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Original Research Article

Effect of Nicotine and Camellia Sinensis on the Survival Rate of Developing Chick.

Maryam Shan*, Saffia Shaukat, Rehmah Sarfraz

House No 23 A. Lane 2 Sector A Askari 14 Adyala Road Rawalpindi Pakistan.

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ABSTRACT

To observe the toxic effects of nicotine on the growing chick and to observe the role of antioxidant camellia sinensis for prevention of these effects. The Random Sampling technique was used. The study was done in the department of Anatomy, Army Medical College (NUST) Rawalpindi from 2nd November 2011 to 1st November 2012. The ethical Review Committee approved the procedures followed in the research project. Fresh fertilized eggs at zero hour of incubation of Fayoumi species were selected. Temperature in hatchery was controlled at 37.5 degree centigrade. The humidity was maintained at 75% and proper ventilation was observed. Four groups were made, each group was comprised of the ten numbers of eggs. The control group G1 was given normal saline, regarding experimental groups, G2 was given green tea extract, G3 was given 0.0001% nicotine solution and G4 was given both 0.0001% nicotine solution and green tea extract. Double exposure of doses was given. First exposure was given at 48 hours of incubation and second at 48 hours of hatching (post natal dose). The survival rate of chick was observed till one month of their age. Experimental groups which were treated with nicotine, such as, G3 & G4 were showing a less number of chicks which survived till the one month of age as compared to the control group G1 and experimental group G2. In case of experimental group G4, both nicotine and green tea extract were given to this experimental group showed better survival in comparison to only nicotine treated experimental group G3, but the number of survival of chick was less in comparison to G1 and G2. Camellia sinensis antioxidant property helps to neutralize the oxidative injury by the use of nicotine, but unable to recover it fully.

Keywords: Incubation, Chick, nicotine, survival

INTRODUCTION

Smoking stress occurs in two ways, either it could be through active smoking or in passive smoking. Active smoking is defined as a condition in which individual inhales smokes by using cigarettes, cigars himself. Whereas passive smoking is a condition in which individual inhales other people's smoke, "second hand smoke" is also called environmental tobacco smoke (1). Nicotine is the active alkaloid component found in tobacco, nicotine has been associated with many diseases it increases oxidative stress. Cigarette smoke is related to many free radicals (2). The free radicals present in the smoke are responsible for the oxidative stress. Women who are the victims of active and passive smoking commonly suffer from delayed conception and infertility (3). Prenatal environmental tobacco smoke exposure is also related to low birth weight and small sized babies (1). Nicotine taking in the cigarette smoking form is one of the world wide developing problems. Smoking is

considered to be active or passive. Chicks are considered to be one of the best avian skeletons, for observing the teratogenic effects. Green tea contains different constituents, which have a protective role against free radical production in the body. The smoke generated by the use of tobacco causes production of free radicals. (4).

MATERIAL AND METHOD

The research work was conducted at the department of Anatomy at Army Medical College, Rawalpindi in collaboration with the Poultry Research Institute (PRI) Rawalpindi. Approval for the procedures were taken by the Ethical Review Committee of Army Medical College Rawalpindi. Fertilized chick eggs of Fayoumi specie were selected at zero hour of incubation. The eggs were collected from Poultry Research institute, Rawalpindi. The Random Sampling technique was used. Each group eggs werewas given a number through

*Corresponding Author: Maryam Shan,
E-mail: drmaryamshan@gmail.com

computer generated technique. Fertilized eggs with normal shape (oval), colour (off-white) and size (medium) were included. Whereas eggs with unknown time of laying, broken shell, abnormal shape (football shaped, pear shaped), colour (other than off-white) and size (very tiny eggs) were excluded from the study. After properly fumigating and clearing the hatchery, the eggs were incubated. The temperature was controlled at 37.50C and the relative humidity was kept between 75% with proper ventilation. Rotations of eggs were done after every 4 hours. Day zero was considered when eggs were placed in the hatchery.

For the study, eggs were divided into four groups, each group comprised of the ten numbers of eggs. The control group G1 was given normal saline in 0.1ml of quantity. Experimental group G2 was given green tea extract in 0.1ml of quantity, experimental group G3 was given 0.0001% nicotine solution in 0.1ml of quantity, experimental group G4 was given both 0.0001% nicotine solution and green tea extract in 0.1ml quantity. All the working solutions were given through the blunt end of the egg with the help of insulin gauge needle. Double exposure of doses was given. First exposure was at 48 hours of incubation and second at 48 hours of hatching (post natal dose). At the age of one month, all the surviving chicks were counted for the results.

STATISTICAL ANALYSIS

For the calculation, data were entered in a database using SPSS (Statistical Package for Social Science) version 16. Mean and standard deviation was calculated for quantitative variables. Data was presented as in tables. One way ANOVA test was used to compare results among all four groups. p value < 0.05 was considered significant.

RESULTS

For results and observations the survival rate of one-month-old chick were taken into account. The control group had 90% survival of chicks. The experimental groups G2 showed a survival rate of 90% chicks and the group G3 and G4 showed a survival rate of 20% and 50% chicks respectively (Fig.1). The p-value was (1.000) when comparing the survival rate of chicks of control group G1 with experimental groups G2. The comparison of the control group G1 with experimental groups G3 and G4 showed statistical significant result with p value (0.000) and (0.027) respectively. Experimental groups when compared with each other, such as, G2 in comparison with G3 and G4 showed p value (0.000) and (0.027) respectively. Comparison of G3 and G4 with each other showed statistically significant result with p value (0.034) (Table 1)

DISCUSSION

Nicotine acts as a neuroeffector and chemosensitive sites by stimulating and desensitizing the cholinergic receptors (5). Nicotine free radicals are responsible for oxidative stress by stimulation of receptors to create hypoxic conditions (6). In different epidemiological studies have shown that the habit of mother's cigarette smoking has a tremendous effect in increasing blood pressure in newborns [7], and children [8]. Nicotine is a ganglionic agonist and is likely to contribute to the developmental disorders. In the current study it was found, the control group had 90% survival of chicks. The experimental groups G2 showed a survival rate of 90% chicks and the group G3 and G4 showed a survival rate of 20% and 50% chicks respectively. The nicotine treated group showed a very less

number of surviving chicks. Whereas green tea extract helped to neutralize the toxic effects of nicotine, but not able to overcome it. Nicotine is responsible for activating nicotinic acetylcholine receptors, causing an increased effect on vessels by causing uterine and placental vasoconstriction. The more vasoconstriction causes placental insufficiency or fetal hypoxia leading to decrease oxygen delivery to the fetus, causing fetal growth retardation [9]. The result recorded in current research showed similarity to the work done by (10) in which it was concluded that nicotine during development keeps on affecting the growth rate in those embryos surviving after the 12th day of incubation.

CONCLUSION

In conclusion, this study demonstrates that the treatment of chick with nicotine at early stages causes decrease in survival rate of chick. This study also suggests that nicotine is harmful for developing chick and antioxidant, green tea helped to detoxify the toxic effects of free radicals.

Table 1: Comparison of number of alive and dead chicks among different groups at time of hatching

Groups	Number of alive chicks/Total number of chicks	Comparison Between Groups	p value
Control Group G1	9/10	G2	1.000
		G3	0.000
		G4	0.027
Experimental Group G2	9/10	G1	1.000
		G3	0.000
		G4	0.027
Experimental Group G3	2/10	G1	0.000
		G2	0.000
		G4	0.034
Experimental Group G4	5/10	G1	0.027
		G2	0.027
		G3	0.034

p value ≤ 0.05 statistically significant

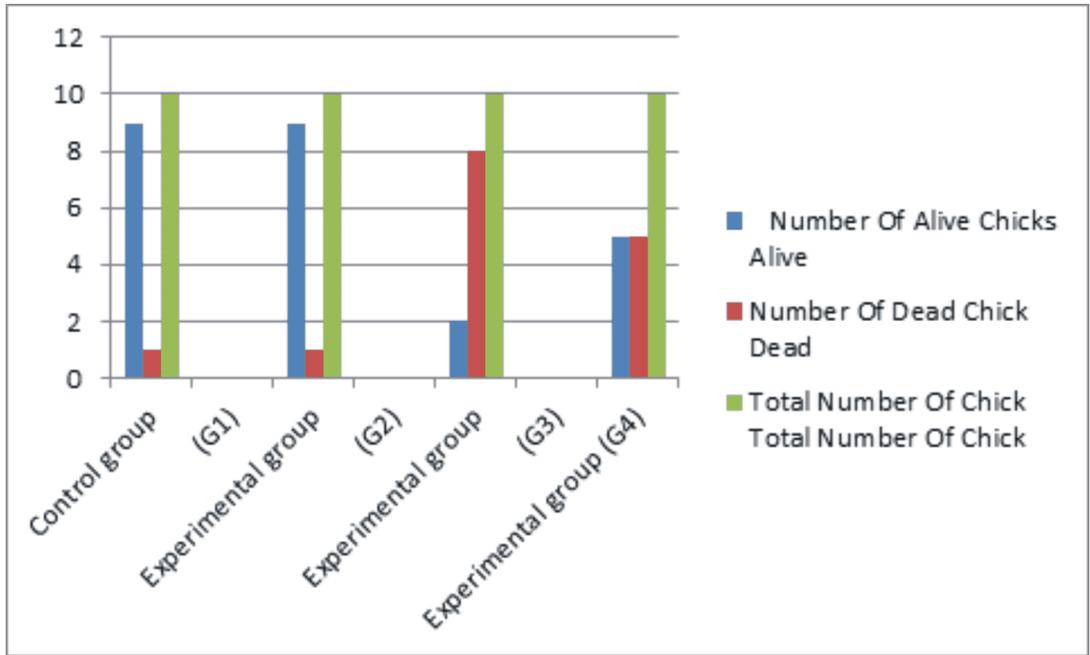


Fig 1: Comparison of number of alive and dead chicks among different groups at time of hatching

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