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Impact of Sodium and Potassium ions in identification of second generation of offspring gender in hamsters

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Abstract

In the present work, the study of impact of sodium and potassium in diet to determine offspring gender in hamsters has been investigated. Sex determination has scientific basis for prevention of genetic diseases in addition to social backgrounds. Twenty healthy hamsters chosen from *the second* generation of the previous experimental hamsters, were divided in to two groups in the hamsters male to female 1:5. The first group was given with Na and K rich food, the second group was control unit without Na and K. It was found that the delivered offspring's male to female ratio were 1.82:1and 1:1, for the first and second groups respectively. Also, it was found that hamsters fed with Na, K food yielded more numbers of offspring (138), while hamsters fed with normal food yielded (136).

Keywords: Sodium, Potassium, sex ratio, hamsters, offspring

1.0 Introduction

Pregnancy is a state that allows a life form to develop with the support and protection from mother's body. The growth and development of the fetus in gestation is partially determined by the genome of the fetus, which produces its own growth factors as well as the majority of its hormones. However, this genetic influence is highly dependent upon interaction with environmental factors [1]. One environmental factor vital in the growth and development of the fetus is nutrition. A balanced, nutritious diet is an important aspect of a healthy pregnancy. Eating a healthy diet, balancing carbohydrates, fat, and proteins, and eating a variety of fruits and vegetables, usually ensures good nutrition. Those whose diets are affected by health issues, religious requirements, or ethical beliefs may choose to consult a health professional for specific advice. Adequate periconceptional folic acid (also called folate or Vitamin B_9) intake has been proven to limit fetal neural tube defects, preventing spina bifida, a very serious birth defect. The neural tube develops during the first 28 days of pregnancy, explaining the necessity to guarantee adequate periconceptional folate intake [2, 3]. Folates are abundant in spinach (fresh, frozen, or canned), and are found in green leafy vegetables e.g. salads, beets, broccoli, asparagus, citrus fruits and melons, chickpeas and eggs. In the United States and Canada, most wheat products (flour, noodles) are fortified with folic acid [4]. Omega-3 DHA is a major structural fatty acid in the brain and retina, and is naturally found in breast milk. It is important for the woman to consume adequate amounts of DHA during pregnancy and while nursing to support her well-being and the health of her infant. Developing infants cannot produce DHA efficiently, and must receive this vital nutrient from the woman through the placenta during pregnancy and in breast milk after birth [5]. The fetus is solely dependent on the mother to supply its nutrients. It is also dependent on the placenta, an essential organ in pregnancy, to transfer these nutrients from the maternal system to its own. Thus the fetal nutrition is a reflection of that of the mother's. This interaction exists in a sensitive equilibrium; if disturbed, there are fetal developmental consequences. Preselection of the gender of offspring is a subject that has held man's attention since the beginning of recorded history. Although scientific studies on genes have been conducted recently, sex selection and gender preference have been considered since ancient time. Anaxagoras, a Greek scientist was the first person who related the sex of fetus to testis [6].

There are many methods of sex selection such as: The consumption of particular foods, the use of various vaginal douches and the timing of intercourse in relation to ovulation, sperm sorting, pre-implantation genetic diagnosis (PGD), selective abortion, infanticide, periconceptual methods, and postconceptual methods.

The first medical technique that can be used to select for sex is that of pre-natal diagnosis [PND] and abortion. To utilize this method, the pregnant woman must undergo some sort of prenatal testing, such as an amniocentesis, chorionic villus sampling or an ultrasound, which will allow the doctor to determine the sex of the child, among other things. Once the woman has the information about the child's sex, she obtains an abortion if the fetus is not of the desired sex. The use of PND and abortion in order to select for sex sounds extreme, it is not common for westerners to utilize such a technique. For example, a follow-up study of 578 patients having prenatal diagnosis at one Melbourne centre found that none of the women had a termination because of the sex of the fetus .Going through the traumatizing experience

of an abortion is usually seen as too high a price to pay for a child of a particular sex[15]. This method is banned in most of the developing countries, where there is a crave for male child because this has lead to imbalance of male and female ratio, and further large scale termination of female unborn.

The second medical technique that can be used to select for sex is that of pre-implantation genetic diagnosis [PGD] with *in vitro* fertilization [IVF]. With this technique, the embryos are screened for sex prior to being implanted into the woman's uterus, thereby eliminating the need to later decide to terminate a pregnancy. PGD and IVF, however, are very invasive and potentially physically harmful, requiring the woman to go through at least one IVF cycle, which includes taking potent drugs to induce super-ovulation, extraction, fertilization and then testing and subsequent implantation of the embryos. Given the expense of IVF treatment cycles (according to IVF Canada in 2005 it cost $5,500 for one cycle of IVF, not including drugs [15] and, according to the same source, the drugs themselves cost approximately $3,000 for one cycle[16]. It would be highly unlikely that it would be used as a technique for sex selection alone. More likely, it could be used as a sex selection technique for those who are already undergoing IVF for other medical reasons.

The last medical technique that can be used to select for sex is sperm sorting. New technologies allow sperm to be sorted into those carrying X or Y chromosomes with varying degrees of accuracy. To date, the most successful way in which to sort sperm is flow cytometry, which has been branded as the Micro Sort technique [17]. Sex selection using flow cytometry results from distinguishing between the identifiable differences between the X and Y chromosomes, as the X chromosome is larger than the Y. The sorted sperm is then used to artificially inseminate the woman. Studies have shown that the Micro Sort technique is more effective in selecting for girls, a success rate of 91%, than for boys, with a success rate of only 76%.12 Sperm sorting appears, then, to be the least invasive and least expensive (at about $2,300US per cycle13) method of selecting for sex.

There are also methods which use different food combinations and especial diets to maximum the chance of having a baby with specific sex. The old believe is that eating salty, savory foods leads to delivering a male and sodium rich foods to a female. Some believes that the ratios of the minerals sodium, potassium are important in determination of baby gender. It was shown that pregnant female house mice maintained on a consistent low-food diet give birth to a lower proportion of males than do control females fed ad labium [18].

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2.0 Materials and methods

Twenty Adult female hamster weighting 150-180g (42-56 days old) from the second generation of hamsters and still in their

reproductive phase , were kept under constant conditions of light (12 hr, light-dark cycle) and humidity, fed with standard laboratory chow ad libitum (Trouw, Gent, Belgium), and had free access to tap water. Before initiation, the hamsters were allowed to adapt for one week. The hamsters were then weighed, and vaginal wet smears were made to determine the estrous cycle of the hamsters. On the evening before estrus, female hamsters were housed overnight with male hamster, the presence of spermatozoa in a vaginal smear the next morning was defined as day one of pregnancy.

Both groups of hamsters (Na, K and non Na, K) were kept in metabolic cages individually and separately (for 16-21 days), on the specified diets (Na and K and non Na and K) and metabolism control (1% sodium and potassium) as shown in Table- 1. The first group (Na and K group) was supplied with drinking water mixed with 1% calcium and magnesium, the second group (non Na and K group) pure drinking water was supplied. After 16-21 days, on the specified diets, the hamsters at the oestrus stage of the reproductive cycle were caged with male hamsters for mating and gestational day 1, was confirmed on the observation of a vaginal plug. At postnatal day two, the number of litters and the gender of pups were recorded. Pups were sexed by means of the ano-genital distance, which is longer in males [14]. This was confirmed in later examinations during pre weaning development. The data were entered and analyses by SPSS software using t-test and the p-value less than 0.05 were considered as significant.

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Mouse Minerals ** (g/Kg)	Amount diet(Kg)	Human *(mg-ug/day)
Calcium	5.0	1000
Chloride	0.5	750
Magnesium	0.5	2-5
Phosphorus	3.0	700
Sodium	0.5	500
Potassium	2.0	2000
Iron	35.0	8
Manganese	10.0	2-5
Zinc	150.0	10-12
Iodine	150.0	150-150
Molybdenum	150.0	75-250(ug)

Table- 1
Estimated minerals requirements.
**adapted from Nutrient Requirements of Nonhuman Primates.
* Adapted from Lanus Micronutrient information Center, Oregon State Unit.

3.0 Results and discussion

In the first group mothers (Na and K group), all of the 10 hamsters became pregnant which delivered 138 offspring. Their gender was 92 male (66.6%) and 46 female (33.4%), in the second group (non Na and K group) all 10 hamsters became pregnant and delivered 136 offspring that is 68 male

(50%) and 68 female (50%) and the data is shown in Table- 2.

The sex ratio of female to male in the first group of mothers (Na and K group) was 1.82:1, While this ratio in the second group (non Na and K) was1:1as shown in Figure-1. The percentage of the male offspring of mothers (66.6%, Na and K group) was higher than the male offspring in the control group (50%) as shown in Figure-2.The difference in the sex ratio between the first group mothers (Na and K) and the control group were statistically significant and the results are shown in Table- 2. The total number of offsprings (138) in the first group mothers (Na and K group) was nearly equal to total number of offspring in the second group (non Na and K group,136) and the results are depicted in Figure-3.

Group	Total no of offspring	No. of male offspring	% age of male offspring	No. of female offspring	% age female offspring	Sex ratio
Na and K group	138	92	66.6	46	33.4	1.82
Non Na and K group	136	68	50	68	50	1

Table- 2
Sex ratio in different groups of hamsters.

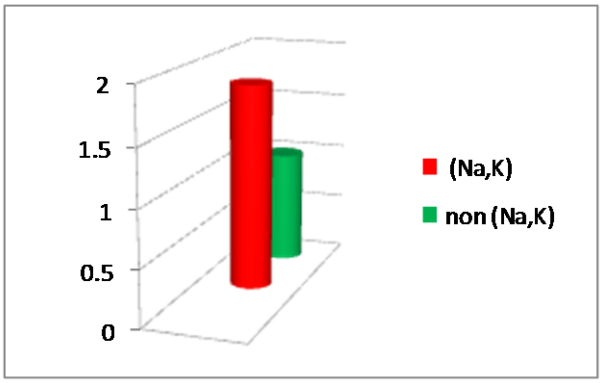

Figure-1:Sex ratio of male to female in different groups of hamsters

4.0 Conclusion

Among all the methods available for selective sex selection of offsprings, one of good known methods on sex constitution is the preconception diet method. This method claims 80% accuracy and the theory is that by altering your diet to include and exclude certain food, the condition in the reproductive tract will be directly affected; increasing the odds of conceiving a particular sex it is also recommended that both mother and father go on the diet. This is also consistent with the oriental philosophy that everything has a yin or yang quality and the foods supplied in the female diet, female and acid are all yin. The female diet is high in sodium but low in salt and potassium, containing acid forming foods. The diets nutritional content is questionable and contains multiple warnings. The diet may influence the conditions within the reproductive tract and the outer barrier surrounding the ovum, enabling only one of the two types of sperm to penetrate the depending on which diet is adhered to.

Langendon and Proctor first proposed the theory of 'the preconception Gender Diet ` [19], the theory is that by altering your diet to include and exclude certain foods, the conditions in the reproductive tract will be directly affected, increasing the odds of conceiving a particular sex. This method under scrutiny claims of 80% accuracy based on one clinical trial of only 260 women, the results were published in the international journal of Gynecology and Obstetrics in 1980. The female diet is high in sodium but low in salt and potassium, containing acid forming foods.

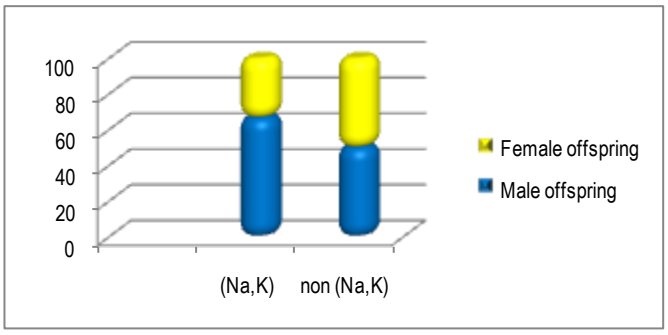

Figure-2:The percentage of the male and female in different groups of hamsters

The diets nutritional content is questionable and contains multiple warnings. It is recommended to seek the advice of medical practitioner before going on such a restrictive diet, and stay on the diet for no longer than threemonths. The diet may influence the condition of the cervical mucus and within the reproductive tract and follicular fluid enabling only one of the two types of sperm to penetrate the egg depending on which diet is adhered to.

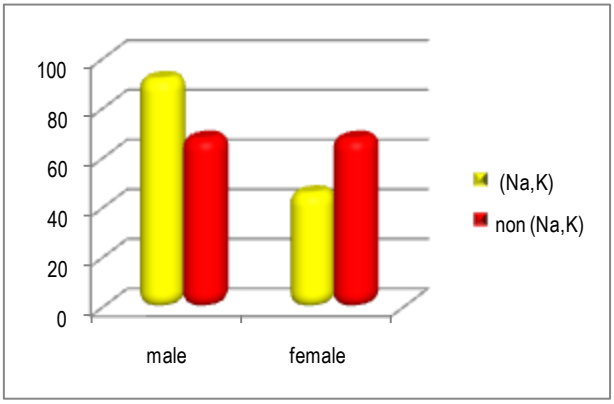

Figure-3: Number of offspring in different groups of hamsters

The aim of this study was to elevate relationship between minerals and sex ratio in hamsters. Results from the present animal study further substantiate the claim of many theories that it is feasible to select sex of offsprings through a specific diet. As the present study was carried out on only species of animals, further studies are

required to confirm the influence of diet on sex of offsprings.

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