

REFERENCES

- Abbas, A., Lichtman, A., & Pillai, S. (2014). *Basic Immunology Functions and Disorders of the Immune System* (4th ed., pp. 54-192). Philadelphia, Pa.: Elsevier/Saunders.
- Abdelmoneim, A., Mustafa, M., Abdelmageed, M., Murshed, N., Dawoud, E., & Ahmed, E. et al. (2020). Immunoinformatics design of multiepitopes peptide-based universal cancer vaccine using matrix metalloproteinase-9 protein as a target. *Immunological Medicine*, *44*(1), 35-52. doi: 10.1080/25785826.2020.1794165
- Abu Samaan, T., Samec, M., Liskova, A., Kubatka, P., & Büsselberg, D. (2019). Paclitaxel's Mechanistic and Clinical Effects on Breast Cancer. *Biomolecules*, *9*(12), 789. doi: 10.3390/biom9120789
- Adluri, S., Gilewski, T., Zhang, S., Ramnath, V., Ragupathi, G., & Livingston, P. (1999). *Specificity analysis of sera from breast cancer patients vaccinated with MUC-1-KLH plus QS-21*. *British Journal of Cancer*, *79*(11-12), 1806–1812. doi:10.1038/sj.bjc.6990288
- Afriani, E., Amarwati, S., Puspasari, D., Miranti, I., Prasetyo, A., & Eka Listiana, D. (2021). Correlation Between MMP-9 Expression with Patient Age and Lymph Node Metastasis on TNBC. *Jurnal Kedokteran STM(Sains Dan Teknologi Medik)*, *4*(2), 90-104. Retrieved from <https://ojsfkuisu.com/index.php/stm/index>
- Albert, U.-S., & Schulz, K.-D. (2003). Clinical Breast Examination: What Can Be Recommended for Its Use to Detect Breast Cancer in Countries with Limited Resources? *The Breast Journal*, *9*(s2), S90–S93. doi:10.1046/j.1524-4741.9.s2.10.x
- Alluri, P., & Newman, L. A. (2014). Basal-like and triple-negative breast cancers: searching for positives among many negatives. *Surgical oncology clinics of North America*, *23*(3), 567–577. doi: 10.1016/j.soc.2014.03.003
- Altun, İ., & Sonkaya, A. (2018). The Most Common Side Effects Experienced by Patients Were Receiving First Cycle of Chemotherapy. *Iranian journal of public health*, *47*(8), 1218–1219.
- Andersen, M. H., Schrama, D., thor Straten, P., & Becker, J. C. (2006). Cytotoxic T Cells. *Journal of Investigative Dermatology*, *126*(1), 32–41. doi:10.1038/sj.jid.5700001

- Apostolopoulos, V., Pietersz, G., Tsibanis, A., Tsikkinis, A., Drakaki, H., & Loveland, B. et al. (2006). Pilot phase III immunotherapy study in early-stage breast cancer patients using oxidized mannan-MUC1 [ISRCTN71711835]. *Breast Cancer Research*, 8(3). doi: 10.1186/bcr1505
- Ataollahi, M. R., Sharifi, J., Paknahad, M. R., & Paknahad, A. (2015). Breast cancer and associated factors: a review. *Journal of medicine and life*, 8(Spec Iss 4), 6–11.
- Atta Manu, E., Bedu-Addo, K., Titiloye, N., Ameh-Mensah, C., Opoku, F., & Duduyemi, B. (2020). Expression of Tumour-Associated MUC1 Is a Poor Prognostic Marker in Breast Cancer in Kumasi, Ghana. *Journal Of Oncology*, 2020, 1-7. doi: 10.1155/2020/9752952
- Augoff, K., Hryniewicz-Jankowska, A., Tabola, R., & Stach, K. (2022). MMP9: A Tough Target for Targeted Therapy for Cancer. *Cancers*, 14(7), 1847. doi: 10.3390/cancers14071847
- Ayyagari, V., T. C., V., K., A., & Srirama, K. (2020). Design of a multi-epitope-based vaccine targeting M-protein of SARS-CoV2: an immunoinformatics approach. *Journal Of Biomolecular Structure And Dynamics*, 40(7), 2963-2977. doi: 10.1080/07391102.2020.1850357
- Berman, H. M. (2000). The Protein Data Bank. *Nucleic Acids Research*, 28(1), 235–242. doi:10.1093/nar/28.1.235
- BIOVIA, Dassault Systèmes, [Discovery Studio Visualizer], [v20.1.0.19295], San Diego: Dassault Systèmes, [2020].
- Blaszczyk, M., Kurcinski, M., Kouza, M., Wieteska, L., Debinski, A., Kolinski, A., & Kmiecik, S. (2016). Modeling of protein–peptide interactions using the CABS-dock web server for binding site search and flexible docking. *Methods*, 93, 72-83. doi: 10.1016/j.ymeth.2015.07.004
- Bui, H. H., Sidney, J., Dinh, K., Southwood, S., Newman, M. J., & Sette, A. (2006). Predicting population coverage of T-cell epitope-based diagnostics and vaccines. *BMC bioinformatics*, 7, 153. doi:10.1186/1471-2105-7-153
- Calis, J. J., Maybeno, M., Greenbaum, J. A., Weiskopf, D., De Silva, A. D., Sette, A., Keşmir, C., & Peters, B. (2013). Properties of MHC class I presented peptides that enhance immunogenicity. *PLoS computational biology*, 9(10), e1003266. <https://doi.org/10.1371/journal.pcbi.1003266>

- Castiglione, F., Deb, D., Srivastava, A. P., Liò, P., & Liso, A. (2021). From Infection to Immunity: Understanding the Response to SARS-CoV2 Through *In-Silico* Modeling. *Frontiers in immunology*, *12*, 646972. doi: 10.3389/fimmu.2021.646972
- Chandrashekar, D., Bashel, B., Balasubramanya, S., Creighton, C., Ponce-Rodriguez, I., Chakravarthi, B., & Varambally, S. (2017). UALCAN: A Portal for Facilitating Tumor Subgroup Gene Expression and Survival Analyses. *Neoplasia*, *19*(8), 649-658. doi: 10.1016/j.neo.2017.05.002
- Chandrashekar, D., Karthikeyan, S., Korla, P., Patel, H., Shovon, A., & Athar, M. et al. (2022). UALCAN: An update to the integrated cancer data analysis platform. *Neoplasia*, *25*, 18-27. doi: 10.1016/j.neo.2022.01.001
- Chen, C., Zhao, S., Karnad, A., & Freeman, J. W. (2018). The biology and role of CD44 in cancer progression: therapeutic implications. *Journal of hematology & oncology*, *11*(1), 64. doi: 10.1186/s13045-018-0605-5
- Chen, W., Zhang, Z., Zhang, S., Zhu, P., Ko, J. K., & Yung, K. K. (2021). MUC-1: Structure, Function, and Clinic Application in Epithelial Cancers. *International journal of molecular sciences*, *22*(12), 6567. doi: 10.3390/ijms22126567
- Chudasama, R., Phung, Q., Hsu, A., & Almhanna, K. (2021). Vaccines in Gastrointestinal Malignancies: From Prevention to Treatment. *Vaccines*, *9*(6), 647. doi:10.3390/vaccines9060647
- Ciemny, M., Kurcinski, M., Kozak, K., Kolinski, A., & Kmiecik, S. (2017). Highly Flexible Protein-Peptide Docking Using CABS-Dock. *Methods In Molecular Biology*, 69-94. doi: 10.1007/978-1-4939-6798-8_6
- Clifton, G., Hale, D., Vreeland, T., Hickerson, A., Litton, J., & Alatrash, G. et al. (2020). Results of a Randomized Phase IIb Trial of Nelipepimut-S + Trastuzumab versus Trastuzumab to Prevent Recurrences in Patients with High-Risk HER2 Low-Expressing Breast Cancer. *Clinical Cancer Research*, *26*(11), 2515-2523. doi: 10.1158/1078-0432.ccr-19-2741
- ClinicalTrial.gov. (2021). Search of: breast cancer | vaccine - List Results - ClinicalTrials.gov. Retrieved

https://clinicaltrials.gov/ct2/results?cond=breast+cancer&term=&type=&rslt=&age_v=&gndr=&intr=vaccine&titles=&outc=&spons=&lead=&id=&cntry=&state=&city=&dist=&locn=&rsub=&strd_s=&strd_e=&prcd_s=&prcd_e=&sfpd_s=&sfpd_e=&rfpd_s=&rfpd_e=&lupd_s=&lupd_e=&sort=

- De Groot, A., Moise, L., Terry, F., Gutierrez, A., Hindocha, P., & Richard, G. et al. (2020). Better Epitope Discovery, Precision Immune Engineering, and Accelerated Vaccine Design Using Immunoinformatics Tools. *Frontiers In Immunology*, 11. doi: 10.3389/fimmu.2020.00442
- de Paula Peres, L., da Luz, F., dos Anjos Pultz, B., Brígido, P., de Araújo, R., Goulart, L., & Silva, M. (2015). Peptide vaccines in breast cancer: The immunological basis for clinical response. *Biotechnology Advances*, 33(8), 1868-1877. doi: 10.1016/j.biotechadv.2015.10.013
- De Talhouet, S., Peron, J., Vuilleumier, A., Friedlaender, A., Viassolo, V., & Ayme, A. et al. (2020). Clinical outcome of breast cancer in carriers of BRCA1 and BRCA2 mutations according to molecular subtypes. *Scientific Reports*, 10(1). doi: 10.1038/s41598-020-63759-1
- Desta, I., Porter, K., Xia, B., Kozakov, D., & Vajda, S. (2020). Performance and Its Limits in Rigid Body Protein-Protein Docking. *Structure*, 28(9), 1071-1081.e3. doi: 10.1016/j.str.2020.06.006
- Dhanda, S. K., Vir, P., & Raghava, G. P. (2013). Designing of interferon-gamma inducing MHC class-II binders. *Biology Direct*, 8(1). doi:10.1186/1745-6150-8-30
- Dillon, P., Petroni, G., Smolkin, M., Brenin, D., Chianese-Bullock, K., & Smith, K. et al. (2017). A pilot study of the immunogenicity of a 9-peptide breast cancer vaccine plus poly-ICLC in early stage breast cancer. *Journal For Immunotherapy Of Cancer*, 5(1). doi: 10.1186/s40425-017-0295-5
- Dimitrov, I., Flower, D., & Doytchinova, I. (2013). AllerTOP - a server for in silico prediction of allergens. *BMC Bioinformatics*, 14(S6). doi: 10.1186/1471-2105-14-s6-s4
- Doytchinova, I. A., & Flower, D. R. (2007a). Identifying candidate subunit vaccines using an alignment-independent method based on principal amino acid properties. *Vaccine*, 25(5), 856–866. doi:10.1016/j.vaccine.2006.09.032
- Doytchinova, I. A., & Flower, D. R. (2007b). VaxiJen: a server for prediction of protective antigens,

- tumour antigens and subunit vaccines. *BMC Bioinformatics*, 8(1). doi: 10.1186/1471-2105-8-4
- Dracham, C. B., Shankar, A., & Madan, R. (2018). Radiation induced secondary malignancies: a review article. *Radiation oncology journal*, 36(2), 85–94. doi:10.3857/roj.2018.00290
- Dubensky, T. W., & Reed, S. G. (2010). Adjuvants for cancer vaccines. *Seminars in Immunology*, 22(3), 155–161. doi:10.1016/j.smim.2010.04.007
- Eliyatkin, N., Yalcin, E., Zengel, B., Aktaş, S., & Vardar, E. (2015). Molecular Classification of Breast Carcinoma: From Traditional, Old-Fashioned Way to A New Age, and A New Way. *Journal Of Breast Health*, 11(2), 59-66. doi: 10.5152/tjbh.2015.1669
- Emens L. A. (2008). Cancer vaccines: on the threshold of success. *Expert opinion on emerging drugs*, 13(2), 295–308. doi: 10.1517/14728214.13.2.295
- Emini, E. A., Hughes, J. V., Perlow, D. S., & Boger, J. (1985). Induction of hepatitis A virus-neutralizing antibody by a virus-specific synthetic peptide. *Journal of virology*, 55(3), 836–839. doi:10.1128/JVI.55.3.836-839.1985
- Fajriani (2019). *Karakteristik dan Ekspresi Imunohistokimia Mucin 1 (MUC-1) pada Karsinoma Payudara Invasif di Rumah Sakit Umum Pusat Haji Adam Malik Medan* (Master's thesis, Universitas Sumatera Utara, Medan, Indonesia). Retrieved from <https://repositori.usu.ac.id/bitstream/handle/123456789/25476/177041050.pdf?sequence=1&isAllowed=y>
- Farhood, B., Najafi, M., & Mortezaee, K. (2018). CD8+ cytotoxic T lymphocytes in cancer immunotherapy: A review. *Journal of Cellular Physiology*. doi:10.1002/jcp.27782
- Filin, I., Solovyeva, V., Kitaeva, K., Rutland, C., & Rizvanov, A. (2020). Current Trends in Cancer Immunotherapy. *Biomedicines*, 8(12), 621. doi: 10.3390/biomedicines8120621
- Gaibar, M., Beltrán, L., Romero-Lorca, A., Fernández-Santander, A., & Novillo, A. (2020). Somatic Mutations in HER2 and Implications for Current Treatment Paradigms in HER2-Positive Breast Cancer. *Journal Of Oncology*, 2020, 1-13. doi: 10.1155/2020/6375956
- García-Aranda, M., & Redondo, M. (2019). Immunotherapy: A Challenge of Breast Cancer

- Treatment. *Cancers*, 11(12), 1822. doi: 10.3390/cancers11121822
- Gasteiger, E., Hoogland, C., Gattiker, A., Duvaud, S., Wilkins, M. R., Appel, R. D., & Bairoch, A. (2005). *Protein Identification and Analysis Tools on the ExPASy Server. The Proteomics Protocols Handbook*, 571–607. doi:10.1385/1-59259-890-0:571
- Geourjon, C., & Deléage, G. (1995). SOPMA: significant improvements in protein secondary structure prediction by consensus prediction from multiple alignments. *Bioinformatics*, 11(6), 681–684. doi:10.1093/bioinformatics/11.6.6
- Gilewski, T., Adluri, S., Ragupathi, G., Zhang, S., Yao, T., & Panageas, K. et al. (2000). Vaccination of High-Risk Breast Cancer Patients with Mucin-1 (MUC-1) Keyhole Limpet Hemocyanin Conjugate plus QS-211. *Clinical Cancer Research*, 6, 1693-1701.
- Global Cancer Observatory. (2021). Indonesia. Retrieved 30 November 2021, from <https://gco.iarc.fr/today/data/factsheets/populations/360-indonesia-fact-sheets.pdf>
- Goldhirsch, A., Wood, W., Coates, A., Gelber, R., Thürlimann, B., & Senn, H. (2011). Strategies for subtypes—dealing with the diversity of breast cancer: highlights of the St Gallen International Expert Consensus on the Primary Therapy of Early Breast Cancer 2011. *Annals Of Oncology*, 22(8), 1736-1747. doi: 10.1093/annonc/mdr304
- Gómez-Campelo, P., Bragado-Álvarez, C., & Hernández-Lloreda, M. J. (2013). *Psychological distress in women with breast and gynecological cancer treated with radical surgery. Psycho-Oncology*, 23(4), 459–466. doi:10.1002/pon.3439
- Gonzalez-Galarza, F., McCabe, A., Santos, E., Jones, J., Takeshita, L., & Ortega-Rivera, N. et al. (2019). Allele frequency net database (AFND) 2020 update: gold-standard data classification, open access genotype data and new query tools. *Nucleic Acids Research*. doi: 10.1093/nar/gkz1029
- Gupta, S., Kapoor, P., Chaudhary, K., Gautam, A., Kumar, R., & Raghava, G. (2013). In Silico Approach for Predicting Toxicity of Peptides and Proteins. *Plos ONE*, 8(9), e73957. doi: 10.1371/journal.pone.0073957
- Gustiananda, M., Sulisty, B., Agustriawan, D., & Andarini, S. (2021). Immunoinformatics Analysis of

- SARS-CoV-2 ORF1ab Polyproteins to Identify Promiscuous and Highly Conserved T-Cell Epitopes to Formulate Vaccine for Indonesia and the World Population. *Vaccines*, 9(12), 1459. doi: 10.3390/vaccines9121459
- Hensen, L., Illing, P., Bridie Clemens, E., Nguyen, T., Koutsakos, M., & van de Sandt, C. et al. (2021). CD8+ T cell landscape in Indigenous and non-Indigenous people restricted by influenza mortality-associated HLA-A*24:02 allomorph. *Nature Communications*, 12(1). doi: 10.1038/s41467-021-23212-x
- Heo, L., Park, H., & Seok, C. (2013). GalaxyRefine: protein structure refinement driven by side-chain repacking. *Nucleic Acids Research*, 41(Web Server issue), W384-W388. doi: 10.1093/nar/gkt458
- Hsu, J., & Hung, M. (2016). The role of HER2, EGFR, and other receptor tyrosine kinases in breast cancer. *Cancer And Metastasis Reviews*, 35(4), 575-588. doi: 10.1007/s10555-016-9649-6
- Huang, H. (2018). Matrix Metalloproteinase-9 (MMP-9) as a Cancer Biomarker and MMP-9 Biosensors: Recent Advances. *Sensors*, 18(10), 3249. doi: 10.3390/s18103249
- Immune Epitope Database (IEDB). (2021). IEDB.org: View Results and Refine Search. Retrieved 30 December 2021, from https://www.iedb.org/result_v3.php?cookie_id=cc938e
- Jie, J., Zhang, Y., Zhou, H., Zhai, X., Zhang, N., & Yuan, H. et al. (2018). CpG ODN1826 as a Promising Mucin1-Maltose-Binding Protein Vaccine Adjuvant Induced DC Maturation and Enhanced Antitumor Immunity. *International Journal Of Molecular Sciences*, 19(3), 920. doi: 10.3390/ijms19030920
- Jing, X., Liang, H., Hao, C., Yang, X., & Cui, X. (2019). Overexpression of MUC1 predicts poor prognosis in patients with breast cancer. *Oncology Reports*, 41(2), 801-810. doi: 10.3892/or.2018.6887
- Jung, I. D., Jeong, S. K., Lee, C.-M., Noh, K. T., Heo, D. R., Shin, Y. et al. (2011). Enhanced Efficacy of Therapeutic Cancer Vaccines Produced by Co-Treatment with *Mycobacterium tuberculosis* Heparin-Binding Hemagglutinin, a Novel TLR4 Agonist. *Cancer Research*, 71(8), 2858–2870. doi:10.1158/0008-5472.can-10-3487
- Kadi, T. A., Hoesin, F. (2014). *Ekspresi Matrix Metalloproteinase-9 (MMP-9), HER-/neu, dan Metastasis*

- Kelenjar Getah Bening pada Karsinoma Payudara Duktal Invasif. Indonesian Journal of Pathology, 23(1),28-34.*
- Kar, T., Narsaria, U., Basak, S., Deb, D., Castiglione, F., Mueller, D., & Srivastava, A. (2020). A candidate multi-epitope vaccine against SARS-CoV-2. *Scientific Reports, 10(1), 10895.* doi: 10.1038/s41598-020-67749-1
- Kastritis, P. L., Moal, I. H., Hwang, H., Weng, Z., Bates, P. A., Bonvin, A. M. J. J., & Janin, J. (2011). A structure-based benchmark for protein-protein binding affinity. *Protein Science, 20(3), 482–491.* doi:10.1002/pro.580
- Kinker, G., Vitiello, G., Ferreira, W., Chaves, A., Cordeiro de Lima, V., & Medina, T. (2021). B Cell Orchestration of Anti-tumor Immune Responses: A Matter of Cell Localization and Communication. *Frontiers In Cell And Developmental Biology, 9.* doi: 10.3389/fcell.2021.678127
- Kirubakaran, P., Pfeiferová, L., Boušová, K., Bednarova, L., Obšilová, V., & Vondrášek, J. (2016). *Artificial proteins as allosteric modulators of PDZ3 and SH3 in two-domain constructs: A computational characterization of novel chimeric proteins. Proteins: Structure, Function, and Bioinformatics, 84 (10), 1358–1374.* doi: 10.1002 / prot.25082
- Knutson, K. L., & Disis, M. L. (2005). *Tumor antigen-specific T helper cells in cancer immunity and immunotherapy. Cancer Immunology, Immunotherapy, 54(8), 721–728.* doi:10.1007/s00262-004-0653-2
- Ko, J., Park, H., Heo, L., & Seok, C. (2012). GalaxyWEB server for protein structure prediction and refinement. *Nucleic Acids Research, 40(W1), W294-W297.* doi: 10.1093/nar/gks493
- Kolaskar, A. S., & Tongaonkar, P. C. (1990). A semi-empirical method for prediction of antigenic determinants on protein antigens. *FEBS letters, 276(1-2), 172–174.* doi:10.1016/0014-5793(90)80535-q
- Kontos, M., & Markopoulos, C. (2017). *Complications of Breast Surgery and Their Management. Breast Cancer Management for Surgeons, 411–423.* doi:10.1007/978-3-319-56673-3_34
- Kozakov, D., Beglov, D., Bohnuud, T., Mottarella, S. E., Xia, B., Hall, D. R., & Vajda, S. (2013). How good

- is automated protein docking?. *Proteins*, 81(12), 2159–2166. doi:10.1002/prot.24403
- Kozakov, D., Hall, D. R., Xia, B., Porter, K. A., Padhorny, D., Yueh, C., Beglov, D., & Vajda, S. (2017). The ClusPro web server for protein-protein docking. *Nature protocols*, 12(2), 255–278. <https://doi.org/10.1038/nprot.2016.169>
- Kufe, D. W. (2012). *MUC-1-C oncoprotein as a target in breast cancer: activation of signaling pathways and therapeutic approaches*. *Oncogene*, 32(9), 1073–1081. doi:10.1038/onc.2012.158
- Kumar, S., Sunagar, R., & Gosselin, E. (2019). Bacterial Protein Toll-Like-Receptor Agonists: A Novel Perspective on Vaccine Adjuvants. *Frontiers in immunology*, 10, 1144. doi:10.3389/fimmu.2019.01144
- Kurcinski, M., Jamroz, M., Blaszczyk, M., Kolinski, A., & Kmiecik, S. (2015). CABS-dock web server for the flexible docking of peptides to proteins without prior knowledge of the binding site. *Nucleic Acids Research*, 43(W1), W419-W424. doi: 10.1093/nar/gkv456
- Larsen, J. E., Lund, O., & Nielsen, M. (2006). Improved method for predicting linear B-cell epitopes. *Immunome research*, 2, 2. doi: 10.1186/1745-7580-2-2
- Larsen, M., Lundegaard, C., Lamberth, K., Buus, S., Brunak, S., Lund, O., & Nielsen, M. (2005). An integrative approach to CTL epitope prediction: A combined algorithm integrating MHC class I binding, TAP transport efficiency, and proteasomal cleavage predictions. *European Journal Of Immunology*, 35(8), 2295-2303. doi:10.1002/eji.200425811
- Laskowski R. A. (2009). PDBsum new things. *Nucleic acids research*, 37(Database issue), D355–D359. doi:10.1093/nar/gkn860
- Laskowski, R. A., MacArthur, M. W., & Thornton, J. M. (2012). *PROCHECK: validation of protein-structure coordinates*. *International Tables for Crystallography*, 684–687. doi:10.1107/97809553602060000882
- Laskowski, R. A., MacArthur, M. W., Moss, D. S., & Thornton, J. M. (1993). PROCHECK: a program to check the stereochemical quality of protein structures. *Journal of Applied Crystallography*, 26(2), 283–291. doi:10.1107/s0021889892009944

- Laskowski, R. A., Rullmann, J. A., MacArthur, M. W., Kaptein, R., & Thornton, J. M. (1996). AQUA and PROCHECK-NMR: programs for checking the quality of protein structures solved by NMR. *Journal of biomolecular NMR*, 8(4), 477–486. doi:10.1007/BF00228148
- Li, H., Qiu, Z., Li, F., & Wang, C. (2017). The relationship between MMP-2 and MMP-9 expression levels with breast cancer incidence and prognosis. *Oncology letters*, 14(5), 5865–5870. doi: 10.3892/ol.2017.6924
- Liu, Y., Tang, L., Gao, N., Diao, Y., Zhong, J., Deng, Y., Wang, Z., Jin, G., & Wang, X. (2020). Synthetic MUC-1 breast cancer vaccine containing a Toll-like receptor 7 agonist exerts antitumor effects. *Oncology letters*, 20(3), 2369–2377. doi: 10.3892/ol.2020.11762
- Longley, D. B., Harkin, D. P., & Johnston, P. G. (2003). 5-Fluorouracil: mechanisms of action and clinical strategies. *Nature Reviews Cancer*, 3(5), 330–338. doi:10.1038/nrc1074
- Lopes, A., Vandermeulen, G., & Pr eat, V. (2019). Cancer DNA vaccines: current preclinical and clinical developments and future perspectives. *Journal of Experimental & Clinical Cancer Research*, 38(1). doi:10.1186/s13046-019-1154-7
- Magnan, C. N., Randall, A., & Baldi, P. (2009). SOLpro: accurate sequence-based prediction of protein solubility. *Bioinformatics*, 25(17), 2200–2207. doi:10.1093/bioinformatics/btp386
- Magnan, C. N., Zeller, M., Kayala, M. A., Vigil, A., Randall, A., Felgner, P. L., & Baldi, P. (2010). High-throughput prediction of protein antigenicity using protein microarray data. *Bioinformatics (Oxford, England)*, 26(23), 2936–2943. doi:10.1093/bioinformatics/btq551
- Mahdevar, E., Kefayat, A., Safavi, A., Behnia, A., Hejazi, S. H., Javid, A., & Ghahremani, F. (2021). Immunoprotective effect of an in silico designed multiepitope cancer vaccine with BORIS cancer-testis antigen target in a murine mammary carcinoma model. *Scientific reports*, 11(1), 23121. doi: 10.1038/s41598-021-01770-w
- Mahdevar, E., Safavi, A., Abiri, A., Kefayat, A., Hejazi, S. H., Miresmaeili, S. M., & Iranpur Mobarakeh, V. (2021). Exploring the cancer-testis antigen BORIS to design a novel multi-epitope vaccine against breast cancer based on immunoinformatics approaches. *Journal of Biomolecular*

Structure and Dynamics, 1–18. doi:10.1080/07391102.2021.1883111

Masoud, V., & Pagès, G. (2017). Targeted therapies in breast cancer: New challenges to fight against resistance. *World journal of clinical oncology*, 8(2), 120–134. doi:10.5306/wjco.v8.i2.120

McGUICKIN, M. (1995). *Prognostic significance of MUC-1 epithelial mucin expression in breast cancer*1*. *Human Pathology*, 26(4), 432–439. doi:10.1016/0046-8177(95)90146-9

Mishra, S., & Sinha, S. (2014). *Immunoinformatics, Molecular Modeling, and Cancer Vaccines*. *Immunoinformatics*, 513–521. doi:10.1007/978-1-4939-1115-8_28

Momenimovahed, Z., & Salehiniya, H. (2019). Epidemiological characteristics of and risk factors for breast cancer in the world. *Breast cancer (Dove Medical Press)*, 11, 151–164. doi:10.2147/BCTT.S176070

Muhammad, S. A., Ashfaq, H., Zafar, S., Munir, F., Jamshed, M. B., Chen, J., & Zhang, Q. (2020). Polyvalent therapeutic vaccine for type 2 diabetes mellitus: Immunoinformatics approach to study co-stimulation of cytokines and GLUT1 receptors. *BMC molecular and cell biology*, 21(1), 56. doi: 10.1186/s12860-020-00279-w

Muhammad, S., Zafar, S., Rizvi, S., Imran, I., Munir, F., & Jamshed, M. et al. (2020). Experimental analysis of T cell epitopes for designing liver cancer vaccine predicted by system-level immunoinformatics approach. *American Journal Of Physiology-Gastrointestinal And Liver Physiology*, 318(6), G1055-G1069. doi: 10.1152/ajpgi.00068.2020

Murias Henriquez, C., Arkenau, H.-T., Dutoit, V., & Patrikidou, A. (2019). *Cancer Vaccines. Cancer Immunotherapy and Biological Cancer Treatments*. doi:10.5772/intechopen.89074

Musselli, C., Ragupathi, G., Gilewski, T., Panageas, K. S., Spinat, Y., & Livingston, P. O. (2002). *Reevaluation of the cellular immune response in breast cancer patients vaccinated with MUC1*. *International Journal of Cancer*, 97(5), 660–667. doi:10.1002/ijc.10081

Nezafat, N., Ghasemi, Y., Javadi, G., Khoshnoud, M. J., & Omidinia, E. (2014). *A novel multi-epitope peptide vaccine against cancer: An in silico approach*. *Journal of Theoretical Biology*, 349, 121–134. doi:10.1016/j.jtbi.2014.01.018

- Nezafat, N., Sadraeian, M., Rahbar, M., Khoshnoud, M., Mohkam, M., & Gholami, A. et al. (2015). Production of a novel multi-epitope peptide vaccine for cancer immunotherapy in TC-1 tumor-bearing mice. *Biologicals*, *43*(1), 11-17. doi: 10.1016/j.biologicals.2014.11.001
- Nikbin, B., Nicknam, M. H., Hadinedoushan, H., Ansari-pour, B., Moradi, B., Yekaninejad, M., Aminikhah, M., Ranjbar, M. M., & Amirzargar, A. (2017). Human Leukocyte Antigen (HLA) Class I and II Polymorphism in Iranian Healthy Population from Yazd Province. *Iranian journal of allergy, asthma, and immunology*, *16*(1), 1–13.
- Nishida, S., Tsuboi, A., Tanemura, A., Ito, T., Nakajima, H., Shirakata, T., Morimoto, S., Fujiki, F., Hosen, N., Oji, Y., Kumanogoh, A., Kawase, I., Oka, Y., Azuma, I., Morita, S., & Sugiyama, H. (2019). Immune adjuvant therapy using Bacillus Calmette-Guérin cell wall skeleton (BCG-CWS) in advanced malignancies: A phase 1 study of safety and immunogenicity assessments. *Medicine*, *98*(33), e16771. doi: 10.1097/MD.00000000000016771
- Nounou, M. I., ElAmrawy, F., Ahmed, N., Abdelraouf, K., Goda, S., & Syed-Sha-Qhattal, H. (2015). Breast Cancer: Conventional Diagnosis and Treatment Modalities and Recent Patents and Technologies. *Breast cancer : basic and clinical research*, *9*(Suppl 2), 17–34. doi: 10.4137/BCBCR.S29420
- Nourmohammadi, H., Javanmardi, E., Shams, M., Shamsinia, S., Nosrati, M., & Yousefi, A. et al. (2020). Multi-epitope vaccine against cystic echinococcosis using immunodominant epitopes from EgA31 and EgG1Y162 antigens. *Informatix In Medicine Unlocked*, *21*, 100464. doi: 10.1016/j.imu.2020.100464
- Nowicki, T. S., Hu-Lieskovan, S., & Ribas, A. (2018). Mechanisms of Resistance to PD-1 and PD-L1 Blockade. *Cancer journal (Sudbury, Mass.)*, *24*(1), 47–53. doi: 10.1097/PPO.0000000000000303
- Park, B. S., Song, D. H., Kim, H. M., Choi, B.-S., Lee, H., & Lee, J.-O. (2009). The structural basis of lipopolysaccharide recognition by the TLR4–MD-2 complex. *Nature*, *458*(7242), 1191–1195. doi:10.1038/nature07830
- Parvizpour, S., Razmara, J., Pourseif, M. M., & Omid, Y. (2018). *In silico design of a triple-negative*

- breast cancer vaccine by targeting cancer testis antigens. BiolImpacts, 9(1), 45–56.*
doi:10.15171/bi.2019.06
- Paston, S., Brentville, V., Symonds, P., & Durrant, L. (2021). Cancer Vaccines, Adjuvants, and Delivery Systems. *Frontiers In Immunology, 12.* doi: 10.3389/fimmu.2021.627932
- Pauwels, E. K., Foray, N., & Bourguignon, M. H. (2016). Breast Cancer Induced by X-Ray Mammography Screening? A Review Based on Recent Understanding of Low-Dose Radiobiology. *Medical principles and practice : international journal of the Kuwait University, Health Science Centre, 25(2), 101–109.* doi: 10.1159/000442442
- PDQ Adult Treatment Editorial Board. (2021). Breast Cancer Treatment (Adult) (PDQ®): Patient Version. *PDQ Cancer Information Summaries* [Internet]. Bethesda (MD): National Cancer Institute (US). Available from: <https://www.ncbi.nlm.nih.gov/books/NBK65969/>
- Peng, S.T., Su, C.H., Kuo, C.C., Shaw, C.F., & Wang, H.S. (2007). *CD44 crosslinking-mediated matrix metalloproteinase-9 relocation in breast tumor cells leads to enhanced metastasis. International Journal of Oncology.* doi:10.3892/ijo.31.5.1119
- Plotkin, S., Robinson, J. M., Cunningham, G., Iqbal, R., & Larsen, S. (2017). The complexity and cost of vaccine manufacturing - An overview. *Vaccine, 35(33), 4064–4071.* doi: 10.1016/j.vaccine.2017.06.003
- Potocnakova, L., Bhide, M., & Pulzova, L. B. (2016). An Introduction to B-Cell Epitope Mapping and In Silico Epitope Prediction. *Journal of immunology research, 2016, 6760830.* doi: 10.1155/2016/6760830
- Rahn, J., Dabbagh, L., Pasdar, M., & Hugh, J. (2001). The importance of MUC1 cellular localization in patients with breast carcinoma. *Cancer, 91(11), 1973-1982.* doi: 10.1002/1097-0142(20010601)91:11<1973::aid-cnrcr1222>3.0.co;2-a
- Rakha, E., Boyce, R., Abd El-Rehim, D., Kurien, T., Green, A., & Paish, E. et al. (2005). Expression of mucins (MUC1, MUC2, MUC3, MUC4, MUC5AC and MUC6) and their prognostic significance in human breast cancer. *Modern Pathology, 18(10), 1295-1304.* doi: 10.1038/modpathol.3800445

- Raman, K., Yeturu, K., & Chandra, N. (2008). targetTB: a target identification pipeline for Mycobacterium tuberculosis through an interactome, reactome and genome-scale structural analysis. *BMC systems biology*, 2, 109. doi: 10.1186/1752-0509-2-109
- Ramírez, D., & Caballero, J. (2018). Is It Reliable to Take the Molecular Docking Top Scoring Position as the Best Solution without Considering Available Structural Data?. *Molecules*, 23(5), 1038. doi: 10.3390/molecules23051038
- Rapin, N., Lund, O., Bernaschi, M., & Castiglione, F. (2010). Computational Immunology Meets Bioinformatics: The Use of Prediction Tools for Molecular Binding in the Simulation of the Immune System. *Plos ONE*, 5(4), e9862. doi: 10.1371/journal.pone.0009862
- Ren, F., Tang, R., Zhang, X., Madushi, W., Luo, D., & Dang, Y. et al. (2015). Overexpression of MMP Family Members Functions as Prognostic Biomarker for Breast Cancer Patients: A Systematic Review and Meta-Analysis. *PLOS ONE*, 10(8), e0135544. doi: 10.1371/journal.pone.0135544
- Reynisson, B., Barra, C., Kaabinejadian, S., Hildebrand, W., Peters, B., & Nielsen, M. (2020). Improved Prediction of MHC II Antigen Presentation through Integration and Motif Deconvolution of Mass Spectrometry MHC Eluted Ligand Data. *Journal Of Proteome Research*, 19(6), 2304-2315. doi: 10.1021/acs.jproteome.9b00874
- Saadi, M., Karkhah, A., & Nouri, H. R. (2017). Development of a multi-epitope peptide vaccine inducing robust T cell responses against brucellosis using immunoinformatics based approaches. *Infection, Genetics and Evolution*, 51, 227–234. doi:10.1016/j.meegid.2017.04.009
- Sanami, S., Azadegan-Dehkordi, F., Rafieian-Kopaei, M., Salehi, M., Ghasemi-Dehnoo, M., Mahooti, M., Alizadeh, M., & Bagheri, N. (2021). Design of a multi-epitope vaccine against cervical cancer using immunoinformatics approaches. *Scientific reports*, 11(1), 12397. doi: 10.1038/s41598-021-91997-4
- Sanches, R., Tiwari, S., Ferreira, L., Oliveira, F. M., Lopes, M. D., Passos, M., Maia, E., Taranto, A. G., Kato, R., Azevedo, V., & Lopes, D. O. (2021). Immunoinformatics Design of Multi-Epitope Peptide-Based Vaccine Against *Schistosoma mansoni* Using Transmembrane Proteins as a

- Target. *Frontiers in immunology*, 12, 621706. doi: 10.3389/fimmu.2021.621706
- Saxena, M., van der Burg, S., Melief, C., & Bhardwaj, N. (2021). Therapeutic cancer vaccines. *Nature Reviews Cancer*, 21(6), 360-378. doi: 10.1038/s41568-021-00346-0
- Shams, N., Nazifi, N., Forouharmehr, A., Jaydari, A., & Rashidian, E. (2021). Assembling the Most Antigenic Peptides of COVID-19 Immunogenic Proteins Along with a Molecular Adjuvant to Develop a Novel Polyepitope Vaccine: a Bioinformatics Investigation. *Vaccine Research*, 8(1), 36-46. doi: 10.52547/vacres.8.1.36
- Shanmugham, B., & Pan, A. (2013). Identification and Characterization of Potential Therapeutic Candidates in Emerging Human Pathogen Mycobacterium abscessus: A Novel Hierarchical In Silico Approach. *Plos ONE*, 8(3), e59126. doi: 10.1371/journal.pone.0059126
- Shende, G., Haldankar, H., Barai, R., Bharmal, M., Shetty, V., & Idicula-Thomas, S. (2016). PBIT: pipeline builder for identification of drug targets for infectious diseases. *Bioinformatics*, btw760. doi: 10.1093/bioinformatics/btw760
- Shi, Y., Qi, K., Fao, G.F. (2016) HLA*A2402 complexed with HIV nef138 10mer epitope from *Homo sapiens* and Human immunodeficiency virus 1 doi: 10.2210/pdb5HGH/pdb
- Sinn, B., von Minckwitz, G., Denkert, C., Eidtmann, H., Darb-Esfahani, S., & Tesch, H. et al. (2013). Evaluation of Mucin-1 protein and mRNA expression as prognostic and predictive markers after neoadjuvant chemotherapy for breast cancer. *Annals Of Oncology*, 24(9), 2316-2324. doi: 10.1093/annonc/mdt162
- Sippl, M. J. (1993). *Recognition of errors in three-dimensional structures of proteins. Proteins: Structure, Function, and Genetics*, 17(4), 355–362. doi: 10.1002/prot.340170404
- Slota, M., Lim, J. B., Dang, Y., & Disis, M. L. (2011). ELISpot for measuring human immune responses to vaccines. *Expert review of vaccines*, 10(3), 299–306. doi: 10.1586/erv.10.169
- Stranzl, T., Larsen, M. V., Lundegaard, C., & Nielsen, M. (2010). NetCTLpan: pan-specific MHC class I pathway epitope predictions. *Immunogenetics*, 62(6), 357–368. doi: 10.1007/s00251-010-0441-

- Sun, Y. S., Zhao, Z., Yang, Z. N., Xu, F., Lu, H. J., Zhu, Z. Y., Shi, W., Jiang, J., Yao, P. P., & Zhu, H. P. (2017). Risk Factors and Preventions of Breast Cancer. *International journal of biological sciences*, *13*(11), 1387–1397. doi: 10.7150/ijbs.21635
- Sung, H., Ferlay, J., Siegel, R., Laversanne, M., Soerjomataram, I., Jemal, A., & Bray, F. (2021). Global Cancer Statistics 2020: GLOBOCAN Estimates of Incidence and Mortality Worldwide for 36 Cancers in 185 Countries. *CA: A Cancer Journal For Clinicians*, *71*(3), 209-249. doi: 10.3322/caac.21660
- Tarrahimofrad, H., Rahimnahal, S., Zamani, J., Jahangirian, E., & Aminzadeh, S. (2021). Designing a multi-epitope vaccine to provoke the robust immune response against influenza A H7N9. *Scientific Reports*, *11*(1). doi: 10.1038/s41598-021-03932-2
- Tay, R. E., Richardson, E. K., & Toh, H. C. (2020). Revisiting the role of CD4+ T cells in cancer immunotherapy—new insights into old paradigms. *Cancer Gene Therapy*, *28*(1-2), 5-17. doi: 10.1038/s41417-020-0183-x
- The UniProt Consortium. (2021). UniProt: the universal protein knowledgebase in 2021. *Nucleic Acids Res.* 49:D1
- UALCAN. Ualcan.path.uab.edu/analysis. Retrieved 26 May 2022, from <http://ualcan.path.uab.edu/analysis.html>
- Vajda, S., Yueh, C., Beglov, D., Bohnuud, T., Mottarella, S. E., Xia, B., Hall, D. R., & Kozakov, D. (2017). New additions to the ClusPro server motivated by CAPRI. *Proteins*, *85*(3), 435–444. doi: 10.1002/prot.25219
- Vangone, A., & Bonvin, A. M. (2015). Contacts-based prediction of binding affinity in protein–protein complexes. *eLife*, *4*. doi:10.7554/elife.07454
- Vassilaros, S., Tsibanis, A., Tsikkinis, A., Pietersz, G. A., McKenzie, I. F., & Apostolopoulos, V. (2013). Up to 15-year clinical follow-up of a pilot Phase III immunotherapy study in stage II breast cancer patients using oxidized mannan–MUC-1. *Immunotherapy*, *5*(11), 1177–1182. doi:10.2217/imt.13.126

- Vita, R., Mahajan, S., Overton, J. A., Dhanda, S. K., Martini, S., Cantrell, J. R., Wheeler, D. K., Sette, A., & Peters, B. (2019). The Immune Epitope Database (IEDB): 2018 update. *Nucleic acids research*, 47(D1), D339–D343. <https://doi.org/10.1093/nar/gky1006>
- Wang, L. (2017). Early Diagnosis of Breast Cancer. *Sensors*, 17(7), 1572. doi: 10.3390/s17071572
- Wang, R., Lai, L., & Wang, S. (2002). Further development and validation of empirical scoring functions for structure-based binding affinity prediction. *Journal of computer-aided molecular design*, 16(1), 11–26. <https://doi.org/10.1023/a:1016357811882>
- Wang, S., Sun, S., Li, Z., Zhang, R., & Xu, J. (2017). Accurate De Novo Prediction of Protein Contact Map by Ultra-Deep Learning Model. *PLOS Computational Biology*, 13(1), e1005324. doi:10.1371/journal.pcbi.1005324
- Waterhouse, A., Bertoni, M., Bienert, S., Studer, G., Tauriello, G., & Gumienny, R. et al. (2018). SWISS-MODEL: homology modelling of protein structures and complexes. *Nucleic Acids Research*, 46(W1), W296–W303. doi: 10.1093/nar/gky427
- Wiederstein, M., & Sippl, M. J. (2007). ProSA-web: interactive web service for the recognition of errors in three-dimensional structures of proteins. *Nucleic Acids Research*, 35(Web Server), W407–W410. doi:10.1093/nar/gkm290
- Wöckel, A., Albert, U. S., Janni, W., Scharl, A., Kreienberg, R., & Stüber, T. (2018). The Screening, Diagnosis, Treatment, and Follow-Up of Breast Cancer. *Deutsches Arzteblatt international*, 115(18), 316–323. doi: 10.3238/arztebl.2018.0316
- World Population Review. (2022). Indonesia Population 2022 (Demographics, Maps, Graphs). Retrieved 26 May 2022, from <https://worldpopulationreview.com/countries/indonesia-population>
- Xu, J. (2019). Distance-based protein folding powered by deep learning. *Proceedings Of The National Academy Of Sciences*, 116(34), 16856–16865. doi: 10.1073/pnas.1821309116
- Yazdani, Z., Rafiei, A., Irannejad, H., Yazdani, M., & Valadan, R. (2020). Designing a novel multiepitope peptide vaccine against melanoma using immunoinformatics approach. *Journal Of Biomolecular*

Structure And Dynamics, 40(7), 3312-3324. doi: 10.1080/07391102.2020.1846625

Yousef, E., Tahir, M., St-Pierre, Y., & Gaboury, L. (2014). MMP-9 expression varies according to molecular subtypes of breast cancer. *BMC Cancer*, 14(1). doi: 10.1186/1471-2407-14-609

Yuliwulandari, R., Kashiwase, K., Nakajima, H., Uddin, J., Susmiarsih, T. P., Sofro, A. S. M., & Tokunaga, K. (2009). Polymorphisms of HLA genes in Western Javanese (Indonesia): close affinities to Southeast Asian populations. *Tissue Antigens*, 73(1), 46–53. doi:10.1111/j.1399-0039.2008.01178.x

Zhang, Z., Lu, M., Qin, Y., Gao, W., Tao, L., Su, W., & Zhong, J. (2021). Neoantigen: A New Breakthrough in Tumor Immunotherapy. *Frontiers In Immunology*, 12. doi: 10.3389/fimmu.2021.672356

Zheng, Q., Li, Z., Zhou, S., Zhang, Q., Zhou, L., & Fu, X. et al. (2017). Heparin-binding Hemagglutinin of *Mycobacterium tuberculosis* Is an Inhibitor of Autophagy. *Frontiers In Cellular And Infection Microbiology*, 7. doi: 10.3389/fcimb.2017.00033