

CHEMICAL AND BIOCHEMICAL COMPOSITION OF PREGNANT CAMEL URINE (*CAMELUS DROMEDARIUS*)

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ABSTRACT

Twenty three pregnant camel urine samples were analysed employing gas chromatographic mass spectrum (GCMS) under optimum conditions. Thus sulphur, oxygen and nitrogen heterocyclic aromatic compounds belonging to thiophen, furan, pyridine and quinoline were identified along with their aliphatic non-aromatic derivatives; with the sulphur containing compounds being most dominant. Some aromatic hydrocarbons as well as their halogeno and alkyl derivatives were also identified including: benzene, naphthalene, anthracene and phenanthrene. Organometallic compounds namely chlorotrimethyl tin (CH₃)₃ SnCl, triethylfluorotin(C₂H₅)₃ SnF and 2-methyl seleno-selenophene C₅Se₂H₆ were also identified along with the constituents of the very complex matrix. The number of compounds identified exceeded 30 with molecular weight ranging between 220-490. However, none of the volatile fatty acids which are usually used for pheromonal function were detected in any of the urine samples analysed. An explanation is put forward to account for this finding.

Key-words: *Camelus dromedarius*, Pregnancy, Urine's chemical & biochemical composition, Pheromones, Fatty acids.

INTRODUCTION

Chemical signals known as pheromones synthesized by male and female for the purpose of identifying the sexual state of each other are common among many classes of mammalian species (Fraser, 1964). Pheromonal function of fatty acids in urine of some species was illustrated three decades ago, (Albone and Perry 1976; Hughins and Preti 1976). It was suggested that volatile pheromones in general serve to attract the opposite sex (Jonston and Branson 1982). Fatty acids in pheromonal communication in primates have been assessed in non-pregnant she camel urine (Michael and Keverne 1968). In previous work some preliminary investigation was carried out in camel urine with the ultimate goal of identifying volatile fatty acids the female camel urine may contain. It was reported that pregnant camels contain no such volatile fatty acids while non-pregnant ones contained some. However, no great accuracy was claimed in preliminary investigations. In the present work urine samples of 23 pregnant camels were investigated with the aim of identifying their chemical and biochemical contents that may or may not bring support to the previous findings.

MATERIALS AND METHODS

Urine samples were collected early morning from 23 pregnant camels in the university of Al Qassim farm, in (250 ml) sterilized glass containers. The extraction was carried out with diethyl ether analar grade (AR) with pH being adjusted to 2 using 2N sulphuric acid. The extracts were concentrated by evaporating the solvent ether at ambient temperature. The analysis was accomplished by CGMS Shimatzu model QP 5050. The running time was adjusted to half an hour for most samples and up to 48 min. for the very few others.

RESULTS AND DISCUSSION

The compounds identified in the urine were quite diverse in composition including distinctly wide spectrum of organic compounds. They included:

- (a) Aromatic hydrocarbon containing one or more aromatic nucleus, with halogen, alkyl, cyano, oxygen, hydroxyl substituents.
- (b) Aromatic and non-aromatic heterocyclic compounds containing sulphur, oxygen and nitrogen as heteroatoms.
- (c) Organometallic compounds containing the metals selenium and tin.

(d) Partially hydrogenated aromatic system of both homocyclic hydrocarbons and their heterocyclic homologues. The sulphur containing compounds being most dominant. The exceeded number of the organic compounds identified thirty with molecular weights ranging between 220-490 mass units:

Group a:

- 9-Methylanthracene.
 - 1-methyl-7-isopropylphenanthrene.
 - 2,2-dicyano 6- phenyl.
 - 1,2-dichloro-4-ethylbenzen.
 - 12-methyl-5-,6-,7-,12-tetrahydrodibenzocycloocten-6-one.
 - 2,3,5-trimethylphenanthrene.
 - 1-propanone 3-(2-hydroxyphenyl) 1-phenyl.
- plus many others of same complexity.

Group b:

These include mainly derivatives of:

- thiophen.
- furan.
- pyrrol.
- pyridine.
- quinoline.

e.g.:

- 1-Propene-2 thiol 1,1-diphenyl.
- pyrazine 2,5bis-(1,1 dimethyl)-1,4-dioxide.
- Indole succinamide derivative.
- 2-methylthiodiphenil.
- Naphtha(2,3 b) thiophene.
- 4-methyldibenzothiophene.
- 2-chlorosantonin.
- methoxyanthone.

Group c:

These include tin selenium complex.

e.g.:

- Chlorodimethyl tin, triethylfluro tin and 2-methylselenium-selenophen.

Group d:

These are quite varied including partially hydrogenated aromatic hydrocarbons and heterocyclic compounds e.g.:

- 12- methyl 5, 6, 7, 12 tetrahydrodibenzocycloocten-6-one.
- 5, 6, 7, 8-tetrahydrodibenz-(c, e) azocine.
- Decahydrobenz (a) anthracene .

It is worthwhile indicating that urine samples of pregnant she camel contain more than 30 different compounds amongst which the sulphur containing compounds being the most dominant. These diverse organic compounds could have been formed by complex metabolic transformations by she camels during the period of pregnancy.

In our present studies no volatile fatty acids were recorded in the urine of pregnant female camels. Several volatile fatty acids such as acetic, propionic, butyric, non-valeric and isovaleric acids which have pheromonal value have been reported in urine of female camels. The absence of such volatile fatty acids in pregnant camel urine is in full concord with the previous work in camel urine (Fraser, 1964, Albone and Perry, 1976, Michael and Keverne, 1966, Abdul Rahim and Nazer, 1992). It is reported that the sexual state of the she camels could be identified by male camels by the presence or absence of such chemical signals. Studies in sexual behavior in camels proved that urine is an evitably important vehicle of sexual pheromones (Abdul Rahim and Nazar, 1992). They reported that flehmen response by the male occurs after olfactory investigation of urine voided by the female. Further more, on mechanical presentation of urine of pregnant and non-pregnant she camels to the male during the breeding season could also induce the flehmen action only with non-pregnant urine (Abdul Rahim and Nazar, 1992). In the present

investigation none of the urine samples analyzed contained any volatile fatty acids of pheromonal function. It appears that pregnant camels stopped production of these pheromones; making thereby the end of sexual desire during pregnancy for the safety of the developing fetus.

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REFERENCES

- Abdul Rahim SEA and El Nazier AT (1992). Studies on sexual behavior of the dromedary camel. *Proceeding of 1st International Conference*, Dubai.
- Albone ES and G.C. Perry (1976). Anal gland secretion of the red fox *Vulpes*. *Volatile fatty acids and journal of chemistry and Ecology*, 2: 101-111.
- Fraser AF (1964). Observations on precoital behavior of the male goat. *Animal behavior* 12:31-33.
- Huggins GR and G. Preti (1976). Volatile constituents of human secretions. *American J. obstetrics and Gynecology*, 126: 129-136.
- Jhonston RE and F. Bronson (1982). Endocrine control of female mouse odours that elicit luteinizing hormone surges and attraction in males. *Biology of Reproduction*, 27: 1174-1180.
- Michael RP and E.B. Keverne (1968). Pheromones in the communication of sexual status in primates. *Nature*, 28:746-749.

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