Dow University of Health Sciences

Prospectus

BS Biotechnology

Session 2024-25

Dow College of Biotechnology (DCoB)

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Prof Mohammed Saeed Quraishy T.I
Vice Chancellor
Dow University of Health Sciences

MESSAGE BY VICE CHANCELLOR

It gives me joy to write this message for the prospectus of the Dow University of Health Sciences, Karachi. DUHS was established in 2004, with just three constituent colleges, and today we are a university with over 30 constituent and affiliated institutions and the most comprehensive health system in Pakistan.

This year, I am also proud to announce that Dow University of Health Sciences, Karachi has continued to enhance the vision of this University by striving to be the pre-eminent academic institution committed to changing and saving lives, as we have continued to place in the QS World University Rankings 2021, with an overall Rank of 401-450. This is a credit to the faculty of DUHS, and their commitment to enhance the learning experience offered to our students that we have achieved progress and prosperity globally, particularly within Asia.

This is also the year we are celebrating our 75th Anniversary of the founding of Dow Medical College, a symbol of scholarship and service to the community that has evolved into DUHS, with expanded program offerings, such as in the fields of the allied health and biomedical sciences, such as pharmacy, physical therapy, medical technology, biotechnology, nursing, public health, business administration, and course in radiology technology, nutritional sciences, midwifery, and optometry.

Furthermore, our symbol of academic excellence is fortified by our adoption of the latest technology, and affordable state-of-the-art healthcare offered, which informs the delivery of quality patient care at Dow University Hospital and our many affiliated healthcare centers and research and diagnostic laboratories. We stand committed to providing and creating a state-of-the-art infrastructure that fosters innovation, research and is evolving to meet the needs of the future, along with providing superior healthcare services today.

Today, we are striving to play a pivotal role in the early diagnosis and treatment of Covid-19 and in the future, I also stand committed to make Dow University of Health Sciences an empowered institution offering the best of the medical knowledge and quality health services.

I am confident that the doctors and health professionals of this institution will go on to contribute to this nation and serve globally with sincerity and ethics, in order to restore faith and humanity to the delivery of healthcare.

Good Luck to the incoming freshmen!

Prof. Dr. Mushtaq Hussain
Principal
Ph.D. (Genetics, Genomics and Systems Medicines)
University of Glasgow, UK

MESSAGE BY PRINCIPAL

It gives me immense pleasure to welcome the new batch of Dow College of Biotechnology. The world of science is fast-moving and progressing at a teeming pace. As a result, many new branches of science have been developed to entertain the need of time and to address emerging problems of the modern-day world. Biotechnology is one such branch of science, amalgamating classical and modern disciplines of both natural and physical sciences with a particular focus on seeking and developing practical applications of theoretical knowledge. Dow College of Biotechnology, an institute of the prestigious Dow University of Health Sciences, holds the same core theme in its foundation and the college is well regarded for imparting both academic and practical skills to the students.

Dow College of Biotechnology has progressed exceptionally well and is now known for its academics and research throughout the country. In recent times, research conducted at Dow College of Biotechnology during the COVID-19 pandemic has been praised both nationally and internationally and has led to some of the best research publications from Pakistan on SARS-CoV-2 with considerable theoretical and practical insights. Like many other leading Universities around the globe, the college also holds a dedicated fly research lab, the first and only in any public sector university in Pakistan.

The college holds a large sum of Ph.D. faculty actively engaged in research and teaching activities. To ensure the translation of theoretical knowledge into practical application, students are encouraged to get engaged with small to advanced-level research projects with faculty as they move along during the four years of their studies. This approach makes Dow College of Biotechnology unique amongst its contemporaries.

Dow College of Biotechnology maintains strong linkages with the industries to keep students aware of their recent developments and demands. The college has developed academic and research collaborations with some of the prestigious International Universities. With a team of highly competent faculty and supporting staff, I am confident that we will extend our utmost support to the students to excel in their respective careers.

I wish all the best to the prospective students at Dow College of Biotechnology, God Speed.

VISION STATEMENT DUHS

To Be a Pre-Eminent Academic Institution Committed to Changing and Saving Lives

MISSION STATEMENT

Providing Outstanding Patient Centered Education, Training and Clinical Care Informed by Cutting Edge Research and Innovation Generating and Disseminating New Knowledge

INTRODUCTION OF DOW COLLEGE OF BIOTECHNOLOGY

DOW COLLEGE OF BIOTECHNOLOGY

Dow College of Biotechnology (DCoB) is a constituent College of the Dow University of Health Sciences. The college is stationed in the graceful building of Dow Research and Diagnostics Complex. The college is centrally air-conditioned and spread over 30,000 sq ft. The college has 3 lecture halls, 1 seminar hall, 3 academic labs, 3 research labs, 1 library, dedicated thesis writing and discussion rooms for the students, and the girls' common room. The college has a bioinformatics suite with 27 computers augmented with a battery of related modern softwares. The college also housed a unique research facility dubbed as "Dow Fly Research Lab and Stock Center". The first of its kind in any public sector university in Pakistan. Additionally industrial scale 500L bioprocessing unit is also near commissioning. The BS-Biotechnology curriculum has been regularly modernized and meticulously designed to produce competent human resources in the field of biotechnology, and to train the graduates to apply the gained scientific knowledge to address locally prevalent health, environmental, food, and industrial issues. The college is also catering to the postgraduate teaching and research of M. Phil. and Ph.D. studies enrolled in the field of biotechnology and other natural and clinical sciences at Dow University of Health Sciences.

Scope of Biotechnology in Pakistan

Biotechnology is the applied flank of the life sciences and/or biological sciences. The recent advancement in the drug discovery, genetic interventions of the diseases, vaccine development and high yielding plant varieties and better performing livestock breeds are by and large the product of Biotechnology. Intrinsically, Biotechnology is a multidisciplinary science that seek the conversion of knowledge generated in the fields of genetic engineering, cell and tissue culture, stem cells, molecular biology, microbiology, biochemistry, vaccinology, virology, and bioinformatics to applications directed to resolve industrial, agriculture, health and environmental issues. Pakistan relies heavily on the imported items in health and industrial sectors, this in turn present huge opportunities where biotechnologist could easily fit in as a integral component of the industry or establishing a standalone business.

Some of these biotechnology driven enterprises, but not limited are as follows:

- To produce r-DNA products, monoclonal antibodies, vaccines, diagnostics, anticancer drugs, insulin, skin grafting, and the development of tissue-specific delivery methods.
- To produce safe, efficient, and cost-effective industrial chemicals and enzymes for textile, paper, sugar, and food industries.
- To produce a wide range of GM crops, bio-fertilizers, and bio-pesticides.
- To improve environmental conditions through soil and water remediation, oil spillage, water, and sewerage treatment.
- To develop vaccines and other forms of immunotherapies against human and live stock diseases.
- To produce fermentation-based products, cheese, yeast, wine, beer, yogurt, food additives, etc.

The curriculum of the BS biotechnology is designed specifically considering these themes. thereby, graduates of Dow College of Biotechnology are placed at prestigious institutes and industries in Pakistan and abroad in the areas of research and development, drug manufacturing, quality control, and academia.

Objectives of the Program

- To develop strong theoretical and practical foundations amongst graduates in different disciplines of science that coalesce in biotechnology.
- To provide challenges that instigate students to transform their theoretical knowledge into practical solutions.
- To enhance critical thinking and interrogative analytical skills amongst the graduates.

Eligibility Criteria of the Candidate

- HSSC Intermediate Science (Pre-Medical or Pre-Engineering)/ A-Level or Equivalent, Min. 60% marks or equivalent only certified by IBCC.
- Candidate’s holding domicile of Sindh Province.

Seat Distribution for BS-Biotechnology Course at Dow College of Biotechnology

Dow College of Biotechnology offers a total of 100 seats, which are filled on a merit basis.

Rules for Payment Fee:

Fee Structure of DCOB

SESSION 2024-25

Amount in PKR.

FEE TYPE	BS DCOB
Admission Fee (Once only)	45,000
Tuition Fee (Yearly)	172,560
Transportation Fee (Optional)	43,000 per year
Documentation Verification Charges (Once only)	2,500
Library Fee (Yearly)	10,000
Student Activity Fee (Yearly)	10,000
TOTAL	**283,060**

RULES FOR THE PAYMENT OF FEE

1. Fees of succeeding years are to be paid within ONE MONTH of issuance of fee vouchers or within the due date provided
2. In case the fee is not submitted during the given specified time, late payment charges will be charged as follows

First Month (After Lapse of First Month)	2.5%
Second Month	5%
Third Month	7.5%
Fourth Month	10%

   After four months of non-payment, the seat is liable to be cancelled and student will not be allowed to appear in any examination
3. Fee of all categories shall be increased by 10% every year
4. Fee deposited is refundable as per the Refund Policy guidelines of the DUHS
5. Taxes will be applied as per the FBR and Government rules
6. Hostel and Transport fee will be valid till the December of every year
7. Amounts stated in the fee vouchers are excluded of all Bank charges
8. The Fee Structure may be revised by the university at any time during the course of the study, due to unavoidable circumstances
9. Associated fees will be charged as per fee structure.

Career Prospects/ Opportunities

Biotechnology is an interdisciplinary science that provides a fascinating platform to grow and experience the diverse fields of science and technology. It is revolutionizing new prospects and developments to improve the quality of human life. Due to the strong academic and practical training provided to biotechnology graduates, they are among the top choice of academic, research, and industrial employers. Biotechnology also offers a wide range of career opportunities related to academics and research in various Institutes and Universities. It also provides innovative and exciting job opportunities in scientific and administrative sectors. Demand for biotechnology products is rising in Pakistan therefore, there is a huge scope for biotechnology students in terms of jobs and entrepreneurship. After completing their graduation, biotechnologists will be able to choose their career in research and development sectors of various industries including textile, food, biofuel production, cosmetics, etc. They can also find their career in diagnostic laboratories and pharmaceutical industries. The horticulture industry and agriculture biotechnology laboratories and research centers are also a captivating target for newly graduated biotechnologists. Students graduate from Biotechnology secure positions at esteemed institutions and industries both nationally and internationally, focusing on research and development, drug design, quality control, and academia.

Recognition by Governing Bodies/Councils

The curriculum has been designed following the centralized BS-Biotechnology curriculum of HEC-2024. The BS-Biotechnology program is approved by the syndicate of Dow University of Health Sciences and the curriculum is approved by the Higher Education Commission, Pakistan.

Curriculum

BS Biotechnology at DUHS is a four-year degree program comprising eight semesters in total. The course layout is prescribed by the Higher Education Commission (HEC) of Pakistan, which consists of 48 courses of 138 credit hours. The BS Biotechnology curriculum at DCoB is laced with upgraded and updated theoretical knowledge of different disciplines of life sciences but also extensively flanked with pertinent practical exercises.

STRUCTURE

Categories	No. of Courses	Credit hours
General Education Courses	13	32
Disciplinary/ Major Courses	29	85
Interdisciplinary/ Allied Courses	4	12
Internship		3
Capstone Project	2 (Research Thesis) or (Project + Media in Sciences)	(6 or 3+3)
Total	**48**	**138**

Total number of credit hours: 138

Duration: Minimum 4 years, Maximum 6 years

Number of semesters: 8

Course load per semester 15-21 credit hours

Semester duration: 16-18 weeks

Number of courses per semester: 5-7

BS-BIOTECHNOLOGY (4 YEAR) CURRICULUM DESIGN

General Education Courses 13 Courses 32 Credit Hours			
Subject	**Cr. hr**	**Subject**	**Cr. hr**
1. Natural Science-Principles of Biology	2+1	8. Social Sciences	2+0
2. Quantitative Reasoning I	3+0	9. Islamic Studies (Ethics for Non-Muslim Students)	2+0
3. Functional English	3+0	10.Time Management & Organization skills	2+0
4. Application of Information & Communication Technologies (ICT)	2+1	11. Civics & Community Engagement	2+0
5. Arts & Humanities	2+0	12. Entrepreneurship	2+0
6. Quantitative Reasoning II	3+0	13. Ideology & Constitution of Pakistan	2+0
7.Expository Writing	3+0		

Disciplinary/ Major		Interdisciplinary/ Distribution Courses		Capstone Research Project	
29 Courses		4 Courses		2 Courses	
85 Credit Hours		12 Credit Hours		6 Credit Hours	
Subject	**Cr. hr**	**Subject**	**Cr. hr**	**Subject**	**Cr. hr**
1. Cell Biology	3+0	1. Organic Chemistry	3+0	1. Research Project I / Media in Science	3+0
2. Biochemistry-I	2+1	2. Ecology & Biodiversity	3+0	2. Research Project II	3+0
3. Biochemistry-II	2+1	3. Physical Chemistry	3+0		
4. Microbiology	2+1	4. Biophysics	3+0		
5. Principles of Genetics	3+0				
6. Analytical Chemistry & Instrumentation	2+1				
7. Molecular Biology	2+1				
8. Introduction to Biotechnology	3+0				
9. Immunology	3+0				
10. Methods in Molecular Biology	2+1				
11. Biostatistics	3+0				
12. Microbial Biotechnology	2+1				
13. Bioinformatics	2+1				
14. Recombinant DNA technology	2+1				
15. Agriculture Biotechnology	3+0				
16. Principles of Biochemical Engineering	3+0				
17. Genomics & Proteomics	3+0				
18. Food Biotechnology	2+1				
19. Scientific Inquiry& Research Methods	3+0				
20. Industrial Biotechnology	2+1				
21. Health Biotechnology	3+0				
22. Biosafety, Biosecurity & Bioethics	2+0				
23. Artificial Intelligence in Biotechnology	2+0				
24. Virology	3+0				
25. Nanobiotechnology	2+1				
26. Environmental Biotechnology	2+1				
27. Molecular Diagnostics	3+0				
28. Seminar	3+0				
29. Cell & Tissue Culture	3+0				

ASSESSMENT METHODS

The examinations for BS Biotechnology are conducted semester-wise through a centralized examination department. Assessments are both theoretical and practical based on the requirements of a specific course. An internal evaluation by the respective faculty members based on pre-defined scoring criteria is also included in the assessment. A student needs to pass the previous semester's courses, including any prerequisites, before moving on to the next semester. All 48 courses, including disciplinary and interdisciplinary courses along with credit hour-based capstone research projects, must be passed to claim the degree.

NUMBER OF STUDENTS GRADUATED AND STUDYING

Year of Enrollment	No. of Students Enrolled	No. of Students Graduated
2016	76	68
2017	100	93
2018	100	97
2019	100	93
2020	100	92
2021	90	--
2022	96	--
2023	100	--
2024	100	--

Inauguration of the New Dedicated Building of Dow College of Biotechnology

The new dedicated building of Dow College of Biotechnology has been inaugurated on 15th March 2023. The formal inauguration was done by Prof. Dr. Ahsan Iqbal Choudhary, Federal Minister of Planning Commission and Development, Pakistan.

کراچی: ڈاؤ یونیورسٹی اوجھا کیمپس میں ایڈوانسڈ مالیکیولر جینیٹکس اینڈ جینومکس لیب کے افتتاح، ڈاؤ فلائی ریسرچ لیب اینڈ اسٹاک اور کالج آف بائیوٹیکنالوجی کے معائنے کے بعد مہمانِ خصوصی وفاقی وزیر پروفیسر احسن اقبال چوہدری اور وائس چانسلر پروفیسر محمد سعید قریشی خطاب کر رہے ہیں

FACILITIES

The Dow College of Biotechnology (DCoB) is a centrally air-conditioned facility holding a dedicated floor in the Dow Research and Diagnostics Complex located in the Southeast of the Dow University of Health Sciences, Ojha Campus. DCoB has three (03) state-of-the-art academic and research laboratories equipped with all basic and advanced instruments that are required for biotechnology research. DCoB also possesses a Dow Fly Research Lab and Stock Center and dedicated animal and plant cell culture laboratories. DCoB is holding three (03) lecture halls equipped with multimedia facilities and a capacity of 100 students in each. A dedicated and well-equipped seminar room for postgraduate students is also a part of the DCoB facility. The in-house advanced library with recent editions of all basic and advanced biotechnology books is also a part of DCoB to facilitate students' learning.

Academic and Research Laboratories

Dow Fly Research Lab and Stock Center

Dow College of Biotechnology has a dedicated Drosophila research facility “Dow Fly Research Lab and Stock Center”. The facility is the first of its kind in Pakistan in any public sector University. In addition to the research, the facility is also engaged in the Bioactive Molecule Screening, Oncogenicity and Teratogenicity testing, Hepatotoxicity, and Nephrolithiasis testing in animal models.

Bioinformatics Laboratory

A dedicated bioinformatics lab is equipped with high-technology equipment of 20 computers with updated software and servers, capable of doing a variety of bioinformatics analysis and effective learning.

Lecture Halls

The college has three large lecture halls and one seminar room for conducting lectures which are equipped with computers connected with multimedia to facilitate the delivery of lectures.

College Library

The DCoB library has a vast collection of multidisciplinary books covering the basic to advance levels of the all the subjects included in the BS biotechnology curriculum adopted at DCoB. The collection includes updated books on Biotechnology, Microbiology, Biochemistry, Bioethics Organic and Inorganic Chemistry, Physiology, Pathology, Immunology, Virology, Tissue Culture Techniques, Pharmaceutical Sciences, Plant Biotechnology, Industrial Biotechnology, Economics, Molecular Biology, Bioinformatics, Artificial Intelligence and Machine Learning.

Bioprocessing Unit

Dow College of Biotechnology is also furnished with a large-scale Bioprocessing Unit. This makes the college the first of its kind in Pakistan being equipped with industrial scale fermentation plant. The unit has a capacity of 500 L that is laced with all the gadgets linked with modern fermentation technology. The plant is commissioned to not only provide relevant research platform but also to provide students hands on experience of industrial scale production of biotechnological cellular and molecular products.

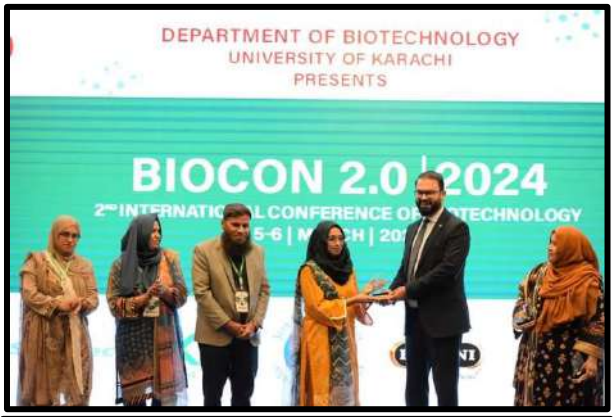
EXTRACURRICULAR ACTIVITIES

ORIENTATION DAY OF DCoB-2024

SPORTS TEAMS OF DCoB

MEDIA EXPOSURE OF DCoB STUDENTS

PARTICIPATION OF DCoB FACULTY AND STUDENTS IN NATIONAL AND INTERNATIONAL SCIENTIFIC EVENTS



ACHIEVEMENTS AND RECENT PRIZES AWARDED TO DCoB STUDENTS


DOW UNIVERSITY OF HEALTH SCIENCES
3D-Science Model
& Research
Poster


DOW UNIVERSITY OF HEALTH SCIENCES
3D-Science Model
& Research
Poster
Exhibition
History &
Creative
Arts
Date
Wednesday,
10th Jan,2024
Time
10:00 am
to
2:00 pm


CERTIFICATE


BUILT
BY HER 5.0
Innovation Challenge Finale
Winner PKR1,000,000
FILTERESHA

SELECTED INTERNATIONAL PUBLICATIONS OF DCoB FACULTY AND STUDENTS FROM 2020 ONWARDS

1. Shabbir, S., Hadi, A., Jabeen, N., & Hussain, M. (2024). Developmental exposure of antibiotics shortens life span and induces teratogenicity in *Drosophila melanogaster*. Toxicology Reports, 101784.

2. Fazil MM, Gul A, Jawed H. Optimization of silver nanoparticles synthesis via Plackett–Burman experimental design: in vitro assessment of their efficacy against oxidative stress-induced disorders. RSC advances. 2024;14(29):20809-23.

3. Gul A, Baig MN, Ahmed D, Najam Z, Aslam T, Ali S. Green Synthesis of Silver Nanoparticles from Spirulina platensis Extract: Antibacterial and Antioxidant Potential. BioNanoScience. 2024 Jun 6:1-0.

4. Siddiqui A, Gul A, Khan H, Anjum F, Hussain T. Bio-inspired synthesis of silver nanoparticles using *Salsola imbricata* and its application as antibacterial additive in glass ionomer cement. Nanotechnology. 2024 Jun 17;35(35):355101.

5. Siddiqui F, Tafur A, Hussain M, García-Ortega A, Darki A, Fareed J, Jiménez D, Bikdeli B, Galeano-Valle F, Fernández-Reyes JL, Pérez-Pinar M. The prognostic value of blood cellular indices in pulmonary embolism. American Journal of Hematology. 2024 May 30.

6. Khan SA, Anwar M, Gohar A, Roosan MR, Hoessli DC, Khatoon A, Shakeel M. Predisposing deleterious variants in the cancer-associated human kinases in the global populations. Plos one. 2024 Apr 18;19(4):e0298747.

7. Shahid F, Aman A, Qader SA. Synthesis and characterization of cross-linked aggregates of dextranase (CLAD) for improved stability and recycling efficiency of the biocatalyst. Biocatalysis and Agricultural Biotechnology. 2024 Jun 1;58:103151.

8. Khan S, Amin F, Amin R, Kumar N. Exploring the Effect of Cetylpyridinium Chloride Addition on the Antibacterial Activity and Surface Hardness of Resin-Based Dental Composites. Polymers. 2024 Feb 21;16(5):588.

9. Ullah, S., Kayani, H.A., Fatima, R., Naz, S. Haq, F., Hussain, Z. & Suhail, H. Surveillance Assessment and Morphological Identification of Culex Mosquito Found in Karachi, Pakistan. Journal of Xi'an Shiyou University, Natural Science Edition 2024 Jan; 20(1): 1107.

10. Mehdi F, Riaz Z, Javed U, Aman A, Galani S. Expression of Sucrose Metabolizing Enzymes in Different Sugarcane Varieties under Progressive Heat Stress. Frontiers in Plant Science.; 2023 October 16; 14:1269521.

11. Israr F, ul Hasan SM, Hussain M, Hasan A. Investigating In-Situ Expression of Neurotrophic Factors and Partner Proteins in Irreversible Pulpitis. Journal of Endodontics. 2023 Sep 3.

12. Amanullah A, Arzoo S, Aslam A, Qureshi IW, Hussain M. Inbreeding-Driven Innate Behavioral Changes in Drosophila melanogaster. Biology. 2023 Jun 28;12(7):926.

13. Khan N, Perveen K, Hussain M, Qadeer-Malik R, Sharafat S. Comparative Histological Analysis of Cerebellum of Representative Species of *Elasmobranchii.* International Journal of Morphology. 2023 Apr;41(2):383-8.

14. Mustansar T, Mirza T, Hussain M. RAS gene mutations and histomorphometric measurements in oral squamous cell carcinoma. Biotechnic & Histochemistry. 2023 Apr 5:1-9.

15. Kamran DE, Hussain M, Mirza T. Investigating In-Situ Expression of c-MYC and Candidate Ubiquitin-Specific Proteases in DLBCL and Assessment for Peptidyl Disruptor Molecule against c-MYC-USP37 Complex. Molecules. 2023 Mar 7;28(6):2441.

16. Gul A, Ahmed D, Fazil MM, Aslam T, Rashid MA, Khan H, Ali A, Ali S. Biofabrication of silver nanoparticles using Spirulina platensis: In vitro anti-coagulant, thrombolytic and catalytic dye degradation activity. Microscopy Research and Technique. 2023 May 26.

17. Wajdan N, Aslam K, Amin R, Khan S, Ahmed N, Lal A, AlHamdan EM, Vohra F, Abduljabbar T, Heboyan A. Anti-fungal efficacy of Miswak Extract (Salvadora Persica) and commercial cleaner against Candida albicans on heat cured polymethylmethacrylate denture base. Journal of Applied Biomaterials & Functional Materials. 2023 Apr; 21:22808000231165666.

18. Shahbaz U, Basharat S, Javed U, Bibi A, Yu XB. Chitosan: a multipurpose polymer in food industry. Polymer Bulletin. 2023 Apr;80(4):3547-69.

19. Hussain M, Siddiqui F, Omer SM, Amanullah A, Jabeen N, Kantarcioglu B, Fareed J. Molecular Systems Network Predicts Sars-Cov-2 NSP3 and Orf6 Role in COVID-19 Related Thrombotic Events. Blood. 2022 Nov 15;140(Supplement 1):11216-7.

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21. Hussain M, Amanullah A, Aslam A, Raza F, Arzoo S, Qureshi IW, Waheed H, Jabeen N, Shabbir S, Sayeed MA, Quraishy S. Design and immunoinformatic assessment of candidate multivariant mRNA vaccine construct against immune escape variants of SARS-CoV-2. Polymers. 2022 Aug 10;14(16):3263.

22. Ali S, Shalim E, Farhan F, Anjum F, Ali A, Uddin SM, Shahab F, Haider M, Ahmed I, Ali MR, Khan S. Phase II/III trial of hyperimmune anti-COVID-19 intravenous immunoglobulin (C-IVIG) therapy in severe COVID-19 patients: study protocol for a randomized controlled trial. Trials. 2022 Nov 8;23(1):932.

23. Gul A, Khan S, Arain H, Khan H, Ishrat U, Siddiqui M. Three-phase partitioning as an efficient one-step method for the extraction and purification of bromelain from pineapple crown waste. Journal of Food Processing and Preservation. 2022 Nov;46(11):e16973.
24. Hussain M, Amanullah A, Aslam A, Raza F, Arzoo S, Qureshi IW, Waheed H, Jabeen N, Shabbir S, Sayeed MA, Quraishy S. Design and immunoinformatic assessment of candidate multivariant mRNA vaccine construct against immune escape variants of SARS-CoV-2. Polymers. 2022 Aug 10;14(16):3263

25. Zainulabid UA, Mat Yassim AS, Hussain M, Aslam A, Soffian SN, Mohd Ibrahim MS, Kamarudin N, Kamarulzaman MN, Hin HS, Ahmad HF. Whole genome sequence analysis showing unique SARS-CoV-2 lineages of B. 1.524 and AU. 2 in Malaysia. PloS one. 2022 Feb 25;17(2):e0263678.

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27. Shabbir A, Waheed H, Ahmed S, Shaikh SS, Farooqui WA. Association of salivary Cathepsin B in different histological grades among patients presenting with oral squamous cell carcinoma. BMC Oral Health. 2022 Mar 8;22(1):63.

28. Aman A, Shahid F, Pervez S. Exploration of a three-dimensional matrix as micro-reactor in the form of reactive polyaminosaccharide hydrogel beads using multipoint covalent interaction approach. Biotechnology Letters. 2022 Feb;44(2):299-319.

29. Gul A, Siddiqui M, Arain H, Khan S, Khan H, Ishrat U. Extraction, partial purification and characterization of bromelain from pineapple (Ananas comosus) crown, core and peel waste. Brazilian Archives of Biology and Technology. 2021 Jul 5;64.

30. Majeed MM, Ahmed I, Roome T, Fatima T, Amin R. Association between interleukin-1β gene polymorphism and chronic periodontitis. European Journal of Dentistry. 2021 Jul 24;15(04):702-6.

31. Batool TS, Hussain M, Masnoon J, Abdullah A, Ali S, Shahzad S, Raza S. Investigating sequence variation in the PNPi protein gene of Puccinia striiformis f. sp. tritici and its interaction with wheat NPR1 protein. Journal of Plant Pathology. 2021 Nov; 103:1231-41.

32. Khan ZM, Waheed H, Khurshid Z, Zafar MS, Moin SF, Alam MK. Differentially expressed salivary proteins in dental caries patients. BioMed Research International. 2021 Oct 14;2021.

33. Raza F, Hussain M. Birth and death of CYLD paralogues in vertebrates. Gene Reports. 2021 Sep 1; 24:101190.

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36. Amin R, Khan S, Zeb TF, Ali S, Baqai N, Baqai M, Shuja S. Knowledge and attitudes toward genetically modified (GM) food among health sciences university students in Karachi, Pakistan. Nutrition & Food Science. 2021 Sep 6;51(7):1150-62.

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RESEARCH GRANTS AWARDED TO DCoB FACULTY

1. Cannabis Derived Bioactive Molecules, Funded by Swiss Pharmaceuticals (Pvt) Ltd. (August 2024)

2. Attenuation of NLRP3 Inflammasome Pathway in Human Synovial Cells using Ticagrelor Nano-formulation. Funded by Vice Chancellors' Seed Funding (VCSFI-2023), Dow University of Health Sciences, Karachi-Pakistan.

3. Green Synthesis of Silver (Ag) Nanoparticles from *In-vitro* Propagated *Cannabis Sativa L*. Cultures: Characterization and Exploring the Therapeutic Potential in Animal Model of Neurodegenerative Disorders. Funded by Vice Chancellors' Seed Funding (VCSFI-2023), Dow University of Health Sciences, Karachi-Pakistan.

4. Whole Genome Sequencing of Microbiota of *Drosophila*, GetGenome, UK.

5. Establishment of Cost-effective Platform for Screening Toxicity of Snake Venom using Drosophila melanogaster. Funded by Vice Chancellors' Seed Funding (VCSFI-2023), Dow University of Health Sciences, Karachi-Pakistan.

6. Production and Recovery of Citric Acid from Indigenously Isolated Aspergillus niger. Funded by Vice Chancellors' Seed Funding (VCSFI-2023), Dow University of Health Sciences, Karachi-Pakistan.

7. BioRaff-Spray wound with Sprite. Funded by Vice Chancellors' Seed Funding (VCSFI-2023), Dow University of Health Sciences, Karachi-Pakistan.

8. UNESCO Green chemistry Research Grant on Development of biodegradable composite food packaging film infused with bioinspired nanoparticles and its utilization in increasing the shelf life of climacteric fruits, June 2023.

9. "Novel approach to combat antimicrobial resistant fungal infections by epigenetic regulation; Expression profiling of histone deacetylases and screening of novel deacetylases inhibitors as potential therapeutic agents for antifungal resistant *C.albicans* infection. Research grant, Awarded by Health Research Institute (HRI), National Institute of Health (NIH) Grant No: SG/22/R3-20/RDC/1640. (1.8 million PKR-Dated: 14-04-2023).

10. Polymorphism in IFN-γ and IL-10 genes and risk of Mtb infection in type II diabetes patients in Karachi, Pakistan. Research grant, Awarded Health Research Institute (HRI), National Institute of Health (NIH). Grant No: SG-22/R3-27/RDC/DUHS/2025.
(2 million PKR 1.5Yr-Dated: 25-05-2023).

11. "Development of Dow Fly Research Lab and Stock Center", Funded by Dow University of Health Sciences (1.4 million PKR).

12. "Poultry Vaccine against Ranikhet, Bird Flu and Gumboro using Indigenous Viral Strain" Funded by Funded by Dow University of Health Sciences (3 million PKR).

13. "In-Vitro and in-Vivo Studies of Camel Milk Proteins and Peptides - A Potential Therapeutic Approach towards Liver Cirrhosis", Awarded by International Foundation for Science (IFS), Swedon.

14. "Small Variations for Big Changes", Awarded by European Society for Evolutionary Biology (ESEB), UK.

15. "Screening COVID-19 Vaccinated and Unvaccinated Population for Hematological Markers, Awarded by Loyola University, Chicago-USA.

16. "Development of Thrombosis Model for Screening of Antithrombotic Drugs", Awarded by Loyola University, Chicago-USA

17. "Demonstration and Promotion of a Series of Tuberculosis Treatment and Prevention Products", Awarded by Institute of Biophysics-Chinese Academy of Sciences (IBP-CAS), China.

18. "Development of Pilot Scale System for Phycoremediation of Textile Effluent with Concomitant Production of Algal Biomass", Awarded by Higher Education Commission, Pakistan.

19. "Development of Raloxifene-Loaded Self-Nanoemulsifying Drug Delivery System (SNEDDS) with Enhanced Bioavailability Potential: A Therapeutic Implication in

Osteoporosis", Awarded by Higher Education Commission, Pakistan.

20. "Evaluation of Anti-Rheumatic Potential of Ticagrelor in Rheumatoid Arthritis Fibroblast-like Synoviocytes via Modulation of NLRP3 Inflammasome", Awarded by Higher Education Commission Sindh, Pakistan.

21. "Error Rate and Coefficients Quantification of Neurological Defects due to Consanguineous Mating using *Drosophila melanogaster* Model", Awarded by Vice Chancellors' Seed Funding Initiative (VCSFI), Karachi, Pakistan

22. "Development of *Drosophila melanogaster*-Based Assay System for Screening of Carcinogenic Compounds", Awarded by Vice Chancellors' Seed Funding Initiative (VCSFI), Karachi, Pakistan.

23. "Isolation, Purification and Characterization of Bioactive and Anti-cancerous Small Molecules from *Oxalis corniculate*", Awarded by Vice Chancellors' Seed Funding Initiative (VCSFI), Karachi, Pakistan.

24. "Osteoinductive Potential of Selenium Nanoparticles via Regulation of Oxidative Stress in Human Umbilical Cord Derived-Mesenchymal Stem Cells: A Promising Therapeutic Approach in Bone Disorders", Awarded by Vice Chancellors' Seed Funding Initiative (VCSFI), Karachi, Pakistan.

25. "*In-vitro* Propagation and Enhanced Cannabinoids Production of *Cannabis Sativa* L. (Industrial Hemp)", Awarded by Vice Chancellor's Seed Funding Initiative (VCSFI), Karachi, Pakistan.

26. "Investigating Protein Interaction of Cancer Associated Ubiquitin Specific Proteases", Awarded by Higher Education Commission, Pakistan.

27. "Establishment of high cell density culture of *Sacchromyces boulardii* and scale up using bench scale bioreactor": Demonstration of lab scale probiotic production", Awarded by Higher Education Commission, Pakistan.

28. "Development of first Commercial scale citric acid production plant in Pakistan by submerged fermentation of *Aspergillus niger* using cane molasses as raw material; A milestone yet to be achieved", Awarded by Higher Education Commission, Pakistan.

29. "Hemicellulosic furfural production from sugarcane bagasse", Awarded by Higher Education Commission, Pakistan.

30. "Plantation drive for *Moringa olifera* (Sohanghna) plant across university campus and awareness campaign regarding its nutritional and medicinal value", Awarded by Higher Education Commission, Pakistan.

31. "Mass production of commercially important micro algae through distillery effluent and selection of specific algal strains", Awarded by Pak Ethanol (PVT) Limited, Pakistan.

INTERNATIONAL INSTITUTIONAL LINKAGES

Dow College of Biotechnology has strong collaborative research links with universities around the world. The numbers are growing each year.

- Loyola University, USA
- Chapman University, USA
- Niversite de Lausanne Hospital Opthalmique Jules-Gonin Lausanne, Switzerland
- Department of Pathology and Immunology PATIM, University of Geneva, Switzerland
- Universiti Malaysia Pahang (UMP), Malaysia
- RHnanopharmaceuticals, USA
- Universite de Lausanne Hospital Opthalmique Jules-Gonin Lausanne, Switzerland
- Department of Pathology and Immunology PATIM, University of Geneva, Switzerland

NATIONAL INSTITUTIONAL LINKAGES

Dow College of Biotechnology has also established scientific collaboration with various national institutes and universities.

- Swiss Pharmaceuticals (Pvt) Ltd
- Sindh Institute of Animal Health (SIAH)
- Usman Institute of Technology (UIT)
- International Center for Chemical and Biological Sciences (ICCBS), University of Karachi
- Shaheed Benazir Bhutto Women University (SBBWU), Peshawar
- Z.H.Z Centre of Proteomics, University of Karachi
- Institute of Sustainable Halophyte Utilization (ISHU), University of Karachi
- Dr. A. Q. Khan Institute of Biotechnology and Genetic Engineering (KIBGE), University of Karachi
- Jinnah University for Women, Karachi
- Shaheed Zulfikar Ali Bhutto Institute of Science and Technology (SZABIST)

FUTURE PROSPECTS

BS Biotechnology opens a wide range of career opportunities due to the multidisciplinary nature of the program. Globally, Biotechnology is an emerging field of science with an ever-increasing demand for biotechnology graduates. The past two years of the COVID-19 pandemic have profoundly demonstrated the importance of Biotechnology. The curriculum of BS Biotechnology at Dow College of Biotechnology would put students in a strong position in the market for careers not only in the Biotechnology in general but concomitantly in Genetic Engineering, Cell & Molecular Biology, Stem Cell Therapy and Regenerative Medicine, Biochemistry, Molecular Genetics, Microbiology, Molecular Diagnostics, and Bioinformatics. Research and development opportunities can also be availed by BS Biotechnology graduates not only in hospitals and public health laboratories but also in major pharmaceuticals, food, and agriculture industries.

Students graduating from this program will be prepared for jobs that provide research and development breakthrough products. The BS Biotechnology graduates could comfortably find their niche in industries where technologies are in development and/or in application and to combat debilitating and rare diseases, reduce environmental footprint, alternate energy sources, and cost effective and ecofriendly industrial manufacturing processes. Additionally, a BS Biotechnology degree may also be useful for careers in Ecology, Forensic Medicine, Science Writing, and Environmental Science.

Many students who have been graduated from Dow College of Biotechnology have secured positions at esteemed research institutions and industries, both in Pakistan and abroad. Their career paths encompass various sectors, including research and development, drug manufacturing, quality control, and academia. This success is a testament to the college's comprehensive educational programs and strong industry connections that enable student to meet the challenge of dynamically evolving academia and industry, once graduated.

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