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Dispersed mobile-phase countercurrent chromatography

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Countercurrent distribution based on liquid-liquid partition is a powerful separation method with minimal incurrence of loss of solutes, but its industrial application has been limited by cumbersome shifting of immiscible solvents. Although centrifugation has been employed to facilitate equilibration between phases, process scaling-up remains difficult. In this study, a dispersed mobile-phase countercurrent chromatography (DMCC) method has been developed to adapt the countercurrent distribution principle to a continuous column chromatography format. Continuous solute-exchange between two immiscible phases within a series of separation columns is achieved by mechanical dispersion of an influx of mobile phase into an upward stream of small droplets travelling through the columns filled with stationary phase. The diameter, length and number of columns and the number of stationary phases employed in the different columns can be varied to match the requisite scale and resolution of operation. Illustrations of DMCC were provided by examples of solute separations where the fractionated solutes could be collected either from the eluate of the series of columns or from drainage of the stationary phases in the individual columns at the end of a chromatographic run.

Biography

Hong Xue has obtained her MD from the Shanghai Second Military Medical University in 1983, PhD from the Institute of Medical Sciences and Department of Biochemistry, University of Toronto in 1992, and carried out Post-doctoral studies at the Department of Genetics, University of Glasgow before joining the Department of Biochemistry, Hong Kong University of Science & Technology (HKUST). Currently, she is the Director of Applied Genomics Center of HKUST, and Professor of Life Science at Hong Kong University of Science and Technology. Her group research focuses on genomics, bioinformatics and evolution biology to decipher the mechanisms of human complex diseases, in particular, schizophrenia. The group is also interested in translational research on novel therapeutics and diagnostics for complex neuropsychiatric disorders including anxiety, depression and neurodegenerative disorders, with a focus on GABAA receptors as the drug targets. In order to effectively isolate active components from medicinal herbs, her group has recently developed a novel chromatographic method designated as Disbursed Mobile-Phase Countercurrent Chromatography (DMCC). In 2003, she and her team discovered the association between schizophrenia and a segment of the GABRB2 gene encoding the β2 subunit of GABAA receptors, the positive selection of genotypes and haplotypes in this segment, determinant role of this segment in the alternate splicing of the β2 subunit protein, and the differential modulation of the GABA-induced membrane current by the long and short forms. These discoveries represent therefore the first instance where a schizophrenia-susceptibility gene has been linked to protein processing and further to electrophysiological response of neurons, thereby opening the door toward understanding the mechanism of schizophrenia etiology leading from gene to neuronal phenotype.

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