

chemische Leberveränderungen⁹⁻¹⁵. Durch wiederholte Applikation der hepatotoxischen Substanz konnte bei einer Gruppe von Tieren eine experimentelle Lebercirrhose hervorgerufen werden^{16,17}. Es interessierte, ob eine langdauernde CCl₄-Zufuhr und vor allem ob die experimentelle Lebercirrhose selbst zu morphologischen Veränderungen der Magenschleimhaut führen werde.

Material und Methode. Wir benützten Hunde mit einem Körpergewicht von 10-25 kg ohne Berücksichtigung des Rasse- und Geschlechtsunterschiedes. Die Tiere bekamen Mischkost. Vor Versuchsbeginn wurde bei allen Tieren eine laparoskopische Untersuchung sowie eine histologische Untersuchung des Leberpunktates nebst einigen biochemischen Untersuchungen des Serums vorgenommen.

Die Hunde wurden in 3 Gruppen eingeteilt: Gruppe I erhielt schon vor Versuchsbeginn wiederholt CCl₄. Bei diesen Tieren stellten wir schon vor dem eigentlichen Versuch eine diffuse Fibrose bzw. Lebercirrhose fest. Gruppe II und III umfassten gesunde intakte Hunde. Gruppe I und II wurde 5 Monate lang jeden 4. Tag 0,3 ml CCl₄/kg Körpergewicht verabreicht. Die Gruppe III war Kontrollgruppe und erhielt Olivenöl in der gleichen Weise wie das CCl₄ bei den Versuchstieren. Nach Abschluss des

Versuches wurden bei allen Tieren histologische Untersuchungen des Leberpunktates und der Magenschleimhaut, die durch Aspirationsbiopsie gewonnen wurde, vorgenommen.

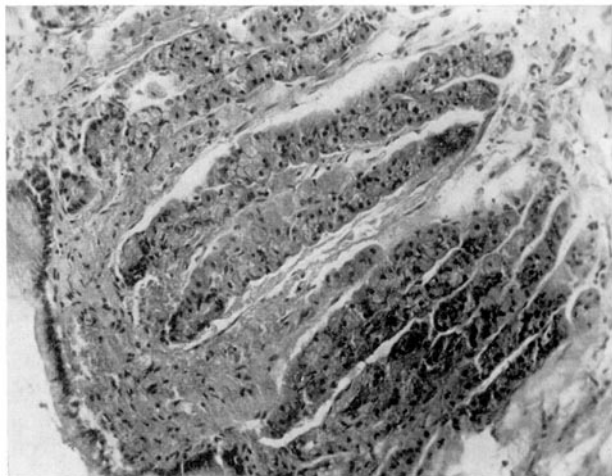
Ergebnisse. Histologische Untersuchungen der Leber: Versuchsgruppe I: Diffuse Fibrose und vereinzelte Pseudolappchen, lokale bis zonale, grosströpfige Steatose und Bildung von Ballonzellen. Gruppe II: Centroazinöse Nekrose im Stadium der Resorption, grosströpfige Steatose mit Bildung von Ballonzellen, einige Tiere mit fokaler oder diffuser Fibrose. Gruppe III: Befunde des Leberpunktates ohne wesentliche Veränderungen.

Histologische Untersuchungen der Magenschleimhaut: In den Präparaten aus der Aspirationsbiopsie der Magenschleimhaut fanden sich weder bei den Versuchstieren noch bei den Kontrollen wesentliche Veränderungen (Figur). Eventuelle diskretere Veränderungen der Magenschleimhaut waren nicht auszuschliessen.

Summary. Long-term administration of tetrachloromethane led to cirrhosis of the liver in dogs. Neither a repeated administration of the hepatotoxic substance nor cirrhotic changes of the liver led to changes of the gastric mucosa. The histological picture of the gastric mucosa was the same in dogs with liver cirrhosis as in healthy animals.

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Normale Struktur der Magenschleimhaut (HE, Vergr. 1:400).

- ⁹ J. DOBIŠ, I. VIDO und T. R. NIEDERLAND, Čs. Gastroent. Výž. 15, 255 (1961).
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- ¹⁶ I. VIDO und T. R. NIEDERLAND, Acta hepato-splenol. 10, 361 (1963).
- ¹⁷ I. VIDO und T. R. NIEDERLAND, Rev. Czech. Med. 9, 245 (1963).

'Supernumerary' or 'Degenerated' Chromosomes (?) in a Chromosomally Aberrant Cryptosacci Grasshopper, *Tristria pulvinata* Uvarov

It was reported earlier¹ that the spermatogonial chromosome number of *T. pulvinata* was 21, while the Cryptosacci group of grasshoppers to which it belongs have in males $2n = 23$ chromosomes as the characteristic num-

ber². On comparison between the caryotypes of *T. pulvinata* and some other species of the same sub-family Catantopinae of Cryptosacci, the previous worker¹ reported that the reason for the deviation from 23 to 21

¹ M. K. DUTT, Proc. Zool. Soc. Bengal 1, 49 (1948).

² M. J. D. WHITE, *Animal Cytology and Evolution*, Ed. II (The University Press, Cambridge 1954).

chromosomes in *T. pulvinata* was the loss of the smallest pair of the medium-sized autosomes. The discovery of the spontaneous occurrence of variable number of 'supernumerary' chromosomes (for real nature vide infra) from a different population of *T. pulvinata* reported hereunder would throw light on the probable mode of loss of the said pair of chromosomes together with the question of 'whether all the chromosomes of grasshoppers carry active genes required for the survival of the species concerned'.

In the course of a cytological survey of the locally available grasshoppers, it was found that some individuals of *T. pulvinata* were carrying a single 'supernumerary' chromosome. In such males, during the early primary spermatocyte prophase, two relatively large, but quite dissimilar in size, positively heteropycnotic elements were observed. Among these two heteropycnotic bodies, the larger one was found to be the X-chromosome and the other was the 'supernumerary' chromosome. The staining behaviour of the 'supernumerary' chromosome was more or less similar to that of the sex chromosome, i.e. both of them had a similar nucleic acid cycle in contrast to the regular autosomes. The 'supernumerary' chromosome from late diplotene stage to metaphase I showed two distinct chromatids attached at the centromere like those of the X. The 'supernumerary' chromosome at early primary prophase remained very close to the X as if it were some component of the sex complex. However, the closer association between the two might be due to some heterochromatic attraction³. The 'supernumerary' chromosome measured about half the size of the sex chromosome. At metaphase I, it always formed an accessory plate at one of the poles. The first spermatocyte division was invariably reductional because it was moving either towards the sex chromosome side or to the other, and the second division was equational. The 'supernumerary' chromosome was found neither to lag behind at the equator during the first and second anaphase divisions, nor did it undergo misdivision. Thus, four types of sperms resulted for the presence of the single 'supernumerary' chromosomes, namely: (i) 10 autosomes only; (ii) 10 autosomes plus the 'supernumerary' chromosome; (iii) 10 autosomes plus the X; and (iv) 10 autosomes, the X, and the 'supernumerary'.

Since the frequency of individuals with one 'supernumerary' was high, the survey was extended with a view to obtaining individuals with more than one 'supernumerary' chromosome if the mating was at random in the population. However, up till now no individual carrying more than two 'supernumerary' chromosomes was encountered.

The spermatogonial chromosome number in individuals with two 'supernumerary' chromosomes was, like the characteristic chromosome number of Cryptosacci, 23. In these individuals, at primary prophase three relatively large positively heteropycnotic elements, one being the X and the others the two 'supernumerary' chromosomes, were observed. At diplotene stage the two 'supernumerary' chromosomes were mostly not in paired condition. In some instances, however, they were not only associated but also were held together by a true chiasma located sometimes even at the interstitial region. At metaphase I, in bivalent condition they were situated along with other regular bivalents; while in the unassociated condition one was at each pole, arranged in a fashion like 'distant conjugation'⁴. At anaphase I, whether paired or not, they moved to the poles, invariably one at each. The first division was reductional and the second division was equational for all the chromosomes including the 'supernumerary' ones. Not a single instance of misdivision of the

'supernumerary' chromosomes was observed, for which the distribution of chromosomes at anaphases was strictly regular like that of normal species of grasshoppers with 23 chromosomes. Two types of sperms only could be formed, namely: (i) 10 autosomes plus one 'supernumerary'; and (ii) 10 autosomes, one 'supernumerary', and the X-chromosome. Thus the possibility of individuals having more than two 'supernumerary' chromosomes was restricted.

The present findings would lead to the following conclusions: (i) The primitive karyotype of *T. pulvinata* typically consists of 23 chromosomes like other Cryptosacci grasshoppers, which by the gradual loss of one regular medium-sized pair of autosomes due to heterochromatization had reached 21 chromosomes. The two heterochromatic chromosomes described as 'supernumerary' chromosomes floating in the present population indicated that 21 chromosome number is under way of fixation from 23. (ii) The number of 'supernumerary' chromosomes strictly limited to two would further support that the two 'supernumeraries' were once a regular pair of autosomes which, for some unknown reason, had lost the power of regular pairing while still maintaining the property of regular disjunction at anaphase, as well as keeping the divisional sequences at first and second division like other normal chromosomes. (iii) In male *T. pulvinata*, if the primitive number is accepted as 23, the two peculiarly behaving autosomes designated above as 'supernumerary' chromosomes should better be known as 'degenerating' chromosomes. If the diploid number was 21, there would be justification in designating them as 'supernumerary' chromosomes. Further, the particular pair possibly did not have the active genes whose loss would have been detrimental for the species. (iv) The present findings appeared to be in contradistinction to WHITE's² claim that a regular member of the chromosome complement cannot be lost without some chromosomal rearrangement. However, there is no positive proof against the possibility of a transference of the active genes to some functional chromosome through some rearrangements before the pair become lost. Further studies are in progress and the detailed account will be presented elsewhere.

Zusammenfassung. Die diploide Chromosomenzahl in Spermatogonien von *Tristria pulvinata* beträgt 21 (XO). In einer natürlichen Population wurden Männchen mit einem oder zwei 'überzähligen' Chromosomen gefunden. Es wird das Verhalten dieser Chromosomen während der Meiose geschildert und die Auffassung vertreten, die Gattung *Tristria* habe wie andere Feldheuschrecken aus der Gruppe der Cryptosacci 23 Chromosomen gehabt und sekundär ein Autosomenpaar verloren.

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³ S. P. RAY-CHAUDHURI and G. K. MANNA, J. exp. Zool. 114, 421 (1950).

⁴ G. LORBEER, Jahrb. wiss. Bot. 80, 567 (1934).