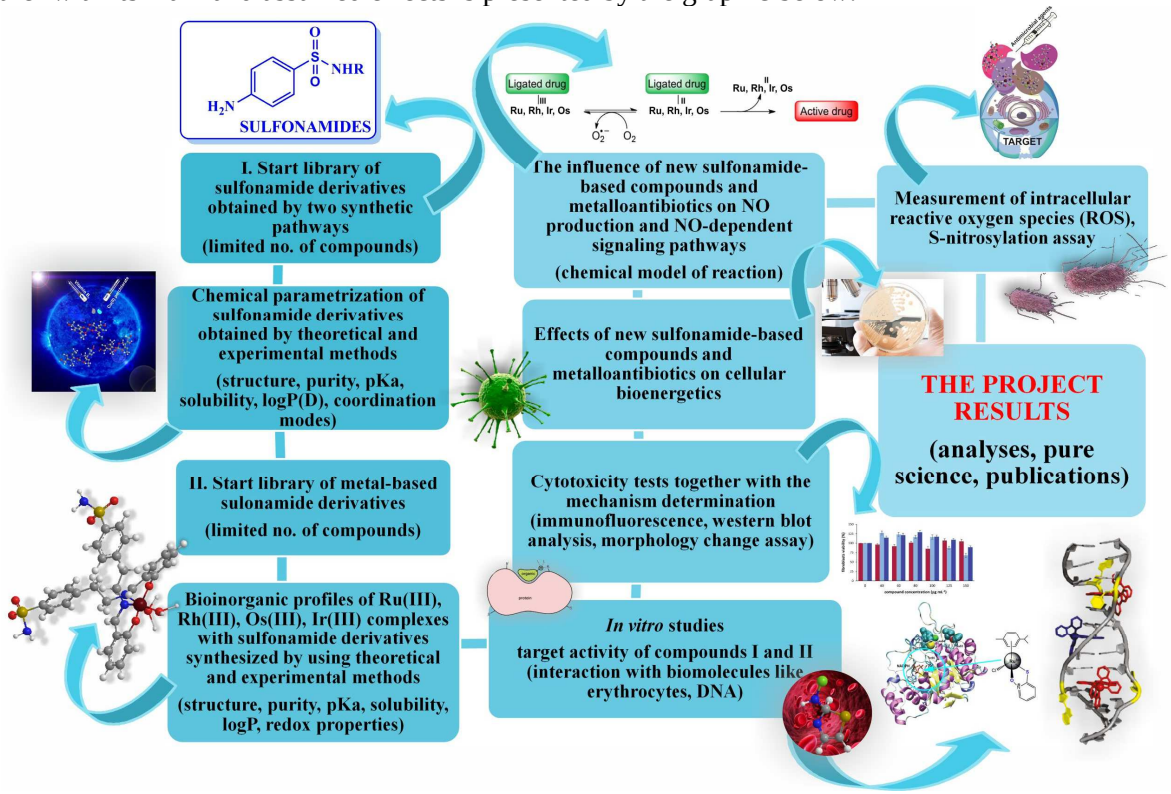
The sulfonamide antibiotic structures are implicated in the reactions associated with the hypersensitivity. Their first important element is the N1 heterocyclic ring, which causes a type I hypersensitivity reaction. The second one is the N4 amino nitrogen that, in a stereospecific process, forms reactive metabolites responsible by either direct cytotoxicity or immunologic response. Moreover, sulfa drugs are structural mimics of *p*-aminobenzoic acid they may bind to dihydropteroate synthetase, one of the enzymes necessary for folic acid synthesis (competitive inhibition). Due to the above, the use of sulfonamide representatives as scaffolds to further synthetic modifications seems to be justified from the chemical point of view.

The scientific purpose of the project is synthesis and comprehensive physicochemical characterization (*bioinorganic profile*) of the systems that contain sulfonamide antibiotic derivatives and their coordination compounds of trivalent metal ions (Ru, Rh, Os, Ir). The method of implementation of the described project together with its main and assumed effects is presented by the graphic below.



The project is divided into three, integral parts. The first one includes the two pathways of sulfa derivatives syntheses together with their detailed chemical properties descriptions based on results of theoretical and experimental methods. The second part includes the synthesis, structural analysis as well as a complete properties characterization of new coordination compounds created by trivalent Ru, Os, Rh, Ir with sulfa derivatives received in the previous step. The third stage of the project comprises biochemical investigations of systems studied. Those research are aimed to establish for sulfonamide-based compounds and metalloantibiotics: (i) the antimicrobial activity, (ii) possibility and nature of interactions with biomolecules (erythrocytes, DNA, *HSA*), (iii) cytotoxicity and its probably mechanism, (iv) effects on cellular bioenergetics, (v) the influence on NO production and NO-dependent signaling pathways. The special attention will be devoted to antimicrobial, antifungal, and cytotoxic properties to present the complete bioinorganic profiles and potential of all systems studied concerning their future application modes. Interestingly, previous reports on sulfa complexes have been rather fragmentary, without a systematic approach and focused mainly on determination of its antibacterial activity. The syntheses methodology published describes merely complexes with divalent ions like Co, Ni, Cu, Zn, Cd, Hg and commercially available sulfonamides. Therefore, the selection of compounds planned to be obtained proves the innovative nature of the application evaluated.

Proposed research can be described as (i) **innovative**; (ii) **development** studies in the chemistry, biology, biotechnology, medicine as well as pharmacy fields; (iii) containing the **challenges and opportunities** for early-career scholars and experienced scientists to develop their skills; (iv) with **application potential** of the results and research continuation possibility; (v) with **anticipated results** which will be **undoubtedly publishable** in journals listed in *Journal Citation Report* including *open access*. In our opinion, the effects of the project realization will have a significant impact on the knowledge expansion about the structure's design and development of drugs and drug-like substances as well as in coordination chemistry of d-block metal-based sulfa pharmaceuticals, which undoubtedly are considered currently as useful trends in science.