

CURRICULUM VITAE

Professor Aremu Olajire ADEGOKE

I. PERSONAL DATA

<u>Date of Birth:</u>	21 August 1970
<u>Age:</u>	48 years
<u>Gender:</u>	Male
<u>Marital status:</u>	Married with children; 17, 15, 10 years old
<u>Department:</u>	Department of Pharmaceutical Chemistry
<u>Faculty:</u>	Faculty of Pharmacy, University of Ibadan, Nigeria.
<u>Emails:</u>	jireade@yahoo.com, ao.adegoke@mail.ui.edu.ng
<u>Telephone:</u>	0803 638 1625

II. PRESENT APPOINTMENT Professor, 1st October 2012

III. SCHOOLS ATTENDED WITH DATES

1. University of Ibadan, Ibadan	2000 – 2005
2. University of Ibadan, Ibadan.	1998-1999
3. University of Jos, Jos	1989-1995
4. Federal School of Medical Laboratory Technology, Jos	1987-1989

IV. ACADEMIC QUALIFICATIONS

1. Fellow, West African Postgraduate College of Pharmacists	2016
2. Doctor of Philosophy (Ph. D.)	2005
3. Master of Science (M.Sc.) Pharmaceutical Chemistry (Weighted Average 75.7%)	1999
4. Bachelor of Pharmacy with Distinction (CGPA 4.57 out of 5.0)	1995

V. WORKING EXPERIENCE

1. Professor of Pharmaceutical Chemistry, University of Ibadan, Nigeria October 2012 – date
2. Visiting Professor, School of Pharmacy, College of Health Sciences, Mekelle University, Tigray, Ethiopia November, 2017
3. Visiting Senior C. V. Raman Fellow, Laboratory of Genetic Toxicology, Centre of Advanced Study, Department of Botany, University of Calcutta, Kolkata, India October –November 2013
4. Visiting Postdoctoral WARA Fellow, Department of Pharmaceutical Chemistry, Faculty of Pharmacy and Pharmaceutical Sciences, KNUST, Kumasi, Ghana August, 2013
5. Visiting Fellow, Laboratory of Pharmaceutical Analysis, Katholieke Universiteit, Leuven, Belgium April – June, 2012
6. Visiting Scholar, Laboratory of Genetic Toxicology, Centre of Advanced Study, Department of Botany, University of Calcutta, Kolkata, India July-September, 2011
7. Post-Doctoral Fellow, Laboratory of Pharmaceutical Analysis, Shanghai Institute of Materia Medica, Shanghai, China July to December, 2009
8. Visiting Scientist, Dept. of Pharmaceutical Sciences, University of Strathclyde, Glasgow, U.K. January to April, 2004
9. Senior Lecturer, Dept. of Pharmaceutical Chemistry, University of Ibadan, Nigeria October, 2006 to September, 2012
10. Lecturer I, Dept. of Pharmaceutical Chemistry, University of Ibadan, Nigeria October, 2003 to September, 2006
11. Lecturer II, Dept. of Pharmaceutical Chemistry, Feb. 2000 – September, 2003

University of Ibadan

12. Graduate Assistant, Department of Pharmaceutical Chemistry, University of Ibadan August 1998 – December 1999
13. National Youth Service at General Hospital, Dutse, Jigawa State December 1996 to November, 1997
14. Junior Research Fellow, National Institute for Pharmaceutical Research and Development (NIPRD), Idu-Abuja August - November 1996
15. Internship training at National Institute for Pharmaceutical Research and Development (NIPRD), Idu-Abuja September 1995 to August, 1996
16. Hospital Pharmacy Practice at Jos University Teaching Hospital, Jos August 1995
17. General (Community) Pharmacy Practice at BODAK Pharmacy ltd, Jos July- Sept. 1994 and Jan.- March 1995
18. Routine laboratory diagnosis at Jos University Teaching Hospital in Parasitology, Microbiology, Blood banking, Hematology and Chemical Pathology August 1988 to April 1989
19. Coordinator, Multidisciplinary Central Research Laboratory (MCRL), University of Ibadan, Nigeria July 2015 to July 2017
20. Pioneer Director, Multidisciplinary Central Research Laboratory (MCRL), University of Ibadan, Nigeria 1 August 2017 – date

VI. PROFESSIONAL QUALIFICATIONS AND DIPLOMA

1. Registered Pharmacist with Pharmacists Council of Nigeria 1996
2. Fellow, West African Postgraduate College of Pharmacists 2016

VII. SCHOLARSHIPS, FELLOWSHIPS AND PRIZES

(a) Postdoctoral Awards, Grants and Fellowships

1. Co-Investigator, CARTA Re-Entry Grant awarded to Thomas OE
Title: Micronucleus as biomarker of cancer risk in textile dye applicators
in Abeokuta, southwest Nigeria 2018
2. Association of African Universities (AAU) Academic Mobility
Award for Staff Exchange 2017
3. TETFUND Overseas Conference grant to attend Drug Discovery and
Therapy World congress in USA 2014
4. West African Research Association Travel Grant 2013
5. CV Raman International Fellowship for Senior African Researchers 2013
6. Principal Investigator, University of Ibadan Senate Research grant
(Ranked first in the Faculty of Pharmacy)
Title: Synthesis, Physicochemical Characterizations and evaluation of some novel
Schiff bases based on sulphonated hydroxynaphthalenes 2012
7. COIMBRA Short Stay fellowship for Young African Researchers 2011
8. INSA JRD TATA Fellowship 2010
9. University of Ibadan Postgraduate school award for publication of articles
from PhD thesis (Publications 52 & 53) 2009
10. CAS-TWAS Postdoctoral fellowship in China 2008
11. Principal Investigator, University of Ibadan Senate Research grant
Title: Evaluation of 4-carboxyl-2,6-dinitrobenzene diazonium ion as derivatizing
reagent for artemisinin derivatives 2007
12. University of Ibadan Postgraduate school award for publication of articles
from PhD thesis (Publications 48 & 57) 2007

(b) Postgraduate level:

1. MacArthur Foundation staff development grant 2003
2. Best M. Sc. Student (Pharmaceutical Chemistry) 1999

(c) Undergraduate level:

1. Pfizer Products Plc Prize for the best graduating student in Pharmacology (1996).

2. SAKA GUCHI the Chemist Prize for the best graduating student in Pharmaceutics and Pharmaceutical Technology (1996).
3. ZITTA Pharmacy Prize for the best graduating student in Clinical Pharmacy (1996).
4. ALFAM Drugs and Chemicals Prize for the best graduating student in Pharmacognosy (1996).
5. COCJOANS Pharmacy Foundation Prize for the best graduating student in Pharmaceutical Chemistry (1996).
6. Pharmaceutical Society of Nigeria (PSN) prize for the best graduating student (1996).
7. University of Jos prize for best graduating student in pharmaceutical sciences (1996).
8. University of Jos Leo club award for academic excellence during 1991/92 session (1993).
9. Mobil Producing Nigeria Unlimited Undergraduate Scholarship Award 1990/91 session to 1993/1994 session (4 years)
10. Chemical and Allied Products Ltd. (CAPL) Undergraduate Scholarship Award 1990/91 session to 1992/1993 session (3 years).
11. University of Jos Scholar Scheme Award (1990/91 session)

(d) Secondary School level:

1. Best overall graduating student
2. Best graduating student in
 - (i) Additional Mathematics
 - (ii) Chemistry
 - (iii) Economics
 - (iv) Geography

VIII. HONOURS, DISTINCTIONS AND MEMBERSHIP OF LEARNED SOCIETIES

1. Member, Pharmaceutical Society of Nigeria (PSN)
2. Member, Nigerian Association of Pharmacists in Academia (NAPA)
3. Member, University-Private Sector Collaboration Sub-Committee, Centre for Entrepreneurship and Innovation, University of Ibadan, Ibadan (2007 – to date)
4. Sub Dean (Postgraduate), Faculty of Pharmacy, University of Ibadan, Ibadan (1st May 2006-30th June 2009)
5. Member, University of Ibadan Zoological Garden Management Committee (2003 – 2007)

6. Member, University of Ibadan Zoological Garden Finance Committee (2005 -2007)
7. Expert reviewer for the following journals:
 - ❖ Journal of the Iranian Chemical Society
 - ❖ Eurasian Journal of Analytical Chemistry
 - ❖ Chemical Industry and Chemical Engineering Quarterly
 - ❖ Journal of AOAC International
 - ❖ African Journal of Food Science
 - ❖ African Journal of Pharmacy and Pharmacological Research
 - ❖ International Journal of Medicine and medical sciences
 - ❖ Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy
 - ❖ Journal of Soil Science and Environmental Management
 - ❖ Asian Journal of Pharmaceutical and Biological Research
 - ❖ African Journal of Biotechnology
 - ❖ Pharmaceuticals
 - ❖ Scientific Research and Essays
 - ❖ African Journal of Pure and Applied Chemistry
 - ❖ Bulletin of the Chemical Society of Ethiopia
 - ❖ Pharmaceutical Biology
 - ❖ Arabian Journal of Chemistry
 - ❖ Toxicology and Industrial Health
 - ❖ Journal of Taibah University for Science
 - ❖ African Journal of Medicine and Medical sciences
 - ❖ West African Journal of Pharmacy
 - ❖ African Journal of Pharmacy and Pharmacology
 - ❖ Sensors and Actuators B: Chemical
 - ❖ Analytical Chemistry Letters
 - ❖ International Journal of Environmental Analytical Chemistry
 - ❖ Egyptian Journal of Basic and Applied Chemistry
 - ❖ Applied Nanoscience
 - ❖ Journal of Liquid Chromatography and Related Technologies
 - ❖ Nigerian Journal of Pharmaceutical Research
 - ❖ Current Pharmaceutical Design
 - ❖ Research on Chemical Intermediates
 - ❖ Nanomedicine: Nanotechnology, Biology, and Medicine

- ❖ Brazilian Journal of Pharmaceutical Sciences
 - ❖ Journal of Pharmaceutical and Biomedical Applications
 - ❖ Environmental Pollution
8. Expert Reviewer, University of Ibadan/University College Hospital Ethical Review Board
 9. Member, Senate Curriculum Committee, University of Ibadan (2015-2017)
 10. External Examiner, Department of Pharmaceutical Chemistry, Obafemi Awolowo University, Ile-Ife
 - ❖ Bachelor of Pharmacy Degree (2009/2010, 2010/2011 and 2011/2012)
 - ❖ Master of Science in Pharmaceutical Chemistry
 - 2013/2014 – 1 Candidate
 - 2014/2015 – 1 Candidate
 - 2016/2017 – 2 Candidates
 11. Acting Head, Department of Pharmaceutical Chemistry, Faculty of Pharmacy, University of Ibadan, Ibadan (1st March 2010 to 31st March 2012).
 12. External Examiner, Department of Pharmaceutical Chemistry, Faculty of Pharmacy, University of Lagos, Nigeria
 - ❖ Bachelor of Pharmacy Degree (2011/2012, 2012/2013, 2013/2014)
 13. Adjunct Senior Lecturer, Department of Pharmaceutical and Medicinal Chemistry, Faculty of Pharmacy, Olabisi Onabanjo University, Sagamu Campus, Ogun state, Nigeria (2009/2010, 2010/11 and 2011/2012 academic sessions)
 14. Visiting Senior Lecturer, Department of Pharmaceutical Chemistry, Faculty of Pharmacy, Obafemi Awolowo University, Ile-Ife (April 2013 to March 2014).
 15. Lifetime Member, West African Research Association (from June 2013)
 16. Member, West African Postgraduate College of Pharmacists (2013 - 2016)
 17. Fellow, West African Postgraduate College of Pharmacists (2016 – date)
 18. Member, Multidisciplinary Central Research Laboratory, University of Ibadan (July 2014 to date)
 19. Deputy Coordinator, Multidisciplinary Central Research Laboratory, University of Ibadan (July 2014 to June 2015)
 20. Adjunct Senior Lecturer, Department of Pharmaceutical and Medicinal Chemistry, Faculty of Pharmaceutical Sciences, University of Ilorin, Nigeria (2014/2015 academic session)

21. Coordinator, Multidisciplinary Central Research Laboratory, University of Ibadan (July 4, 2015 to July 31, 2017).
22. External Examiner, Pharmaceutical and Medicinal Chemistry, Pharmacists Council of Nigeria Orientation Training Programme for Overseas Trained Pharmacists (2016).
23. External assessor for Professorial grade in the following Universities:
 - a. Kwame Nkrumah University of Science and Technology (KNUST), Kumasi, Ghana
 - 1 Candidate in 2016
 - 1 Candidate in 2017
 - b. Nnamdi Azikiwe University, Awka, Anambra State, Nigeria
 - 1 Candidate in 2018
 - c. Obafemi Awolowo University, Ile-Ife, Osun State, Nigeria
 - 1 Candidate in 2019
 - d. University of Lagos, Lagos Nigeria
 - 2 Candidates in 2019
 - e. Niger Delta University, Bayelsa State, Nigeria
 - 1 Candidate in 2019
24. Member, Curriculum Review Committee, West African Postgraduate College of Pharmacists (2017).
25. Lecturer of the year award by the Pharmaceutical Association of Nigerian Students (PANS), University of Ibadan Chapter (2016).
26. External Examiner, Department of Pharmaceutical and Medicinal Chemistry, Faculty of Pharmaceutical Sciences, University of Port Harcourt, Port Harcourt, Nigeria (2016/2017 and 2017/2018 academic sessions).
27. External Examiner, Department of Pharmaceutical Chemistry, Dora Akunyili Faculty of Pharmacy, Igbinedion University, Okada, Edo State (2016/2017, 2017/2018,).
28. Director, Multidisciplinary Central Research Laboratory, University of Ibadan, Ibadan (1 August 2017 - to Date)
29. Member, Pharmacists Council of Nigeria Accreditation Panel to Dora Akunyili College of Pharmacy, Igbinedion University, Okada, Edo State (February 11-15, 2018).
30. Member, Pharmacists Council of Nigeria Visitation Panel to Dora Akunyili College of Pharmacy, Igbinedion University, Okada, Edo State (July 30 – August 1, 2018)
31. External Examiner, Department of Pharmaceutical Chemistry, Faculty of Pharmacy, Obafemi Awolowo University, Ile-Ife, Osun State (2017/2018 to date).

32. External Examiner, PhD (2019), Centre for Nanobiotechnology, Vellore Institute of Technology (VIT), Vellore-632014, India.

IX. DETAILS OF TEACHING EXPERIENCE AT UNIVERSITY LEVEL

Undergraduate work

PCH 201: Introduction to Inorganic Pharmaceutical Chemistry, Inorganic compounds as medicinal and pharmaceutical agents. Laboratory Practicals to demonstrate concepts taught in the above topics

PCH 202: Introduction to physical pharmaceutical chemistry, non-electrolyte solutions, solubility of pharmaceuticals and distribution phenomena. Chemical and Ionic equilibria, Electrochemistry

PCH 203: Organic Pharmaceutical Chemistry I

PCH 301: Introduction to pharmaceutical analysis. Dispersive techniques. Introduction to spectroscopy

PCH 302: Synthetic methods in organic chemistry, Reactivity of organic compounds.

PCH 303: Introduction to Medicinal Chemistry, Physicochemical principles of Drug action

PCH 401: Spectroscopic techniques

SAP 402: Pharmacy Laws and Ethics

PCH 501: Quality Assurance principles, Applications of spectroscopic techniques

PAA 502: Veterinary Pharmacy

PCH 503: Principles of Drug Design

PAA 501: Project supervision: Supervision of final year project student (20 students completed within the last 14 sessions).

GES 104: Science and Mankind

Associate Lecturer 2002/2003 Topics taught: Drugs and Mankind

GES 102: Culture and Civilizations

Associate Lecturer 2007/2008. Topics taught: Drugs and Mankind

GES 102: Culture and Civilizations

Associate Lecturer 2010/2011. Topics taught: Opportunities for Entrepreneurship in Nigeria

ETR 301: Basic Entrepreneurship and Innovation. Topic taught: Business Plan (2008/2009 to date)

GES 301: Introduction to Entrepreneurial Skills. Topic Taught: Feasibility Studies and Business Plan (2013/2014 to 2016/2017 Session)

Postgraduate work in Pharmaceutical Chemistry (old curriculum)

1. **PCH 702:** Instrumental Methods of Analysis (MSc)
2. **PCH 706:** General Quality Control Methods (MSc)

3. **PCH 711:** General principles of Drug quality Assurance (PGD)
4. **PCH 712:** Chemical and Physical Methods in Drug Analysis (PGD)
5. **PCH 713:** Instrumental Methods in Drug Analysis (PGD)
6. **PCH 707 & 717:** Advanced Laboratory course for postgraduate students (MSc. and PGD)

Postgraduate work in Pharmaceutical Chemistry (New curriculum)

1. **PCH 702:** Chemical and Instrumental Methods of Analysis (MSc)
2. **PCH 706:** Drug Quality Control Methods (MSc)
3. **PCH 711:** Advanced Separation Techniques (MSc)
4. **PCH 721:** General Principles of Drug Quality Assurance (PGD)
5. **PCH 723:** Electrochemical and Spectroscopic Methods of Drug Analysis (PGD)
6. **PCH 725:** Microbiological Methods in Drug Analysis (PGD)
7. **PCH 729:** Analytical Methods Validation and Data Evaluation (PGD)
8. **PCH 730:** Detection of Counterfeit and Substandard Pharmaceutical Products (PGD)
9. **PCH732:** Separation Techniques in Drug Analysis (PGD)
10. **PCH 742:** Current Trends in Herbal Medicine Standardization (PGD)
11. **PCH 713:** Experimental Design in Drug Analysis (MSc)
12. **PCH 708:** Seminar and Directed Reading (MSc)
13. **PCH 707:** Advanced Laboratory Course (MSc)

Postgraduate Teaching: MSc in Entrepreneurship (2014/2015 – 2016/2017 session)

1. **ETR 746:** Business Environment
2. **ETR 747:** Writing and Presenting a Business Plan

POSTGRADUATE PROJECT SUPERVISION

(a) Postgraduate Diploma

Completed

1. Daramola O. P. (2008): Derivatization of artesunate and dihydroartemisinin for UV-VIS spectrophotometry using 4-carboxyl-2,6-dinitrobenzene diazonium ion
2. Ogunsanya O. S. (2009): Derivatization of artemether for UV-VIS spectrophotometry using 4-carboxyl-2,6-dinitrobenzene diazonium ion

3. Osoye A. O. (2011): Derivatization of artesunate and dihydroartemisinin for colorimetric analysis using *p*-dimethylaminobenzaldehyde.
4. Olaifa F. O. (2012): Simultaneous Spectrophotometric determination of trimethoprim and sulphamethoxazole following azo dye formation with *p*-dimethylaminobenzaldehyde with solid phase extraction
5. Emmanuel S. (2012): Charge-transfer complexation of olanzapine with chloranilic acid
6. Makanjuola D. M. (2014): Spectrophotometric determination of olanzapine *via* condensation reaction with *p*-dimethylaminobenzaldehyde
7. Abiodun O. J. (2014): Preferential Solvation of 4-carboxyl-2,6-dinitrophenylazohydroxynaphthalenes in hydroxylic and partly aqueous mixed solvent systems
8. Abolaji K. A. (2016): Spectrophotometric determination of lisinopril using *p*-dimethylaminobenzaldehyde
9. Amao S. A. (2016): Novel colorimetric micro-determination of *p*-aminophenol in paracetamol tablets
10. Adediran A. I. (2017): Spectrophotometric determination of isoniazid following condensation reaction with salicylaldehyde
11. Adebusuyi T. O. (2018): British Pharmacopoeial assessment of Lidocaine Hydrochloride injection

(b) Master of Science (Pharmaceutical Chemistry)

Completed

1. Umoh O. E. (2009): Two approaches to the spectrophotometric determination of metronidazole and tinidazole
2. Adeniyi-Akee M. A. (2010): Antimicrobial properties of 4-carboxyl-2,6-dinitrophenylazo hydroxynaphthalenes
3. Balogun B. B. (2010): Spectrophotometric determination of some quinolones antibiotics following oxidation with cerium sulphate
4. Quadri M. O. (2010): Novel Colorimetric assays of certain cephalosporins following azo dye formation with *p*-dimethylaminobenzaldehyde
5. Orokotan A. O. (2011): Evaluation of Directly Observed Treatment Short Courses (DOTs) at a secondary health institution in Oyo state [M. Pharm. Project supervision]

6. Adewole O. O. (2012): Synthesis, antimicrobial properties and applications of some novel Schiff bases as metallochromic and acid-base indicators
7. Adesuji T. E. (2012): Evaluation of 4-carboxyl-2,6-dinitrophenylazohydroxynaphthalenes as sensitive and selective colorimetric sensors for cyanide
8. Otache A. S. (2015): Synthesis and Characterization of a novel Schiff base based on sulphonated hydroxynaphthalene as a solvatochromic probe
9. Oladimeji J. A. (2015): A novel nitrite colorimetric chemosensor based on sulphonated hydroxynaphthalene Schiff base
10. Aiyenale O. E. (2016): Spectrophotometric determination of gabapentin *via* azo dye derivatization using chromotropic acid and *p*-dimethylaminobenzaldehyde
11. Adenmosun F. G. (2016): Preferential solvation of 4-carboxyl-2,6-dinitrophenylazohydroxynaphthalenes in mixed hydroxylic and partly aqueous binary solvent systems
12. Anekwe C. I. (2016): Spectrophotometric determination of some cephalosporins using chromotropic acid
13. Olaleye S.O. (2016): Design, synthesis and evaluation of some 8-hydroxyquinolone azo dyes as chemosensors
14. Ayodele O.T. (2016): Phytochemical, Antimicrobial and novel manganese colorimetric chemosensing investigations of *Indigofera macrophylla* Schum (Thonn.) stem and leaf dye extracts
15. Olayinka C. O. (2016): Synthesis and characterizations of a novel Schiff base as a colorimetric chemosensor for copper
16. Sotade A. A. (2017): Comparative assessment of Ceftriaxone injections marketed in Southwest Nigeria
17. Olakojo O.O. (2018): A new naphthalene diazonium ion as colorimetric chemosensor for ketone bodies
18. Adegboye T. S. (2018): Computational and Experimental investigations of novel 8-hydroxyquinolone azo dyes

In progress

8 MSc Pharmaceutical Chemistry students in progress

(c) Master of Science (Entrepreneurship Education)

1. Ngoboh K. J. (2016); A critical examination of the failure of small businesses in Nigeria among Patent medicine stores in Ibadan metropolis, Oyo State, Nigeria (MSc, Entrepreneurship Education)
2. Ganiyu D. B. (2017): The impact of entrepreneurship on Nigeria's socio-economic development - A case study of Ibadan North Local Government Area of Oyo stat (MSc Entrepreneurship Education)
3. Adekunle E. O. (2017): The dynamics of managing family business in Lagos state, Nigeria (MSc Entrepreneurship Education)

In Progress

I currently supervise six (6) MSc (Entrepreneurship Education) and two (2) MSc Professional students.

1. Akanji JO (2018): Impact of Curriculum Development and Implementation on Sustainable National Development in the School of Agriculture and Agricultural Technology, The Federal University of Technology, Akure
2. Gbadeyanka MA (2018): Challenges and Solutions of Pattern Making among the Fashion Designers in Ibadan North-East Local Government, Oyo State
3. Gbenga-Julius O. (2018): Physical Evidence: A Tool for Increase in Productivity among Small and Medium Scale Enterprises within Ijebu-Ode, Ogun State.
4. Oladepo RA (2018): Assessing the Impact of Bank Loan on Small and Medium Scale Enterprises (SMEs) Performance in Abeokuta South Local Government of Ogun State
5. Shaba OM (2018): Perception of Intellectual Property Rights as Predictor of Technological Innovation among Entrepreneurs in Yaba, Nigeria.
6. Babarinde K (2018): Knowledge, Awareness and Adoption of Blockchain Practices among Business Owners in Lagos Mainland
7. Iroka UA (2018): Importance of Emotional Intelligence to Human Resource Management

Doctor of Philosophy (PhD Supervision)

Completed

1. Thomas O. E.: Design and Synthesis of novel non-Genotoxic azo dyes based on the tetracyclic skeletons (2017).

2. Umoh O. E.: Design, Synthesis and Evaluation of some nitroaromatic derivatives as charge-transfer reagents in spectrophotometric analysis of drugs (2018).

In Progress

3. Adeniyi-Akee M. A.: Insecticidal and repellent activities of some Nigerian indigenous plant materials against the Malaria vector: *Anopheles gambiae*.
4. Olakojo O. O.: Synthesis and Applications of Naphthalene Diazonium Ions as Chemical Derivatization Reagents
5. Olaleye S. O.: Design, Synthesis and evaluation of some novel 8-hydroxyquinolone-based azo dyes as colorimetric chemosensors for heavy metals

MY CORE COMPETENCIES

I have been opportune to work in research-related areas since my undergraduate school years. I had a two-year stint at the Federal School of Medical Laboratory Technology in Jos, Plateau state, Nigeria from 1987-1989. During the course of this training, I was exposed to fundamentals of biomedical research in core areas of Parasitology, Microbiology, Blood banking, Haematology, Chemical Pathology and Histopathology. I was on the Distinction roll of the school throughout my stay and I acquired a commendable expertise in instrumentations, laboratory tests and simple laboratory management.

Due to a desire to acquire a University degree, I left the school at the end of the second year upon securing admission to study Pharmacy programme at the University of Jos from 1989 to 1995. My stay in the Faculty of Pharmaceutical Sciences further exposed me to all research-related activities in Biomedical (Physiology, Anatomy and Biochemistry) and Pharmaceutical sciences. In my final project, I worked in the area of Pharmaceutical Technology and sourcing of excipients from local indigenous sources. My exposure enabled me to traverse such areas, once again, as instrumentation and laboratory analysis. I graduated with a Distinction, which due to the de-classification of B. Pharm. degree translates to a first class. This was the first time of making such a feat in the Faculty of Pharmaceutical Sciences, University of Jos. I also graduated as the Best student in all areas of Pharmaceutical Sciences; Pharmacology, Pharmacognosy, Pharmaceutical Chemistry, Clinical Pharmacy and Pharmaceutics and Pharmaceutical Technology. I also enjoyed three undergraduate scholarships during the course of my stay. They were Chemical and Allied Products PLC (3 years), Mobil Producing Nigeria Unlimited (4 years) and the University of Jos Scholar scheme award for being the best student all throughout my studentships.

The performance at the undergraduate years earned me a special call as the first Intern Pharmacist of the prestigious apex pharmaceutical research institute in Nigeria; the National Institute for Pharmaceutical Research and Development (NIPRD). My performance in instrumentation, laboratory tests and management earned me an extended stay even at the expiration of the Internship period where I was granted full salary and the status of a Junior Research Fellow. My stay in NIPRD led to the publication of two journal articles and one conference abstract. The stay was characterized by a great exposure to several biomedical, chemical, biological and pharmaceutical research-related endeavours which served as a great advantage and platform for my research academic career in the University of Ibadan.

Sequel to these exposures and experiences, I have had several fellowships in my postgraduate studies which have further enhanced my core competencies. In my MSc level, I was granted the graduate assistantship of the College of Medicine, University of Ibadan in Pharmaceutical Chemistry with full salaries and this left all the departmental and faculty equipment in my care and led to the early completion of the project report of many undergraduate and postgraduate students.

As part of my PhD programme, I was awarded a MacArthur Foundation grant under the short duration category in 2002 and I had the opportunity of visiting the School of Biomedical Sciences at the University of Strathclyde, Glasgow UK between January and April 2004. This further granted me the opportunity of learning laboratory and hazards managements as well as solvent and waste disposal techniques. I also had hands-on training on such facilities as NMR, IR, UV and mass spectrometer.

I have had several other postdoctoral research trainings in China, India, Belgium and Ghana. My research exposure in China was mainly on HPLC instrumentation, trouble shooting and general laboratory management. My two research visits to India in 2011 and 2013 focused mainly on training and research in genetic toxicology of anthropogenic substances. These periods have advanced my competencies in biomedical research especially in research with DNA as well as nanoparticles.

My visits to Belgium (2012) and Ghana (2013) opened another sphere of knowledge for me in the area of impurities profiling of pharmaceuticals and exposed me to the management of research equipment such as HPLC, GC, LC-MS and Karl-Fisher titrator.

I have been instrumental to the successful completion of four doctoral theses through multidisciplinary research collaborations with colleagues within the University. My core competency in bioactivity-guided liquid chromatographic fractionation, isolation and spectroscopic characterizations led to the successful completion of the Ph.D. programme of Dr. F. O. Olayemi (now Prof. F. O. Olayemi) of the Department of Veterinary Physiology, Biochemistry and Pharmacology in 2007; Dr. K. O. Oyedeji's PhD (2010) in the Department of Physiology (Now Prof. K. O. Oyedeji at Afe Babalola University, Ado-Ekiti, Nigeria) and Dr. Mrs. Akintola's PhD in Biochemistry (2015) while my competency in synthesis and

spectroscopic characterization formed the basis of collaboration for the completion of the PhD thesis of Dr. Mrs. O. O. Ologe of the Department of Pharmacology (2017).

Since 2014, I have been saddled with responsibilities of coordinating the central research facilities at the University of Ibadan's Multidisciplinary Central Research Laboratory, first as Deputy Coordinator from 2014-2015 and Coordinator from July 2015 – July 2017 and more recently as the Pioneer Director of the Laboratory. This experience is further enhancing my proficiency in the handling, maintenance and operations of the various state-of-the-art facilities. This experience is also giving the opportunity to contribute to the research designs and project execution by members of the academic communities all over Nigeria.

X. RESEARCH

(i) Dissertation and Thesis

1. The use of the gum obtained from *Cerathotheca sesamoides* Endl Pedaliaceae as a binder in chloroquine phosphate tablets [B. Pharm., 1995]
2. Spectrophotometric determination of aspirin using Diazotized 4-amino-3,5-dinitrobenzoic acid [M.Sc., 1999]
3. Novel colorimetric assays of some selected pharmaceutical phenol ethers using 4-Carboxyl-2,6-dinitrobenzene diazonium ion (CDNBD) [Ph.D., 2005]

(ii) Research completed

1. The use of the gum obtained from *Cerathotheca sesamoides* Endl Pedaliaceae as a binder in chloroquine phosphate tablets (B. Pharm, 1995)
2. Spectrophotometric determination of aspirin using Diazotized 4-amino-3,5-dinitrobenzoic acid (M.Sc., 1999)
3. Comparative analysis of brands of Sulphadoxine-Pyrimethamine tablets
4. Determination of physicochemical properties of Halofantrine
5. Colorimetric Assay of propranolol by derivatization: Novel application of diazotized 4-amino-3, 5-dinitrobenzoic acid (ADBA)
6. Physicochemical properties of pyronaridine-a new antimalarial
7. Novel colorimetric assays of some selected pharmaceutical phenol ethers using 4-Carboxyl-2,6-dinitrobenzene diazonium ion (CDNBD) Ph.D. Thesis
8. Synthesis, isolation, purification and characterization of novel 4-Carboxyl-2,6-dinitrobenzene diazonium ion (CDNBD)-derived azo dyes
9. Evaluation of CDNBD as a pre-column derivatizing reagent for HPLC analysis of some clinically useful drugs
10. Antimicrobial activities of novel azo dye series based on 4-carboxyl-2,6-dintrophenylazohydronaphthalene skeleton

(iii) Research in progress

1. Determination of the physicochemical properties of some important drugs and relationship to their biological activities
2. Chromatographic separations and isolation of some bioactive principles from medicinal plants
3. Application of charge transfer techniques for the analysis of drugs

4. Studies on structure-spectra relationships of 4-carboxyl-2,6-dinitrophenylazohydroxynaphthalenes
5. Development of 4-carboxyl-2,6-dinitrophenylazo hydroxynaphthalenes as non-toxic azo dyes
6. Development and assessment of new acid-base and metallochromic indicators based on sulfonated amino-naphthol skeletons
7. Impurities profiling of antibiotic preparations
8. Development of novel colorimetric chemosensors for environmental pollutants and other chemicals of public health importance
9. Evaluation of pharmacopoeial compliance of marketed drugs in Southwest Nigeria
10. Synthesis and evaluation of new charge transfer reagents for analysis of pharmaceuticals
11. Design and development of novel azo dyes as non-genotoxic food colourants

(iv) Research Interests

- a. Synthesis and structure-activity-relationship of novel molecules for the treatment of cancer, malaria and other protozoan diseases
- b. Modulation of activities of neurotransmitters and other endogenous substances for the management of common disease conditions affecting the GIT, CVS and sensory systems
- c. Development of analytical methods for monitoring of drugs and other xenobiotics in the body
- d. Development of novel assay procedures for drugs using newer instrumental techniques e.g. HPLC, GC-MS and other techniques

RESEARCH FOCUS

My primary area of research is analytical method development using three main derivatization methodologies; azo dye formation, Schiff base synthesis and organic charge transfer techniques. Methods based on UV-VIS spectroscopy have been well developed with current extension to precolumn derivatization for chromatographic analyses. The applications of 4-carboxyl-2,6-dinitrobenzene diazonium (CDNBD) ion as a derivatizing reagent have produced methods based on simple and validated spectrophotometric determination of pharmaceuticals of varied skeletons such as secondary amines, reactive methylene centres and phenol ethers. Applications of CDNBD as a chromophoric labeling reagent for reactive methylene centres and phenol ethers represent *novel contributions* to spectrophotometric assays as other diazonium ions do not readily react with these skeletons. The application of the reagent has yielded the synthesis of four novel azo dyes which possess the phenylazohydroxynaphthalene skeleton similar to approved colourants. These dyes have been characterized and details of their properties are reported. The dyes are also potential anti-MRSA agents. CDNBD has also been extended as a precolumn derivatization reagent for the artemisinin derivatives. A novel study in the azo dye derivatization technique was the application of *para*-dimethylaminobenzaldehyde (DMAB) as a coupling component for the analysis of diazotized skeletons for the *first* time. DMAB has also been used as a Schiff base reagent, oxidizing agent and reducing agent for the spectrophotometric analysis of pharmaceuticals. Further derivatization methodology adopted organic charge transfer reactions with chloranilic acid as charge acceptor. Various equations for the physicochemical characterizations of the formed charge-transfer complexes have been applied and these established the superiority of the new methods. In particular, the use of room temperature metal hydride reductions for nitroimidazoles prior to charge-transfer complexation was *first reported* by my group.

Recognizing that the physicochemical properties of drugs play an important role in disposition within the body and eventual pharmacological activity, physicochemical characterization of halofantrine and pyronaridine have been carried out using various spectrophotometric and chromatographic parameters. The physicochemical parameters generated were at variance with that reported in literature inserts emphasizing adequate post-marketing surveillance.

As collaborative efforts, I have contributed to ensuring the safety and efficacy of multisource (generic) drugs and the results have been published. The need to adequately control diet before medication has also been reported for diclofenac following co-administration with a natural fruit juice.

The need to investigate folkloric claims of medicinal plants has been carried out with the plant *Cnestis ferruginea* (de Candolle). The acute and chronic toxicities of crude extracts and purified chromatographic fractions as well as its anti-reproductive effects have been studied. These studies have also been conducted for *Portulaca oleracea*.

XI. PUBLICATIONS LIST

(A) Books/contributions to books

1. **Adegoke A. O.** and Omojola A. O. (2018): Business Plan Development, In: ETR 301 eBooks: Basic Entrepreneurship and Innovation. Published online 27 April 2018.
http://cei.ui.edu.ng/includes/ebooks/ETR301_chapter8.htm
2. **Adegoke A. O.** (2016): Of Colours, Colourants and Coloured Substances: A Pharmacist's Tripodal Trawl. 2015/2016 University of Ibadan Inaugural Lecture Series. ISBN 978 -978-54291-2-1. Ibadan University Press, Publishing House, University of Ibadan, Ibadan. 101pp.
3. **Adegoke A. O.** (2012): Feasibility studies and starting a new business In: *GES 301: Introduction to Entrepreneurial skills*, Oke G. and Adedapo A. (Eds.) ©The General Studies Programme (GSP) Unit, University of Ibadan. ISBN 978-31064-8-3. Pp. 69-82.
4. Olaniyi A.A., Babalola C.P., Oladeinde F.O. and **Adegoke A.O.** (Editors): Towards better quality assurance of drugs in the 3rd millennium –*Biopharmaceutical methods in drug quality assurance*. Proceedings of fourth national workshop 2001. ISBN 978-30585-6-8. Department of Pharmaceutical Chemistry, University of Ibadan, Nigeria. 179pp.

(B) Articles that have appeared in learned journals

5. **Adegoke A. O.**, Thomas O. E., Agboola S., and Amao S. A. and Omotosho A.E. (2019): A New method for the micro-determination of *para*-aminophenol in generic brands of paracetamol tablets *Arab Journal of Basic and Applied Sciences*. **Accepted 15 February 2019** <https://doi.org/10.1080/25765299.2019.1585513>
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7. **Adegoke A. O.**, Adegbolagun O. M., Aiyenale E. O. and Thomas O. E. (2018): New spectrophotometric determination of gabapentin in bulk and dosage forms using *p*-dimethylaminobenzaldehyde. *Journal of Taibah University for Science* 12 (6): 754 – 764. <https://doi.org/10.1080/16583655.2018.1495418>

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12. **Adegoke A. O.** and Ayodele O. T. (2017): Novel manganese colorimetric chemosensing investigations of *Indigofera macrophylla* schum (thonn.) stem and leaf dye extracts. *Nigerian Journal of Pharmaceutical Research* 13 (2):115-125.
13. **Adegoke A. O.**, Babalola C. P., Kotila O. A. and Oyakhire Obuebhor (2017): Simultaneous Spectrophotometric Determination of Trimethoprim and Sulphamethoxazole following Charge-transfer Complexation with Chloranilic acid, *Arabian Journal of Chemistry* 10 (supplement 2):S3848-3860. doi: <http://dx.doi.org/10.1016/j.arabjc.2014.05.022> Appeared first online 18 June 2014
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15. **Adegoke A. O.** Thomas O. E. and Emmanuel S. N. (2016): Colorimetric determination of olanzapine via charge transfer complexation with chloranilic acid *Journal of Taibah University for Science* 10 (5):651-663.
16. Labulo A. H., Adesuji E. T., Dedeké O. A., Bodede S. O., Oseghale C. O., Moodley R., Nyamori V. O., Dare E. O. and **Adegoke A. O.** (2016): A dual-purpose silver

nanoparticles biosynthesized using aqueous leaf extract of *Detarium microcarpum*: an underutilized species. *Talanta* 160: 735-744. DOI:10.1016/j.talanta.2016.07.066.

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CONTRIBUTIONS TO SCHOLARSHIP AND KNOWLEDGE

1. *Contributions to Advancing Chemical Derivatization methodology*

My main research focus since the commencement of my postgraduate studies has been on derivatization methodology for UV-VIS spectrophotometric analyses of pharmaceuticals. Judging from the fact that majority of pharmaceuticals do not have significant light absorption in the visible region, specific reaction pathways have been developed for the analysis of these drugs. The methods developed have provided relatively simple, cost-effective and yet accurate means of determining these drugs.

In particular, the applications of three derivatization methodologies have been well developed and this has served as a platform for the training of several undergraduate and postgraduate students over the years. I have significantly contributed to the development of assay techniques based on azo dye formation, charge-transfer complexation and Schiff base synthesis. The applications of 4-carboxyl-2,6-dinitrobenzene diazonium (CDNBD) ion as a derivatizing reagent was extensively adopted as an off-shoot of my PhD research. The use of the reagent led to the ready determination of pharmaceutical phenol ethers whose determination hitherto as a chemical group was not possible by azo dye formation since phenol ethers being weakly activating do not react with majority of diazonium ions. Some of my papers are based on the concept of ready determination of these pharmaceutical phenol ethers and the methods compared favorably with official spectrophotometric and HPLC methods of analyses. The formation of azo dyes by artemisinin derivatives was also *first* reported by my research group. This represents a *significant contribution* as the artemisinin derivatives do not belong to the class of skeletons for which azo dye formation might be plausible. The success recorded in the UV spectrophotometric work led to the extension to liquid chromatographic analyses of artemisinin, artesunate, artemether and dihydroartemisinin with good sensitivity recorded. The CDNBD reagent has also been demonstrated to possess some versatility as it was found to couple readily with secondary amino and anthralinic acid derivatives – mefenamic acid, diclofenac and aceclofenac.

Further contribution to azo dye derivatization was the use of *p*-dimethylaminobenzaldehyde (DMAB) as a coupling component for diazotized skeletons. The *first* ever report in literature of the ability of DMAB to function in this regard was reported by my group. The mechanism envisaged was that coupling of the diazotized skeletons with

DMAB in methanol (as opposed to water) destroys the deactivating internal mesomeric effect of the aldehyde functional group thus permitting optimal activating influence of the dimethylamino group. The end result is usually the formation of colored azo adducts that are determined using the visible wavelength range. This has opened another sphere of spectrophotometric analysis with on-going extension to other groups such as cephalosporins, anti-viral agents and trimethoprim-sulphamethoxazole combinations. DMAB has also been successfully utilized as a reagent in Schiff base formation, as oxidizing and reducing agents. Current effort in this regard is the synthesis of novel Schiff bases possessing amino naphthols residues as metallochromic and acid-base indicators in chemical analysis as well as using them as excellent and sensitive chemosensor for environmentally important toxicants and other inorganic substances.

Charge-transfer (CT) complexation using chloranilic acid as n -electron acceptor has been well reported in pharmaceutical analysis. However, ***a novel contribution*** was the utilization of this reagent for reduced nitroimidazoles following room temperature hydride transfer. Another ***novel application*** was the demonstration that chloranilic acid can form a CT band with lumefantrine. Various parameters that determine the stability of the formed complexes are estimated from standard equations. Part of the on-going research focuses on the development of other charge-transfer acceptors following optimization of some these parameters. This is the main focus of research of one of my doctoral students.

2. Azo dye synthesis, Properties and Structure-Spectra relationships

A critical requirement for the completion of my PhD research was to demonstrate the mechanism of the diazo coupling reaction between CDNBD and the pharmaceutical phenol ethers. Spectroscopic characterization for the ***first time*** established the scission of the ether linkage on diazo coupling to generate naphthols. This was a ***remarkable*** observation as confusion seems to exist in literature as to the exact mechanism of coupling and if the ethers are formed again after coupling reaction. The scission of ether linkage occurs without reconversion back to the ether. However, this led to the ***serendipitous discovery of a new class of azo dye series named phenylazohydroxynaphthalenes***. These dyes have similar structures to approved colorants –sunset yellow and allura red. Their physicochemical properties were established and reported. The dyes have also been used as excellent solvent probes in assessment of solvatochromic behaviors of solvents of varying polarities. Some

excellent structure-spectra correlations were afforded by the dyes. Another **remarkable contribution** to knowledge in this field was the demonstration of the ability of these dyes to serve as anti-multidrug resistant *Staphylococcus aureus*. However, one structural defect with the new azo dye series is lack of water solubilizing agents. Two approaches are currently being investigated; use of sulphonated dye intermediates as coupling components for CDNBD and diazotization of amino-sulphonated intermediates prior to diazo coupling reaction with activated skeletons. It is anticipated that a further series of azo dyes with varied skeletons will emerge with likely industrial and pharmaceutical applications.

3. Genotoxicity evaluation and mechanistic-based binding studies

One of the properties studied for the congeneric monoazo dyes is their ability to produce specific DNA damages on isolated cells and *in vivo* in laboratory animals. These dyes were discovered to exhibit different properties which bear a direct relationship to their structure. A mechanistic-based binding study was also conducted with bovine serum albumin and Calf thymus DNA to explain the observed *in vitro* and *in vivo* effects of the dyes. The results are currently being utilized to design other molecules and to advance knowledge in the area of structure-activity relationships for monoazo dyes.

4. Chromatographic Isolation of Bioactive principles from plants

My specific contribution to development of natural products from plant sources is in the area of bioactivity-guided fractionation of plant materials especially of the plants; *Cnestis ferruginea*, *Portulaca oleracea* and *Crinum jagus*. Some other on-going collaborative work involves the optimization of various chromatographic techniques both in the normal- and reversed-phase modes as well as solvent-solvent partitioning to isolate some of the bioactive components and then characterizing them through spectroscopic techniques. A great success was accomplished in the isolation of two pure components from *Eucalyptus* spp. for which potent anti-mycobacterial activities are reported. Bioactivity-guided fractionation of the plant *Portulaca oleracea* has demonstrated specific fractions possessing effects on biochemical parameters and reproductive functions in laboratory animals.

5. Quality Assessment of Multi-sourced (generic) pharmaceutical products

As collaborative efforts, I have contributed to ensuring the safety and efficacy of multisource (generic) drugs and this has yielded results which have been published. The reports in these studies have led to careful selection of generic brands by practitioners and in

particular have provided an alert system on the need to adequately carry out post-marketing surveillance of these generic brands. Some of the work discovered complete lack or substandard concentration of purported active pharmaceutical ingredients in the formulations. Some of the publications have been well cited by regulatory authorities as a benchmark for constantly ensuring that generic products meet up with the requirements of quality and in the long run determine the efficacy and safety of these products.

6. Assessment of Physicochemical Parameters of some antimalarial drugs

Recognizing that the physicochemical properties of drugs play an important role in disposition within the body and their eventual pharmacological activity, physicochemical characterization of halofantrine, pyronaridine and lumefantrine have been carried out using various spectrophotometric and chromatographic parameters. The physicochemical parameters generated were at variance with that reported in literature inserts emphasizing adequate post-marketing surveillance.