Summary

Sulfonamides with different substituted groups are considered as several types of pharmacological agents and are known to possess wide varieties of biological activities. In addition to antibacterial activity of sulfonamides, they are used in the prevention and treatment of diabetes mellitus, edema, hypertension, cancer, viral infections, malaria, and gout.

Our thesis is based on synthesis of biphenyl-4,4'-disulfonyl chloride (**1**) from the reaction of biphenyl with chlorosulfonic acid at 0 °C and then it was reacted with nitrogen nucleophiles such as o-phenylenediamine, amino acid, dipeptide, tripeptide to afford biphenyl-4,4'-disulfonamide compounds series A (A_{1-4}) bis (2-aminophenyl) biphenyl-4,4'-disulfonamide (**A_1**), biphenyl-4,4'-disulfonyl-bis-L-glutamic acid (**A_2**), biphenyl-4,4'-disulfonyl-bis-valinyl leucine dipeptide (**A_3**) and biphenyl-4,4'-disulfonyl-bis-glycyl glycyl arginine tripeptide (**A_4**) [**Scheme I**]. Bis (2-aminophenyl) biphenyl-4,4'-disulfonamide (**A_1**) was then refluxed with different fatty acids to give amine acid salts compounds (series B_{1-6})bis (2-aminium phenyl) biphenyl-4,4'-disulfonamide dioctanoate (**B_1**), bis (2-aminium phenyl) biphenyl-4,4'-disulfonamide didecanoate (**B_2**), bis (2-aminium phenyl) biphenyl-4,4'-

disulfonamide didodecanoate (**B_3**) and bis (2-aminium phenyl) biphenyl-4,4'-disulfonamide diglutaminate (**B_6**) [**Scheme II**].

Moreover, metal complexes of bis (2-aminophenyl) biphenyl-4,4'-disulfonamide (**A_1**) were formed coordinately with copper and cobalt chloride solutions giving (series C_{1-2}). copper complex of bis (2-aminophenyl) biphenyl-4,4'-disulfonamide (**C_1**), cobalt complex of bis (2-aminophenyl) biphenyl-4,4'-disulfonamide (**C_2**) [**Scheme III**].

The structures of all synthesized compounds were confirmed by elemental analysis (C, H, N, and S) and spectroscopic characterization such as FT-IR and ^{1}H-NMR analysis. in addition to, atomic absorption spectroscopy and UV-Vis spectra for metal complexes.

The other objective of this work is comparing three different kinds of sulfonamide compounds by evaluating structure modification through their examination towards more important properties such as:

(a) surface properties of the synthesized sulfonamide compounds were studied through surface parameters such as surface tension at cmc (γ_{cmc}), critical micelle concentration (cmc), the minimum surface area per adsorbed molecule (A_{min}) and the maximum adsorption amount (Γ_{max}). Most of these tested compounds have remarkable

surface activity especially amine acid salts of bis (2-aminophenyl) biphenyl-4,4'-disulfonamide (series B) and cobalt complex of bis (2-aminophenyl) biphenyl-4,4'-disulfonamide (series C).

(b) The target compounds were tested to determine structure-biological activity relationship against different types of pathogenic bacterial species (Gram-positive bacteria, *Staphylococcus aureus* (NCTC 7447), and Gram-negative bacteria, *Escherichia coli* (NCTC 10418)). The amine acid salts of bis (2-aminophenyl) biphenyl-4,4'-disulfonamide (Series B) were powerfully effective series against both of pathogenic bacteria as well as they were tested against selected fungal species (*Aspergillus flavus* and *Candida albican*). Only carboxylic acid salts of bis (2-aminophenyl)biphenyl-4,4'-disulfonamide (Series B) were powerfully effective series against selected pathogenic fungal species.

(c) Selected compounds were screened for cytotoxicity against selected human tumor cell lines – MCF7 (breast carcinoma), HEPG2 (liver carcinoma), and HCT116 (colon carcinoma). Most of tested compounds have potent cytotoxic activity against liver carcinoma

and colon carcinoma, meanwhile, exhibit moderate activity against breast carcinoma.

By using these data, we established the correlations between surface properties with both of antimicrobial and anticancer activities. These correlations are beneficial to ascertain how the surface properties of selected compounds influence their efficacy against selected microorganisms and three human tumor cell lines. Moreover, these data may reflect the biological effects which caused by the surfactant action on the bacterial surface or cell membrane. Therefore, it will be easy to estimate the role of modification of chemical structure to improve their activities.