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Biomimetic characteristics of dual TLC retention mechanism

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Most biomimetic chromatography measurements provide information on the ability of drugs to pass through cell membranes, their interaction with protein-based structures and distribution properties. The biomimetic properties of thin-layer chromatography (TLC) conditions have not been investigated so far. In our previous research, the presence of dual retention mechanisms for selected imidazoline and serotonin receptor ligands was confirmed under TLC conditions on C-18, diol, and a silica-based phases. The mobile phase was a mixture of ACN and water with 20 mM ammonium acetate and 0.1 volume % of acetic acid [1]. In this research, the average retention parameters were determined by using the integration procedure [2]. The parameter R_M^H is the average retention in the hydrophilic-dominated (HILIC), while R_M^R is the average retention in the region of reversed-phase interactions (RP). The parameter R_M^A corresponds to the average retention within the overall HILIC/RP region. The lipophilicity successfully correlates with the C-18 and silica based behaviour. For plasma protein binding affinity, the best correlations were found within C-18 and silica-based systems ($r > 0.70$). There is also a correlation of average silica gel and C-18 mechanism of interaction with the volume of distribution ($r > 0.73$), and the intestinal absorption ($r > 0.70$). The retention behaviour on the diol phase showed a good correlation with the P-gp inhibitor activity ($r = 0.80$). TLC systems that provide dual retention mechanisms can be successfully used in the rapid biomimetic profiling of serotonin and imidazoline receptor ligands in the first steps of drug discovery.

[1] D. Obradović, T. Kowalska, D. Agbaba, J. Chromatogr. Sci. 60 (2022) 372-386.

[2] D. Obradović, L. Komsta, D. Agbaba, J. Chromatogr. A 1619 (2020) 460951.

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