Twin Research and Human Genetics
Volume 19 ▌ Number 1 ▌ pp. 77–79 ▌ © The Author(s) 2016 ▌ doi:10.1017/thg.2015.95

Cells With Chromosomal Aberrations Trigger Neoplastic Transformations in Humans

Hit Kishore Goswami

Human population cytogenetic studies have revealed that a majority of persons who are prone to developing malignant features possess chromatin bodies termed as marker dots (MDs) measuring nearly 2 to 3 microns. These MDs are seen emanating from certain specific chromosomes, which may be early indicators of neoplastic transformation within cells.

■ **Keywords:** marker dots, MDs, early detection of malignancy by chromosomes, specific chromosomal attenuation releases marker dots

Conventional studies were conducted on mutational damages both by SCE (sister chromatid exchanges) as well as by scoring chromosomal aberrations on more than 600 individuals exposed to methyl isocyanate gas in Bhopal (central India) in order to assess the genotoxicity imposed by the exposure. This short note re-emphasizes the importance of certain chromatin dots that were seen emanating from chromosomes which are decidedly early indicators of neoplastic transformations. MDs have always been found in all breast, colon, and bone cancer patients we have studied.

Results and Discussion

Lymphocyte cultures were routinely carried out and chromosomes were stained with Giemsa banding as per standard techniques, and approaches have been published (Goswami, 1986; Goswami & Chang, 2001). Small chromatin dots measuring 1.5–3 microns were observed emanating from different chromosome in several metaphases, as well as seen freely near the specific chromosomes (Figures 1–4). As far back as 1973, a few chromatin dots of variable sizes were already encountered in squashes of brain tumor tissues, that is, medulloblastoma, ependymoma, and tuberculoma, along with hyper and hypoploid chromosome counts (Dharker et al., 1973). Studies were then extended to various malignancies and the presence of MDs was recorded in all of them. Intriguingly, only selective chromosomes are involved (chromosomes 1, 3, 4, 5, 9, 11, 16; Goswami, 2001; Goswami, & Chang, 2001) in emanating MDs.

With a view to establish that the MDs frequently found in patients with malignancy are actually chromatin structures observed as freely found dots (Figures 2 and 3) or seen emanating from chromosomes (Figure 4), they were also stained with conventional Feulgen's reaction. It has been now well established that these MDs are DNA containing chromatin structures, which most likely are the outcome of some additional molecular mechanism.

It appears that the molecular attenuation of chromatin structures movable from chromosomes is related with triggering neoplastic transformations (Goswami, 1993). These dots appear only in those metaphases that exhibit translocations and acrocentric associations, which are again precursors to firm installation of chromosomal mutagenesis in cells as established since the time of Boveri (German, 1974).

Acknowledgments

I am grateful to the Late Professor T. C. Hsu for his initial encouragement during 1973 and to surgeons in hospitals at Gwalior and Bhopal for facilitating this long-term study (1970–2002).

RECEIVED 18 October 2015; ACCEPTED 27 October 2015.

ADDRESS FOR CORRESPONDENCE: Hit Kishore Goswami, 24, Kaushalnagar, PO Misrod, Bhopal (MP) India. E-mail: hitkishoreg@gmail.com

FIGURE 1

A part of the metaphase plate stained with Feulgen's method showing two darkly stained dots emanating from the terminal part of human chromosome 1; this patient died of breast cancer nearly 2 years after the study.

FIGURE 2

A part of a metaphase spread from the same slide to show a free marker dot (ca 1,500).

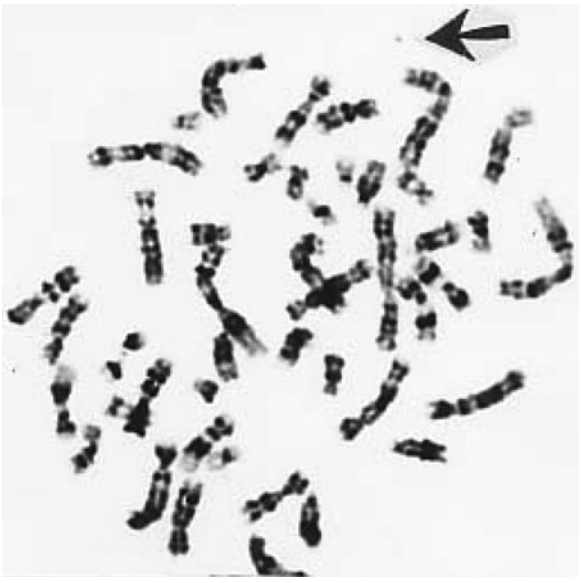

FIGURE 3

Giemsa banded metaphase showing a detached marker dot; it appears faintly stained due to change in the focusing chromosomes. Note that most of the marker dots photographed showing fine fibrillar connections with some part of any chromosome (see Figure 4) can be seen only by changing focus, thereby making the chromosome surface a little unclear.

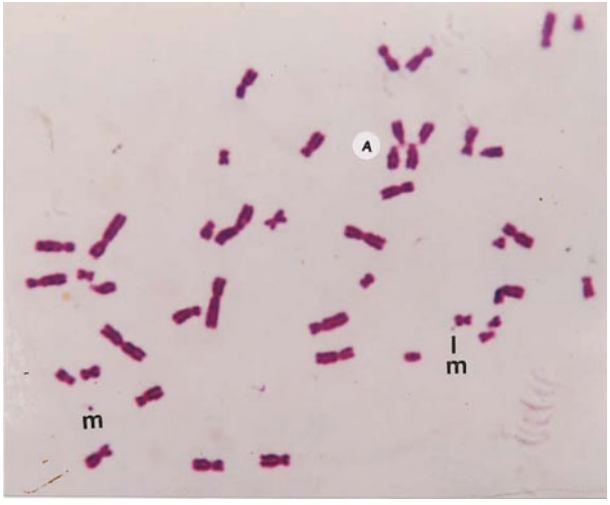

FIGURE 4

(Colour online) A major part of Giemsa stained metaphase exhibiting a detaching marker dot still attached by a fine fibril. Marker dots (m), acrocentric (A) associations, and translocations are also present in this methylisocyanate exposed person.

References

Dharker, R. S., Chaurasia, B. D., & Goswami, H. K. (1973). Hypoploidy in brain tumours. *Acta Biologica Academiae Scientiarum Hungaricae Magyar Tudományos Akadémia*, *24*, 233–235.

German, J. (1974). *Chromosomes and cancer*. New York: John Wiley & Sons.

https://doi.org/10.1017/thg.2015.95 Published online by Cambridge University Press

Goswami, H. K. (1986). Cytogenetic effects of methyl isocyanate exposure in Bhopal. *Human Genetics (Berlin)*, *74*, 81–84.

Goswami, H. K. (1993). Marker dot is indicator of chromosomal mutagenesis. *Bionature*, *13*, 325–333.

Goswami, H. K. (2001). Genetic significance of marker dots. *Perspectives in Cytology & Genetics*, *10*, 265–269.

Goswami, H. K., & Chang, S. I. (2001). Marker dots are expelled by attenuation in heterochromatin of a chromatid. *Bionature*, *21*, 41–48.

https://doi.org/10.1017/thg.2015.95 Published online by Cambridge University Press