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Pericentric Inversion of Chromosome 9

CHROMOSOME banding systems allow new insight into the variations of the human chromosome complement. The cases discussed below show the value of carefully using a combination of banding techniques, and we feel that a more routine use of centromeric (C) banding in conjunction with Giemsa (G) or fluorescence (Q) banding helps in establishing the true frequency of variation in the centromeric region. Our evidence suggests that pericentric inversion of chromosome 9 is a relatively common heteromorphism of the human karyotype.

Three recent reports have identified a pericentric inversion of chromosome 9. Wahrman *et al.*[1], using the secondary constriction of 9 as a marker, have suggested the presence of this change in two families and one individual, while Craig-Holmes[2] and Bobrow *et al.*[3] both mention one case each, recognized by C-banding.

Out of approximately two hundred individuals studied over the past two years by the fluorescence technique using quinacrine mustard, three inversions of chromosome 9 have been detected in individuals examined for reasons other than the direct possibility of this chromosome abnormality.

First, PRU 6615, was a developmentally abnormal child shown to be unbalanced for a reciprocal translocation between chromosomes 18 and 21 transmitted from the paternal grandmother. In addition to the translocation, the grandmother had an inversion of the heterochromatic segment of chromosome 9, resulting in a metacentric chromosome. The father of the propositus had the balanced form of the translocation but not the inversion; the father's sister, however, had the inversion but not the balanced interchange. Second, PRU 6691, was a child with Down's syndrome (47,XY,+21), examined as part of a survey of (so far 34) cases of trisomy 21. The fluorescence karyotypes suggested that a pericentric inversion involving the heterochromatic segment of chromosome 9 was present. Third, PRU 7481, was found in a survey to investigate transplacental transfusion where one of twenty-seven mothers examined had a similar pericentric inversion.

Using regular bright field analysis, one can miss such structural changes, any difficulties in pairing being attributed to preparative artefacts. Fluorescence analysis of all three cases showed a metacentric C group chromosome with a dull staining segment in the proximal region of the short arm. A centromeric banding technique[4,5] similar to the modification of Evans *et al.*[6] was used to demonstrate more clearly the variant chromosome, which in each case was similar in morphology to that illustrated by Bobrow *et al.*[3].

There are reports of pericentric inversion in group C, mostly identified by grossly abnormal morphology[7,8]. Berg *et al.*[9], Lubs and Ruddle[10] and Gerald and Walzer[11] also have described cases of metacentric C group chromosomes which are morphologically similar to those described here, and Wahrman *et al.*[1] suggest that most C group inversions may involve chromosome 9. Schmid and Vischer[12] and Reeves and Lawler[13] have presented cases with fragility of the heterochromatic segment of 9. This suggests that there may be a fragile point at the junction of the centromeric heterochromatin and the euchromatin of the long arm of chromosome 9. This, together with breaks in the short arm of the same chromosome, could readily lead to rearrangements of differing morphology dependent on the position of the short arm lesion.

These observations indicate that this structural change of chromosome 9 is one of the human polymorphisms which should be looked for during chromosome studies. There is considerable variation in the size of the bands that stain with the centromeric techniques (refs. 2, 3, 14, and M. G. D., unpublished work) and the fact that these heterochromatic variants apparently segregate normally in pedigrees should prove valuable in linkage studies[15].

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D. E. MUTTON
M. G. DAKER

Paediatric Research Unit,
Guy's Hospital Medical School,
London SE1

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Pressor Responses of Ketamine and Circulating Biogenic Amines

THE new "dissociative" anaesthetic ketamine increases arterial pressure, heart rate and output when given intravenously to human subjects[1], has biphasic effects on blood pressure in dogs[2], is a vasodepressor in rats[3] and depresses the isolated mammalian heart[4]. The mechanisms underlying these changes are not yet understood, although several[3-8] have been postulated. We have measured cardiovascular responses to ketamine in dogs and simultaneously monitored changes in blood levels of vaso-active substances by the continuous superfusion bio-assay technique of Vane[9]. An