

Study the effect of cigarette smoke exposure on the uterine histology and some blood parameters in pregnant female Rats.

دراسة التعرض لدخان السكائر على نسيجية الرحم وبعض معايير الدم لإناث الجرذان الحوامل

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الاختصاص الدقيق: فسلجة حيوانية

Summary

Thirty- two pregnant female rats exposed to cigarette smoke in three levels (5, 10 and 15) cig /day for one-month period, the pregnant females exposed to 10 cig /day had suffered from endometritis and inflammation occurred in the decidua capsularis and thrombotic phenomena, while pregnant female exposed into 15 cig /day had an increased frequency of coagulation necrosis and inflammation in the decidua capsularis and decidua basalis. The decidua basalis had arterial fibrosis. The two levels (10, 15 cig/day) cigarette smoking exposure causes fetal growth retardation and shorter gestation period, pregnant rats showed significantly reduced ($P \leq 0.05$) and ($P \leq 0.01$) food intake and body weight. In the two levels (10, 15 cig / day) it was found significantly increased ($P \leq 0.05$) and ($P \leq 0.01$) respectively Erythrocyte count but decrease ($P \leq 0.05$) and ($P \leq 0.01$) in differential count in white blood cell (Lymphocyte).

الخلاصة

تم تعريض أنثى الجرذان الحوامل لدخان السكائر لمدة ٣٠ يوم وبتلات جرع، عرضت المجموعة الأولى لدخان خمسة سكائر يومياً والمجموعة الثانية لدخان عشرة سكائر يومياً والمجموعة الثالثة لدخان خمسة عشر سيكاراً يومياً وقورنت النتائج مع المجموعة الرابعة (مجموعة السيطرة). وقد تمثلت التغيرات النسيجية في المجموعة الثانية لأنثى الحوامل في التهاب بطانة الرحم وحصول خمج في الطبقة المحفظية للرحم مع صفة التجلطات. أما المجموعة الثالثة من الإناث الحوامل فقد أظهرت النتائج حدوث تنكس فجوي وخرم الطبقة المحفظية والطبقة القاعدية لبطانة الرحم بالإضافة لحصول تليف الشرايين الرحمية. سببت المعاملتين الثانية والثالثة تراجع نمو الأجنة وقصر مدة الحمل، وانخفاض معنوي ($P \leq 0.05$) و ($P \leq 0.01$) في وزن الجسم للإناث الحوامل على التوالي، وانخفاض معنوي في معدل استهلاك الطعام المأخوذ يومياً ($P \leq 0.05$) و ($P \leq 0.01$). كذلك أظهرت المعاملتين الثانية والثالثة زيادة معنوية في كريات الدم الحمراء ($P \leq 0.05$)، ($P \leq 0.01$) وانخفاض معنوي في العد التفرقي لخلايا الدم البيض (اللمفاوية) على التوالي.

Introduction

There are more than 4000 chemical compounds in tobacco smoke, the most important of which is nicotine, carbon monoxide, carbon dioxide and polynuclear aromatic hydrocarbon (1). Fetal growth retardation produced by cigarette smoking (2). In a review article on smoking estrogen related disease (3) had suggested that the consequences of smoking could include an (anti - estrogenic) effect which may modify the risk of estrogen - related disease including endometrial cancer (4, 5). Smoking was a risk factor for cancer of the uterine cervix (6). Osteoporosis and cancers of the breast and endometrium (7, 8).

Haemoglobin levels during pregnancy, the means of all (Hb) measurements by week of gestation, declined sharply in the first trimester and rose moderately in the third trimester. Throughout gestation, haemoglobin levels were lower in smokers than non-smokers (9). Influence of cigarette smoking on certain plasma hormonal assays like: prolactin, FSH, LH, It was found significantly lower in smoker (10). In another study found that smoking causes significantly Neutrophilia and decrease Lymphocyte in man (11).

The principle aim from this study is to demonstrate the effect of cigarette smoke exposure on histological changes of the uterus and some parameter component blood in pregnant female rats.

Material and Method

Thirty-two adult healthy female rats, weighing between 215 ± 16 gm were used in the experiment. This study performed in Biology Department – College of the Education for Women / Kufa-University in 1998. Female rats were marked with serial ear number and they were individually housed in plastic cages (50x 30x15 cm) at least for 10 days before mating. The temperature of the animal house was maintained at 25 C° with a photoperiod system of 12 hr. light – 12 hr. dark, the pregnant rats given dry fed 4% from body weight and water ad lib. along the period of the experiment. The pregnant rats were divided randomly and equally into four groups, as follows:

Group 1: Exposed to cigarette smoke of 5 cig /day.

Group 2: Exposed to cigarette smoke of 10 cig /day.

Group 3: Exposed to cigarette smoke of 15 cig /day.

Group 4: Control

Three groups were exposed to cigarette smoke by using ready chamber for cigarette smoke exposure, a cigarette was lit for 10 minutes. Control group not exposed to cigarette smoke, Iraqi brand cigarette Sumer was used, an average nicotine of (1.1) mg /cig.

Histological technique: after delivery the females were killed by using halothane inhalation anaesthesia and laparotomy was performed immediately. Their specimens of uterus rinsed with normal saline and fixed in Boun's solution. The blocks from each portion were cut into a thin sections (6 micrometer) by microtome and stained with Hematoxylin and Eosin (12).

Body weight and food intake determinate by Mattler balance and used heamocytometer when the blood component determinate.

The mean values of each parameter in the four groups were compared by student's t-test(13).

Results and discussion

The results revealed, the group 2 had microscopic lesion in the uterus Fig.1, including some destruction in simple columnar epithelium lining and mild inflammation in decidua capsularis, and various thrombotic lesion in the uterine arteries was observed. In group 3, the histological observation revealed necrosis in the endometrium and sever inflammation occurred in the decidua capsularis and decidua basalis. The inflammation was involved the uterine glands and myometrium, and oblitative in the uterine arteries Fig. 2, fibrosis tissue of uterus was obtained .

The histological finding of the present study further support the results of the previous study (14), this author believed that a carcinogen can be absorbed from cigarette smoke, transported through the circulatory system and secreted by endometrium and cause endometritis in body and cervix of the uterus. Similar histological findings was reported by (11), and added more frequent amnionitis infection in the smokers .

The offspring of the female rats exposed to cigarette smoke in group 2 were smaller, the mean body weight was 2.60 ± 0.50 * gm while the mean body weight in group 3 was 2.10 ± 0.30 ** gm when compared with control group 2.90 ± 0.70 gm. The mean body weight in group 3 was highly significant difference at ($P \leq 0.001$) when compared with control group. These results were in agreement with (15) who reported that reduced fetal oxygenation was another possible cause of the growth retardation since pregnant women who smoke had increased levels of carboxyhemoglobin and nicotine which may reduce uteroplacental perfusion, while other authors such as (16) suggested that smoking causes chronic fetal hypoxia resulting in small fetal size , and that the relative placental hypertrophy was compensatory. But the authors (17) has been found that smoking women suffering from sever anemia in pregnancy .

The most impressive changes caused by smoking were those related to anorxia nervosa (Table 1). Dietary intake was reduced in late pregnancy, particularly in smokers, women who smoke during pregnancy give birth to lighter infants than do non-smoking women (18).

The results of the present study was decreased WBC count in smoking females during pregnancy were found identical to those results reported by (19).

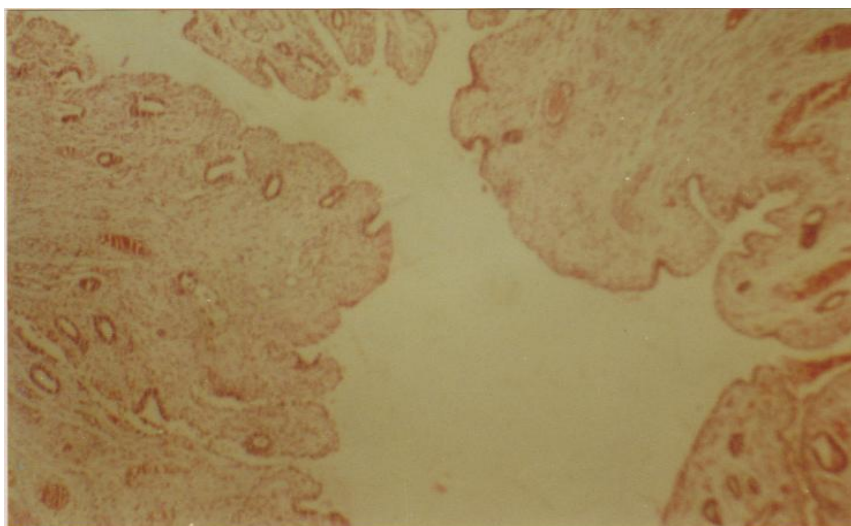
Table (1): Effect of cigarette smoke exposure on some physiological Parameters in pregnant female rats.

Physiology parameters	Control N=8	Dose		
		5 cig / day N=8	10 cig / day N = 8	15 cig / day N = 8
RBC count x10 ¹² /L	6.5 ± 0.70	6.9 ± 0.50	7.1 ± 0.200*	7.60 ± 4.00**
Lymphocyte (%)	60 ± 7.00	58 ± 9.00	55 ± 3.00*	47.00 ± 2.00**
Body weight (gm)	210 ± 11.00	205 ± 11.00	178 ± 8.00*	153.00 ± 13.00**
Food intake (gm)	18 ± 4.00	18 ± 1.00	13 ± 2.00*	11.00 ± 4.00**

Values are means ± S.E

* (P ≤ 0.01)

** (P ≤ 0.01)



Figure(1): Light micrograph of the uterus from cigarette smoke exposed group at dose (10 cig/day) showing destruction in simple columnar cpithelial lining and mild inflammation in desidua capsularis. (H&E x 400)

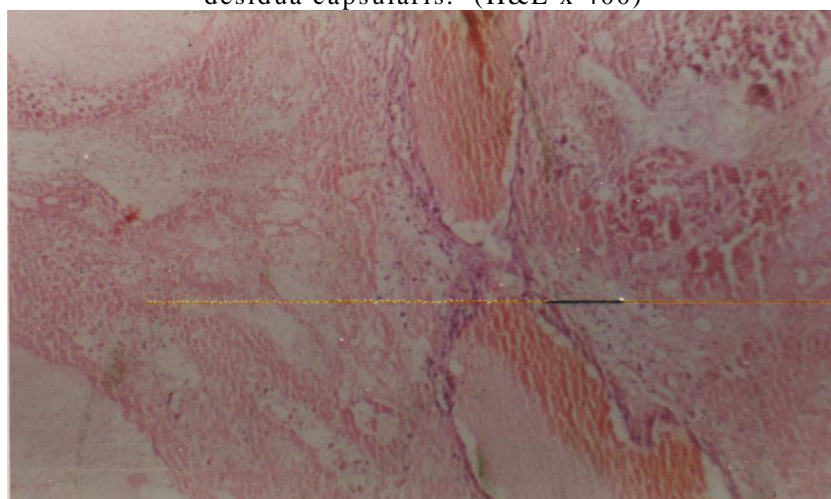


Figure (2): Light micrograph of the uterus from cigarette Smoke exposed group at dose (15 cig/day) showing obliteration and fibrosis in the uterine arteries was obtained. (H & E x 400)

References

- 1- Adeeb, T.F. (1980). Chemical components of cigarette smoke. Studies on smoking . 2 nd. ed. Iraq. P: 11 - 200 .
- 2- Naeyc, R. L. (1981). Influence of maternal cigarette smoking during pregnancy on fetal and childhood growth. *Am. J. Obstet. Gyneco.*, 57 : 18- 21 .
- 3- Baron, J. A. (1984). Smoking and estrogen related disease. *Am. J. Epidemiol.*, 119: 9- 22 .
- 4- Lesko, S. M.; Rosenberg, L. and Kanfman, D. W. (1985). Cigarette smoking and the risk of endometrial cancer. *N. Engl. J. Med.*, 313 : 593 - 598 .
- 5- Suteri, P. K. (1978). Steroid hormones and endometrial cancer. *Cancer Res.*, 38 : 4360 -4366 .
- 6- Winkelstein, W. J. (1977). Smoking and cancer of the uterine cervix, hypothesis. *Am. J. Epidemiol.*, 106 : 257 - 259 .
- 7- Kalache, A . and Vessey, M. (1982). Risk factors for breast cancer. *Clinics in Oncology*, 1 : 661 - 678 .
- 8- Wyshak, G. (1980). Hip Fracture in elderly women and reproductive history. *J. Gerontol.*, 36 : 424 - 427 .
- 9- Shiverick, K. T. and Salafia, C. (1999). Cigarette smoking and pregnancy 1: ovarian, uterine and placental effects. *Placenta* , 20 (4) : 265 -72
- 10- Berta, L. ; Fortunati, N. and Gennari, P. (1991). Influence of cigarette smoking on pituitary and sex hormone balance in healthy premenopausal women. *Am. Ferti. Socie.*, 56 (4) : 788 - 789 .
- 11 - Naeye, R. L. (1978) . Effect of maternal cigarette smoking on the fetus and placenta. *Br. J. Obstet. Gyneco.*, 85 : 732 - 737 .
- 12- Luna, L. G. (1968). Histologic staining methods of the Armed forces Institute of pathology. 3d. ed. *Mc Graw Hill book company* . Newyork, U.S.A.
- 13- Steel, R. and Torrie,J.H. (1980). Principles and procedures of statistics. M.C. Graw Hill Book Company.
- 14- Yule, R. (1979). Mortality from carcinoma of the cervix. *Lancet*, 1: 1031- 1033 .
- 15- Cole, P. V.; Hawkins, L. H. and Roberts, D. (1972). *J. Qbstet. Gynecol. Br. Common wealth*, 79 : 782 , cited by Naeye, R. L. (1978). *Br. J. Obstet. Gynecol.*, 85 : 732 - 737 .
- 16- Wilson, K. W. (1971). The effect of smoking in pregnancy on the placental co- efficient. *N. Z. Med. J.*, 74 : 384 - 385 .
- 17- John, W.; Roberta, C.; William, L. and Edgar, J. (1976). Placental ratio in white and black women relation to smoking and anemia. *Am. J. Obstet. Gyneco.*, 124 (7): 671 - 674 .
- 18- Haste, F. M.; Brooke, O. G.; Anderson, H. R. and Peacock, J. (1990). Nutrient intake during pregnancy: Observation on the influence of smoking and social class. *Am. J. Clin. Nuter.*, 51 (68) : 29-36.
- 19- Ludviksdottir, D.; Blondal, T.; Franzon, M. and Gudmundsson, T. V. (1999). Effect of nicotine nasal spray on atherogenic and thrombogenic factors during smoking cessation. *J. Intern. Med.*, 246 (1) : 61-66 .