

pachytene configurations, completely free of chromatin, the SC of the autosomes preserve the morphology of the complement (Figure d). Some chromosomes show a dense body attached to the lateral element (Figure e). SOLARI² in analyzing thin sections, using as a marker the quadrivalent produced by the Searle's X-autosome translocations, concluded that the X chromosome pairing region belongs to the long arm. This agrees with the conclusions of FORD and EVANS⁶ but not with those of OHNO and LYON's⁷ who assume a pairing by the short arm of the X. But HSU et al.⁸, observing the centromeric heterochromatin of the X chromosome in the diplotene XY bivalent, confirm that the pairing region is the long arm of the mouse X chromosome.

According to this last hypothesis, the small pairing region of the XY bivalent shown in our preparations would correspond to the distal region of the long arm of the X (Figure a-b).

The aspects of the XY cores in normal meiosis and in Searle's translocations, led SOLARI² to suggest that the lateral elements are part of the chromosome structure.

Such association may be inferred from the fact that the lateral elements which remain in the treated preparations maintain the topographical disposition of the autosomes

and the XY pair, even at the non-pairing region. However the implication that these protein axes are part of the chromosome structure is difficult to reconcile with the actual knowledge of chromosome ultrastructure.

Résumé. Des complexes synaptonématiques de souris, exempts de chromatine, ont été obtenus par une méthode d'étalement aqueux après traitement par une solution de NaCl 0,9%. Les aspects d'appariement de la paire sexuelle XY et des autosomes sont présentés.

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⁷ S. OHNO and M. F. LYON, *Chromosoma* 16, 90 (1965).

⁸ T. C. HSU, J. E. K. COOPER, M. L. MACE JR. and B. R. BRINKLEY, *Chromosoma* 34, 73 (1971).

⁹ Supported by the Conselho Nacional de Pesquisas and Fundo Especial de Despesas do Instituto Butantan.

A Gross Abnormality in a Common Invertebrate: 'twinning' in *Chthamalus depressus* (Poli)

Although there is vast literature on vertebrate teratology and numerous experimentally induced abnormalities have been described by invertebrate biologists, records of 'fully developed', naturally occurring abnormalities in invertebrates are rare. The existence of abnormal development in the living adult of a common cirripede leading to a 'twinned' body is, therefore, of considerable interest.

The animal concerned was found in a collection of *Chthamalus depressus* (Poli) from high in the littoral on Isola Rossa, near Rovinj (Yugoslavia) in May 1973. It was living and apparently quite viable. The size of the animal was 10 mm along its rostrocarinal axis. The shell itself was eroded, thus reflecting the conditions of its habitat (KLEPAL¹; KLEPAL and BARNES²) and the animal

was probably at least 5 years old. The appearance, as seen after the animal had been removed from the substratum, is shown in Figure 1; the membranous basis was left on the rock. The abnormality appears only to have affected the body of the animal since the wall plates and the opercular valves were completely normal (Figure 2).

The abnormality consisted of the development of an additional and smaller prosoma and thorax, with a second set of cirri present on the latter. This smaller prosoma, projecting somewhat laterally from the larger and facing the carina, had a series of cirri arising at an angle and projecting somewhat basally; in life, it would therefore lie closer to the basis when the animal was withdrawn into its shell. The first set of cirri had normal pedicels and rami and the penis was also normal in position and morphology. The second set of cirri was incompletely developed, only the pedicels being well defined; the rami and distal parts of the cirri were incomplete and their pedicels set more closely together at their attachment to the smaller thorax. So placed, it would seem that this smaller 'twin' would be carried, at least partly, out of the mantle cavity when the larger 'twin' was extruded but it seems doubtful whether, with such an incomplete cirral net, it could take part in any feeding activity.

Abnormalities of various kinds have been recorded in the Cirripedia but they largely refer to the nauplius stages. Thus NORRIS and CRISP³, and NORRIS, JONES, LOVEGROVE and CRISP⁴, have described intermediates in the normal sequence of 6 nauplius stages in the form of larvae with characters intermediate between 2 normal stages. They suggest that this is due to the rate of morphological development getting 'out of step' with physio-

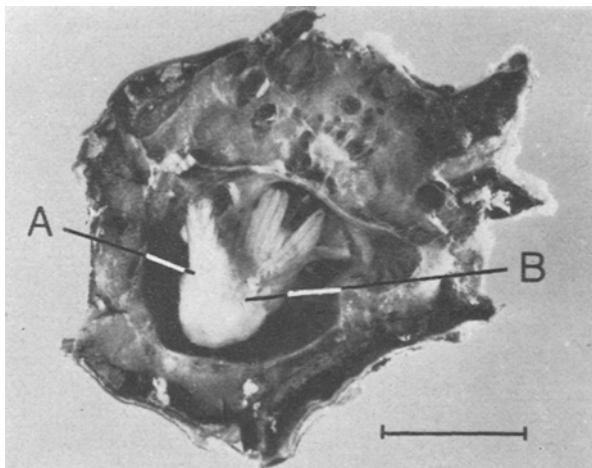


Fig. 1. *Chthamalus depressus* (Poli): animal removed from the substratum and viewed from underside. A) smaller 'twin' with incompletely developed cirri; B) larger prosoma and thorax with normal cirri; scale bar: 3 mm.

¹ W. KLEPAL, *J. exp. mar. Biol. Ecol.* 7, 1 (1971).

² W. KLEPAL and H. BARNES, *J. exp. mar. Biol. Ecol.* 17, 269 (1975).

³ E. NORRIS and D. J. CRISP, *Proc. zool. Soc. Lond.* 123, 393 (1953).

⁴ E. NORRIS, L. W. G. JONES, T. LOVEGROVE and D. J. CRISP, *Nature, Lond.* 167, 444 (1951).

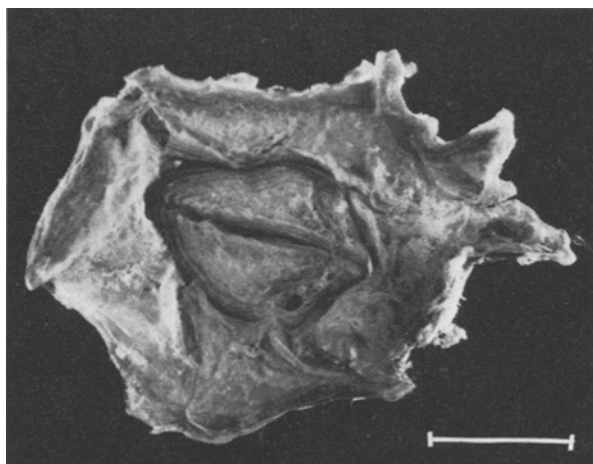


Fig. 2. *Chthamalus depressus* (Poli): same animal viewed from above; opercular valves and wall plates normal; shell eroded indicating exposed habitat; scale bar: 3 mm.

logical processes and differentiations. CRISP⁵ has also found occasional abnormal development in the ova of *Balanus balanoides* (L.); part of the vegetative pole of a normal egg became detached and the remainder gave rise to a miniature embryo which did not, however, give a viable nauplius. Partially viable, abnormal larvae are also formed as the result of development in hypertonic media; such abnormalities are largely confined to the limbs but do give larvae, which are viable for a limited time (BARNES and BARNES⁶).

CHEUNG⁷ has described abnormalities resulting from the treatment of cyprids with 20-hydroxyecdysone; abnormal larvae are produced but the adult shell remains

unaffected and TIGHE-FORD⁸ found that analogies of an insect juvenile hormone induced abnormalities in the nauplii and cyprids of *Elminius modestus* Darwin – gross extension of the anterior region bearing the antenna; there was no evidence of a duplication of structures.

Dr. H. BARNES informs me that Dr. P. CHEUNG, in examining the exuvia of some experimental animals, has found one with 2 complete penes on the exuvia: unfortunately the animal itself was not retained. It seems unlikely that the abnormality found in the adult *C. depressus* had originated and been carried through from the larval stage but rather that it had arisen at, or subsequent to, metamorphosis from the cyprid to the adult. It seems clear that it would have to give rise to an exuvia in which both 'twin' parts could have been recognized.

Zusammenfassung. Eine bemerkenswerte Abnormität wird von einem adulten *Chthamalus depressus* (Poli), gefunden in der oberen Litoralzone von Rovinj, Jugoslawien, gemeldet. Der cirrentragende Körperabschnitt war verzwillingt, wobei die Cirren selbst am kleineren Teil nur unvollständig entwickelt waren. Das Tier lebte. Frühere Meldungen von Abnormitäten an Cirripediern beziehen sich immer auf Larven unter Experimentierbedingungen.

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⁶ H. BARNES and M. BARNES, J. exp. mar. Biol. Ecol. 15, 197 (1974).

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⁸ D. J. TIGHE-FORD, Ph. D. Thesis, The University of Southampton (1974), p. 180.

Binding of D- α -Tocopherol to Rat Liver Nuclear Components

Previous studies have shown that significant amounts of vitamin E are associated with the nuclear apparatus in mammalian cells^{1,2}. Although binding of this vitamin to various native proteins like serum albumin and egg albumin under in vitro conditions³, and to a cytosolic lipoprotein under in vivo conditions⁴, has been observed, information is lacking with respect to the binding of this vitamin to intranuclear components. The present report describes the identification of a nucleoprotein receptor complex that binds D- α -tocopherol when it is administered to vitamin E deficient rats.

Materials and methods. Weanling male rats of the Sprague-Dawley strain maintained on a vitamin E deficient diet⁵ for 10 to 12 weeks, were injected i.v. with specified amounts of ³H-D- α -tocopherol (3.7 Ci/mmol, The Radiochemical Center, Amersham, England) dissolved in a compatible vehicle (0.5 – 1.0 ml of a mixture of dimethylsulfoxide, saline and tween 80, 1:0.9:0.1). The rats were sacrificed 3 h after administration of labelled tocopherol. Highly purified nuclei were isolated from liver^{6,7}.

The nuclei associated receptor complex was solubilized by homogenization of the labelled nuclei in a hypotonic *tris* buffer using a glass-teflon homogenizer, and the homogenate was extracted with varying concentrations of sodium chloride, essentially as described by BRUCHOVSKY and WILSON⁸. Each milliliter of homogenate con-

tained 29,000 dpm of ³H-D- α -tocopherol, 6.8 mg of protein, 1.0 mg of DNA and 0.34 mg of RNA. After completion of the extraction, each sample was centrifuged and both supernatant and the pellet were analyzed for radioactivity, protein, DNA and RNA.

The total nuclear extract prepared by the method described above, containing 0.6 M NaCl, was fractionated through a Sephadex G-200 column (65 \times 2.5 cm, i.d.) at 20°C. Fractions of 2.5 ml each were collected and were analyzed for radioactivity, protein, DNA and RNA.

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