Dr. Bilal Azab

b.azab@ju.edu.jo / azab.belalm@gmail.com

A Human molecular geneticist with 10 years post Ph.D. experience in academic, research and diagnostic institutions. Possess strong expertise in gene curation, variant interpretation, and genetic testing development, validation, implementation, and reporting. Interested in utilizing genomic knowledge to transition individual prognosis, diagnosis, treatment, and precision medicine.

Career Experience

The University of Jordan, Amman, Jordan — 2013 – present

Tenured Associate Professor

Molecular research Core Director

Secured several grants (refer to Grants section of this document) to elucidate the variants spectrum of inherited diseases in the Jordanian population. Researched and configured platforms to perform tests for hereditary diseases. Also supervised graduate students research projects and taught genetics courses to medical students, graduate students, and residents.

Acquired multiple research grants and collaborated with a group of physicians at the University of Jordan and the Jordan University of Science and Technology. Engaged in research to understand the genetic etiology of hereditary diseases in the Jordanian population. The findings are published in a series of manuscripts delineating the spectrum of variants in Jordanian patients.

- Ocular Genetics: Collaborating with Dr. Sami Amr at Partners Healthcare to identify disease-causing variants in consanguineous Jordanian families who have a history of inherited retinal dystrophies. Investigated the clinical variability in the affected individuals. Examined the exomes of approximately 80 families with 300 affected members.
- Muscular Dystrophy (MD) and cerebellar ataxia: investigated affected consanguineous families whose previous clinical assessments failed to clarify the disease type and/or misdiagnosed patients.
- Rare pediatric gastrointestinal (GI) disorders: Implemented genetic approaches to attain the proper diagnosis of families with rare pediatric GI disorders.
- Congenital Heart Diseases (CHD): Collaborating with Dr. Saquib Lakhani at the Yale pediatric genome discovery program to exome sequenced a trio cohort of families with CHD to identify the disease that causes the genes and elucidate the consequent phenotypic impact of the filtered variants.

Developed the molecular diagnostic services infrastructure and initiated testing for *BRCA1/2* hereditary breast cancer, hearing loss, and Wilson's disease.

Prevention Genetics LLC, Marshfield, WI — 2020

Associate Human Molecular Geneticist

Conduct in-depth sequence data analyses and prepare clinical molecular reports delivering genetic testing results. Develop and validate new diagnostic tests, implement, and market these tests.

- Interpret testing results for a wide variety of diseases such as hearing loss, hereditary spastic paraplegia, cerebral palsy, vision and prenatal disorders.
- Develop NGS based gene panel or whole-exome tests and validate/ supplement them utilizing Sanger sequencing and microarray.
- Perform variant classification and update the internal Prevention Genetics (PG) variant databases according to the ACMG and PG guidelines.
- Participate in "special projects" through working with clients from pharmaceutical companies in testing patient cohorts affected with certain genetic diseases.

Bilal Azab, Ph.D.

Partners HealthCare Personalized Medicine, Harvard, Boston, MA 2016
Visiting Scientist, Translational Genomics Core
Performed exome sequence for a cohort of inherited retinal dystrophies patients. Utilized ACMG protocols to interpret the variants.

Medical College of Virginia, Virginia Commonwealth University, Richmond, VA 2011 – Present
Affiliate Researcher, Department of Human and Molecular Genetics (2012 – Present)
Visiting Scientist, Clinical Molecular Genetics, Clinical Pathology (2011 – 2012)
Completed the Molecular Pathology Practicum program in which conventional molecular techniques I utilized in research are applied in a diagnostic setup. Accumulated knowledge and experience of various molecular procedures. Validated clinical genetic tests and interacted daily with the clinical molecular fellow. Acquired a better understanding of the concepts, environment, and technical aspects of a molecular diagnostics facility.

Education

Ph.D., Human and Molecular Genetics
Medical College of Virginia
Virginia Commonwealth University
Richmond, Virginia (2011)
Developed approaches for enhancing cancer gene therapy utilizing chimeric adenoviral delivery vehicles and dissected the molecular pathways of genes involved in cancer resistance, sensitization, apoptosis and autophagy. Also, studied Treacher Collins Syndrome through recapitulating its associated phenotypes in a mouse model.

Post-Baccalaureate Diploma
Business Administration
School of Business
Virginia Commonwealth University
Richmond, VA (2011)

Bachelor of Science (B.Sc.)
Biotechnology and Genetic Engineering
Jordan University of Science and Technology
Irbid, Jordan. (2003)

Publications
46 manuscripts since 2010

1. Al-Iede M, Khanfar M, Srour L, Rabah R, Al-Abbadi M, **Azab B**, Badran EF. A homozygous variant in ABCA3 is associated with severe respiratory distress and early neonatal death. Congenit Anom (Kyoto). 2021 Nov;61(6):231-233. doi: 10.1111/cga.12437. Epub 2021 Aug 18. PubMed PMID: 34245068.
2. Saleh T, El-Sadoni M, Alhesa A, Awad H, Jaradat M, Al-Hazaimeh M, Dawoud R, Mryyian A, **Azab B**. Expression of Senescence and Apoptosis Biomarkers in Synchronous Bilateral Breast Cancer: A Case Report. Curr Oncol. 2021 Sep 30;28(5):3836-3845. doi: 10.3390/curroncol28050327. PubMed PMID: 34677245; PubMed Central PMCID: PMC8535022.
3. Saleh T, Alhesa A, Al-Balas M, Abuelaish O, Mansour A, Awad H, El-Sadoni M, Carpenter VJ, **Azab B**. Expression of therapy-induced senescence markers in breast cancer samples upon incomplete

response to neoadjuvant chemotherapy. Biosci Rep. 2021 May 28;41(5). doi: 10.1042/BSR20210079. PubMed PMID: 33948615.

4. **Azab B**, Dardas Z, Aburizeg D, Al-Bdour M, Abu-Ameerh M, Saleh T, Barham R, Maswadi R, Ababneh NA, Alsalem M, Zouk H, Amr S, Awidi A. Unique Variant Spectrum in a Jordanian Cohort with Inherited Retinal Dystrophies. Genes (Basel). 2021 Apr 19;12(4). doi: 10.3390/genes12040593. PubMed PMID: 33921607; PubMed Central PMCID: PMC8074154.

5. Mashal S, Khanfar M, Al-Khalayfa S, Srour L, Mustafa L, Hakooz NM, Zayed AA, Khader YS, **Azab B.** *SLC30A8* gene polymorphism rs13266634 associated with increased risk for developing type 2 diabetes mellitus in Jordanian population. Gene. 2021 Feb 5;768:145279. doi: 10.1016/j.gene.2020.145279. Epub 2020 Nov 5. PubMed PMID: 33161057

6. Altamimi E, Khanfar M, Rabab'h O, Dardas Z, Srour L, Mustafa L, **Azab B.** Effect of genetic testing on diagnosing gastrointestinal pediatric patients with previously undiagnosed diseases. Appl Clin Genet. 2020;13:221-231. doi: 10.2147/TACG.S275992. eCollection 2020. PubMed PMID: 33364809

7. Abu-Helalah M, **Azab** B, Mubaidin R, Ali D, Jafar H, Alshraideh H, Drou N, Awidi A. BRCA1 and BRCA2 genes mutations among high risk breast cancer patients in Jordan. Sci Rep. 2020 Oct 16;10(1):17573. doi: 10.1038/s41598-020-74250-2. PubMed PMID: 33067490

8. **Azab B**, Dardas Z, Rabab'h O, Srour L, Telfah H, Hatmal MM, Mustafa L, Rashdan L, Altamimi E. Enteric anendocrinosis attributable to a novel Neurogenin-3 variant. Eur J Med Genet. 2020 Sep;63(9):103981. doi: 10.1016/j.ejmg.2020.103981. Epub 2020 Jun 20. PubMed PMID: 32574610.

9. Alsalem M, Altarifi A, Haddad M, **Azab B**, Kalbouneh H, Imraish A, Saleh T, El-Salem K. Analgesic Effects and Impairment in Locomotor Activity Induced by Cannabinoid/Opioid Combinations in Rat Models of Chronic Pain. Brain Sci. 2020 Aug 6;10(8). doi: 10.3390/brainsci10080523. PubMed PMID: 32781705; PubMed Central PMCID: PMC7547378.

10. Alsalem M, Aldossary SA, Haddad M, Altarifi A, Kalbouneh H, Azab B, Mustafa AG, Jaffal SM, El-Salem K. The desensitization of the transient receptor potential vanilloid 1 by nonpungent agonists and its resensitization by bradykinin. Neuroreport. 2020 Aug 5;31(11):781-786. doi: 10.1097/WNR.0000000000001485. PubMed PMID: 32618816.

11. Ababneh N A, Ali D, Al-Kurdi B, Sallam M, Alzibdeh A M, Salah B, Ryalat A T, **Azab B**, Sharrack B, Awidi A. Identification of APTX disease-causing mutation in two unrelated Jordanian families with cerebellar ataxia and sensitivity to DNA damaging agents. PLoS One 2020;15(8):e0236808. doi: 10.1371/journal.pone.0236808. eCollection 2020. PubMed PMID: 32750061; PubMed Central PMCID: PMC7402469.

12. Al-Bdour M, Pauleck S, Dardas Z, Barham R, Ali D, Amr S, Mustafa L, Abu-Ameerh M, Maswadi R, **Azab B**, Awidi A. Clinical heterogeneity in retinitis pigmentosa caused by variants in RP1 and RLBP1 in five extended consanguineous pedigrees. Mol Vis. 2020;26:445-458. eCollection 2020. PubMed PMID: 32587456; PubMed Central PMCID: PMC7305691.

13. Dardas Z, Swedan S, Al-Sheikh Qassem A, **Azab B.** The impact of exome sequencing on the diagnostic yield of muscular dystrophies in consanguineous families. Eur J Med Genet. 2020 Apr;63(4):103845. DOI: 10.1016/j.ejmg.2020.103845. Epub 2020 Jan 15. PubMed PMID: 31953240.

14. Saleh T, Bloukh S, Carpenter VJ, Alwohoush E, Bakeer J, Darwish S, **Azab B**, Gewirtz DA. Therapy-Induced Senescence: An "Old" Friend Becomes the Enemy. Cancers (Basel). 2020 Mar 29;12(4). doi: 10.3390/cancers12040822. Review. PubMed PMID: 32235364; PubMed Central PMCID: PMC7226427.

15. Abu-Ameerh M, Mohammad H, Dardas Z, Barham R, Ali D, Bijawi M, Tawalbeh M, Amr S, Hatmal MM, Al-Bdour M, Awidi A, **Azab B**. Extending the spectrum of CLRN1- and ABCA4-associated inherited retinal dystrophies caused by novel and recurrent variants using exome sequencing. Mol Genet Genomic Med. 2020 Mar;8(3):e1123. doi: 10.1002/mgg3.1123. Epub 2020 Jan 22. PubMed PMID: 31968401; PubMed Central PMCID: PMC7057102.

16. **Azab B**, Alassaf A, Abu-Humdan A, Dardas Z, Almousa H, Alsalem M, Khabour O, Hammad H, Saleh T, Awidi A. Genotoxicity of cisplatin and carboplatin in cultured human lymphocytes: a comparative study.
Interdiscip Toxicol. 2019 Oct;12(2):93-97. doi: 10.2478/intox-2019-0011. Epub 2020 Feb 20. PubMed PMID: 32206030; PubMed Central PMCID: PMC7071837.

17. Alsalem M, Haddad M, Aldossary S, Kalbouneh H, **Azab B**, Dweik A, Imraish A, El-Salem K Effects of Dual Peroxisome Proliferator-Activated Receptors Alpha and Gamma Activation in Two Rat Models of Neuropathic Pain. PPAR Research. PPAR Res. 2019;2019:2630232. doi: 10.1155/2019/2630232. eCollection 2019. PubMed PMID: 31139213; PubMed Central PMCID: PMC6500665.

18. Abualhaj N, Dardas Z, **Azab B,** Ali D, Sughayer A, Aladilya T, Ahram M. The frequency of NOTCH1 variants in T-acute lymphoblastic leukemia/lymphoma and chronic lymphocytic leukemia/small lymphocytic lymphoma among Jordanian patients. Ann Diagn Pathol. 2019 Apr;39:53-58. doi: 10.1016/j.anndiagpath.2019.01.004. Epub 2019 Jan 24. PubMed PMID: 30718223.

19. **Azab B**, Barham R, Ali D, Dardas Z, Rashdan L, Bijawi M, Maswadi R, Awidi A, Jafar H, Abu-Ameerh M, Al-Bdour M, Amr S, Awidi A. Novel CERKL variant in consanguineous Jordanian pedigrees with inherited retinal dystrophies. Can J Ophthalmol. 2019 Feb;54(1):51-59. doi: 10.1016/j.jcjo.2018.02.018. Epub 2018 Apr 10. PubMed PMID: 30851774.

20. Aldossary SA, Alsalem M, Kalbouneh H, Haddad M, **Azab B**, Al-Shboul O, Mustafa AG, Obiedat S, El-Salem K. The role of transient receptor potential vanilloid receptor 1 and peroxisome proliferator-activated receptors-α in mediating the antinociceptive effects of palmitoylethanolamine in rats. Neuroreport. 2019 Jan 2;30(1):32-37. doi: 10.1097/WNR.0000000000001161. PubMed PMID: 30418420.

21. Hammad HM, Imraish A, **Azab B**, Best AM, Khader YS, Zihlif M. Associations of CYP2A6 Gene Polymorphism with Smoking Status Among Jordanians: Gender-Related Differences. Curr Drug Metab. 2019;20(9):765-770. doi: 10.2174/1389200220666190827161112. PubMed PMID: 31453782.

22. **Azab B**, Dardas Z, Alzghoul L, Masri A, Hasan D, Saleh T, Alsalem M. Genotoxicity assessment in autism spectrum disorder patients using sister chromatid exchange and chromosomal aberration assays.
International Journal of Clinical and Experimental Medicine. 2019; 12(9):11476-11482.

23. Hasan D, Gamen E, Abu Tarboush N, Ismail Y, Pak O, **Azab B**. PKM2 and HIF-1α regulation in prostate cancer cell lines. PLoS One. 2018;13(9):e0203745. doi: 10.1371/journal.pone.0203745. eCollection 2018. PubMed PMID: 30216369; PubMed Central PMCID: PMC6138389.

24. **Azab B**, Dardas Z, Hamarsheh M, Alsalem M, Kilani Z, Kilani F, Awidi A, Jafar H, Amr S. Novel frameshift variant in the IDUA gene underlies Mucopolysaccharidoses type I in a consanguineous Yemeni pedigree. Mol Genet Metab Rep. 2017 Sep;12:76-79. doi: 10.1016/j.ymgmr.2017.06.001. eCollection 2017 Sep. PubMed PMID: 28649516; PubMed Central PMCID: PMC5470527.

25. Alsalem M, Altarifi A, Kalbouneh H, Alzer H, **Azab B**, El-Salem K. The Role of PPARα and PPARγ in Mediating the Analgesic Properties of Ibuprofen in vivo and the Effects of Dual PPARα/γ Activation in Inflammatory Pain Model in the Rat. International Journal of Pharmacology. 2016 Oct 12:8 812-820. DOI: 10.3923/ijp.2016.812.820.

26. Quinn BA, Dash R, Sarkar S, **Azab B**, Bhoopathi P, Das SK, Emdad L, Wei J, Pellecchia M, Sarkar D, Fisher PB.
Pancreatic Cancer Combination Therapy Using a BH3 Mimetic and a Synthetic Tetracycline. Cancer Res. 2015 Jun 1;75(11):2305-15. doi: 10.1158/0008-5472.CAN-14-3013. PubMed PMID: 26032425; PubMed Central PMCID: PMC4453003.

27. Sarkar S, **Azab B**, Quinn BA, Shen X, Dent P, Klibanov AL, Emdad L, Das SK, Sarkar D, Fisher PB. Chemoprevention gene therapy (CGT) of pancreatic cancer using perillyl alcohol and a novel chimeric serotype Cancer Terminator Virus. Curr Mol Med. 2014 Jan;14(1):125-40. doi: 10.2174/1566524013666131118110827. PubMed PMID: 24236457.

28. **Azab B**, Dash R, Das SK, Bhutia SK, Sarkar S, Shen XN, Quinn BA, Dent P, Dmitriev IP, Wang XY, Curiel DT, Pellecchia M, Reed JC, Sarkar D, Fisher PB. Enhanced prostate cancer gene transfer and therapy using a novel serotype chimera cancer terminator virus (Ad.5/3-CTV). J Cell Physiol. 2014 Jan;229(1):34-43. doi: 10.1002/jcp.24408. PubMed PMID: 23868767; PubMed Central PMCID: PMC4332535.

29. Bhutia SK, Das SK, **Azab B**, Menezes ME, Dent P, Wang XY, Sarkar D, Fisher PB. Targeting breast cancer-initiating/stem cells with melanoma differentiation-associated gene-7/interleukin-24. Int J Cancer. 2013 Dec 1;133(11):2726-36. doi: 10.1002/ijc.28289. Epub 2013 Jul 6. PubMed PMID: 23720015; PubMed Central PMCID: PMC4334374.

30. Sarkar S, **Azab B**, Das SK, Quinn BA, Shen X, Dash R, Emdad L, Thomas S, Dasgupta S, Su ZZ, Wang XY, Sarkar D, Fisher PB. Chemoprevention gene therapy (CGT): Novel combinatorial approach for preventing and treating pancreatic cancer. Curr Mol Med. 2013 Aug;13(7):1140-59. doi: 10.2174/1566524011313070008. PubMed PMID: 23157679.

31. Rajput S, Kumar BN, Sarkar S, Das S, **Azab B**, Santhekadur PK, Das SK, Emdad L, Sarkar D, Fisher PB, Mandal M. Targeted Apoptotic Effects of Thymoquinone and Tamoxifen on XIAP Mediated Akt Regulation in Breast Cancer. PLoS One. 2013;8(4):e61342. doi: 10.1371/journal.pone.0061342. Print 2013. PubMed PMID: 23613836; PubMed Central PMCID: PMC3629226.

32. Das SK, Bhutia SK , **Azab B**, Kegelman TP, Peachy L, Santhekadur PK, Dasgupta S, Dash R, Dent P, Grant S, Emdad L, Pellecchia M, Sarkar D, Fisher PB. MDA-9/Syntenin and IGFBP-2 promote angiogenesis in human melanoma. Cancer Res. 2013 Jan 15;73(2):844-54. doi: 10.1158/0008-5472.CAN-12-1681. Epub 2012 Dec 10. PubMed PMID: 23233738; PubMed Central PMCID: PMC3548987.

33. Das SK, Bhutia SK, Sokhi UK, **Azab B**, Su ZZ, Boukerche H, Anwar T, Moen EL, Chatterjee D, Pellecchia M, Sarkar D, Fisher PB. Raf kinase inhibitor RKIP inhibits MDA-9/syntenin-mediated metastasis in melanoma. Cancer Res. 2012 Dec 1;72(23):6217-26. doi: 10.1158/0008-5472.CAN-12-0402. Epub 2012 Oct 11. PubMed PMID: 23066033; PubMed Central PMCID: PMC3939082.

34. **Azab B,** Dash R, Das S, Bhutia SK, Dmitriev I, Su ZZ, Yacoub A, Dent P, Curiel DT, Grant S, Wu B, Stebbins J, Pellecchia M, Reed J, Wang X, Sarkar D, Fisher PB. Enhanced delivery of mda-7/IL-24 using a serotype chimeric adenovirus (Ad.5/3) in combination with the apogossypol derivative BI-97C1 (Sabutoclax) improves therapeutic efficacy in low CAR colorectal cancer cells. J Cell Physiol. 2012 May;227(5):2145-53. doi: 10.1002/jcp.22947. PubMed PMID: 21780116; PubMed Central PMCID: PMC3228880

35. Bhutia SK, Das SK, Kegelman TP, **Azab B**, Dash R, Su ZZ, Wang XY, Rizzi F, Bettuzzi S, Lee SG, Dent P, Grant S, Curiel DT, Sarkar D, Fisher PB. mda-7/IL-24 differentially regulates soluble and nuclear clusterin in prostate cancer. J Cell Physiol. 2012 May;227(5):1805-13. doi: 10.1002/jcp.22904. PubMed PMID: 21732348; PubMed Central PMCID: PMC3228882.

36. Das SK, Bhutia SK, Kegelman TP, Peachy L, Oyesanya RA, Dasgupt S, Sokhi UK, **Azab B**, Dash R, Quinn BA, Kim K, Barral PM, Su ZZ, Boukerche H, Sarkar D, Fishe PB. ClusterinMDA-9/syntenin: a positive gatekeeper of melanoma metastasis. Front Biosci (Landmark Ed). 2012 Jan 1;17:1-15. doi: 10.2741/3911. Review. PubMed PMID: 22201728.

37. Quinn BA, Dash R, **Azab B**, Sarkar S, Das SK, Kumar S, Oyesanya RA, Dasgupta S, Dent P, Grant S, Rahmani M, Curiel DT, Dmitriev I, Hedvat M, Wei J, Wu B, Stebbins JL, Reed JC, Pellecchia M, Sarkar D, Fisher PB. Targeting Mcl-1 for the therapy of cancer. Expert Opin Investig Drugs. 2011 Oct;20(10):1397-411. doi: 10.1517/13543784.2011.609167. Epub 2011 Aug 19. Review. PubMed PMID: 21851287; PubMed Central PMCID: PMC3205956.

38. Bhutia SK, Das SK, **Azab B**, Dash R, Su ZZ, Lee SG, Dent P, Curiel DT, Sarkar D, Fisher PB. Autophagy switches to apoptosis in prostate cancer cells infected with melanoma differentiation-associated gene-7/interleukin-24 (mda-7/IL-24). Autophagy. 2011 Sep;7(9):1076-7. doi: 10.4161/auto.7.9.16163. Epub 2011 Sep 1. PubMed PMID: 21610321; PubMed Central PMCID: PMC3210317.

39. Dash R, **Azab B***, Quinn BA, Shen X, Wang XY, Das SK, Rahmani M, Wei J, Hedvat M, Dent P, Dmitriev IP, Curiel DT, Grant S, Wu B, Stebbins JL, Pellecchia M, Reed JC, Sarkar D, Fisher PB.

Apogossypol derivative BI-97C1 (Sabutoclax) targeting Mcl-1 sensitizes prostate cancer cells to mda-7/IL-24-mediated toxicity. Proc Natl Acad Sci U S A (PNAS). 2011 May 24;108(21):8785-90. doi: 10.1073/pnas.1100769108. Epub 2011 May 9. PubMed PMID: 21555592; PubMed Central PMCID: PMC3102401. *Contributed equally

40. Bhutia SK, Kegelman TP, Das SK, **Azab B**, Su ZZ, Lee SG, Sarkar D, Fisher PB. Astrocyte elevated gene-1 activates AMPK in response to cellular metabolic stress and promotes protective autophagy. Autophagy. 2011 May;7(5):547-8. doi: 10.4161/auto.7.5.15078. Epub 2011 May 1. PubMed PMID: 21412050; PubMed Central PMCID: PMC3127215.

41. Venkatesan P, Puvvada N, Dash R, PrashanthKumar P, Sarkar D, **Azab B**, Pathak A, Kundu SC, Fisher PB, Mandal M. The potential of celecoxib-loaded hydroxyapatite-chitosan nanocomposite for the treatment of colon cancer. Biomaterials. 2011 May;32(15):3794-806. doi: 10.1016/j.biomaterials.2011.01.027. PubMed PMID: 21392822.

42. Das SK, Bhutia SK, Sokhi UK, Dash R, **Azab B**, Sarkar D, Fisher PB. Human polynucleotide phosphorylase (hPNPase (old-35)): an evolutionary conserved gene with an expanding repertoire of RNA degradation functions. Oncogene. 2011 Apr 14;30(15):1733-43. doi: 10.1038/onc.2010.572. Epub 2010 Dec 13. Review. PubMed PMID: 21151174; PubMed Central PMCID: PMC4955827.

43. Dash R, **Azab B**, Shen X, Sokhi UK, Sarkar S, Su ZZ, Wang XY, Claudio PP, Dent P, Dmitriev IP, Curiel DT, Grant S, Sarkar D, Fisher PB. Developing an effective gene therapy for prostate cancer: new technologies with the potential to translate from the laboratory into the clinic. Discov Med. 2011 Jan;11(56):46-56. Review. PubMed PMID: 21276410; PubMed Central PMCID: PMC4348040.

44. Bhutia SK, KegelmanTP, Das SK, **Azab B**, Su ZZ, Lee SG, Sarkar D, Fisher PB. Astrocyte elevated gene-1 induces protective autophagy. Proc Natl Acad Sci U S A (PNAS). 2010 Dec 21;107(51):22243-8. doi: 10.1073/pnas.1009479107. Epub 2010 Dec 2. PubMed PMID: 21127263; PubMed Central PMCID: PMC3009793.

45. Dash R, Bhutia SK, **Azab B**, Su ZZ, Quinn BA, Kegelmen TP, Das SK, Kim K, Lee SG, Park MP, Yacoub A, Rahmani M, Emdad L, Dmitriev IP, Wang XY, Sarkar D, Grant S, Dent P, Curiel DT, Fisher PB. mda-7/IL-24: A Unique Member of the IL-10 Gene Family Promoting Cancer-Targeted Toxicity. Cytokine Growth Factor Rev. 2010 Oct;21(5):381-91. doi: 10.1016/j.cytogfr.2010.08.004. Review. PubMed PMID: 20926331; PubMed Central PMCID: PMC3164830.

46. Dash R, Su ZZ, Lee SG, **Azab B**, Boukerche H, Sarkar D, Fisher PB. Inhibition of AP-1 by SARI negatively regulates transformation progression mediated by CCN1. Oncogene. 2010 Aug 5;29(31):4412-23. doi: 10.1038/onc.2010.194. Epub 2010 Jun 7. PubMed PMID: 20531301.

47. Dash R, Dmitriev I, Su ZZ, Bhutia SK, **Azab B**, Vozhilla N, Yacoub A, Dent P, Curiel DT, Sarkar D, Fisher PB. Enhanced delivery of mda-7/IL-24 using a serotype chimeric adenovirus (ad.5/3) improves therapeutic efficacy in low CAR prostate cancer cells. Cancer Gene Ther. 2010 Jul;17(7):447-56. doi: 10.1038/cgt.2009.91. Epub 2010 Feb 12. PubMed PMID: 20150932.

48. Das SK, Sokhi UK, Bhutia SK, **Azab B**, Su ZZ, Sarkar D, Fisher PB. Human polynucleotide phosphorylase selectively and preferentially degrades microRNA-221 in human melanoma cells.

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Proc Natl Acad Sci U S A (PNAS). 2010 Jun 29;107(26):11948-53. doi: 10.1073/pnas.0914143107. Epub 2010 Jun 14. PubMed PMID: 20547861; PubMed Central PMCID: PMC2900648.

49. Dash R, Richards JE, Su ZZ, Bhutia SK, **Azab B**, Rahmani M, Dasmahapatra G, Yacoub A, Dent P, Dmitrive IP, Curiel DT, Grant S, Pellecchia M, Reed JC, Sarkar D, Fisher PB. 2010. Mechanism by which mcl-1 regulates cancer-specific apoptosis triggered by mda-7/IL-24, an IL-10-related cytokine. Cancer Res. 2010 Jun 15;70(12):5034-45. doi: 10.1158/0008-5472.CAN-10-0563. Epub 2010 May 25. PubMed PMID: 20501829; PubMed Central PMCID: PMC3171699

50. Bhutia SK, Dash R, Das SK, **Azab B**, Su ZZ, Lee SG, Grant S, Yacoub A, Dent P, Curiel DT, Sarkar D, Fisher PB.
Mechanism of autophagy to apoptosis switch triggered in prostate cancer cells by antitumor cytokine melanoma differentiation-associated gene 7/interleukin-24.
Cancer Res. 2010 May 1;70(9):3667-76. doi: 10.1158/0008-5472.CAN-09-3647. Epub 2010 Apr 20. PubMed PMID: 20406981; PubMed Central PMCID: PMC2874885.

Patents

Microbubble Assisted Viral Delivery
Patent number: US20120195935 A1
Publication date: Aug 2, 2012
Application number: US 13/386,165

Grants

2019

Funding Body: Abdul Hameed Shoman Scientific Research Support Fund, Jordan
Title: "Investigating the Molecular Pathway of a Novel Gene in Consanguineous Family with Inherited Hematological Disease" 2019. Principal Investigator.

Funding Body: Jordan Ministry of Education/Scientific Research and Innovation Support Fund
Title: Using Next-Generation Sequencing to Investigate the Disease-Associated Variants among Jordanian Families with Retinal Degenerative Diseases. Principal Investigator.

Funding Body: The University of Jordan: Scientific Research Deanship.
Title: Investigating the Genetics of Congenital Vitamin K Factors Deficiency. Co-Investigator.

2018

Funding Body: The University of Jordan: Scientific Research Deanship. Research Grant.
Title: Investigating the Causative Molecular Variations of Pediatric Cardiomyopathies.
Principal Investigator.

Funding Body: The University of Jordan: Scientific Research Deanship. Research Grant.
Title: Investigating the Underlying Molecular Variants of Familial Teratology of Fallot (TOF) and Other Complex Heart Congenital Heart Disease. Co-Investigator.

Funding Body: Abdul Hameed Shoman Scientific Research Support Fund.
Title: "Using Next-Generation Sequencing to Study the Genetic Prevalence and Discovery for Retinitis Pigmentosa and Leber Congenital Amaurosis in the Jordanian Population" 2018.
Grant number: 7/2017. Principal Investigator.

Funding Body: Jordan University of Science and Technology: Scientific Research Deanship Graduate Student Grant.
Title: "Investigating the Underlying Molecular Variants of Familial Muscular Dystrophy Among Jordanian Families." Principal Investigator/ co-advisor.

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2017

Funding Body: The University of Jordan: Scientific research Deanship. Research Grant.
Title: "Using Next-Generation Sequencing to Study the Genetic Prevalence and Discovery for Nonsyndromic Congenital Hearing Loss in the Jordanian Population". Co-Investigator.

Funding Body: The University of Jordan: Scientific Research Deanship. Research Grant.
Title: "Utilizing Next-Generation Sequencing to Study the Genetics of Wilson disease in the Jordanian Population" 2017. Co-Investigator. Grant number: 2088.

2016

Funding Body: The University of Jordan: Scientific research deanship. Research Grant
Title: "Using Next-Generation Sequencing to Study the Genetic Prevalence and Discovery for Retinitis Pigmentosa, Leber Congenital Amaurosis and Choroideremia Disease in the Jordanian Population" 2015. Principal Investigator. Grant number:1695.

Scientific tools and platforms

- Gene Curation
- Variant annotation and interpretation according to ACMG guidelines
- Molecular testing development and validation
- Next Generation Sequencing
- DNA sequence (panel, WES and WGS) analysis and interpretation
- RNASeq analysis interpretation
- Chromosomal microarray analysis (CMA), deletion and duplication analysis
- Sanger Sequencing
- Polymerase Chain Reaction (PCR) & Real-Time PCR.
- Capillary electrophoresis
- Genotyping
- Molecular cloning
- Western blot
- DNA, RNA and protein extraction
- In situ hybridization
- Tissue culture and in vitro modeling
- Stable and transient cell lines transfection
- Proliferation, Apoptosis, cell death, senescence and other in vitro assays
- Viral transduction
- Immunohistochemistry
- Microscopy: Confocal, fluorescent and light
- Zebrafish model

- Mouse model: Extensive experience in studying the effect of genetic mutations and deletions (transgenic and knockout) on the phenotypes of transgenic mice and their progeny; Evaluating the response and effect of molecular therapy on tumor xenografts; In vivo Bioluminescent Imaging (BLI).

Graduate Students

- Master student Nour Ghosheh (نور محمود احمد غوشه) 8180826. The University of Jordan School of Medicine. Main Advisor. Thesis title: The association of TCF7L2 gene polymorphisms rs12255372 and rs7903146 with type 2 diabetes mellitus in the Jordanian population. Defense date: To be announced

- Masters student: Ezaldeen Esawi (عزالدين اسماعيل خليل عيساوى) 8180575. The University of Jordan School of Medicine. Main Advisor. Thesis title: Developing ATP-AS1411 aptamer chimera for targeted delivery and triggering the release of doxorubicin into cancer cells. Defense date: 30 Aug 2021.

- Masters student: Mohammad Ismail محمد اسعد ابراهيم اسماعيل 8180826. The University of Jordan School of Medicine. Main Advisor. Thesis title: Development of lipopolyplex-based nanocarriers for targeted gene delivery purposes. Defense date: 2021 May 20

- Masters student. Ahmad Salem Alhiassah. The University of Jordan School of Medicine. Main Advisor. Thesis title: detection of cellular senescence within human invasive breast carcinomas in response to neoadjuvant. Defense date: 2020 May

- Masters Student Sawsan Raja Al-Khalayfa. The University of Jordan School of Medicine. Main Advisor. Thesis title: Genotyping type 2 diabetes mellitus susceptibility variant rs5219 (E23K) in a Jordanian patient's cohort. Defense date: 2019 December

- Master student. Safa'a Ghanim Mashal. The University of Jordan School of Medicine. Main Advisor. Thesis title: genotyping type 2 diabetes mellitus susceptibility variant rs13266634 in a Jordanian patients' cohort. Main Advisor. Defense date: 2019 December

- Masters student: Abeer Abd Alwadoud AbuZaina. Jordan University of Science and Technology. Co-Advisor. Thesis title: Whole Exome Sequencing: An Unprecedented Opportunity for Identifying Disease Genes in Inherited Cardiomyopathies. Defense date: 2019 August

- Masters student: Rami Hamad (رامي محمود صالح حماد) 8170876. The University of Jordan School of Sports Sciences. Co-Advisor. Thesis title: The Impact of Maximal Aerobic Physical Effort on the Expression of HSP90AA1, HSP90AB1 and PTGES3 Genes, and Some Physiological Variables in professional Taekwondo players. Defense date: 2019 August

- Masters student: Zain Bassam Mohammad Dardas (زين بسام محمد دردس). Jordan University of Science and Technology. Mentor and Co-Advisor. Thesis title: Utilization of Exome Sequencing for The Diagnosis of Muscular Dystrophy in Jordanian Patients. Defense date: 2018 December 24

- Masters student: رانيا منيب الزغول 8171299 .The University of Jordan School of Medicine. Examiner (Dr. Mamoun Ahram / Supervisor). Thesis title: Defense date: 2021 May 16 10:00am

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Professional Meetings

American College of Medical Genetics and Genomics (ACMG) Annual Meeting, Seattle, WA (2019)
Poster presentation: Identifying the spectrum of novel and recurrent retinal dystrophies variants in a Jordanian cohort utilizing exome sequencing analysis approach.

The Jordanian Society of Hematology International Conference on Benign Hematological Disorders and Immunotherapy in Malignancies (2019)
Invited speaker: Principles and Update on Hematological Diseases Genetics

American College of Medical Genetics and Genomics (ACMG) Annual Meeting, Charlotte, NC (2018)

24th Board of Governors Session of International Centre for Genetic Engineering and Biotechnology (ICGEB), Trieste, Italy (2018)

23rd Board of Governors Session of International Centre for Genetic Engineering and Biotechnology (ICGEB), Trieste, Italy (2017)

Bilal Azab, Ph.D.

The 4th International Jordanian Conference of the Jordan Society for Medical Laboratory Sciences (2016)
Invited speaker: Molecular Diagnosis of Mucopolysaccharidosis, Retinitis Pigmentosa (RP) and Leber Congenital Amaurosis (LCA) using Sanger and Next Generation Sequencing.

8th International Medical Conference Faculty of Medicine at Jordan University of Science and Technology King Abdullah University Hospital (2016)
Invited speaker: Prostate Cancer Gene Therapy Using a Serotype Chimera Adenovirus

American Association for Cancer Research (AACR) Annual Meeting (2012)
Poster Presentation: A New Serotype Chimera Cancer Terminator Virus (Ad.5/3-CTV) Expands the Efficiency and Specificity of Prostate Cancer Gene Transfer and Therapy.

American Association for Cancer Research (AACR) Conference. Second AACR Dead Sea International Conference, Advances in Cancer Research: From the Laboratory to the Clinic (2010)

Poster Presentation: Enhancing the Efficiency and Specificity of Gene Therapy Using a Serotype Chimeric Adnovirus (Ad.5/3), Microbubble and Ultrasound

Cold Spring Harbor (CSH) In Vivo Barriers to Gene Delivery Conference (2009)
Poster Presentation: in vivo Molecular Delivery of Therapeutic Molecules Using Microbubbles and Ultrasound

Royal Medical Services, Jordan (2005)
Lecture: Hereditary Hearing Loss and Blindness in the Jordanian Population
Middle East Hearing Association (MEHA), Lecture: Usher Syndrome, Jordan (2004).

Scientific Awards

Excellence in Graduate Studies and Research Roscoe D. Hughes Award, Human & Molecular Genetics, Virginia Commonwealth University School of Medicine (2012)
Ph.D. Studies Scholarship, Virginia Commonwealth University School of Medicine, Virginia (2008)
Joukowsky Family Foundation scholarship, New York (2007)
Peter A. Silverman Centre for International Health Research Extern at Mt. Sinai Hospital, Ontario, Canada (2004).

Memberships

American Society for Human Genetics (ASHG)
European Society of Human Genetics (ESHG)
American College of Medical Genetics (ACMG), Affiliate Member
International Center for Genetics Engi and Biotech (ICGEB), Board of Governors
Jordan Society for Medical Laboratory Sciences, Executive Committee
Jordan Society for Scientific Research, Scientific Conferences Committee

Teaching

University of Jordan School of Medicine:

1. 0504321 Genetics in Medicine. 2 credit hours. Third year medicine
2. 0501217 Principals of Genetics and Molecular Biology. 3 credit hours. Second year medicine
3. 0501217 Diagnostic Molecular Biology. 3 credit hours. Masters Clinical Laboratory Sciences
4. 501104 Biochemistry. 3 credit hours. Nursing
5. 0541230 Introductory Biochemistry. 4 credit hours. Dentistry
6. Cytology and Molecular Biology. 3 credit hours. Premedicine
7. 0504209 Introduction to Microbiology and Immunology. 5 credit hours. Medicine

8. 0504307 Medical Immunology. 2 credit hours. Medicine

School of Science:

1. 0334282 Human Genetics. 3 credit hours. Undergraduate Clinical Laboratory Sciences and Biology
2. 0308321 Diagnostic Genetics. 3 credit hours. Undergraduate clinical laboratory sciences
3. 0344716 Molecular Biology. 3 credit hours. Graduate biology students.
4. 0308213 Pathology. 3 credit hours. Undergraduate clinical laboratory sciences
5. 1303775 Craniofacial Growth and Development. 1 credit hour. Pediatric Dentistry
6. 0308101 Essentials and Ethics of Clinical Laboratory Profession. 1 credit.Graduate clinical laboratory sciences under
7. 0308241 Medical Laboratory Instrumentation & Techniques. Undergraduate clinical laboratory sciences
8. 0308102 Medical Terminology. 1 credit hour. Undergraduate clinical laboratory sciences

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Professional Websites

https://www.linkedin.com/in/bilal-azab-663a354a/

https://www.researchgate.net/profile/Bilal_Azab

https://scholar.google.com/citations?user=KPoHnNwAAAAJ&hl=en

https://www.ncbi.nlm.nih.gov/myncbi/1ZkbT8n57nuUhs/bibliography/public/