FIG 2 Autoradiograph showing genomic DNA samples digested with *MnlI* and hybridised to the *NcoII/BamHI* β fragment probe. Lanes 1, 4, and 6=normal subjects (β^A/β^A), lane 2=subject heterozygous for Hb E (β^A/β^E), lanes 3 and 5=subjects homozygous for Hb E (β^E/β^E).

method requires no modification of routine gene mapping procedures and is directly applicable to prenatal diagnosis of Hb E by fetal DNA analysis. Studies have shown that the majority of thalassaemic children in south-east Asia result from the interaction of Hb E and β thalassaemia.³ Thus, detection of the Hb E mutation alone offers a 50% chance of excluding compound heterozygosity for Hb E thalassaemia in a large proportion of Asian couples at risk of producing thalassaemic children. The isolation of restriction enzymes with different cleavage sites should permit more mutations to be directly detectable by this approach, since detection of small DNA fragments should no longer be a limiting factor.

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Translocation chromosome map of oncogenes

Recent progress in medical genetics has shown that chromosomal reciprocal translocation is one of the most frequent and consistent mechanisms of genetic disease and human malignancies.^{1,2} Human gene maps currently used to identify gene loci are based on a classical Denver idiogram which is unable to display the connections between chromosome breakpoints.¹ Consequently, chromosome maps representing oncogene loci, breakpoints, and reciprocal translocations are confusing. In order to solve this problem, I propose to use a special circular translocation chromosome map ordered by size which allows translocation lines to be traced in the area of the circle.

The figure shows a circular idiogram which contains 24 human chromosomes, including the X and Y, in order of size. The outer circumference shows gene loci symbols of proto-oncogenes² and the lines represent translocation tracks between chromosome breakpoints (arrows). Associated malignant diseases are displayed along the translocation lines. Relative chromosome lengths are approximate to those of McKusick's map.¹

This new circular idiogram has considerable advantages over the classical Denver model for displaying a general overview of oncogenic reciprocal translocation. This new model is preferable to other designs, such as oval or bicycle chain models, because it allows identification of oncogenic loci on the standard scale of 360° of the circumference of the circle; for example, proto-oncogene *abl* is located at 200° and proto-oncogene *sis* at 346°. These

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FIGURE Circular model of a chromosome map for reciprocal translocations of oncogenes.

co-ordinates may facilitate work with computer models in the future. A limitation of this circular model is the difficulty of tracing translocation lines between adjacent chromosomes.

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