[DEPARTMNET OF CHEMISTRY]

UNIVERSITY OF ENGINEERING AND TECHNOLOGY, LAHORE

No. Univ/Chem/ 173
Dated: 28.11.2023

HOLDING OF PUBLIC DEFENSE/
VIVA VOCE EXAMINATION OF PhD CANDIDATE

Reference to the letter No. Exams/B/2023/5579 dated 08.11.2023.

Ms. Rizwana Zahoor, Registration No.2014-PhD-Chemistry-05, PhD Scholar of Chemistry Department under supervision of Dr. Aisha Munawar, Associate Professor has successfully fulfilled the requirements of publishing paper in impact factor international journal and positive reports from four external examiners (two from abroad and two from Pakistan) have been received with the recommendations that the viva voce examination be held to enable the candidate to defend his thesis.

Open defense and viva voce examination of Ms. Rizwana Zahoor will be held on the same date and time mentioned below: -

Date: -	07.12.2023 (Thursday)
Time: -	12.00noon
Venue: -	Conference Room, Department of Chemistry
Thesis title: -	"Development of multifunctional radiolabelled biomolecules for detection of infection and cancer"

A. munawar

Dr. Aisha Munawar
Research Supervisor

Assistant Professor
Chemistry Department
University of Engineering
and Technology, Lahore

(Dr. Humayun Ajaz)
Chairperson

Chairperson
Chemistry Department
University of Engineering &
Technology, Lahore.

Copy to: -

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ABSTRACT

Cancer is among foremost death causes worldwide and detection of bacterial illness has been a threatening challenge for humanity. Nuclear medicine Imaging is now a dynamic tool in identification, disease tracking and treatment monitoring for both infection and cancer. Specific biomolecules are radiolabeled with diagnostic and therapeutic radionuclides for imaging and therapy, respectively. It is therefore dire need of time to search for emerging radiolabeled moieties for detection of cancer and infection.

This study was designed to optimize radiolabelling conditions for various bioconstructs for the detection of bacterial infection and tumor along with development of nano payloads that can act as carriers in this regard. The quantification of labelled products was carried by a combination of methods like chromatography using well shaped gamma counter, radio TLC scanner or by UV-Visible and MALDI-TOF. A labelling percentage of more than 90 % was considered acceptable. Lipophilicity, protein binding and serum stability was determined for all radiolabeled materials. Animal model study was also performed to evaluate the in vivo stability of the labelled material. We divided the study into three projects. In the first part of study three radiolabelled nanocarriers including ZrO2 stabilized Fe3O4 nanoparticles, Fe3O4 stabilized ZrO2 nanoparticles and (dodecane tetraacetic acid) DOTA-Bombesin conjugated Albumin nanoparticles were developed. Radiolabeling parameters as pH, amount of material to be labelled, amount of reducing agent, temperature, room temperature stability and serum stability were optimized for all nanoparticles. In the second part of the project radiolabeled infection imaging agents were developed by utilizing two compounds Cephradine and Kanamycin, which were evaluated for their infection imaging potential against bacteria (gram positive/gram negative). In the third part of the project, five radiolabeled cancer imaging agents were

developed, (Water soluble silk fibroin (WSSF-DOTA-Bombesin), Water soluble chitosan (WSCS-DOTA- Bombesin), poly(lactic-co-glycolic acid) (PLGA-DOTA-BBN), 1,4,7-triazacyclononane, 1-glutaric acid-4,7-diacetic acid -3-(6-amino-purin-9-yl)-5-hydroxymethyl-cyclopentane-1,2-diol (NODAGA-NOC), 1,4,7-triazacyclononane, 1-glutaric acid-4,7-diacetic acid -Arginylglycylaspartic acid (NODAGA-RGD) and papain nanoparticles. After the successful radiolabeling of peptides and papain nanoparticles, we tested receptor binding affinities in different cancer cell lines (PC3, for prostate cancer, SW-620, for colorectal cancer, MMTV, for breast cancer, 143B, for bone cancer and PANC-1, for pancreatic cancer). Biodistribution study of these cancer imaging agents was also performed. In the present project we used four types of radionuclides Tc-99m, Ga-68, Lu-177 and Cu-64 for PET and SPECT. All materials were successfully radiolabeled. In vivo stability of the radiolabelled nanoparticles reflected their ability to be used as nanocarriers for cancer drug delivery. All nanocarriers were considered to be good candidates for their use as carriers for infection or cancer. Our results of bacterial culture study for infection imaging agents showed that the infection imaging agents developed by us can be used as tracers for tracking infection. Furthermore, our results of receptor binding study show that our radiolabelled compounds have great potential to be used as cancer imaging agents and the compounds NODAGA-NOC and NODAGA-RGD radiolabeled with diagnostic and therapeutic radionuclide can serve as ideal theranostic agent, thereby performing both functions of diagnosis and treatment of cancer. Hence in the present work we have successfully harnessed the potential of nuclear chemistry and prepared radiolabeled nanocarriers, infection imaging agents and cancer diagnostic and therapeutic agents with applications in biomedical science.