

out to elucidate the possible detrimental effects of sidestream whole smoke solutions (SSWSS) on wound healing and related angiogenesis, using a well-defined chicken dorsum excision wound assay. Gross, histopathologic, SEM and computer based 3D image-probing modalities were utilized to quantify different detrimental effects of SSWSS on the fundamental processes of wound healing; including wound closure, re-epithelialization, dermal matrix regeneration and angiogenesis. A total of 160 chicks, aged 1 week, divided in eight groups were topically exposed for 8 days to SSWSS with different nicotine concentrations; group A (0.2 mg), group B (0.3 mg), group C (0.5 mg), group D (0.6 mg), group E (0.7 mg), and group F (1mg). At day 6 and day 8 post-wounding, very highly significant reduction ( $P < 0.001$ ) in wound closure was observed among all SSWSS treated groups. Histological and SEM evaluation of SSWSS treated wounds unveiled delayed re-epithelialization, deteriorated dermal matrix, and retarded neovascularization. Moreover, image-probing exploration of SSWSS treated wounds also divulge a very highly significant decrease ( $P < 0.001$ ) in the values of angular spectrum,  $S_a$ ,  $S_y$  and  $S_{ci}$ , at day 6 post-wounding. Our study suggests that the cumulative effect of the different components of SSWSS has a negative impact on wound healing and related angiogenesis. Furthermore, our study demonstrates the effects that can contribute to abnormal healing and may explain why people who are consistently exposed to SSS suffer from slow healing and excessive scarring of wounds, much like the smokers themselves.

Key words : SSWSS, chicken, wound, angiogenesis

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### **P#32**

## **Toxicological Effects of Mainstream Whole Smoke Solutions on Embryonic Movements of the Developing Embryo**

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Cigarette smoking is unrivaled among developmental toxicants in terms of total adverse impact on the human population. Maternal tobacco use during pregnancy adversely affects prenatal and postnatal growth and increases the risk of behavioral and developmental defects in children and adolescents. In the current study, the effects of different preparations of nicotine and mainstream whole smoke solutions (MSWSS) on embryonic movements during neonatal development were examined in vivo, using the chicken embryo model, recorded in real-time by a video camera. It was observed that low doses of nicotine induced hyperactivity and higher doses induced hypoactivity. Accordingly, a significant ( $p < 0.01$ ) decrease in movements was observed by application of 10 microg of nicotine and

different preparations of MSWSS. A dose-dependent decrease in embryonic movements was observed, which did not recover by the end of experiment. It was concluded that nicotine could alter embryonic movements, which are important during embryogenesis for differentiation and maturation of the body systems.

Key words : Nicotine, MSWSS, Chicken embryo, Embryonic movement

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### **P#33**

#### **Disruption of Normal Embryonic Angiogenesis by Direct Exposure of Mainstream Whole Smoke Solutions of Commercial Cigarettes**

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Angiogenesis is activated in the female reproductive system during embryogenesis and embryo implantation. Smoking during pregnancy has been linked to interfere with normal process of angiogenesis resulting an increased incidence of ectopic pregnancy, spontaneous abortion, preterm delivery and sudden infant death syndrome. Chorioallantoic membrane (CAM) assay was used as an

alternative in vivo approach to evaluate the toxicological effects of different mainstream whole smoke solutions (MSWSS) of commercial cigarettes on embryonic angiogenesis. Seventy 5-day-old CAMs, divided in seven groups were exposed to MSWSS with different nicotine concentration: 0.2 mg (group B), 0.3 mg (group C), 0.5 mg (group D), 0.6 mg (group E), 0.7 mg (group F) and 1mg (group G). All smoke solutions caused varying levels of disruption on the normal process of angiogenesis and have shown to adversely affect the diameters of blood vessels, capillary plexus formation and organization of the fibrillar materials of CAMs. Abbot curve, angular spectrum and 3D surface roughness of CAMs were also measured for precise quantification of angiogenesis. Moderate to dramatic changes were observed in all treated groups with a very highly significant ( $P < 0.001$ ) disruption observed on CAMs of group G. No significant change was observed in different groups treated with pure nicotine. Current observations demonstrated that MSWSS of different commercial cigarettes have toxic effects on the process of angiogenesis and smoking during pregnancy may lead to an increased risk of spontaneous abortion and preterm delivery.

Key words: Angiogenesis; MSWSS; Nicotine; CAM; Cigarette

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