

5. Patnaik, G. K. and Dhawan, B. N., *Current Research on Medicinal Plants in India* (ed. Dhawan, B. N.), Indian National Science Academy, New Delhi, 1986, pp. 45-71.
6. Patnaik, G. K. and Dhawan, B. N., *Current Research in Pharmacology in India (1982-1987)* (eds. Agarwal, K. K., Seth, P. K. and Dhawan, B. N.), Indian National Science Academy, New Delhi, 1994 (in press).
7. Dandiya, P. C. and Sakina, M. R., *Research and Development of Indigenous Drugs* (eds. Dandiya, P. C. and Vohra, S. D.), Institute of History of Medicine and Medical Research, New Delhi, 1989, pp. 34-44.
8. Dhawan, B. N., *Proc. Indo-US Symposium on Mental Health and Neurosciences in the Decade of the Brain* (eds. Srinivasa Murthy, R. and Koslow, S. H.), National Institute of Mental Health, Rockville, 1994 (in press).
9. Bhattacharya, S. K., Bose, R., Dutta, S. C., Roy, A. B. and Guha, S. R., *Ind. J. Exp. Biol.*, 1979, **17**, 598-600.
10. Bhattacharya, S. K., Ray, A. B. and Dutta, S. C., *Planta Medica*, 1975, **27**, 164-170.
11. Jamwal, K. S., Anand, K. K. and Chopra, I. C., *Arch. Int. Pharmacodyn.*, 1962, **138**, 400-411.
12. Sharma, J. D., Dandiya, P. C., Baxter, R. M. and Randell, S. I., *Nature*, 1961, **192**, 1299-1300.
13. Arora, R. B., Chatterji, A. K., Gupta, R. D., Arora, C. K. and Tandon, P. N., *CNS Drugs* (eds. Sidhu, G. S., Kacker, I. K., Sattur, P. B. and Thyagarajan, G.), Council of Scientific and Industrial Research, New Delhi, 1966, pp. 118-132.
14. Bhide, N. K. and Aimen, R. A., *Nature*, 1959, **183**, 1735-1736.
15. Sheth, U. K., Vaz, A., Deliwala, C. V. and Bellare, R. A., *Arch. Int. Pharmacodyn.*, 1963, **144**, 34-50.
16. Singh, H. K. and Dhawan, B. N., *J. Ethnopharmacol.*, 1982, **5**, 205-214.
17. Singh, H. K., Rastogi, R. P., Srimal, R. C. and Dhawan, B. N., *Phytotherap. Res.*, 1988, **2**, 70-75.
18. Singh, H. K., Srimal, R. C. and Dhawan, B. N., *Actes I Colloq. Europ. Ethnopharmacol.*, 1990, pp. 319-321.
19. Karanth, K. S., Haridas, K. K., Gunasundari, S. and Guruswami, M. N., *Arogya*, 1980, **6**, 137-139.
20. Chopra, R. N., Chopra, G. S. and Chopra, I. C., *Ind. J. Med. Res.*, 1942, **30**, 155-171.
21. Chopra, R. N. and Chopra, G. S., *Ind. J. Med. Res.*, 1935, **23**, 359-389.
22. Dhawan, B. N., *Structure-Activity Relationships of the Cannabinoids* (eds. Rapaka, R. S. and Makriyannis, A.), National Institute on Drug Abuse, Rockville, 1987, pp. 189-203.
23. Atal, C. K., Siddiqui, M. A., Zutshi, V., Alma, V., Johri, R. R., Rao, R. G. and Kaur, S., *J. Ethnopharmacol.*, 1984, **11**, 309-317.
24. Ghosh, D., Thejomoorthy, P. and Veluchamy, *Ind. J. Pharmacol.*, 1983, **15**, 331-342.
25. Nazimuddin, S. K., Viswanathan, S., Kulanthaival, P., Gopalakrishnan, C. and Kameshwaran, L., *Ind. J. Med. Res.*, 1980, **71**, 476-479.
26. Gujral, M. L., Kohli, R. P., Bhargava, K. P. and Saxena, P. N., *Ind. J. Med. Res.*, 1955, **43**, 89-94.
27. Palanicherry, S. and Nagarajan, S., *J. Ethnopharmacol.*, 1990, **29**, 73-78.
28. Srimal, R. C. and Dhawan, B. N., *J. Pharm. Pharmacol.*, 1973, **55**, 447-452.
29. Ghosh, D. and Anand Kumar, A., *Ind. J. Pharmacol.*, 1983, **13**, 391-402.
30. Kulkarni, S. K. and Varma, A., *Ind. J. Exp. Biol.*, 1992, **30**, 885-888.
31. Dhawan, B. N., *The Medicinal Plant Industry* (ed. Wijesekera, R. O. B.), CRC Press, Boca Raton, 1991, pp. 77-84.
32. Pradhan, S. N., Pandey, K. and Badola, R. P., *Br. J. Anaes.*, 1964, **36**, 306-311.
33. Dhawan, B. N., *Comp. Rend. Cong. Internat. Phytotherap.*, Nice, 1989, pp. 27-35.

## Peripheral markers for CNS disease

Prahlad K. Seth\* and Devika Nag\*\*

\*Developmental Toxicology Division, Industrial Toxicology Research Centre, Lucknow 226 001, India

\*\*Department of Neurology, K. G. Medical College, Lucknow 226 003, India

GROWING evidence of a biochemical basis for the alterations in nervous activity, including behaviour and mood, has led the neuroscientists to investigate the precise mechanisms of neuropsychiatric disorders. Experimental studies involving animals and in some cases human volunteers have helped in understanding the pathogenesis of a variety of neurological and neuropsychiatric disorders and actions of drugs and chemicals. Delineation of the role of dopamine receptors in Parkinson's disease and the observations that two environmental chemicals, viz. MPTP and manganese, could produce Parkinsonism-like syndrome is one such achievement. Similarly, copper and aluminium have been shown to play a role in Wilson's disease and Alzheimer's disease, respectively. These studies have

helped in the development of effective therapeutic drugs and better management of the patients.

Advances in cellular and molecular neurobiology have established that neurotransmitters and their receptors and cellular signalling play a central role in the functioning of the brain. Ever since the understanding that neurotransmitters play a key role in the functioning of the brain<sup>1</sup>, neuroscientists have attempted to study them under clinical conditions using body fluids and post-mortem brain samples from disease-affected individuals. The latter studies have provided some useful information. However, the reliability of the data using post-mortem samples is uncertain due to difficulties associated with proper isolation and preservation of the tissue; this could significantly affect