BIODATA

M. OWAIS, Ph D

Professor

Interdisciplinary Biotechnology Unit

Aligarh Muslim University, Aligarh-202002

A glance at some of the coveted achievements of the applicant:

- **Clinical trials on the in-house developed formulation against COVID-19**
- **National Bioscience Award-2007** by DBT, Govt. of India
- **TATA Innovation Award-2013** by DBT, Govt. of India
- **Rashtriya Gaurav Award-2013**
- **VIFRA Distinguished Research Scientist Award-2015**
- **Indus Research Excellence Award-2015**
- **Young Scientist Award (MYSA) in Life Sciences-2002**
- **Best University Teacher Award-2009**
- **Outstanding University Researcher Award-2008**
- **Fogarty International Fellowship, NIH, Maryland, USA**
- **Published work displayed on cover page of *FEMS Immunol.Med Microbiology* for all the issues of *Year* 2006**(copy attached)
- **Published work highlighted on** cover page of *Molecular Medicine* in May-June issue of Year **2007**(copy attached)
- **Technology Transfer to Cadilla Pharmaceuticals Ltd. under PRDSF program of DST, Govt. of India**
- **Technology Transfer to Gennova Pharmaceuticals Ltd.**
- **Merit scholarship for** First class first **in B. Pharm.**
- **GATE 1987,** Percentile **98.89**; **GATE 1988,** percentile **93.36**
- **UGC-CSIR Research Fellowship (**NET 1988 **&** NET 1989**)**

- The article entitled as "**Phospholipid diversity: correlation with membrane–membrane fusion events. *BiochimBiophys. Acta(Biomembrane)* (2005) 1669: 170-181**" was categorized among top 25 by Science Direct.

- Another article entitled as "**Ethanol production from crude whey by *Kluyveromycesmarxianus. Biochemical Engineering Journal (2006) 27: 295-297***" was categorized among top 25 by Science Direct.

- Best poster Award on work entitled as "Escheriosome entrapped soluble blood stage antigens impart protective immunity against a multidrug resistant isolate of *Plasmodium yoeliinigeriensis* in BALB/c mice" at **Indo-Australian Conference on Biotechnology in infectious diseases at Kasturba Medical College, MAHE, Manipal**

- Best poster Award on work entitled as "**Fusogenic potential of sperm membrane lipids: Nature's wisdom to accomplish targeted gene delivery** at International symposium on the Predictive, Preventive and Mechanistic Mutagenesis & XXXIII EMSI annual Meeting, AMU, Aligarh during Jan 1-3, 2008.

Three articles co-authored by applicant have been ranked with "**THREE STARS**" by '**BIOWIZARD**' The Biomedical Research Portal.

1. Sharma et. al. (2006) Escheriosome entrapped soluble blood stage antigens impart protective immunity against a multi-drug resistant isolate of *Plasmodium yoeliinigeriensis* in BALB/c mice, ***Vaccine*** 24(7): 948-956.

2. Bajpai et. al. (2005) Concomitant delivery of tetracycline and DEC against experimental filariasis. ***J Drug Targetting*** 13(6): 375-381.

3. Mittal et. al. (2005) Expression, purification and characterization of *Leishmania donovani* trypanothione reductase in *E. coli*. ***ProteinExpression and Purification*** 40: 279-286.

11. Are you member/Fellow of the Indian national Science Academy/ Indian Academy of Sciences/National Academy of Sciences/others? If Yes give detail: NIL

Member of Editorial Boards of various international journals

1. The open Vaccine Journal (Bentham Press)
2. BioMed Research International (Hindawi Publishing Group)
3. Journal of Clinical Medicine Research (Academic Press)
4. Journal of Chinese Clinical Medicine
5. Biomedical Research
6. World Journal of Critical infectious diseases (BPG Press)
7. World Journal of Experimental medicine (BPG Press)
8. Member of the International Advisory Board of the 12th International Liposome Research DAYS & 3rd conference on "Lipid, Liposomes & Membrane biophysics held at Vancouver, Canada (Aug 4-8, 2010)

S. No.	INFORMATION						
01.	Name of the Candidate	First			Last		
		Mohammad			**Owais**		
	Designation	**Professor**					
02.	Date of Birth	July 01, 1962					
03.	Address alongwith Telephone/Mobile/E-mail	a. Official address: **I. Biotechnology Unit,** **Aligarh Muslim University,** **Aligarh-202002.** **Telephone: 91-571-2720388** **Fax: 91-571-2721776** **Mobile: 07534049778** **e-mail: mdowais2012@gmail.com,** **owais_lakhnawi@yahoo.com**					
05.	Specialization	**Drug Targeting & Vaccine Development**					
06.	Academic Qualification	**Name of Degree**	**Subjects**	**Class/ Division**	**Name of University**	**Year**	**Rank/Prizes**
		B. Pharm	Pharmacognosy Pharmaceutics Pharmacology Human-Physiology Medicinal-chemistry	**First**	**Delhi University**	1987	Ist position DYEA Merit Scholarship Merit Scholar Ship for securing Ist position
		M. Pharm	Pharmaceutics	**First**	**Delhi University**	1990	GATE fellowship
		Ph. D	Biotechnology		**IMTECH**, Chandigarh	1996	CSIR-NET fellowship

07.	(A) Tilte of Ph D thesis	**Liposome as carrier of drug and antigen** Name of the supervisor: Dr. C. M. Gupta; Former Director, CSIR-IMTECH,& CSIR-Central Drug Research Institute	
	(B) Detail of Ph D thesis publications	**1.** **Owais, *et.al*.** (1993). Tuftsin-bearing liposomes as drug vehicles in the treatment of experimental aspergillosis. **FEBS Lett**. 326: 56-58.**[Impact Factor: 3.86]** **2.** **Owais, *et.al*.** (1995). Chloroquine encapsulated in malaria-infected erythrocyte specific antibody bearing liposomes effectively controls Chloroquine resistant Plasmodium berghei infections in mice. **Antimicrobial agent & Chemotherapy** 39: 180-184. **[Impact Factor: 4.80]** **3.** Agrewala, J.N., **Owais, M**., Gupta, C.M. and Mishra, G.C. (1996). Antigen …… preferential expansion of Th-2 cells. **Cytokine Molecular Therapy** 2: 59-65. **[Impact Factor: 1.70]** **4.** **Owais, *et.al*.** (2001) Delivery of the antigen entrapped in the yeast lipid vesicles leads to the generation of $CD4^+$ Th2 and $CD8^+$ CTL cell response. **Scand. J. Immunol**. 54: 125-132 **[Impact Factor: 2.10]** **5.** **Owais, M**., Gupta, C.M. (2000) Yeast vesicles as carriers for introducing macromolecules into cytoplasmic compartment of adherent cells. **Eur. J. Biochem.** 267: 3946-3956. **[Impact Factor: 3.84]**	
	(C) If Ph D thesis not published, whether uploaded on shodhganga	Not applicable	
08.	Position held in chronological order	1998- **At present**	**Faculty position at IB Unit, AMU, Aligarh**
		1994-1998	**Fogarty fellow at NCI, National Institute of Health, USA**
		1992-1994	**Senior Research Fellow CSIR, Govt. of India**
		1990-1992	**Junior Research Fellow CSIR, Govt. of India**

PART-B

09. Have the achievements already been recognized by Awards by any learned body. If so, the names of the body, award and year of the award may be given. (A copy of the citation has been).

Awards & Honors:

Name of the Award	Name of the Organization	Purpose of the Award	Nature of the Award/Frequency
National Bio-Science Award-2007	DBT, New Delhi Govt of India	To promote Scientific Research	National/ Annual
TATA Innovation Award-2013	DBT, New Delhi Govt of India	To promote Scientific Research	National/ Annual
YM Scientist Award-2002	MAAS (INDIA)	To promote Scientific Research	National/ Annual
Distinguished Research Scientist Award-2015	VIFRA FOUNDATION (INDIA)	To promote Scientific Research	Inter-National/ Annual
Research Excellence Award-2015	The Indus Foundation, NJ (USA)	To promote Scientific Research	Inter-National/ Annual
Best Teacher Award-2009	AMU, Aligarh	For outstanding Scientific/Teaching contributions	National/ University Level Annual
Rashtriya Gaurav Award	IIF, Society, New Delhi (INDIA)	To promote Scientific Research	National/ Annual
Merit Award	Delhi University, New Delhi	For securing Ist position in B. Pharm.	University Level Annual
Merit Award	DYEA, New Delhi	For outstanding perfor-mance in B. Pharm	National/ Annual

CLINICAL TRIAL ON FLUNORM, AN IN-HOUSE NOVEL FORMULATION, DEVELOPED BY NOMINEE'S RESEARCH GROUP, AT JN MEDICAL COLLEGE ALIGARH

F.No.-Z-28015/09/2020-HPC (EMR)-AYUSH
Government of India
Ministry of AYUSH

2nd Floor, Office Block No.-3,
NBCC Office Complex,
Eastern Kidwai Nagar, New Delhi-23
Dated: 25th June, 2020

To

Dr. Mohammad Owais, Professor, PhD (Biotechnology)
Department of TB and Chest Diseases,
JNMC, AMU, Aligarh-2
Email ID:

Sub. Project proposal submitted under EMR scheme of Ministry of AYUSH - reg.

Sir/Madam,

The undersigned is directed to convey that your proposal titled *"A herbal composition named FluNorm™ for treating viral infections"* was taken up in the 2nd Special Meeting of the Project Approval Committee (PAC) for SARS CoV-2 infection and COVID-19 held on 15th & 16th June, 2020 under EMR scheme. A copy of the minutes of the said PAC has already been sent to you vide mail dated 23.06.2020.

2. The decision of the above PAC is reproduced as under:

"Approved the project proposal in the completed in six months' time from the day of submitting first case subject to appropriate revision of the budget with details of contingency amount, submission of the IEC Clearance certificate and fulfilment of the conditions for proprietary formulation within 7 days."

3. You are therefore requested to submit the above mentioned information/documents to EMR Section at the earliest.

Yours faithfully,

(K.B. Sinha)
Under Secretary to the Government of India
Emrayush.soicfd@gmail.com
Emr_ayush@yahoo.com

D.No.10/IEC
13-10-20

Institutional Ethics Committee (Regd.)
(Under Central Drugs Standard Control (CDSCO) Ministry of Health & Family Welfare, Govt. of India)
Jawaharlal Nehru Medical College & Hospital, Faculty of Medicine
Aligarh Muslim University, Aligarh U.P. India - 202 002

Prof. Mohammad Shameem
MD, FRCP (Edin)
Member Secretary

Prof. (Retd.) M.R. Ajmal
MD
Chairman

CERTIFICATE

A HERBAL COMPOSITION NAMED FLUNORM™ FOR TREATING VIRAL INFECTIONS.

Members of Institutional Ethics Committee examined & approved the **Project** proposal submitted by **Dr. Mohammad Owais**, Professor & Principal Investigator, Interdisciplinary Biotechnology Unit AMU, and Co- Principal Investigators, **Prof. Zuber Ahmad**, Department of TB and Chest Diseases, J.N. Medical College, Faculty of Medicine AMU.

(Prof. Mohammad Shameem)
Member Secretary, IEC

MEMBER SECRETARY
Institutional Ethics Committee
Faculty of Medicine
A.M.U., Aligarh

(Prof. M.R. Ajmal)
Chairperson

CHAIRPERSON
Institutional Ethics Committee
Faculty of Medicine
A.M.U., Aligarh

Contact Details:
Prof. Mohammad Shameem (Member Secretary)
Department of Tuberculosis and Respiratory Diseases, JN Medical College, Aligarh Muslim University, Aligarh
Ph. 0571-2721113 (Off.) Ext. 7084, Mob. 9412231333, Email: wqmc@yahoo.co.in

सत्यमेव जयते

Government of India
Ministry of Science and Technology
Department of Biotechnology

PRESENTS

NATIONAL BIOSCIENCE AWARD FOR CAREER DEVELOPMENT 2007

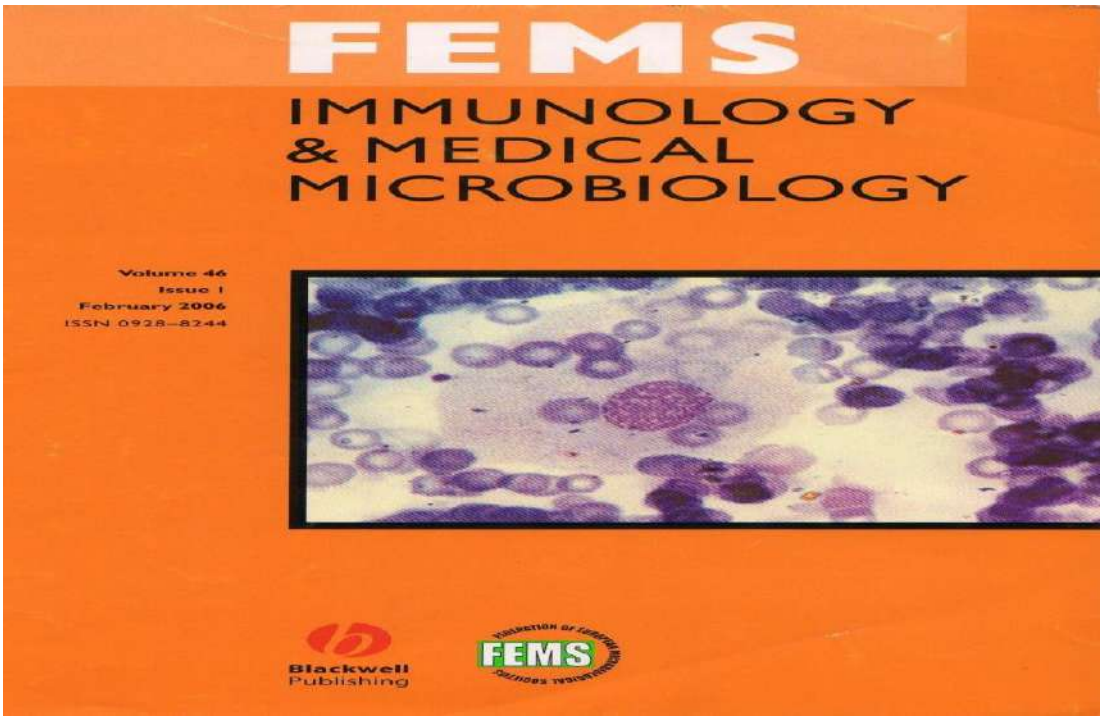
TO

DR. OWAIS MOHAMMAD
ALIGARH MUSLIM UNIVERSITY, ALIGARH

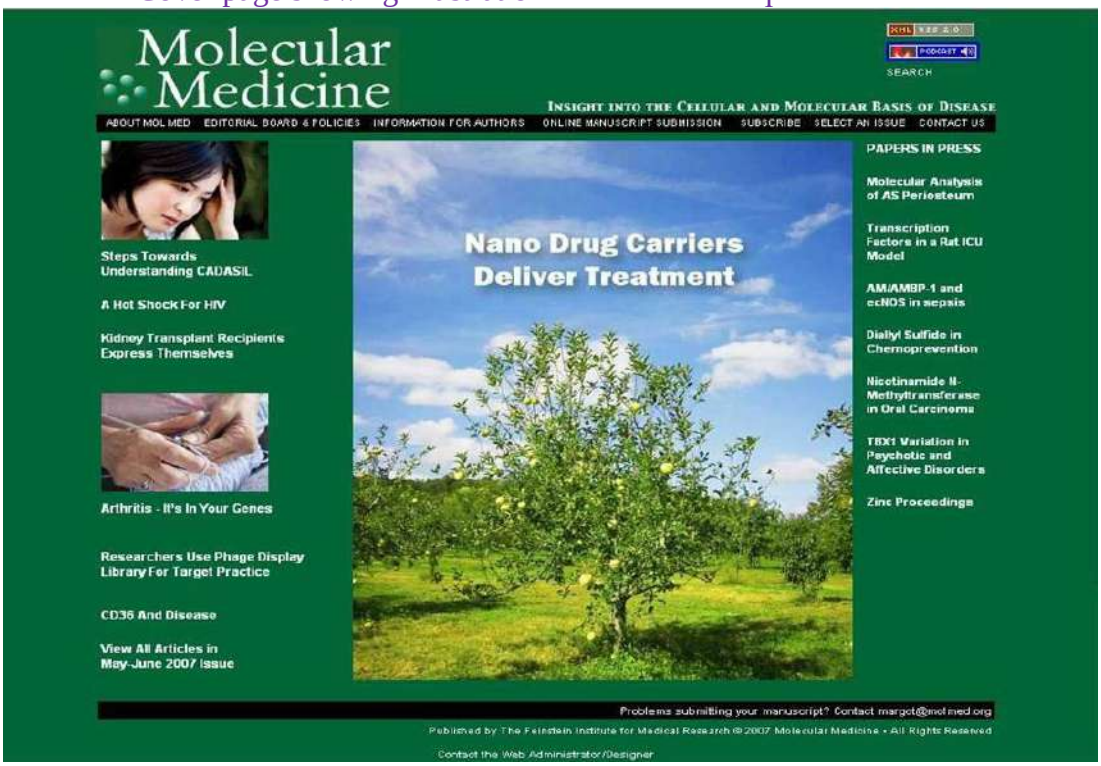
in recognition of his pioneering work in development of nano-particles based delivery systems such as virosomes for gene packaging, liposomes and microspheres for vaccine development, gene therapy vectors and drug delivery systems. He has developed liposome based antigen delivery vehicles, which can elicit strong immune response against model antigens in animals.

Given this Day, the 17th of March 2008 at the function organized in connection with the Foundation Day of the Department.

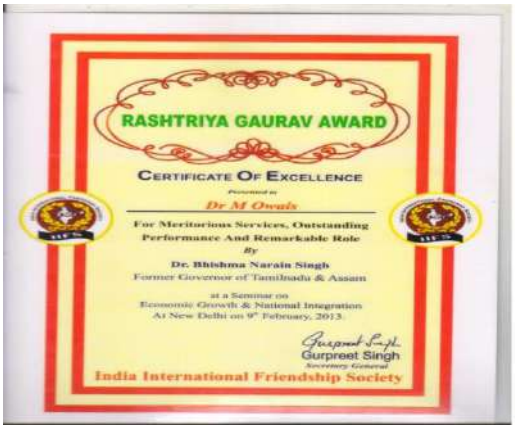
KAPIL SIBAL
MINISTER OF SCIENCE & TECHNOLOGY
AND EARTH SCIENCES



Cover page showing illustration from nominee's published work

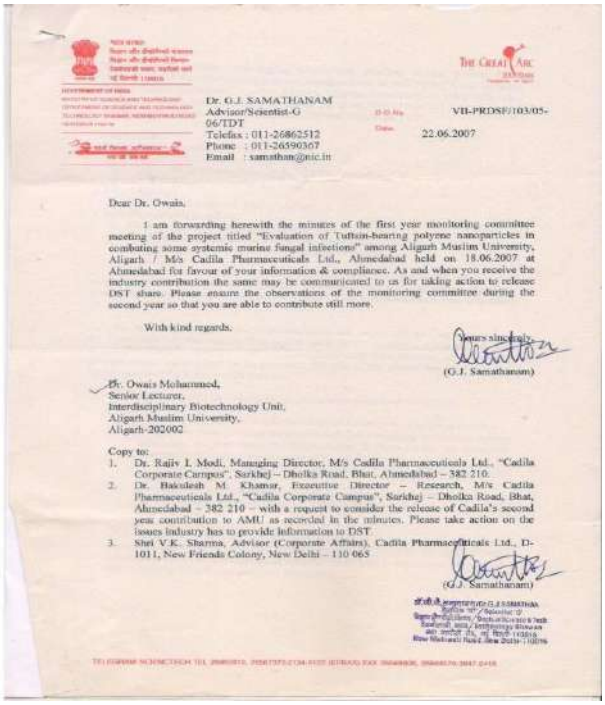


Cover page highlighting nominee's work


RASHTRIYA GAURAV AWARD
CERTIFICATE OF EXCELLENCE
Dr M Owais
For Meritorious Services, Outstanding Performance And Remarkable Role
By
Dr. Bhishma Narain Singh
Former Governor of Tamilnadu & Assam
at a Seminar on
Economic Growth & National Integration
At New Delhi on 9th February, 2013.
Gurpreet Singh
Secretary General
India International Friendship Society


THE INDUS FOUNDATION
Indo-Global Education Summit 2015
AWARD FOR RESEARCH EXCELLENCE
Dr. M. Owais
Professor, Interdisciplinary Biotechnology Unit
Aligarh Muslim University, Aligarh


YOUNG MUSLIM SCIENTIST AWARD
The Governing Council of
The Muslim Association for the Advancement of Science
confers Young Muslim Scientist Award for the year 2001 on
Dr. Mohammad Owais
with
Dr. Javed Ali
for his outstanding contribution in the field of Life Sciences.
Dr. Rais Ahmad
Hony Secretary
Prof. M.A. Roquib
President



Dr. G.J. SAMATHANAM
Advisor/Scientist-G
06/TDT
Telefax : 011-26862512
Phone : 011-26590367
Email : samathan@nic.in

VII-PRDSF/103/05-
22.06.2007

Dear Dr. Owais,

I am forwarding herewith the minutes of the first year monitoring committee meeting of the project titled "Evaluation of Tuftsin-bearing polyene nanoparticles in combating some systemic murine fungal infections" among Aligarh Muslim University, Aligarh / M/s Cadila Pharmaceuticals Ltd., Ahmedabad held on 18.06.2007 at Ahmedabad for favour of your information & compliance. As and when you receive the industry contribution the same may be communicated to us for taking action to release DST share. Please ensure the observations of the monitoring committee during the second year so that you are able to contribute still more.

With kind regards.

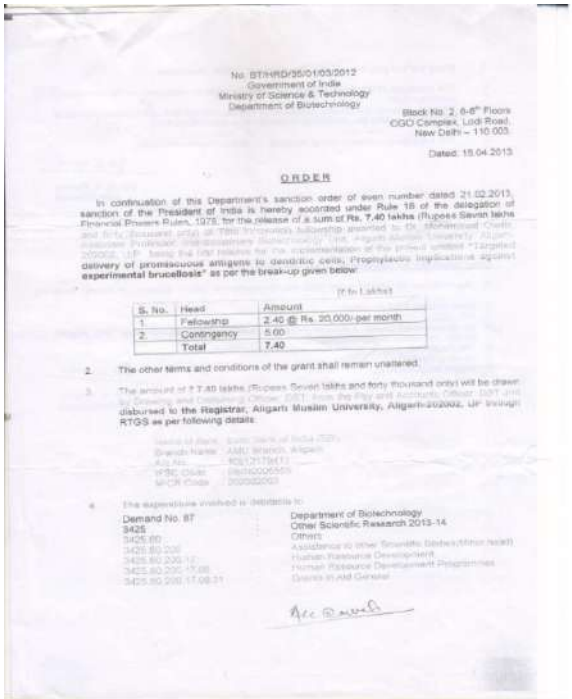
Yours sincerely,

(G.J. Samathanam)

Dr. Owais Mohammad,
Senior Lecturer,
Interdisciplinary Biotechnology Unit,
Aligarh Muslim University,
Aligarh-202002

Copy to:
1. Dr. Rajiv I. Modi, Managing Director, M/s Cadila Pharmaceuticals Ltd., "Cadila Corporate Campus", Sarkhej – Dholka Road, Bhat, Ahmedabad – 382 210.
2. Dr. Bakulesh M. Khamar, Executive Director – Research, M/s Cadila Pharmaceuticals Ltd., "Cadila Corporate Campus", Sarkhej – Dholka Road, Bhat, Ahmedabad – 382 210 – with a request to consider the release of Cadila's second year contribution to AMU as recorded in the minutes. Please take action on the issues Industry has to provide information to DST.
3. Shri V.K. Sharma, Advisor (Corporate Affairs), Cadila Pharmaceuticals Ltd., D-1011, New Friends Colony, New Delhi – 110 065

(G.J. Samathanam)



No. BT/HRD/35/01/03/2012
Government of India
Ministry of Science & Technology
Department of Biotechnology

Block No. 2, 6-8th Floors
CGO Complex, Lodi Road,
New Delhi – 110 003.

Dated: 15.04.2013

ORDER

In continuation of this Department's sanction order of even number dated 21.02.2013, sanction of the President of India is hereby accorded under Rule 18 of the delegation of Financial Powers Rules, 1978, for the release of a sum of **Rs. 7.40 lakhs** (Rupees Seven lakhs and forty thousand only) as [illegible] to Dr. Mohammad Owais and Ms. Shazia Anjum, Senior Research Fellow, Aligarh Muslim University, Aligarh, UP, being the [illegible] for the implementation of the project entitled "Targeted delivery of promiscuous antigens to dendritic cells: Prophylactic implications against **experimental brucellosis**" as per the break-up given below:

(₹ in Lakhs)

S. No.	Head	Amount
1.	Fellowship	2.40 @ Rs. 20,000/- per month
2.	Contingency	5.00
	Total	7.40

2. The other terms and conditions of the grant shall remain unaltered.

3. The amount of ₹ 7.40 lakhs (Rupees Seven lakhs and forty thousand only) will be drawn by Drawing and Disbursing Officer (DDO) from the Grant and Accounts Officer (GAO) and disbursed to **the Registrar, Aligarh Muslim University, Aligarh-202002, UP through RTGS as per following details:**

[illegible]

4. The expenditure involved is debitable to:

Demand No. 87	Department of Biotechnology
3425	Other Scientific Research 2013-14
3425.60	Others
3425.60.200	Assistance to other Scientific Bodies(Minor head)
3425.60.200.17	Human Resource Development
3425.60.200.17.08	Human Resource Development Programmes
3425.60.200.17.08.31	Grants in Aid General

FIRST ANNOUNCEMENT

12th INTERNATIONAL LIPOSOME RESEARCH DAYS
joint meeting with the 3rd conference on
LIPIDS, LIPOSOMES & MEMBRANE BIOPHYSICS

UBC Campus, Vancouver, Canada
August 4-8, 2010

International Advisory Board

Canada	*Italy*
M. Bally	M. Ponzoni
C. Allen	*Germany*
R. Epand	R. Zeisig
R. McElhaney	*Spain*
Japan	F. Goni
K. Maruyama	*Czech Republic*
N. Oku	J. Turanek
H. Harashima	*Russia*
T. Ishida	L. Yakushenko
USA	*Taiwan*
C. Alving	J. Ae Wang
F. Szoka	*China*
L. Huang	Y. Xu
V. Torchilin	*Israel*
D. Needham	A. Gabizon
D. Deamer	C. Barenholz
P. Felgner	*India*
The Netherlands	P. Devarajan
G. Storm	P. C. Ghosh
B. de Kruijff	M. Owais
D. Hoekstra	*Brazil*
United Kingdom	H. Bueno da Costa
Y. Perrie	*Australia*
H. Bayley	G. Russell-Jones
France	M. Patane
L. Leserman	*South Africa*
Portugal	H. Swai
R. Gaspar	

Conference topics will include:

Nanotoxicology

Ligand-targeted and combination therapeutics

Intracellular delivery

New technology developments

Roles of lipids in membranes

Self-organization of lipids

Lipid trafficking

Membrane nanotechnology

PLUS workshops on
- commercialization of nanomedicines
- delivery of gene therapeutics (DNA, siRNA)
- recent clinical develoments

PLUS the International Alec Bangham Award, poster awards, and sponsor exhibits

All researchers with interests in liposomes, nanomedicines, lipids and biomembranes are invited to join us on the beautiful University of British Columbia campus for an exciting interdisciplinary conference.

Organizers: Theresa M Allen (terry.allen@ualberta.ca; Pieter R Cullis (pieterc@interchange.ubc.ca)

एड्सः अमुवि के प्रोफेसर बनाएंगे दवा

बहुराष्ट्रीय दवा की कंपनी मेडीला से हुआ करार

राजपथ

अमुवि द्वारा एड्स की दवा बनाने हेतु त्रिपक्षीय समझौता

अमुवि ने एड्स ... लिए त्रिपक्षीय समझ

एड्स पर नियत्रण के लिए त्रिपक्षीय समझौता

आज

अमुवि वैज्ञानिक एड्स की दवा तैयार करने में जुटे

10. Paper published in referred journals: Average Impact Factor: 3.69
Total Reserch articles: 168

Total Review articles: 11, Chapters in books: 16

Original research papers published in full:

1. Faraz Ahmad, Mohd. Saad Umar, Nazoora Khan, Fauzia Jamal, Pushpa Gupta, Swaleha Zubair, Umesh Datta Gupta and **Mohammad Owais** (2021) Immunotherapy With 5, 15-DPP Mediates Macrophage M1 Polarization and Modulates Subsequent *Mycobacterium tuberculosis* Infectivity in rBCG30 Immunized Mice. Frontiers in Immunology, section Vaccines and Molecular Therapeutics Manuscript ID: | https://doi.org/10.3389/fimmu.2021.706727, [IF 4.70]
2. Hina Qamar, Adil Saeed, **Mohammad Owais**, Touseef Hussain, Kashif Hussain, Sarfraz Ahmed, Sachin Kumar, Zulfiqar Ahmad Khan (2021) CuO Bionanocomposite with Enhanced Stability and Antibacterial Activity against Extended-Spectrum Beta-Lactamase Strains. **Materials** 14 (21): 1331
3. M Shahnawaz Khan, Mohd Umar Hayat, Madiha Khanam, Haris Saeed, **Mohammad Owais**, Mohd Khalid, M Shahid, Musheer Ahmad (2021). Role of biologically important imidazole moiety on the antimicrobial and anticancer activity of Fe (III) and Mn (II) complexes. Journal of Biomolecular Structure and Dynamics 39 (11): 4037-4050
4. MS Ahmad, M Khalid, MS Khan, M Shahid, M Ahmad, H Saeed**, M Owais** M. Ashafaq (2021). Tuning biological activity in dinuclear Cu (II) complexes derived from pyrazine ligands: Structure, magnetism, catecholase, antimicrobial, antibiofilm, and antibreast cancer activity**.** Applied Organometallic Chemistry 35 (7), e6221. https://doi.org/10.1002/aoc.6221
5. Mohamed F AlAjmi, Asim Azhar, Mohd Owais, Summya Rashid, Sadaf Hasan, Afzal Hussain, Md Tabish Rehman. Antiviral potential of some novel structural analogs of standard drugs repurposed for the treatment of COVID-19. Journal of Biomolecular Structure and Dynamics 2020: 1-13.

6. Fauzia Jamal, Manish Kumar Singh, Jagadish Hansa, Pushp Anjali, Ghufran Ahmad, Saad UM, Manas R Dikhit, Anzar Abdul Mujeeb, Sanjiva Bimal, Pradeep Das, Shubhankar K Singh, Swaleha Zubair, **Owais, M** (2020) A Leishmania specific promiscuous membrane protein Tubulin Folding Cofactor D divulges Th1/Th2 polarization in the host via ERK-1/2 and p38 MAPK signaling cascade**. Frontiers in Immunology**, section Vaccines and Molecular Therapeutics Manuscript ID: 506961. [IF 4.70]
7. Khan MS, Hayat MU, Khanam M, Saeed H, **Owais M**, Khalid M, Shahid M, Ahmad M (2020) Role of biologically important imidazole moiety on the antimicrobial and anticancer activity of Fe (III) and Mn (II) complexes. **Journal of Biomolecular Structure and Dynamics** : 1-17. (Accepted) [IF 4.120]
8. Fatima N, Ahmed SH, Chauhan SS, **Owais M**, Rehman SM. Structural equation modelling analysis determining causal role among methyltransferases, methylation, and apoptosis during human pregnancy and abortion. **Scientific reports**. 2020 Jul 24; 10(1): 1-5. [IF 4.120]
9. AlAjmi MF, Azhar A, **Owais M**, Rashid S, Hasan S, Hussain A, Rehman MT. Antiviral potential of some novel structural analogs of standard drugs repurposed for the treatment of COVID-19. **Journal of Biomolecular Structure and Dynamics**. 2020 Jul 29:1-3. [IF 3.5]
10. Zia I, Jolly R, Mirza S, Umar MS, **Owais M**, Shakir M. Hydroxyapatite Nanoparticles Fortified Xanthan Gum–Chitosan Based Polyelectrolyte Complex Scaffolds for Supporting the Osteo-Friendly Environment. **ACS Applied Bio Materials**. 2020 Sep 4;3(10):7133-46.
11. **Owais M**, Faisal SM, Ahmad N, Rauf MA, Umar MS, Mujeeb AA, Pachauri P, Ahmed A, Kashif M, Ajmal M, Zubair S. (2019) Bio-mediated synthesis of 5-FU based nanoparticles employing orange fruit juice: a novel drug delivery system to treat skin fibrosarcoma in model animals. **Scientific Reports (NPG)** 9(1):12288. doi: 10.1038/s41598-019-48180-7. [IF 4.40]
12. Umar MF, Ahmad F, Saeed H, Usmani SA, **Owais M**, Rafatullah M (2020) Bio-Mediated Synthesis of Reduced Graphene Oxide Nanoparticles from Chenopodium album: Their Antimicrobial and Anticancer Activities. **Nanomaterials,** 10(6):1096. [IF 4.080]

13. Mirza, S., R Jolly, I Zia, Saad Umar, **Owais, M,** Shakir, M. (2020).Bioactive Gum Arabic/κ-Carrageenan-Incorporated Nano-Hydroxyapatite Nanocomposites and Their Relative Biological Functionalities in Bone Tissue Engineering. ACS Omega 5: (20) 11279–11290. [IF 3.40]
14. Saeed, H, Mateen, S,Moin, S, AQ Khan, **Owais, M**. (2020). Cardiac glycoside digoxin ameliorates pro-inflammatory cytokines in PBMCs of rheumatoid arthritis patients in vitro International Immunopharmacology 82: 106331. .[IF 3.60]
15. Jolly, R., AA Khan, SS Ahmed, S Alam, S Kazmi, **Owais**, **M**, MA Farooqi, Mohd Ahmadullah Farooqi, Mohammad Shakir. (2020). Bioactive Phoenix dactylifera seeds incorporated chitosan/hydroxyapatite nanoconjugate for prospective bone tissue engineering applications: A bio-synergistic approach. **Materials Science and Engineering**: C 109, 110554..[IF 4.10]

11. AA Mujeeb, NA Khan, F Jamal, KFB Alam, H Saeed, S Kazmi, **Owais, M**. (2020). *Olax scandens* mediated biogenic synthesis of Ag-Cu nanocomposites: potential against inhibition of drug-resistant microbes. Frontiers in Chemistry 8.[IF 3.70]
12. Bano, N., MA Rauf, Owais, M, Shakir M. (2020) Pharmacologically bio-relevant N-functionalized homo-binuclear macrocyclic complexes: synthesis, spectral studies, biological screening, HSA binding, and molecular docking. Inorganic and Nano-Metal Chemistry 49 (12), 413-430
13. Ahmed, N., NK Konduru, Owais M (2019) Design, synthesis and antimicrobial activities of novel ferrocenyl and organic chalcone based sulfones and bis-sulfones. Arabian Journal of Chemistry 12 (8), 1879-1894
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***Scientific Reviews**:*

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i) **Other publications (poster presentation**):

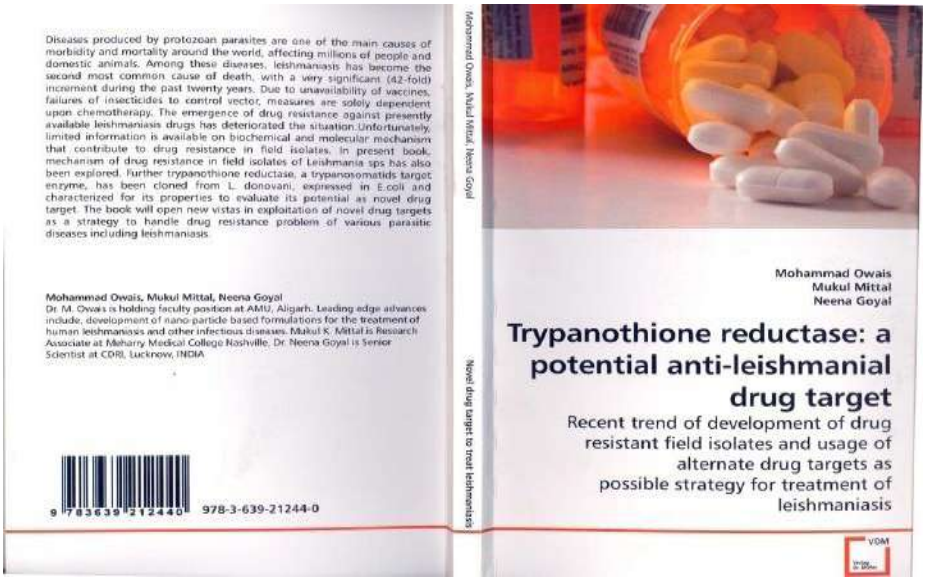
- Paper entitled as “Liposome in treatment of infectious diseases” was presented in Second Chandigarh Symposium on “New Biology” at IMTECH, Chandigarh during March 22-23, 1993.
- AIDSLINE ICA12/98385118. Meeting Jan 1998. National Cancer Institute, National Institute of Health, Bethesda, MD, USA.Anti-HIV chemokines: domain mapping and HIV-2 lentivirus delivery.
- International Conference on “Current Trends in Drug Discovery Research (CTDDR)” at CDRI, Lucknow during Feb 13-17 2001 and presented poster entitled “Liposome mediated removal of bilirubin in jaundice rats.”
- 9th Asia Pacific Congress in Clinical Biochemistry, 2002 at New Delhi during March 9-14, 2002and presented a poster entitled “Binding of bilirubin with albumin coupled liposomes: Implication in treatment of jaundice.”
- Yeast 2003: An International meeting on yeast biology at IMTECH, Chandigarh during Feb 20-22, 2003 and presented poster entitled “Reconstitution of Candida albicans antigen in fusogenic yeast lipid vesicles: Implication in vaccine development.”
- Yeast 2003: An International meeting on yeast biology at IMTECH, Chandigarh during Feb 20-22, 2003 and presented poster entitled “Glyoxylate cycle enzymes as potential drug targets for treatment of intracellular infections.”
- 2nd World Congress on “Biotechnological developments of herbal medicines” at NBRI Lucknow during Feb 20-22, 2003, and presented poster entitled “Antibacterial efficacy of Withania somnifera against experimental Salmonella typhimurium infection in BALB/c mice.”
- 6th International Conference on “Liposome Advances: Progress in drug and vaccine delivery” at School of Pharmacy, University of London, London, UK during Dec 15-19, 2003, and presented a poster entitled “Fusogenic liposomes: potential as future vaccine candidates.”
- Indo-Australian Conference on Biotechnology in infectious diseases at Kasturba Medical College, MAHE, Manipal during 1-3 March, 2005, and

presented poster entitled “Role of vaccine adjuvant against experimental murine Salmonellosis.”

- Indo-Australian Conference on Biotechnology in infectious diseases at Kasturba Medical College, MAHE, Manipal during 1-3 March, 2005, and awarded best poster entitled “Escheriosome entrapped soluble blood stage antigens impart protective immunity against a multidrug resistant isolate of Plasmodium yoeliinigeriensis in BALB/c mice.”
- National symposium on Nano particles, IVRI, Izat Nagar during 22-23 Dec, 2007, delivered talk on Development of nanoparticle based drug and antigen delivery system.
- International symposium on the Predictive, Preventive and Mechanistic Mutagenesis & XXXIII EMSI annual Meeting, AMU, Aligarh during Jan 1-3, 2008 and presented poster entitled as “Fibrin mesh encapsulated tuftsin activates immune functions of host macrophages.
- International symposium on the Predictive, Preventive and Mechanistic Mutagenesis & XXXIII EMSI annual Meeting, AMU, Aligarh during Jan 1-3, 2008 and presented poster entitled “Fusogenic potential of sperm membrane lipids: nature’s wisdom to accomplish targeted gene delivery.”

Total Books Published: 03

1. Modern Phytomedicine: Turning Medicinal Plants into Drugs (2006) Wiley VCH, Verlag Gmbtt& Co. KgaA.
2. Trypanothione reductase: a potential anti-leishmanial drug target (2009) (ISBN-NR 978-3-639-21244-0) VDM Verlag Dr. Müller Aktiengesellschaft& Co. KG
3. Combating Fungal Infections: Problems and Remedy (2010) Springer-Verlag, Heidelberg, Germany.



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1. Herbal Medicines: Prospects and Constraints. Iqbal Ahmad, Aqil F, Ahmad F, Owais M. In: Modern Phytomedicine: Turning Medicinal Plants into Drugs. (2006) Wiley VCH, Verlag Gmbtt& Co. KGaA. pp: 59-76.
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9. Biotechnological application of cheese whey. Owais, M. Khan, A., Khan, S. (2008) In: Advances in cheese whey utilization Ed: Cerdan, E., Gonzalez, MI, Becerra, M. (John Wiley and Sons).
10. Virulence and pathogenicity of fungal pathogens with special reference to C. albicans. Mohd Sajjad A. Khan, Iqbal Ahmad, M. Sajid, Owais, M., Shahid, M. In: Combating Fungal Infections: Problems and Remedy, Springer-Verlag, Heidelberg, Germany (pp 21-46).

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14. Novel drug delivery systems in combating opportunistic fungal infections: Old wine in new packing. Alam, M., Bisht, D, Venkatesan Balu Krishnamurthy, Ali Azmat, Arun Chauhan,Ahmad Iqbal, Ahmad Nadeem, Owais Mohammad. In: Combating Fungal Infections: Problems and Remedy, Springer-Verlag, Heidelberg, Germany (pp: 449-484).
15. Antifungal compounds from medicinal plants and herbal drugs: Prospects and limitations. Aqil, F., Zahin, M., Ahmad, I., Khan MSA, Farroq, S., and Owais , M. In: Combating Fungal Infections: Problems and Remedy, Springer-Verlag, Heidelberg, Germany (pp: 485-528).
16. Nanoscale drug delivery systems: An update view. Khan FB, Owais, M., In: Nanobiotechnology, One Central Press (pp: 181-204).

Ph D/M Phil/MD/MS/M Tech supervised by the nominee:

Total Ph D Dissertations (Awarded): **Thirty**

Details of the Ph D Dissertations supervised by the nominee:

1. Liposomes as an immuno-potentiating delivery system: Prophylactic and therapeutic implications against fungal infections (Alam MK, 2004).

2. Biochemical and molecular chararcterization of drug resistance in *Leishmania donavani* (Mittal MK, 2005)

3. Development of liposome based vaccines against infectious diseases (Faisal SM, 2006).
4. Fusogenic liposome based vaccines against some infectious diseases (Mallick, AI, 2009).

5. Concomitant delivery of immunomodulator and chemotherapeutic agents: Perspective in treatment of cancer in model animals (Arif, K, 2009).

6. Spermatosome based vaccines against intracellular pathogens (Atif SM, 2009).

7. Liposome based vaccines: Prophylactic measure against infectious diseases (Sharad K Sharma, 2009).
8. Epidemeological studies on prevalence of oral cancer in North India (Ahmad MG, 2010).

9. Saccharosomes as vehicle for delivery of drugs and antigens (Varun D, 2010).

10. Nano particles: Potential delivery systems against some intracellular infectious diseases (Maroof A, 2010).

11. Development of fibrin mesh based delivery system (Aijaz, A, 2011).

12. Characterization of some immunogenic proteins and their potential as vaccine candidates (Ansari MA, 2011).

13. Studies on molecules associated with polycystic ovary syndrome (Fatima N, 2011).

14. Development of nanoparticle based formulations against treatment of cancer (Azmat Ali, 2011).

15. Evaluation of nano-particle based delivery systems against prophylactic treatment of opportunistic fungal infections in Balb/C mice (Arun Chauhan, 2012)

16. Development of nano-particles based formulations against infectious diseases (Farazuddin M, 2012).

17. Some defense strategies against pathogen living in intracellular compartment of host (Zia Q, 2013)

18. Antioxidant and antiglycation effects of some phytochemicals (Shazia Aman, 2014)

19. Potential of fibrin based vaccines against experimental murine infections (Ejaj Ahmad, 2014)

20. Prophylactic potential of nano-particles in prevention of infectious diseases (Saba T, 2015)

21. Prospective prophylactic strategies against some diseases (KF Badrealam, 2015)

22. Targeted delivery of immune-nano-composite based delivery systems: potential in treatment and prophylaxis of cancer (Asif MS, 2015)

23. Nanoparticle mediated targeted delivery of drug and antigen (Ahmar MR, 2017)

24. Emerging role of Interleukins IL-23/IL-17 axis and biochemical markers in the pathogenesis of Type 2 Diabetes (Naureen F, 2017)

25. Theranostic biosensors: Application in detection of food borne pathogens

(Shadab Kazmi, 2017)

26. Role of cytokines in the regulation of host immune responses during infection (Faisal SM 2018)
27. Immune potential of M tb hypoxic stress induced Acr1 protein against intracellular M tb species infection (Nida 2019)
28. Studies on some prophylactic and chemotherapeutic strategies against some fungal infection (Faraz A, 2019).
29. Exosome mediated dendritic cell priming: potential in treatment of brucellosis (Anzar M, 2020)
30. Evidence implicating role of immune components of the host in autoimmunity (Haris Saeed, 2020)

M Phil Dissertations (Awarded): Three

1. Antifertility Vaccines (Nishat F, 2006).
2. Role of immunomodulators in cancer (Arif K, 2004).
3. Development of nanoparticle based formulations against infectious diseases (M. Farazuddin, 2008)

MD Dissertations (Awarded): Nine

1. T. L. C. profile and protein analysis of certain indigenous drugs (Shebaz, A. 2005).
2. Use of nano particles in treatment of Jaundice (Uzma, F. 2006).
3. Correlation between various inflammatory markers with different grades of blood pressure in essential hypertensive patients (Aslam, M. 2007).
4. A study of inflammatory markers and its correlation with severity in patients with chronic heart failure (Ansari, N, 2007).
5. A study of inflammatory markers in diabetic patients (Lubna, H, 2007).
6. Cytokine profile in auto-immune patients (Zuhaib, M. 2008).
7. Absorption of Triamcinolone Acetonide after posterior sub-tenon injection (Mahamood S, 2009)

8. Study of pro-inflammatory cytokines in patients of ischemic and non ischemic dilated cardiomyopathies (Hamid, A. 2011)

9. Potential of Cox-2 in prognosis of pulmonary tuberculosis (Zubair, M. 2011)

10. Immune staus of the tuberculosis patient with diabetes (Adil M, 2015)

11. Role of Th17 cells in HIV patients (Ahmad M, 2015)

M. Tech.Dissertation (Awarded): One

1. Ethanol production from crude whey by *Kluyveromycesmarxianus* (Salman, Z. 2004)

Ph D Dissertations (pursuing): eight

1. Targeted delivery of RD antigens to dendritic cells: potential vaccine against experimental tuberculosis (Nida Naaz)

2. siRNA Nanoparticles: potential in treatment of cervical cancer (Anzar M)

3. Exosome mediated dendritic cell priming: potential in treatment of brucellosis (Haris R)

4. Studies on some prophylactic and chemotherapeutic strategies against some fungal infection (Faraz A).

5. Host pathogen interaction special reference to *Candida albicans* (Saad T).

6. Cytokine praxis in control of viral infections (Ashima Gupta)

7. Metal nanoparticle: possible role in treatment of infectious diseases (Ruqayya Khan)

8. Photo Dynamic therapy mediated elimination of drug resistant microbes (Farheen Saba)

Details of Sponsored Research Schemes

1. **Name of the project:** **Development of Flunorm^{R}…… COVID-19 patients**
   Funding agency: **Minstry of AYUSH, Govt. of India**
   Duration: **Six months (w.e.f. 08. 07. 2020)**
   Amount*:* ***Rs. 18.0 lakhs***

2. **Name of the project:** Towards establishing ……. modes of gene delivery
   Funding agency: **DBT, Govt. of India**
   Duration: **Two years (w.e.f. 10. 01. 2017)**
   Amount*:* ***Rs. 78.0 lakhs***

3. **Name of the project:** **Microarray for detection of food borne pathogens**
   Funding agency: **ICAR, Govt. of India**
   Duration: **Four years (w.e.f. 1. 10. 2012)**
   Amount*:* ***Rs. 231 lakhs (02.31 crores)***

4. **Name of the project:** **Development of diagnostic kit… detection of GAS isolates**
   Funding agency: **DST, Govt. of India**
   Duration: **Three years (w.e.f. 1.09. 2015)**
   Amount*:* ***Rs. 64 lakhs***

5. **Name of the project:** **Exosome mediated delivery of antigen to dendritic cells.**
   Funding agency: **DBT, Govt. of India**
   Duration: **Five years (w.e.f. 1. 04. 2013)**
   Amount*:* ***Rs. 27.0 lakhs***

6. **Name of the project:** **Immunoprophylaxis approaches….. protozoal parasite**
   Funding agency: **DBT, Govt. of India (BUILDER program)**
   Duration: **Five years (w.e.f. 1. 04. 2012)**
   Amount*:* ***Rs. 981 lakhs (9.81crores)***

7. Name of the project: Cancer siRNA therapy by ……. ligand Nanoparticles.
   Funding agency: ICMR, Govt. of India
   Duration: Four years (w.e.f. 1. 10. 2011)
   Amount: Rs. 54.0 lakhs

8. Name of the project: Potential of nano particle …. si RNA in cancer.
   Funding agency: DBT, Govt. of India
   Duration: Four years (2008-2011)
   Amount: Rs. 66.0 lakhs

9. Name of the Project: Evaluation of tuftsin ……. fungal infections.
Funding agency: DST (PRDSF Program), Govt. of India
Duration: Two years (2006-2008)
Amount: Rs. 89.0 lakhs

10. Name of the project: si RNA in treatment of viral infections.
Funding agency: DBT, Govt. of India
Duration: Three years (2008-2011)
Amount: Rs. 09.0 lakhs

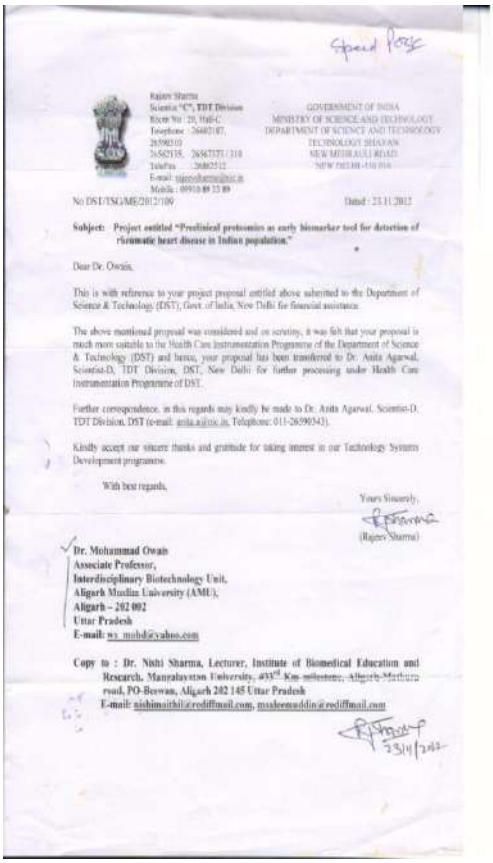
11. Name of the project: Development of liposome/ ……. malaria infection.
Funding agency: Council of Science & Technology, Govt. of India
Duration: Three years (2001-2004)
Amount: Rs. 3.0 lakhs

12. Name of the project: Effect of bioactive medicinal plant ….. potential prospection.
Funding agency: UGC, Govt. of India
Duration: Three years (2002-2005)
Amount: Rs. 5.73 lakhs
Score: 05 points

13. Name of the project: Reversal of resistance…….. liposomes
Funding agency: UGC, Govt. of India (special assistance)
Duration: One year
Amount: Rs. 1.23 lakhs

14. Name of the project: Evaluation of fibrin mesh ……. murine cryptococcosis.
Funding agency: CSIR, Govt. of India
Duration: Three years (2005-2008)
Amount: Rs. 10.0 lakhs

Multi-Institutional Collaborative Projects: **Three**



Speed Post

Rajeev Sharma
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GOVERNMENT OF INDIA
MINISTRY OF SCIENCE AND TECHNOLOGY
DEPARTMENT OF SCIENCE AND TECHNOLOGY
TECHNOLOGY BHAVAN
NEW MEHRAULI ROAD
NEW DELHI-110 016

No DST/TSG/ME/2012/109 Dated : 23.11.2012

Subject: Project entitled "Preclinical proteomics as early biomarker tool for detection of rheumatic heart disease in Indian population."

Dear Dr. Owais,

This is with reference to your project proposal entitled above submitted to the Department of Science & Technology (DST), Govt. of India, New Delhi for financial assistance.

The above mentioned proposal was considered and on scrutiny, it was felt that your proposal is much more suitable to the Health Care Instrumentation Programme of the Department of Science & Technology (DST) and hence, your proposal has been transferred to Dr. Anita Agarwal, Scientist-D, TDT Division, DST, New Delhi for further processing under Health Care Instrumentation Programme of DST.

Further correspondence, in this regards may kindly be made to Dr. Anita Agarwal, Scientist-D, TDT Division, DST (e-mail: anita.a@nic.in, Telephone: 011-26590343).

Kindly accept our sincere thanks and gratitude for taking interest in our Technology Systems Development programme.

With best regards,

Yours Sincerely,

(Rajeev Sharma)

Dr. Mohammad Owais
Associate Professor,
Interdisciplinary Biotechnology Unit,
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Uttar Pradesh
E-mail: ws_mohd@yahoo.com

Copy to : Dr. Nishi Sharma, Lecturer, Institute of Biomedical Education and Research, Mangalayatan University, 493rd Km milestone, Aligarh-Mathura road, PO-Beswan, Aligarh 202 145 Uttar Pradesh
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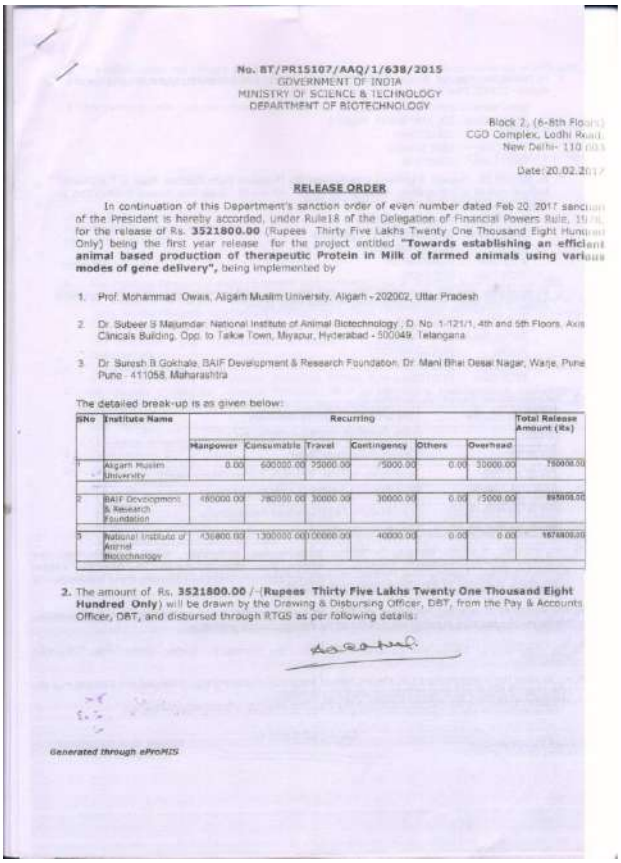
23/11/2012



No. BT/PR15107/AAQ/1/638/2015
GOVERNMENT OF INDIA
MINISTRY OF SCIENCE & TECHNOLOGY
DEPARTMENT OF BIOTECHNOLOGY

Block 2, (6-8th Floors)
CGO Complex, Lodhi Road,
New Delhi- 110 003

Date:20.02.2017

RELEASE ORDER

In continuation of this Department's sanction order of even number dated Feb 20, 2017 sanction of the President is hereby accorded, under Rule18 of the Delegation of Financial Powers Rule, 1978, for the release of Rs. **3521800.00** (Rupees Thirty Five Lakhs Twenty One Thousand Eight Hundred Only) being the first year release for the project entitled **"Towards establishing an efficient animal based production of therapeutic Protein in Milk of farmed animals using various modes of gene delivery"**, being implemented by

1. Prof. Mohammad Owais, Aligarh Muslim University, Aligarh - 202002, Uttar Pradesh
2. Dr. Subeer S Majumdar, National Institute of Animal Biotechnology, D. No. 1-121/1, 4th and 5th Floors, Axis Clinicals Building, Opp. to Talkie Town, Miyapur, Hyderabad - 500049, Telangana
3. Dr. Suresh B Gokhale, BAIF Development & Research Foundation, Dr. Mani Bhai Desai Nagar, Warje, Pune Pune - 411058, Maharashtra

The detailed break-up is as given below:

SNo	Institute Name	Recurring						Total Release Amount (Rs)
		Manpower	Consumable	Travel	Contingency	Others	Overhead	
1	Aligarh Muslim University	0.00	600000.00	35000.00	75000.00	0.00	30000.00	740038.00
2	BAIF Development & Research Foundation	480000.00	780000.00	30000.00	30000.00	0.00	75000.00	995808.00
3	National Institute of Animal Biotechnology	450800.00	1300000.00	00000.00	40000.00	0.00	0.00	1674808.00

2. The amount of Rs. **3521800.00** /-(**Rupees Thirty Five Lakhs Twenty One Thousand Eight Hundred Only**) will be drawn by the Drawing & Disbursing Officer, DBT, from the Pay & Accounts Officer, DBT, and disbursed through RTGS as per following details:

Generated through eProMIS

Patents:

1. Gupta, C.M., **Owais, M**., and Varshney, G.C. A process for the preparation of the drug encapsulated target specific immuno-liposomes for the treatment of drug resistant disease. Patent No. 182550 (Indian Patent).

2. **Owais**, **M**., Verma J. N., Development of liposome based herbal formulations Patent No. 318455 (Indian Patent)..

3. **Owais**,**M**.,Swaleha Z, Shadab K. Production of bispecific antibodies for rapid detection of food borne parhogens. Appln. No US 62/133,412 (US Patent).

4. **Owais M**, Khamar BK. Nano particle based polyene anti-fungal formulations (technology development).

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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE RECD	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
62/133,412	03/15/2015		80			

CONFIRMATION NO. 7816

UPDATED FILING RECEIPT

OC000000075420930

Dr. Mohammad Owais
Interdisciplinary Biotechnology Unit
Aligarh Muslim University
Aligarh, 262201
INDIA

Date Mailed: 05/28/2015

Receipt is acknowledged of this provisional patent application. It will not be examined for patentability and will become abandoned not later than twelve months after its filing date. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Inventor(s)

Mohammad Owais, Aligarh, INDIA;
Swaleha Zubair, Aligarh, INDIA;
Shadab Kazmi, Aligarh, INDIA;

Applicant(s)

Mohammad Owais, Aligarh, INDIA;
Swaleha Zubair, Aligarh, INDIA;
Shadab Kazmi, Aligarh, INDIA;

Power of Attorney: None

If Required, Foreign Filing License Granted: 03/25/2015

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 62/133,412**

Projected Publication Date: None, application is not eligible for pre-grant publication

Non-Publication Request: No

Early Publication Request: No
**** MICRO ENTITY ****
Title

PRODUCTION OF BISPECIFIC ANTIBODIES FOR RAPID DETECTION OF FOOD BORNE PATHOGENS

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

Details of the Technologies Developed

The nominee has been helping several Indian pharmaceutical industries such as Cadilla Pharmaceutical Ltd (Amphotericin B), Ahmedabad;Life Care, New Delhi (DAS, Perillyl alcohol, Eugenol etc.) and Gennova Biopharmaceuticals Limited, Pune (Doxorubicin) in development of nano-particle based drug formulations. He has used lipid as well as other polymers (e.g. fibrin, non-ionic surfactant, PLGA *etc*) based-nano-particles to overcome the problems that are encountered by the liposome based delivery systems in blood circulation. A number of patents in collaboration with these companies have been filed.

Various nanoparticle based novel formulations developed by nominee's group

1. Immunoliposomes: Chloroquine bearing immunoliposomes decorated with Mab specific for surface of infected erythrocyte (Antimicrob Agents & Chemother 1995)
2. DNA delivery vehicle: The Brucella SOD protein expressing DNA was encapsulated in liposome and used as DNA vaccine for prophylaxis against brucellosis (Microbes & Infection 2009, Plos One 2014)

3. Tuftsin bearing Amphotericin B liposome: Immunomodulator tuftsin bearing Amp B liposomes for treatment of aspergillosis, candidiasis and cryptococcosis (FEMS 2005, JDT 2004).

4. pH sensitive liposomes: pH sensitive liposome for treatment of fibrosarcoma (Molecular Medicine 2007)

5. Tuftsin bearing Amphotericin B niosomes: Tetrapeptide tuftsin was intercalated in the bilayer of AM B containing niosomes. The formulation was used for treatment of fungal infection (Cadila Pharmaceuticals, Ahmedabad).

6. Tuftsin bearing Amphotericin B microspheres: The PLGA microspheres were grafted with tuftsin to activate macrophages. The formulation was used in treatment of fungal infections (Cadila Pharmaceuticals, Ahmedabad).

7. Non PC liposomes: Various liposome using non PC phospholipid were develop to develop novel antigen delivery system (Vaccine 2006).

8. Saccharosome: Lipid isolated from Saccharomyces cerevisiae were used to develop antigen delivery system (Vaccine 2009).

9. Escheriosome: The fusogenic lipids abundant in *Escherichia coli* were used to develop escheriosome based antigen delivery system the formulation was used to develop vaccine against murine malaria in model animal (Vaccine 2003, Nanomedicine 2014.

10. Erythrosome: The lipid isolated from human erythrocytes were used for development of antigen delivery system. Both inside out as well right side out vesicles were also exploited for homing of entrapped antigen to the antigen presenting cells (BBA 2005).

11. Subtilosme: The lipid isolated from Bacillus subtilis was used in development of novel vaccines (BBA 2005).

12. Spermatosome: The potential of sperm to transfer encapsulated genetic material was further exploited to deliver encapsulated antigen to the target cells (Febs Letters 2006, Vaccine 2008).

13. Archaeosome: The lipid isolated from archae-bacteria was used in development of antigen delivery system. The formulation was used in prophylaxis against listeriosis and experimental tuberculosis.

14. Fibrin microbeads: Autologous plasma was used to fabricated plasma beads that were used in prophylaxis and chemotherapy of fungal infections (JDT 2012, Therapeutic Delivery 2011, Vaccine 2013, IJMM; 2015).

15. 5-FU nanoassemblage: Biomimetic synthesis of 5-FU nano-particles (Plos One 2013)

16. Amphotericin B nanoassembly: The antifungal agent was biomimetically transformed to nano-crystals (Ph D thesis Dr. Zia)

17. Poly glutamic acid nano-particles: Gama PGA based solid nano-particles were fabricated to various immunogenic antigens and antifungal agents (IJN 2014).

18. Essential oil bearing liposomes: Various essential oil bearing liposomes were developed to facilitate targeted delivery (JDT 2004).

19. Essential oil bearing microspheres: Perillyl alcohol, allyl sulphide derivatives of garlic were used for development of anticancer formulations (IJN 2013, Molecular Medicine 2007, Nanomedicine 2013)

20. siRNA bearing nano-particles: Fox-P3 and Plk-1 specific siRNA formulations were developed to treat various types of cancer in model animals (Plos One 2014).

21. Fatty acid based anticancer agents and their nano-particle based formulations: Propofol-fatty acid conjugates were encapsulated in nano-particles to treat breast and liver cancer (Nanomedicine 2013, EJMC 2012).

B. Biosensors:

1. Gold immuno-nanoparticles: Antibody conjugated gold nano-particles were fabricated to detect various types of cancer (IJN 2011).

2. Bispecific antibodies: Hybridization based bispecific antibodies were developed to detect food borne pathogens (Plos One 2014)

Significant Research contribution at the international level:

Dr. Mohammad Owais is currently serving as a professor of biotechnology at Aligarh Muslim University, Aligarh. Besides active involvement in teaching modern biochemistry/biotechnology courses to M.Sc./Ph.D. students, Dr. Owais has successfully established a small but active research group with focus on nano-particle-based novel delivery systems including dendrimers/virosomes for gene packaging and liposomes, niosomes, microspheres and solid core lipid nano-particles for vaccine delivery, gene delivery, targeted drug delivery *etc*; with a view to increase the efficacy and safety of encapsulated chemo-therapeutic agents/sub-unit vaccines for some important infectious diseases.

The research focus of Dr. Owais's group has been on:

- Nanoparticles based antigen/DNA vaccine against various infectious diseases with special converges on intracellular pathogens.
- Novel nano-carriers for targeted delivery of encapsulated therapeutic agents (siRNA/drug of interest) for improved treatment of cancer and some imperative infectious diseases.
- Nanoparticles with assorted applications in the field of diagnostics, taste/odor masking and treatment of hyper-bilirubinemia in model animals.

1. ***Nano-carrier based vaccines: prophylactic measures against major infectious diseases.***

Reckoning with the limitations of conventional vaccines, the main focus of Dr. Owais's research endeavors has been to develop nano-vaccines against various infectious diseases of bacterial (tuberculosis, salmonellosis, listeriosis and brucellosis), protozoan (malaria, leishmaniasis) and fungal (candidiasis and cryptococcosis) origin.

In general, specialized groups of pathogens adapt intracellular parasitism as a strategy to avoid antibody onslaught. Keeping into consideration the non-effectiveness of humoral immune response against intra-cellular pathogens, Dr. Owais evaluated potential of amyloid fibril based vaccines against various

intracellular pathogens such as *M. tuberculosis* and *Brucella abortifaciens,etc*. (Saba *et. al* JBC 2014, Faraz et al., Frontiers in Immunology and Tufail et. al. JBC 2018). Next, he assessed prophylactic potential of fusogenic lipid based vaccines as an alternative prophylactic strategy. In this regard, he has compared lipid compositions of plasma membranes of both prokaryotic as well as eukaryotic cells. These studies established a correlation between the lipid compositions of plasma membranes of living organisms with evolutionary trend (Deba*et. al*. BBA 2005). Lipid isolated from lower organisms possesses strong fusogenic potential (Owais*et. al*. FEBS J 1999, Ahmad *et. al*. FEBS J 2000, Farah *et. al*. BBA 2005, Ansari *et. al*. Plos One 2011). He further established that model antigens entrapped in liposomes made up of fusogenic lipids can be delivered to the target cells including antigen presenting cells. This eventually facilitates both endo/lysosomal and cytosolic degradation pathways for antigen processing. The dual processing of antigens in the antigen presenting target cells activated both the CD4+ T helper as well as CD8+ T cytotoxic cells. Further, he established that immunization with fusogenic liposomes resulted in expression of both IL-2 and IFN-γ, the two key cytokines that eventually help in protection against intracellular infections (Faisal *et. al*Vaccine 2003, Farah *et. al*, BBA 2005, Atif*et. al*, FEBS Letters 2006, Sharad*et. al*, Vaccine 2006).

Keeping in view that sperm-ova fusion during zygote formation is generally facilitated by specific lipid compositions of the two cell populations, he demonstrated the fusogenic attributes of sperm plasma membrane lipids (Atif *et. al*. Vaccine 2008) and established the prophylactic potential of Spermatosomebased vaccines against various intracellular pathogens (Atif*et. al*. Vaccine 2010).

As conventional egg phosphatidyl-choline (PC) based liposomes are of limited application in activation of pathogen specific CTL response, required for inhibiting intra-cellular pathogens, Dr. Owais developed non-PC liposome as vehicle for delivery of antigens in prophylactic treatment of experimental leishmaniasis (Sharad*et. al*. Vaccine 2006). Further, the liposome/niosome based vaccines were also found to be effective against malaria parasite (Sharma *et. al*. Vaccine

2006, Sharma *et. al*. Vaccine, 2007, Varun*et.al;* Pharmaceutical Research 2009). In addition, he has preparedArchae lipid based (Archaeosome) liposomes and demonstrated their immunoadjuvant potential in model animals. Of note the archaeosomebased vaccine were used to mount long lasting memory response against experimental listeriosis (Ansari *et. al*. I. J Nanomedicine 2012).

Further, Dr. Owais has highlighted interactions between two mycobacterial proteins viz. Rv3619 (RD9 family) and Rv3620 (CFP-10 analog). He demonstrated that Rv3619 protein disrupted the biomembrane and also evoked a strong immunological response (Mahmood*et. al.* FEBS J 2010). Moreover, it was revealed that nano-particle mediated targeting of RD9 gene products to dendritic cells favors Th1 prototype of CD4+ T lymphocytes. Targeted delivery of encapsulated antigen to dendritic cells was achieved by coupling anti-DEC antibodies to the surface of archaeosome (archaebacteria lipid vesicles), which helped to cut down the antigen dose significantly thereby making the immunization protocol cost effective (Ansari *et. al*. 2011).

He had successfully expressed L7/L12 ribosomal protein, SOD-IL-18 fusion protein of *Brucella sp*. and trypanothione-reductase of *Leishmania donavani*. The recombinant proteins were used as potent sub unit vaccines in protection studies (Sharad*et. al*. Vaccine 2006, Mallick*et. al*Vaccine 2007, Mallick*et. al*. Vaccine 2008). A liposome-based DNA vaccine developed by Dr. Owais has shown remarkable promise against experimental murine brucellosis (Singha*et. al*. Microbes & Infection 2008).

Besides introducing liposome, niosome and microsphere based novel particulate vaccines; Dr. Owais has recently employed an autologous plasma bead based dual antigen delivery system as a prophylactic strategy against intracellular infections (Ejaj*et. al*. Vaccine 2011). The liposome/microsphere entrapped antigen further co-entrapped in dual core fibrin beads based vaccine was shown to eliminate intracellular pathogens from systemic circulation (Khan *et. al.* JAC 2012).

2. ***Targeted nano-delivery system***.

Targeted delivery of anticancer agents and antibiotics has been considered as one of the most coveted endeavors in the field of nano-vehicle based drug delivery technology employing adjunctive antimicrobial agents. Efforts from Dr. Owais research group to use a combination of nano-particles based formulations with immunomodulators have been highly successful in combating infectious diseases in experimental diseases (Khan *et. al*. FEMS Micro & Immunol.2003, Khan *et. al*. JDT 2004, Khan *et. al*. JAC 2004). His studies suggest that drug delivery potential of nano-particles can be increased considerably by co-entrapment of potential immunomodulators, such as picroliv, tetrapeptidetuftsin, protein A and various analogs of muramyl peptide, *etc*, in combination with the anti-microbial agents. The resulting formulations were found to be effective against treatment of a range of infectious diseases such as fungal (candidiasis, cryptococcosis, aspergillosis), bacterial (tuberculosis, leprosy, salmonellosis), protozoal (leishmaniasis, malaria) nematodes (filariasis) *etc* (Owais *et. al.* FEBS Letters 1993, Owais *et. al.* AAC 1995, Owais *et. al.* FEBS J 1999, Khan *et. al.* JACS 2002, Khan, *et. al.* FEMS Microb. & Immun. 2003, Deeba *et. al.*Biochimie 2005, Sharma, *et. al*. Vaccine 2006, Sharad, *et. al.* Vaccine 2006).

Liposomes have been widely considered useful as drug/enzyme/nucleic acid vehicles in therapy. However, their successful application was limited by their rapid lysis in blood, major uptake by the RES, and lack of availability of simple procedures for specific targeted delivery. The main emphasis of DrOwais has been therefore on addressing some of the problems associated with the liposomes as drug delivery systems. He demonstrated that covalent attachment of anti-erythrocyte $F(ab')_2$ to the liposomes surface enables the liposomes to specifically recognize the erythrocytes in vivo and deliver their contents to these cells. It was further demonstrated that the entrapment of anti-malarial drugs like chloroquine (chq), in the antibody-coated liposomes increases the drug efficacy not only against the chq-sensitive but also against the chq-resistant malarial infections. Encouraged by these results, the liposomes were coated with $F(ab')_2$fragments of a monoclonal antibody which specifically recognized the malaria-infected erythrocytes (Patent No. 182550). The monoclonal antibody

bearing liposomes with encapsulated chq were found to be highly effective in the treatment of chq-resistant experimental malaria (Owais *et. al.*AAC 1995).

RNA interference is a newly discovered cellular mechanism for silencing genes in a sequence specific manner at the mRNA level.It involves introduction of cognate double stranded small interfering RNA (siRNA) to target desired mRNA and has been shown to have application in viral and cancer therapy. Administration of naked siRNA is susceptible to rapid degradation by plasma RNAses. Cationic lipids have been used as carrier of siRNA, however, not desirable due to innate toxicity of the RNA-lipid complex. To overcome this problem, Dr. Owais has developed a novel nano-particle based formulation encapsulating siRNA that down-regulates Polo like kinase 1(Plk1) and Fox O protein in treatment of skin, liver and breast cancer (Chauhan *et. al.*Nanomedicine 2014, Sherwani et. al. RSC Advances, 2015, Asif et. al. RSC Advances 2015).

Further, the nano-particle based formulations (*cf*. dendrimers, niosomes, liposomes and microspheres) of some important essential oils, viz. clove oil, perillyl alcohol, eugenol and various allyl-sulphide analogs, were first time developed by nominee's group and shown to be effective against drug resistant isolates of various fungal as well as bacterial pathogens (Arif *et. al.*Mol Medicine 2007, Arif, *et. al.*Mol Medicine 2009). Interestingly besides infectious diseases, the pH sensitive as well as fusogenic liposomes-based formulations of diallyl-sulphide were shown to be effective against skin carcinoma in model animals as well (Maroof *et. al*, Nanomedicine 2010, Khan *et. al.*JACS 2011).

As evident from one of his studies that introduction of HIV-1 genome into PBMCs blocks the propagation of HIV-2 viruses, he developed gene therapy vector for transfecting HIV-2 infected PBMCs with HIV-1 genome using SCID mice (Al-Harathy*et. al*. AIDS RHV 1998). Several studies have defined a close relationship between the HIV-1 infection and the components of the immune system involving chemokines. Suppression of HIV by chemokines represents a special case in virology and immunology where soluble molecules other than antibodies inhibit infection by a specific virus. Consequently, studies by Dr. Owais have focused on the role of various domains of chemokines that are responsible for anti-HIV activity or help in inflammatory responses in the host. He cloned genes of important β

chemokines such as RANTES and MIP-1α and expressed them in eukaryotic (HEK 293) and insect cells (SF-9 and SF-21). In order to develop chemokine as a future therapeutic agent against the treatment of HIV infection, it is necessary to establish their structure and function relationship. In this context, he successfully characterized the functional domains of β chemokine RANTES in relation to its anti-HIV activity (Owais&Arya J Hum Virol 1998).

3. Other applications of as-synthesized novel nano-particles

a) The research group of Dr. Owais group developed a liposome based mouthwash containing essential oil that binds to the mucus membrane inside the mouth. This enables the essential oils to remain in the mouth for extended time period to achieve long-lasting germ-killing and breath-freshening protection. Because liposomes have a tremendous amount of surface area, which may facilitate transfer of the essential oils to the mucus membrane, thusaffect the efficacy of the oils. The encapsulation of the essential oils also protects them from hydrolysis or oxidation (Ahmad *et. al*. JDT, 2004).

b) Bilirubin, a metabolic by-product of hemoglobin, has been considered as an effective biomarker of liver function. The elevated plasma level of bilirubin exerts deleterious effects on the liver function. The liposome/microsphere based nano-carriers developed by Dr. Owais have been found to be potential scavenger of bilirubin from experimental animals (Masood*et. al.*FEMS Micro & Immunol. 2004, Ahmad *et. al*. BBA 2004, Ahmad*et. al*. BBA 2006).

c) Nano-particles have been exploited as an effective tool for diagnostics in detection of cancer as well as the presence of pathogens in various food products. The gold-nano-particle based immunodiagnostic device developed by Dr. Owais has been found to be very effective in cancer diagnosis (Arun*et. al*. IJ Nanomedicine 2011). Besides, aptamer/antibody based biosensor devices developed by Dr. Owais have wide application in detection of food borne pathogens in meat and shrimps industry (Owais *et. al.*Plos One 2014).

International visits:

1. AsimAzhar**,** Ahmar Rauf, Swaleha Zubair, Haris Saeed and Mohammad Owais. **"Dietary Components Bearing Nanoparticles: potential in Treatment of Cancer in Model Animals".***International Symposium on Current Advances in Radiology, Stem Cells and cancer Research organized by School of Life Sciences, Finland during 19-21 Feb, 2015.*
2. AsimAzhar**,** Qamar Zia, Shadab Kazmi, Ejaj Ahmad, M Ansari, K.E Johnson, Swaleha Zubair, M Owais. **"Efficacy of Cell-Wall Deficient spheroplasts Against Experimental Murine Listeriosis"** organized by The 15th Awaji International Forum on Infection and Immunity in Yumebutai International Conference, Awaji Japan 6-9th Sept, 2016.

Invited Lectures:

- Delivered invited lecture in **SFRR-Satellite India-2008 Meeting** held on 11-12th Feb, 2008 at AIIMS, New Delhi on the topic entitled as **"p53 mediated modulation of p21/WAF1 in Benzo pyrene induced Fibrosarcoma by tuftsin bearing Liposomal etoposide in swiss Albino mice".**
- Delivered invited lecture in National symposium on Nano particles, IVRI, Izat Nagar during 22-23 Dec, 2007, delivered talk on Development of **Nano particle based drug and antigen delivery system**.
- **Chaired two scientific sessions** in National symposium on Nano particles, IVRI, Izat Nagar during 22-23 Dec, 2007.
- Delivered invited lecture in National symposium on Infectious diseases at Kashmir Universit June 09, 2014
- Delivered invited lecture in National symposium on Parasite and Health at CDRI, Lucknow, August 01, 2014
- **Chaired scientific session** in National symposium on New facet of Biotechnology: from Genes to Proteins at IBU, Aliagrh during 15-17 Jan, 2014
- **Chaired scientific session** in National symposium on Modern trend in human diaseses at JNMC, Aliagrh during 14-15 Dec, 2013
- Delivered invited lecture in National symposium on Nanoscience at Nanotechnology Center ZHE College, AMU, Aligarh Dec 12, 2012
- Delivered invited lecture in National symposium on Metal toxicity and oxidative stress at JMI, New Delhi on, 23 Sept, 2014
- Delivered an invited lecture on "*Multifunctional nanosystems: growing sanguinity in development of particulate antigen delivery vehicle based vaccines* Golden Jubilee International Conference on Advances in Biophysics organized JMI, New Delhi Feb 07, 2015

- Delivered invited lecture on ‘TLR agonist enhances the immunogenicity and protective efficacy of RD antigen based nanovaccine’ in National ConferenceonNanoscience, Nanotoxicology and Nanoinformatics” at Integral University, Lucknow on, 13 March 2015.
- Delivered an invited lecture on “Multifunctional particulate antigen delivery vehicle based vaccines: potential in prophylaxis against intracellular pathogens’in 5th Annual International Conference onAdvances in Biotechnology organized GSTF & IIT Kanpur on 14-15 March, 2015
- Delivered invited lecture in National symposium on "Immune cell surveillance: Strategies opted by host to keep intruders at bay" at Panjab University Chandigarh on, March 23, 2015
- Delivered invited lecture in National symposium on "Nanoparticle based vaccine delivery system" at IVRI, Izat Nagar on, Nov 20, 2015
- Delivered an invited lecture on “Nano: Vaccine exploiting TLR agonist”in2ndNano-bio Interface in Biotechnology organized organized by JNU, New Delhi on 18-20 March, 2016
- Delivered an invited lecture on “Nanoparticles: emerging technology to facilitate homing of drugs and antigens in Ist Annual International Conference and Knowledge Park organized by Dept of Biotechnology, Sharda University, Noida on Aug 17, 2016.
- Delivered an invited lecture on “Liposome based drug and antigen delivery system in International Conference on Advances in Biotechnology organized by Mangalayatan University on 28-29 August, 2016

Best Poster Awards

- **Indo-Australian Conference on Biotechnology in infectious diseases at Kasturba Medical College, MAHE, Manipal** during 1-3 March, 2005, and awarded best poster for work entitled “Escheriosome entrapped soluble blood stage antigens impart protective immunity against a multidrug resistant isolate of Plasmodium yoeliinigeriensis in BALB/c mice.”
- **International symposium on the Predictive, Preventive and Mechanistic Mutagenesis & XXXIII EMSI annual Meeting,** AMU, Aligarh during Jan 1-3, 2008 and awarded best poster for work entitled “Fusogenic potential of sperm membrane lipids: Nature’s wisdom to accomplish targeted gene delivery.”

Details of the Technologies Developed

The nominee has been working in collaboration with several Indian pharmaceutical industries such as **Cadilla Pharmaceutical Ltd, Ahmedabad**, **Life Care Inc., New Delhi** and **Gennova Biopharmaceuticals Limited, Pune** to develop nano-particle based drug formulations. He has used not only liposomes as drug carriers but also exploited polymers (e.g. fibrin, PLGA etc) based-nano-particles to overcome the problems that are encountered by the liposomes in blood circulation. A number of patents with these companies are currently in the process of filing.

For the last eighteen years, Dr. Owais is actively involved in the development of liposome-based formulations for the treatment of a range of infectious diseases such as fungal (candidiasis, cryptococcosis, aspergillosis), bacterial (tuberculosis, leprosy, salmonellosis), protozoal (leishmaniasis, malaria) nematodes (filariasis) and HIV infections (Owais *et. al*, 1993, Owais *et. al*, 1995, Owais *et. al* 1999, Khan *et. al* 2002, Khan, *et. al* 2003, Deeba*et. al.* 2005, Sharma, *et al* 2006, Sharad, *et al* 2006). He worked in collaboration with one of the world repute multi national Pharmaceutical Company, **Cadilla Pharmaceutical Ltd**., Ahmedabad to develop Nano particle based drug formulation for treatment of opportunistic fungal infections under PRDSF program of Department of Science & Technology, Govt. of India. He has also developed liposome based antigen delivery vehicles, which can elicit strong immune response against model antigens in the animals (Owais & Gupta 2000, Nadeem *et. al* 2001, Nadeem *et. al* 2001, Owais *et. al.* 2001, Faisal *et. al* 2003, Farah *et. al,* 2005, Atif *et. al,* 2006, Sharad *et. al*, 2006].

The experience of applicant's research group in developing liposome/microsphere/niosomes based drug and antigen delivery systems is being currently exploited by some of the leading pharmaceutical and biotechnology companies to develop some novel drug formulations. **The nominee also promulgates the idea of administering suitable drug formulation along with immunomodulators to combat infectious diseases**. In this regard, various liposome/microsphere/niosomes based

antifungal formulations of Amp B, nystatin and azole have been developed. The coadministration of such drugs along with immunomodulators tuftsin, protein A, muramyl peptide *etc* has been found to exert tremendous increase in efficacy of antifungal drugs.

The RD antigen based vaccine against tuberculosis developed in applicant's lab is being evaluated by **Gennova, Pune** for its prophylactic potential. In another such project that is being run in collaboration with one of the renowned biotechnology company, the nominee has developed liposome based formulations of some essential oils as well as other natural herbal products and in process of patenting these formulations.

Dr. Owais is also actively collaborating with some industries of **USA** to develop **nanoparticles based mouth fresheners**. The formulation is in final stage of trial and is likely to be launched in the market soon.

GENNOVA Biopharmaceuticals

To Whom it may concern

This letter is my personal recommendation for Dr. Mohammed Owais. I have seen the profile of Dr. Owais very closely who holds a distinguished record from his Ph.D. days till today specifically in the area of development of liposome-based formulations for the treatment of a range of infectious diseases. His pioneering work in development of nano-particle based delivery systems such as virosomes for gene packaging, liposomes and microspheres for vaccine development, gene therapy vectors and drug delivery systems are being currently exploited by some of the leading pharmaceutical and biotechnology companies to develop some novel drug formulations. Dr Owais work in the area of liposomes technology and nanoparticle has been featured as a cover page by reputed International journals (Molecular Medicine & FEMS-Immunology and Medical Microbiology). He has also developed liposome based antigen delivery vehicles, which can elicit strong immune response against model antigens in animals. Dr. Owais is also currently propagating idea of administering suitable drug formulation along with immunomodulators to combat infectious diseases.

Cadila Pharmaceuticals Ltd., India has sought help of Dr. Mohammed Owais in development of nanoparticle based novel antifungal formulations for treatment of opportunistic fungal infections under the PRDSF program of DST, Govt of India. This product is likely to have great market value and the formulations have been found to impart tremendous increase in efficacy of the drugs. Presently Gennova is evaluating liposome based vaccine delivery options for human phase I clinical trial which have been developed at Dr. Owais lab.

On a personal note, I would like to mention that it has been a pleasure to know a scientist like Dr. Owais, who has developed applied science area so well within academic environment. I wish him all the success in his endeavors and he may add more laurels to his illustrious career.

Yours Sincerely,

Sanjay Singh, Ph.D.
Chief Executive Officer

Gennova Biopharmaceuticals Limited
Plot No.: P-1, I.T. – B.T.Park, Phase – II, M.I.D.C., Hinjwadi, Pune – 411 057 (India) Phone Nos.: + 91 20 39821300 Fax: 91 20 – 39821441
Registered Office : Emcure house, T – 184, M.I.D.C., Bhosari, Pune – 411 026 (India)

Agreement for (re-)use of an illustration

June 10, 2005

Dr. Mohammad Owais
A.M. University - Int. Biotech. Unit
Int. Biotech. Unit,
AMU, Aligarh,
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U.P. 202002

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Dear Dr. Mohammad Owais

Co-administration of Immunomodulator tuftsin and Liposomised nystatin can combat less susceptible C. albicans infection in temporarily neutropenic mice / FEMSIM 41 (2004) 249-258

Your above-detailed article was recently published in FEMS Immunology and Medical Microbiology.

FEMS Publications Office is presently preparing the new cover for the Journal FEMS Immunology and Medical Microbiology for 2006 and would like to use Figure 1b from your article on the cover. The image accompanied by the legend would be used for all issues of FEMS Immunology and Medical Microbiology in 2006 and appear in miniature on the FEMS website and publisher's website. In addition, our publisher may use the cover for marketing purposes.

We understand that you are the copyright holder for this image. If you allow us to use the image, possibly with alterations to complement the cover design, could you please sign a copy of this agreement letter and send it to my attention, confirming that we may use the illustration as indicated, in both print and electronic versions of the Journal.

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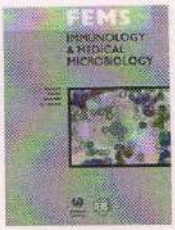
Thank you for your assistance.
Yours sincerely,

Dr Alenka Princic
FEMS Editorial Coordinator



Signed..... Date.....

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THE GREAT ARC
200 YEARS

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Email : samathan@nic.in

D O No. VII-PRDSF/103/05-

Date: 22.06.2007

Dear Dr. Owais,

I am forwarding herewith the minutes of the first year monitoring committee meeting of the project titled "Evaluation of Tuftsin-bearing polyene nanoparticles in combating some systemic murine fungal infections" among Aligarh Muslim University, Aligarh / M/s Cadila Pharmaceuticals Ltd., Ahmedabad held on 18.06.2007 at Ahmedabad for favour of your information & compliance. As and when you receive the industry contribution the same may be communicated to us for taking action to release DST share. Please ensure the observations of the monitoring committee during the second year so that you are able to contribute still more.

With kind regards,

Yours sincerely,

(G.J. Samathanam)

Dr. Owais Mohammed,
Senior Lecturer,
Interdisciplinary Biotechnology Unit,
Aligarh Muslim University,
Aligarh-202002

Copy to:

1. Dr. Rajiv I. Modi, Managing Director, M/s Cadila Pharmaceuticals Ltd., "Cadila Corporate Campus", Sarkhej – Dholka Road, Bhat, Ahmedabad – 382 210.
2. Dr. Bakulesh M. Khamar, Executive Director – Research, M/s Cadila Pharmaceuticals Ltd., "Cadila Corporate Campus", Sarkhej – Dholka Road, Bhat, Ahmedabad – 382 210 – with a request to consider the release of Cadila's second year contribution to AMU as recorded in the minutes. Please take action on the issues industry has to provide information to DST.
3. Shri V.K. Sharma, Advisor (Corporate Affairs), Cadila Pharmaceuticals Ltd., D-1011, New Friends Colony, New Delhi – 110 065

(G.J. Samathanam)

डॉ.जी.जे.समाथानम/Dr.G.J.SAMATHAN
वैज्ञानिक 'जी' / Scientist 'G'
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Biotechnology in the Service of Humanity

Message

Biotechnology is a frontier area of science with a high promise for the welfare of humanity. New generation of biotechnology developed as a result of intensive work in India has opened up research of national relevance. I am confident that fruits of biotechnology would be harnessed for the benefit of millions of our poor people as we move into the next millennium.

(Atal Bihari Vajpayee)
Prime Minister

Message

India is well poised to leapfrog towards a bio-industrial development by conserving and using the precious biodiversity of the country on a sustainable basis with the application of biotechnological tools.

(Dr. Murli Manohar Joshi)
Minister for HRD & Science and Technology

Significant Achievements

- A novel targeted gene delivery system dedicated for liver cells developed and patented in US.
- Identification of a mutation conferring resistance to HIV infection in Indian population.
- Cloning and sequencing of atleast six genes achieved, specially the seed storage, amino acids, biosynthetics and genes for plant defence, for enhancing the nutritional quality. A US patent granted for the seed storage protein gene.
- Plant tissue culture established as an industrial activity. 45 lakh plants of forest and horticulture species field planted in 4000 ha.; 40% increase in yield achieved in tissue cultured cardamom plants.
- Biobeneficiation and desulphurisation technologies perfected and transferred to industry, bioremediation field tested for wasteland recovery.
- Transgenic silkworm with luciferous gene can act as a bioreactor for producing proteins of agricultural and therapeutic importance.
- Biofertilizers and biopesticide formulations demonstrated on large scale in farmers' field; production units set up.
- 1000 genetically superior calves born through Embryo Transfer Technology (ETT), including 100 buffalo calves.
- Specific primers developed for sex determination of embryos; being used as a customerised service for farmers.
- Record production of over 10 tonnes/ha./year in two crops of prawns through semi-intensive aquaculture attained.
- Through intensive carp farming production level of 18 tonnes/ha./ year achieved.
- First indigenous recombinant vaccine strain for oral cholera, VA 1.3 and Rotaviral diarrhoea enter clinical trials.
- Three indigenous test systems perfected for detection of HIV-I and II, and Streptococcal infections, transferred to industry.
- Low cost nutritious food supplement for the school children being produced.
- Liposome intercalated Amphotericin B, a drug for curing systemic fungal infections and leishmaniasis commercialised.
- Skin culture technology for burn, nevi vitiligo, cord blood and bone marrow preservation technologies transferred to hospitals.
- Centres for DNA Fingerprinting; Plant Genome; Brain Research; a Golden Jubilee Women's Biotechnology Park and a Biovillage being established.
- Human resource development in 17 States and UTs; produced about 4000 trained students.
- A wide spread bioinformatics network with INTERNET based Biotechnology Service Provider established.
- Large number of biotechnology based programmes to benefit rural population, SC/ST and women successfully conducted.

Department of Biotechnology , Ministry of Science and Technology