesh et al., 2009). It seems that factors affecting the collagen regulation during lung development may put the normal health of the respiratory system at risk (West, 2009; Kang et al., 2009; Hinenoya et al., 2008; Lan et al., 2008). Hence, the aim of this study was to investigate the effects of maternal nicotine exposure on lung connective tissue