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Original Research Paper

Health Science

GOLD IN MALE REPRODUCTIVE TRACT OF GUINEA PIG AND RABBIT

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ABSTRACT Gold in male reproductive system and in its secretion gathered attention of people in medical and biological fields. In this study we tried to search out if gold was present in two animals, guinea pig and rabbit. For this we dissected out male reproductive tract of guinea pig (n=13) and rabbit (n=19). The metal gold was measured by employing atomic absorption spectrophotometer. Gold was present in reproductive tissues of guinea pig and rabbit. Gold is essential for sperm motility. Probably it helps in spermatogenesis also. Discussion is done on the basis of available references.

KEYWORDS :

INTRODUCTION

The importance of inorganic elements for life was identified centuries ago. Toxicity of some of them was also recognised at a later stage. Our understanding on electrolytes and metals present in the body is each one of it has different functions. Role of some are recognised, but some are not known. Elemental composition and its functions in body at different levels is known.

Several elements are present in semen [1-4] (Skandhan et al. (BD 29, 38, 83, 92)). We have discovered gold in human semen (Skandhan 1981 16)[5]. We reported values of many elements in human semen [6-17] (Skandhan et al. (19,30,32,36,74,79, 80,86, 93,98,106,125)). Our attempts to find out the role of gold in human and animal semen has been continuing.

In the present study we tried to find out the level of gold in tissues of male reproductive system of two animals, guinea pig and rabbit.

MATERIALS AND METHODS

The study was conducted in the Department of Physiology, Government Medical College at Surat.

Workers of this study excluded wearing gold ornaments during the period of study.

All glass wares used in this study were cleaned well by following procedure. Overnight they were kept in 6N HNO_3. Later, it was cleaned in tap water, glass distilled water, double and triple glass distilled water. Except volumetric glass wares all were dried in hot air oven. Volumetric glass wares were dried by placing on filter paper.

Animals used in this study were housed in animal house where the room temperature was 20 – 25 °C and daylight present was 12 – 14 hours. Standard diet and water at libitum were provided to the animals.

A total number of 13 male guinea pigs and 19 male rabbits were sacrificed for this study. After anesthetisation, their reproductive organs were dissected out and separately their tissues were pooled and all tissues were blotted with Whatman Filter paper No: 41 and weighed individually and kept for wet oxidation[18] (Reitz et al. 1960).

After this procedure, samples were estimated by employing Atomic Absorption Spectrophotometer (Perkin Elmer A 373) available at Forensic Science Laboratory, Ahmedabad. Setup of this instrument was as follows; wavelength at 242.8 nm and skit opening at 0.7 nm. A gold cathode lamp was used. Air and acetylene gas were used as source of flame. Final value was taken when two consecutive readings were same. Calculation was carried out to find out metal present in total tissue and from this gold present in µg/g tissue.

The present study was initiated to establish the level of gold if any in the male reproductive tract of guinea pig and rabbit. The whole study was conducted in one season to exclude if seasonal changes in elemental composition of tissues takes place[19] (Mann, Mann 1981).

RESULTS

We observed gold in tissues of male reproductive tract of guinea pig and rabbit. The mean value and range of element in each tissue of guinea pig and rabbit are given in (Table 1). It was negligible in quantity in coagulating gland of guinea pig. We compared the values of gold in male guinea pig with that of an earlier report (Table 2).

Table 1. Average value of metal gold (µg/gm tissue) in different tissues of male reproductive tract of guinea pig and rabbit. Range of element in each tissue is given in bracket.

Tissues	Guinea pig (n=13) *	Rabbit (n=19)
Testes	0.07 (0.02 – 0.12)	0.635 (0.6 – 0.67)
Caput epididymis	0.04 (0.01 - 0.07)	0.423 (0.34 – 0.47)
Corpus epididymis	0.24 (Negligible – 0.27)	0.51 (0.35 - 0.64)
Cauda epididymis	0.216 (0.04 - 0.44)	0.69 (0.38 – 0.88)
Vas deferens	0.13 (Negligible – 0.14)	0.44 (0.35 – 0.60)
Ampula		0.603 (0.35 – 1.1)
Seminal Ves	0.08 (0.07 – 0.09)	0.736 (0.34 – 1.52)
Prostate (Para)	0.143 (0.01 – 0.24)	0.693 (0.41 – 1.17)

Coagulating gland	Negligible	_____

*Number of animals

Table 2. The gold values (µg/gm tissue) of different reproductive organs of male guinea pig observed in the present study is compared with an earlier study report.

Guinea Pig		
Tissues	Present study	Earlier study*
Testes	0.07 (0.02 – 0.12)	0.04
Caput epididymis	0.04 (0.01 – 0.07)	0.09
Corpus epididymis	0.24 (Negligible – 0.27)	1.16
Cauda epididymis	0.216 (0.04 - 0.44)	0.19
Vas deferens	0.13 (Negligible – 0.14)	0.42
Seminal Ves	0.08 (0.07 – 0.09)	0.04
Prostate (Para)	0.143 (0.01 – 0.24)	0.48
Coagulating gland	Negligible	0.45

*Skandhan KP,Valsa J,Sumangala B,Jaya V.Gold in male reproductive tract of rat and guinea pig.J Adv Res Med Sci 7:21-25,2015

DISCUSSION

Knowledge about male reproductive system is far behind than that of female (Weyer 1980). Currently at many places studies are carried out to find out the details of male system, its secretion and functions. Inorganic elements present in genital tissue and semen secured attention (Skandhan et al. 1992). Bondani et al. (1973) believed seminal plasma is a medium to throw out excess electrolytes present in body. Present knowledge is they are important for different functions of spermatozoa like its role in action potential. Detailed studies on inorganic substances present in semen were carried out showing these elements are essential to fulfil important functions of sperm, its motility (Blean et al.1997; Skandhan et al. 1978a; 1978b) and maintaining quality of semen. A negative correlation between level of sodium and potassium is maintained in semen (Skandhan, Mazumdar 1985; Skandhan et al. 1978a; Gusani et al. 1988). Some electrolytes and metals move to inside and outside sperm by maintaining a fixed time (Lindholmer, Eliasson 1974; Sivapriya et al. 2020). The results on male reproductive organs showed in both animals throughout the length gold was present except in coagulating glands (Table 1).

Sea water contains gold. Thus it shall be expected in many biological media. Gold present in human body is negligible (Oser 1975). In human ash gold was detected and considered it as an artefact (Oser 1975) and it was considered gold in human body as a contaminant. Gold in semen was first shown in 1981(Skandhan). A similar report appeared later in 2010 (Jain et al.). In human male reproductive tract, gold was present in all tissues studied (Skandhan, Abraham 1984; Skandhan et al. 2009; 2011). It is now understandable that gold is an integral part of sperm (Skandhan et al. 2009; 2011; 2017a). It may be entering the cell during spermatogenesis. It is also shown that gold enters sperm from outside after ejaculation (Sivapriya et al. 2020). Gold is present inside and outside sperm (Skandhan et al. 2011; Sivapriya et al. 2020). X-ray diffraction analysis of tissues of human male reproductive tract and semen showed the presence of a tri metal complex of gold, zinc, and copper (Skandhan et al. 2009).

Quality of semen differed from season to season (Levine et al. 1990). Possibly concentration of elements present in semen may change accordingly. No studies are done in this aspect. Gold level was correlated with total sperm count (Skandhan et al. 2010; 2017). It is known gold level decreased in seminal plasma from first to third hour after collection of it (Sivapriya et al. 2020). Semen from men from gold mine area was superior than that of non- gold mine area (Prasad et al. 2010; 2011b; 2021a; 2021b). It showed level of gold is more in gold deposit area than in non- gold deposit area (Sahab khan et al. 2011) which changes the level of gold in semen. Sahab khan et al. (2011) observed in semen from gold deposit area as superior to that of from non-gold deposit area.

In the present study we attempted to find out the level of gold in male reproductive tissues of two mammals, guinea pig and rabbit. Our study has shown in both guinea pig and rabbit gold is present in tissues studied. Employing histological methods in rat gold was shown in testes and caput epididymis (Skandhan et al. 1992). Studies conducted in rat proved gold enters into semen from testes and caput epididymis (Skandhan et al. 1992). The element was present in the rim of seminiferous tubule in rat (Skandhan et al. 1992). Gold was shown in male reproductive tract of frog (Skandhan et al. 2021). Earlier we reported level of gold in male reproductive tissues of guinea pig (Skandhan et al. 2015). Values seen in the present is compared with that of earlier (Table 2).

Gold was also shown in rabbit reproductive tissues (Table 1). The utility of this metal in reproduction is discussed at different places. Its importance for fertility is now known as it is seen in reproductive tissues. It was also seen in reproductive tissues of female frog (Skandhan et al. 2013).

Suvarna bhasma (SB), an Ayurvedic medicine is prepared from pure gold which is prescribed for some male infertile patients. Gold present in SB was seen as 8 to 64 % (Prasad et al. 2011a). Patients who were on treatment with SB for months increased sperm count and sperm motility. In vitro studies using SB showed which increased survival time of motile spermatozoa (Skandhan et al. 2017b). The study proved SB as a good choice for the treatment of male infertile patients (Godatwar et al. 2020).

SB was administered to rat which increased total sperm count and percentage of sperm motility in epididymal fluid. Histological changes observed in an experimental study was increased interstitial space, proliferation and branching of epithelial layer of seminal vesicle and size of Leydig cells (Godatwar et al. 2021).

Two studies with gold nanoparticles with mice or bovine spermatozoa were done. The result showed in both cases, sperms were seen as damaged its function (Nazari et al. 2016; Taylor et al. 2014). In these studies, possibly sperms were exposed to large amount of gold and caused the damage.

The present study showed levels of gold in male reproductive tract of guinea pig and rabbit. This is adding to the previous studies about gold in human and animal reproductive organs and its secretion.

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