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Student: Ing. Jan Čížek
Supervisor: Ing. Pavel Izák, Ph.D., DSc.
Supervising Expert: Doc. Ing. Zdeněk Slouka, Ph.D.

Many chiral drugs and food supplements were developed and are still sold as racemic mixtures of both enantiomers. However, human metabolism is a complicated set of biochemical reactions involving many chiral recognition sites, which recognize only one of the two enantiomers found in racemic drugs, while the other one is found to be inactive or even toxic. Therefore, it is very important to use enantiomerically pure drugs to avoid undesired side effects caused by administration of racemic mixtures. Yet, the enantioseparation of racemic substances on larger than laboratory scale has been a difficult challenge and membrane technology is a promising candidate to overcome this issue.

To separate enantiomers using membranes, a special type of membrane with immobilized chiral recognition sites (chiral membrane) is required.[1] In this work, a simple and effective method for chiral membrane preparation is demonstrated, involving electrostatic interaction between negatively charged sulfobutylether-β-cyclodextrin (SBE-β-CD) as a chiral selector and a commercially available anion-exchange membrane.[2] The modified home-made chiral membrane was tested in diffusion cells to characterize its enantioselectivity towards D,L–Tryptophan. We demonstrated in our work that L–Tryptophan is preferentially absorbed into the membrane, while D–Tryptophan is transported through the membrane with enantiomeric excess exceeding 80%. To increase the permeation rate of the membrane, thinner ion-exchange membrane substrate with higher degree of swelling is proposed.

References

1. Kasal, P.; Michel, M.; Gaálová, J.; Cuřínová, P.; Izák, P.; Dian, J.; Jindřich, J. *Mater. Today Commun.* **2021**, *27*, 102234.
2. Kučerová, G.; Procházková, H.; Kalíková, K.; Tesařová, E. *J. Chromatograph. A* **2016**, *1467*, 356–362.