Dental caries and periodontal diseases were considered as one among the global oral health problem, and this is mainly caused due to the micro flora in the oral cavities. In India, the expenditure spent for oral health care is low. The cheap and best way to treat the oral diseases in an effective manner is to use the medicinal plants. Indian subcontinent is cherished with numerous valuable medicinal plants. But only a few of them were thoroughly studied for their preventive care and treatment against various diseases. The plant *Glycyrrhiza glabra* was choosen to inhibit the oral flora. The reason behind this plant is, it contains Glycyrrhizin, the principle compound, which is mainly known for its sweetness. It is believed to be 50 – 200 times sweeter than sucrose (Obolentseva *et al.*, 1999). Also the plant contains many bioactive compounds which is responsible for antibacterial activity. *Glycyrrhiza glabra* Linn commonly known as ‘liquorice’ belongs to Leguminosae/ Pappilionaceae family. Licorice is 50 – 200 times sweeter than sucrose The root and rhizome of *Glycyrrhiza glabra* has been extensively used in medicine.

Commercially available mouthwashes lead to some irritant effect inside the mouth, and continuous usage leads to browning of teeth. Such mouthwashes cannot be used by children. The cork layer of the rhizome of Glycyrrhiza glabra showed a powerful antibacterial activity against both Gram positive and Gram negative bacterium. The antibacterial activity of water and methanol extract of *Glycyrrhiza glabra* was studied by well diffusion method (Perez *et al.*, 1990). Antibacterial activity was tested against Gram positive *Staphylococcus aureus* and *Bacillus subtilis* and Gram negative *Escherichia coli*, *Salmonella typhi*, *Klebsiella pneumoniae*, *Enterobacter aerogenes*.

The rhizome of *Glycyrrhiza glabra* contains many layers. They are the outer cork, middle cambium and the inner pith. All the layers of the rhizome were not equally
bioactive. Cross section and vertical section of the rhizome of Glycyrrhiza glabra was used for antibacterial assay. Antibacterial activity was analyzed by zone formation around different layers of rhizome. Cork layer alone exhibited good antibacterial activity.

Among the various compounds present in the cork extract of Glycyrrhiza glabra, specific compound with maximum bioactivity was identified and purified using Preparative Thin Layer Chromatography. The purified compound was characterized and the structure was elucidated using Spectroscopic techniques. Further mouthwash was formulated using the crude cork and purified compound of the rhizome of Glycyrrhiza glabra. The sweetness of the rhizome and their wonderful antibacterial activity led to the formulation of a mouthwash. The children also will not have any second thoughts to use the newly synthesized mouthwash because of its sweetness.

Oral flora is collected from a healthy volunteer and used for analysis. The Minimal Inhibitory Value (MIC) of the crude and the compound against the oral flora was analyzed and it was found to be 100 mg/ml for crude and 50 mg/ml for purified compound. Chlorhexidine is used as control against oral bacteria. The growth curve of oral flora was studied using the minimum inhibitory concentration of the crude cork and the purified compound for 12 hours. The graph showed that, control ie., the oral flora started to grow from the 5th hour after inoculation and the ethanol treated oral flora started to grow after the 7th hour of incubation. The oral flora treated with the ethanol extract of crude cork and purified compound showed significant activity till 24hrs after treatment. This was examined spectrometrically by taking the optical density at 620nm. The efficient killing time of the crude cork and purified compound was analyzed and it was found to be 30 seconds.

The mode of action of the compound on how the purified compound and the crude extract inhibit the bacterium was studied. Any changes in the protein profile of bacterium
were studied using SDS-PAGE. The bacteria was allowed to incubate with the crude and the compound for 20 mts and their protein profile was observed. Protein bands of the treated culture remains as the control *E.coli*. Thus it was confirmed that the transcription or the translation was not affected by the crude and the purified compound. Bacterial inhibition due to replication was analyzed by Immunohistochemistry technique using Bromodeoxyuridine (BrdU) as marker. The purified compound inhibits the replication pathway of the bacteria. The specific site at which the compound binds with DNA gyrase, the enzyme used in replication process was studied and the data confirms that, the compound binds to gyrase with hydrogen bond interactions and blocks the replication pathway. The toxicity of the purified compound and the crude extract of *Glycyrrhiza glabra* were studied using earthworm, *Eudrilus euginae* as model organism. Earthworm is an apt organism to compare the toxicity since earthworms have 85% sequence similarity of human. The worms remain healthy in the concentration which was used to formulate the mouthwash.