9.1 SUMMARY AND CONCLUSION

Bilayer phospholipid membrane was formed using planar, salt bridge (agargel) and glassy carbon electrode in 1.0 M, 0.1 M and 0.01 M KCl bath solutions and characterized electrochemically. Using the mentioned model membrane systems interaction of Lorazepam with BLM was studied. The stability of model membrane systems was studied by monitoring their electrical properties using electrochemical impedance spectroscopy. The electrical properties of all membrane systems reach almost a stable value within 300 seconds. The kinetics studies on membrane formation show that solid supported membrane has longer life time than planar and agargel supported BLM systems.

The stability of BLM in all model membrane systems depend on the concentration of the bath. With increase in concentration of KCl the stability of BLM system increases due to tightening effect exerted by chloride ions on the membrane surface at membrane surface – solution interface. Because of this tightening effect the lateral diffusion of phospholipid molecules is greatly reduced and hence the ionic conductance of BLM decreased. Thus, with decrease in KCl concentration the membrane conductance increases or membrane resistance decreases.
Studies on interaction of Lorazepam with planar BLM shows the membrane conductance increases with Lorazepam concentration. The Lorazepam is highly lipophilic i.e. highly lipid soluble. The partition of Lorazepam into the BLM phase increases the fluidity of BLM phase, which makes the BLM phase much leakier to small ions such as K\(^+\) and thus membrane ionic conductance increased. The partition of Lorazepam also increases the capacitance of membrane phase, which is due to dielectric nature of Lorazepam and increase in surface area of BLM. An impedimetric sensor was developed for the quantification of Lorazepam. The membrane resistance measured for Lorazepam doped BLM follows a linear relation with the concentration of Lorazepam. This concentration range, where membrane resistance shows linear relation also depends on KCl concentration in the bath. The detection levels of Lorazepam using planar lipid membrane in 1.0 M, 0.1 M and 0.01 M KCl bath solutions respectively are 1200 nM, 800 nM and 200 nM respectively.

Interaction of Lorazepam with sb-BLM studied in KCl bath solutions using electrochemical impedance spectroscopy. Partition of Lorazepam into the BLM has shown fluidization effect. The fluidization effect of Lorazepam increased the conductance of sb-BLM. Thickness of BLM phase decreases with increase in KCl concentration in the bath solution. An impedimetric sensor was developed for the quantification of Lorazepam. The detection range of Lorazepam in the bath solution depends on KCl concentration. The detection levels of Lorazepam in 1.0 M, 0.1 M and 0.01 M KCl bath solutions...
using sb-BLM respectively are 5000 nM, 1000 nM and 600 nM. Thus, in the sb-BLM based impedimetric sensor the detections levels of Lorazepam increased in the KCl bath solutions.

Bilayer lipid membrane was successfully formed on the electrochemically activated GCE surface in KCl bath solutions. The concentration of KCl affects the membrane capacitance \( (C_M) \) and membrane resistance \( (R_M) \). With decrease in KCl concentration in the bath solution the membrane capacitance and membrane resistance decreases. An opposite trend was observed in membrane resistance in the presence of ferri-ferro cyanide marker ions. Cyclic voltammetric studies show Lorazepam can be detected in solution upto 1000 nM using ferri-ferro cyanide marker ions.

Interaction of Lorazepam with model membrane systems indicate that Lorazepam interacts with cell membranes non-specifically.

The results of the present work suggest the scope for the following studies:

- To study the effect of pH on the interaction of Lorazepam with model membrane systems.
- To develop BLM based sensors for other drugs
- To identify the groups responsible for non-specific interaction and modifying such functional groups without compromising clinical action of drug.
References


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