from the basaltic rock. Prieskaite can be regarded as the product of metamorphic reaction such as

$$Ca\,(Mg,Fe)\,Si_2O_6 + 2Fe_3O_4 + 6SiO_2 + H_2O$$
$$\text{cpx} + \text{mt} + \text{qz} + \text{Water}$$
$$= (CaFeMg)_7\,Si_8O_{22}\,(OH)_2,\ \text{Prieskaite.}$$

This reaction suggests that clinopyroxene (cpx) of original basic rock reacted with the constituents of iron stones under appropriate fluid pressures resulting in the formation of prieskaite. The iron-rich phase is considered as $Fe_3O_4$; however the equation may be rewritten in terms of $Fe_2O_3$ as well, assuming appropriate oxygen fugacity. This reaction can take place under P–T conditions of green schist facies.

The development of asbestiform morphology may be attributed to the role of shearing stress, directive pressures or to minor chemical impurities. The formation of cross fibers of prieskaite may as well be related to the control exerted by the parallel surfaces in individual seams during crystallization[12].

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## SOME REPRODUCTIVE ANOMALIES IN THE INDIAN RUFUS HORSE SHOE BAT, *RHINOLOPHUS ROUXI* (TEMMINCK)

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ABSTRACT

The female genitalia of the bat, Rhinolophus rouxi, exhibits pronounced physiological asymmetry, the right ovary normally releasing the ovum during each cycle and the right uterine cornu carrying the pregnancy. Among 285 pregnant females examined for the present study two presented unique features. One female had monozygotic twin embryos at the unilaminar blastocyst stage of development in the right uterine cornu. In another specimen both ovaries had a corpus luteum each, and there was an embryo in each uterine cornu, but the embryo in the right cornu was more advanced in development than the one in the left cornu. It is suggested that the retarded growth of the embryo in the left cornu is due to the development of this embryo in an abnormal environment with deficient hormonal and nutritional levels.

### INTRODUCTION

THE uterus is bicornuate and the two cornua are morphologically bilaterally symmetrical in all the bats except in the members belonging to the family Phyllostomatidae which have simplex uterus. However, from a physiological point of view the bats possessing bicornuate uterus can be recognized into three major categories: (1) Those in which ovulation normally occurs from both the ovaries and pregnancy is carried in both the uterine cornua as in several vespertilionids[1-8]. (2) Those in which only one ovary normally releases a single ovum during each cycle and the embryo is carried in the ipsilateral uterine cornu, but the two sides of the genitalia alternate in releasing the ovum and in carrying pregnancy in successive cycles as in *Desmodus rotundus murinus*[9], *Taphozous longimanus*[10,11] and *Rousettus leschenaulti*[12-18]. (3) Those in which, although the two sides of the genitalia

are morphologically symmetrical, there is a distinct physiological dominance of one side in releasing the ovum and in carrying the pregnancy. Three different conditions can further be recognized among the bats of the third category—(*a*) those where only the right ovary is functional and pregnancy invariably occurs in the right uterine cornu as in the British horse shoe bats[14], and a few South African bats[15]; (*b*) those where the left ovary is invariably functional except in rare cases where the right ovary may also release an ovum in addition to the left ovary as in *Megaderma lyra lyra*[16-20]; (*c*) those where the left side of the genitalia is functional in about 70% of the cases and the right in about 30% as in *Hipposideros fulvus fulvus*[21] and *H. ater ater*[22].

## Material

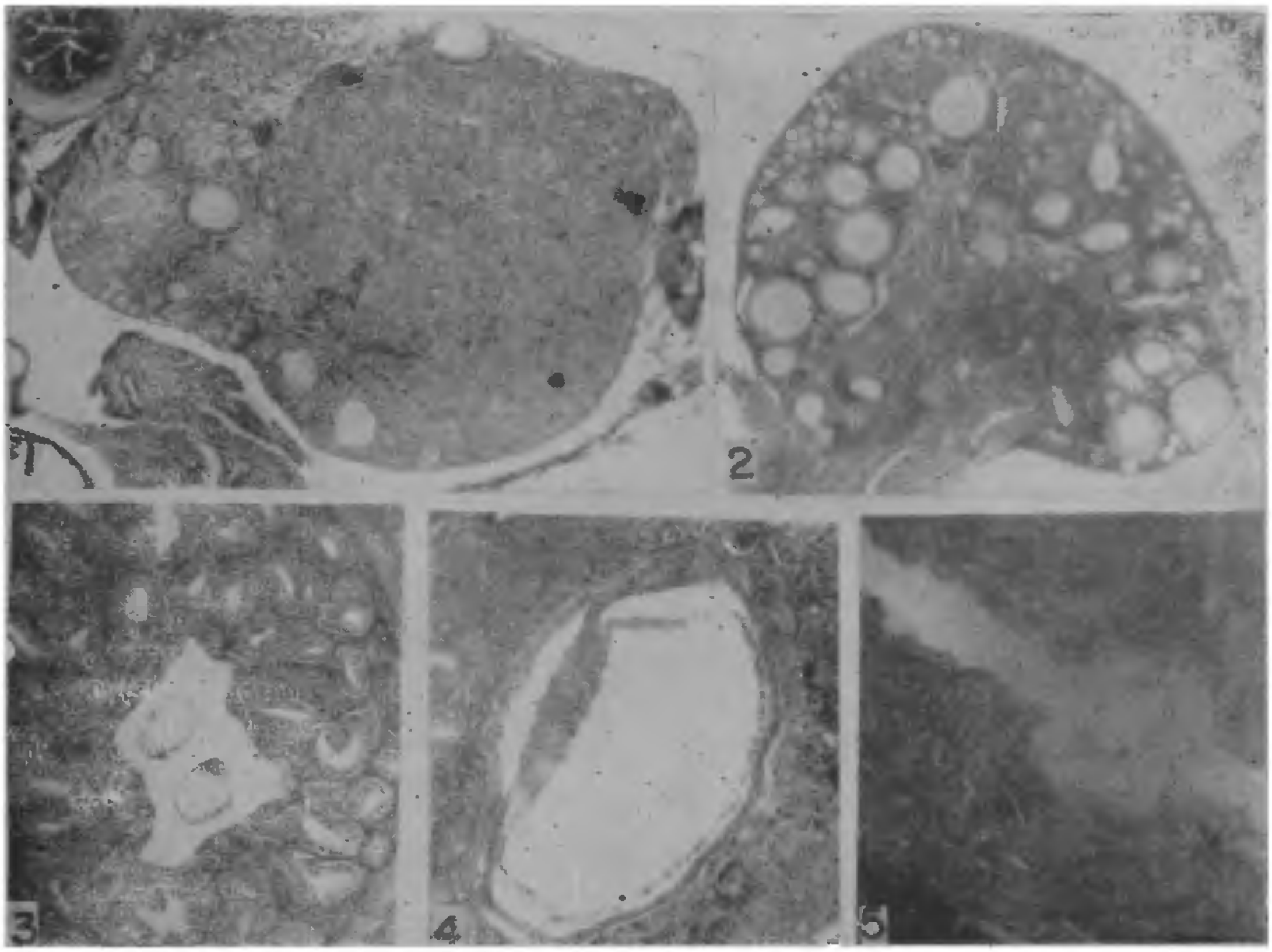
Although *Rhinolophus rouxi* breeds in a sharply defined season and the female produces a single young one each time[23,24] this bat exhibits certain special reproductive adaptations to suit different ecological conditions so that the young ones are delivered during the most propitious period when the mother in lactation and the weaned young ones get abundant food supply, namely the insects[25]. During the course of a detailed study of the breeding behaviour of this species, the present authors noted that among 285 pregnant specimens examined, 283 females had undergone ovulation in the right ovary and carried the embryo in the right uterine cornu, while the remaining two exceptional cases exhibited unique characters which are of considerable significance in view of the pronounced physiological asymmetry, with dextral dominance of the female genitalia. Since these two cases pose interesting problems concerning the physiology of reproduction in particular and of other monotocous bats with unilateral dominance of the female genitalia in general, it was felt that the description of these two unique cases would be of considerable theoretical interest.

## Observations and Discussion

In one of the two exceptional cases the right ovary had released a single ovum as indicated by the fact that the ovary contained a single large corpus luteum (Fig. 1). The left ovary had not ovulated but contained numerous follicles at various stages of development or undergoing atresia (Fig. 2). However, there were two free unilaminar blastocysts in the right uterine cornu (Fig. 3). The two blastocysts were of the same size, and contained nearly the same number of cells in the inner cell mass. The two blastocysts were lying in the uterine lumen at the same level and extended through the same number of transversely cut series of sections of the uterine cornu. The two blastocysts were completely independent of each other and each blastocyst had its own covering of the zona pellucida. The fact that there was a single corpus luteum in the right ovary and none in the left indicates that the two blastocysts were monozygotic twins which had become separated either during the first cleavage of the egg or at some stage during the early development of the embryo.

Only one unquestionable case of a monozygotic twins in a bat has been described so far in the case of *Pipistrellus ceylonicus chrysothrix*[26] in which the twin embryos were synchorial and these had undergone implantation and were in late neural groove stage of development. Karim[27] described a rare case of synchorial twins in *Hipposideros fulvus fulvus*, but she could not determine if they were monozygotic. Similarly, exceptional cases of twinning have been mentioned in a few more bats which are normally monotocous[19,20,28-33]. But none of these has been shown to be unquestionably monozygotic.

The second anomalous case noticed during the present investigations refers to a specimen in which both ovaries had undergone ovulation as revealed by the fact that a corpus luteum was present in each ovary. The right uterine cornu contained a late implanted blastocyst (Fig. 4) and the left cornu had a free bilaminar blastocyst (Fig. 5). Evidently the blastocyst in the right cornu was more advanced in development than the one in the left cornu. Apart from the fact that the occurrence of ovulation from both the ovaries in this species is in itself unique, the difference in the stage of development of the two blastocysts requires explanation. There are only two other reports of analogous cases in the bats, and both the reports refer to *Megaderma lyra lyra*[18,19]. In both these cases the embryo in the left uterine cornu (which normally carries the conceptus in this species) is far more advanced in development than the one in the right cornu. Whereas no explanation was given for the differential development of the two embryos in *Megaderma lyra lyra* since the embryos studied were far advanced in development and since there was no other evidence which could be used for giving an explanation, *Rhinolophus rouxi* offers evidence for a plausible explanation for this phenomenon. The size and histology of the corpus luteum are identical in the two ovaries thereby indicating that ovulation must have occurred simultaneously in the two ovaries. The left side of the genitalia in this species does not normally




FIGS. 1–5. Fig. 1. Right ovary of the exceptional specimen with twin blastocysts. Note the large corpus luteum. Fig. 2. Left ovary of the same specimen as above. See text for descriptions. Fig. 3. Part of the section of the uterus containing the twin blastocysts. Note the complete independence of the two blastocysts. This is the right uterine cornu. Fig. 4. Section of the right uterine cornu of the second exceptional specimen. Note the late implanted blastocyst. Fig. 5. Section of the left uterine cornu of the specimen mentioned in Fig. 4. Note the free blastocyst in the uterine lumen.
(All figures are photomicrographs and magnified to the same mangification. × 96.)

exhibit progestational reaction during normal cycles when only the right ovary releases an ovum and develops a corpus luteum. There is, perhaps, a special mechanism in this bat as in a few other bats[34-36] in which the corpus luteum induces progestational reaction only in the ipsilateral uterine cornu by short-circuiting the flow of progesterone directly into the ipsilateral uterine cornu through a portal system between the ovary and the corresponding uterine cornu. However, in the exceptional specimen in which both the ovaries ovulate and develop a corpus luteum each, the progestational reaction in the left cornu is less vigorous and slower than in the right cornu. Consequently, the environment in the left cornu does not provide as efficient a hormonal and nutritional level as that in the right cornu. Hence, the preimplantation development of the embryo in the left cornu is retarded and the blastocyst in the abnormal cornu remains unimplanted for some time while the one in the normal cornu undergoes implantation and further development. After the difference in the development of the two embryos is established, this difference is maintained until parturition. Consequently, the two embryos are always different in size and in the degree of development at any given stage of gestation. This explanation would be valid also for the two abnormal cases of *Megaderma lyra lyra*[18,19], where both the uterine cornua carried an embryo each, and where the embryo in the normal cornu was larger and was more advanced in development than the one in the abnormal cornu.

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# COBALT TOXICITY AND ITS REVERSAL BY IRON AND MAGNESIUM IN *OGAWA* SEROTYPES OF *VIBRIO CHOLERAE* AND *VIBRIO ELTOR*

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## ABSTRACT

Toxic effects of $Co^{2+}$ on growth, glucose utilisation and acid production were studied, and the capability of $Fe^{3+}$ and $Mg^{2+}$ for counteracting $Co^{2+}$ toxicity was investigated in *Ogawa* serotypes of *Vibrio cholerae* and *Vibrio eltor*. Bivalent Co induced 50% growth inhibition in *V. cholerae Ogawa* and *V. eltor Ogawa* at 150 $\mu$g and 100 $\mu$g per 10 ml test medium respectively. It was toxic to both the biotypes and destroyed their metabolic activity at 250 $\mu$g. $Co^{2+}$ toxicity was reversed by both $Fe^{3+}$ and $Mg^{2+}$ to a varying degree in *V. eltor Ogawa*. In *V. cholerae Ogawa*, $Mg^{2+}$ reversed $Co^{2+}$ effects to a considerable extent while $Fe^{3+}$ supplementation caused the total extinction of all the metabolic parameters in $Co^{2+}$ toxicosed cells. The results indicate interesting interactions between $Co^{2+}$, $Mg^{2+}$ and $Fe^{3+}$ in these strains.

## INTRODUCTION

IN compound and ionic form, elements such as H, Na, K, Mg, Ca, Fe, C, N, P, O and S are constituents of many types of living cells, whereas several other elements occur in smaller amounts or as trace elements[1]. Metals of low atomic weights are less toxic than those of high atomic weight; moreover, bivalent metals are more toxic than monovalent metals[2].

Extra physiological concentrations of certain heavy metals are known to produce pathological changes in animals, plants and micro-organisms. The toxic effects of different concentrations of Co, Zn, Ni and Mo in mostly non-pathogenic organisms have been demonstrated. Responses towards certain pairs of metals varied and the interaction occurring in one microbial species need not occur in others. In *Neurospora crassa* deranged Fe and Mg metabolism particularly caused