



Position :

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Laboratory for Quality Research in
Chinese Medicine,

Macau Institute for
Applied Research in Medicine and
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Dr. Neher's
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Biosketch

Dr. Elaine Leung is an Associate Professor of the State Key Laboratory of Quality Research in Chinese Medicine, Macau University of Science and Technology (MUST) and Assistant Director of the Macau Institute For Applied Research in Medicine and Health (MIAR). Her research focuses on new drug discovery and drug mechanism investigation from Traditional Chinese Medicines (TCM). Another scope of her research is about the investigation of the potential modulatory role of TCM in cancer metabolism and redox balance in cancer and inflammation. The results of these studies have been published in *Nature (Outlook)*, *Science (Supp)*, *Pharmacology and therapeutics*, *Briefings in Bioinformatics*, *Antioxidants and redox signaling*, *Scientific Reports*, *Leukemia*, *Oncogene*, *Molecular Cancer Research*, *Molecular Cancer Therapeutics*, *Cancer* etc. She has also obtained 39 international patents. Currently, she is appointed as the Associate Editor of the "Bioactive molecules derived from medicinal plants or natural products section" of the journal *Pharmacological research* (IF 5.574, Q1 in pharmacology and pharmacy area). She is also the Executive Council of the Speciality Committee on Immunology of Traditional Chinese Medicine of the World Federation of Chinese Medicine Societies, Macau Society of Clinical Oncology (MSCO) and honorary advisor of Macau Life Science Institute. She has achieved multiple funding supports from the China National Science Foundation, Macau Foundation, Macao Science and Technology Development Fund and the Ministry of Science and Technology of the People's Republic of China. She is also awardee from the Macau Bank of China Research Award (2013), the Macau Science and Technology Award (Natural Science Second Prize) (2014) and the Higher Education Outstanding Scientific Research Output Awards (Science and Technology) in the category of Natural Sciences from the Ministry of Education (First Prize) (2015&2018).

Biochemistry; Modern Biotechnology; Methodology of Pharmacological Experiment; Advances in Research into Chinese Materia Medica; Clinical Pharmacology; Medical English

Academic Qualifications

2006.07

Department of Physiology, The Chinese University of Hong Kong
Department of Obstetrics & Gynecology and Cellular & Molecular Medicine,
University of Ottawa

2003.08

Department of Biochemistry, The Chinese University of Hong Kong

2001.08

Molecular Biotechnology Programme, Department of Biology and Department of Biochemistry, The Chinese University of Hong Kong

Teaching Experiences

2019.9- Present

/Dr. Neher's Biophysics Laboratory for Innovative Drug Discovery

2015.9-Present

/State Key Laboratory of Quality Research in Chinese Medicine,
Macau Institute for Applied Research in Medicine and Health, Macau University of Science and Technology

/Department of Internal Medicine, Taihei Hospital, Hubei

2017.10-Present

/The first Affiliated Hospital of Guangzhou medical University

2017.11-Present

/Janssen Pharmaceuticals Inc (Pharmaceutical companies of Johnson & Johnson)

2013.7-2015.8

/Macau Institute for Applied Research in Medicine and Health,
Macau University of Science and Technology

2011.9-2013.6

/State Key Laboratory of Quality Research in Chinese Medicine,
Macau Institute for Applied Research in Medicine and Health, Macau University of Science and Technology

2011.3-2011.8

- /Supervisor: Prof. Liu Liang (Current: Rector of Macau University of Science and Technology)

Former Dean, Chair Professor and Director of Shum Yiu Foon Shum Bik Chuen Memorial Centre for Cancer and Inflammation Research,
School of Chinese Medicine, Hong Kong Baptist University

2006.7-2011.3

- /Supervisor: Dr. Maria Pik Wong Department of Pathology,
Queen Mary Hospital, The University of Hong Kong

Representative Publications

Journal Articles:

1. Zhong ZH, Yi ZL, Zhao YD, Wang J, Jiang ZB, Xu C, Xie YJ, He QD, Tong ZY, Yao XJ, Coghi PS, Fan XX, Chen M. "Pyronaridine induces apoptosis in Non - small cell lung cancer cells by upregulating DR5 expression and inhibiting EGFR." Chem Biol Drug Des 2021

Jul 21.

2. Jiang ZB#, Wang WJ#, Xu C#, Xie YJ#, Wang XR, Zhang YZ, Huang JM, Huang M, Xie C, Liu P, Fan XX, Ma YP, Yan PY, Liu L, Yao XJ*, Wu QB*, - *. "Luteolin and its derivative apigenin suppress the inducible PD-L1 expression to improve anti-tumor immunity in KRAS-mutant lung cancer." *Cancer Lett* 2021 Sep 01;515.
3. Huang J#, Liu D#, Wang Y#, Liu L, Li J, Yuan J, Jiang Z, Jiang Z, Hsiao WW, Liu H, Khan I, Xie Y, Wu J, Xie Y, Zhang Y, Fu Y, Liao J, Wang W, Lai H, Shi A, Cai J, Luo L, Li R, Yao X, Fan X, Wu Q, Liu Z, Yan P, Lu J, Yang M, Wang L, Cao Y*, Wei H*, *. "Ginseng polysaccharides alter the gut microbiota and kynurenine/tryptophan ratio, potentiating the antitumour effect of antiprogrammed cell death 1/programmed cell death ligand 1 (anti-PD-1/PD-L1) immunotherapy." *Gut* 2021 May 18.
4. Chen HH#, Meng WY#, Li RZ#, Wang QY, Wang YW, Pan HD, Yan PY, Wu QB, Liu L, Yao XJ*, Kang M*, *. "Potential prognostic factors in progression-free survival for patients with cervical cancer." *BMC cancer* 21.1 (2021): 1-10.
5. Jiang ZB#, Xu C#, Wang W#, Zhang YZ#, Huang JM, Xie YJ, Wang QQ, Fan XX, Yao XJ, Xie C, Wang XR, Yan PY, Ma YP*, Wu QB*, *. "Plumbagin suppresses non-small cell lung cancer progression through downregulating ARF1 and by elevating CD8+ T cells." *Pharmacological Research* 169 (2021): 105656.
6. Deng J, Han J, Chen J, Zhang Y, Huang Q, Wang Y, Qi X, Liu Z, , Wang D, Feng Q, Lu L. "Comparison of analgesic activities of aconitine in different mice pain models." *PloS one* 16.4 (2021): e0249276.
7. Wang J, Xu C, Chen Y, Shao L, Li T, Fan X, Yu L, Zhang R, Chen B, Chen H, Sui X, *, Wu Q*. " -elemene enhances the antitumor activity of erlotinib by inducing apoptosis through AMPK and MAPK pathways in TKI-resistant H1975 lung cancer cells." *Journal of Cancer* 12.8 (2021): 2285.
8. Song Q, He X, Xiong Y, Wang J, Zhang L, , Li G*. The functional landscape of Golgi membrane protein 1 (GOLM1) phosphoproteome reveal GOLM1 regulating P53 that promotes malignancy. *Cell Death Discovry*.2021 Mar 01;71(1)
9. Shen C, Weng G, Zhang X, , Yao X, Pang J, Chai X, Li D, Wang E, Cao D, Hou T. Accuracy or novelty: what can we gain from target-specific machine-learning-based scoring functions in virtual screening?. *Briefings Bioinformatics*.2021 Jan 08
10. Wu Z, Zhu M, Kang Y, , Lei T, Shen C, Jiang D, Wang Z, Cao D, Hou T. Do we need different machine learning algorithms for QSAR modeling? A comprehensive assessment of 16 machine learning algorithms on 14 QSAR data sets. *Briefings Bioinformatics*.2020 Dec 14
11. Wang Y, Tang S, Lai H, Jin R, Long X, Li N, Tang Y, Guo H, Yao X*, *. Discovery of Novel IDH1 Inhibitor Through Comparative Structure-Based Virtual Screening. *Frontiers in Pharmacology*.2020 Nov 11;11:1583.
12. Jiang JB, Huang JM, Xie YJ, Zhang YZ, Chan C, Lai HL, Wang WJ, Yao XJ, Fan XX, Wu QB, Xie C, Wang MF*, *. Evodiamine suppresses non-small cell lung cancer by elevating CD8+ T cells and downregulating the MUC1-C/PD-L1 axis. *Journal of Experimental & Clinical Cancer Research*.2020 Dec;39(1):1-6.

13. Xie Y#, Meng WY#, Li RZ#, Wang YW, Qian X, Chan C, Yu ZF, Fan XX, Pan HD, Xie C, Wu QB, Yan PY, Liu L, Tang YJ, Yao XJ*, Wang MF* and *. Early lung cancer diagnostic biomarker discovery by machine learning methods. *Translational Oncology*.2020 Nov 17;14(1):100907.
14. Zhang YZ#, Lai HL#, Chen PP#, Li D, Khan I, Hsiao WL, Fan XX, Yao XJ, Wu QB*, Wang MF* & *. Clinical significance of LSECtin and its association with PVR in non-small-cell lung cancer patients. *Annals of Translational Medicine*.2020 Nov;8(21).
15. Lai HL#, Fan XX#, Liu RZ#, Wang YW, Zhang JM, Liu L, Neher E*, Yao XJ* and *. Roles of ion fluxes, metabolism, and redox balance in cancer therapy. *Antioxidants and redox signaling*.2020 Oct 29(ja).
16. Liu Y, Wang M, Luo G, Qian X, Wu C, Zhang Y, Chen B, *, Tang Y*. Experience of N-acetylcysteine airway management in the successful treatment of one case of critical condition with COVID-19. *Medicine*.2020 Oct 16;99(42).
17. #, Lai HL#, Li RZ, Pan HD, Jiang ZB Li Y, Duan FG, Xu JH, Zhang YZ, Shi AX, Wei CL, Zhang FY, Yao XJ and Liang Liu. Roles of serum amyloid A1 protein isoforms in rheumatoid arthritis. *Engineering*.2020
18. Wu QB*, Yao XJ, Chen HW, Li T, Fan XX, Zhang GL, Yu LL, Chen M, Xu C, Zhang RN, Chen B, Sui XB*, *. Long-term aspirin use for primary cancer prevention: An updated systematic review and subgroup meta-analysis of 29 randomized clinical trials. *Journal of Cancer*.2020;11(21):6460.
19. , Pan HD, Huang YF, Fan XX, Wang WY, He F, Cai J, Zhou H, Liu L. The scientific foundation of Chinese herbal medicine against COVID-19. *Engineering*.2020 Oct;610(10)
20. *, Xu S*. Traditional Chinese Medicine in Cardiovascular Drug Discovery. *Pharmacological Research*.2020 Oct 1;160:105168.
21. Wang WJ, Mao LF, Lai HL, Wang YW, Jiang ZB, Li W, Huang JM, Xie YJ, Xu C, Liu P, Li YM, *, Yao XJ*. Dolutegravir derivative inhibits proliferation and induces apoptosis of non-small cell lung cancer cells via calcium signaling pathway. *Pharmacological Research*.2020 Nov 1;161:105129.
22. Liu H, Zheng J, Lai HC, Hu L gcer

Oct 1;54:1-0.

27. Luo S, Xu J, Jiang Z, Liu L, Wu Q, *, Leung AP*. Artificial Intelligence-Based Collaborative Filtering Method with Ensemble Learning for Personalized Lung Cancer Medicine without Genetic Sequencing. *Pharmacological Research*.2020 Oct 1;160:105037.
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30. Huang F, Li Y, , Liu X, Liu K, Wang Q, Lan Y, Li X, Yu H, Cui L, Luo H, Luo L. A review of therapeutic agents and Chinese herbal medicines against SARS-COV-2 (COVID-19). *Pharmacological Research*.2020 May 20:104929.
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efficacy of Chinese medicine Bushen Capsule on cognition and brain activity in patients with amnesic mild cognitive impairment. *Pharmacological Research*.2019 Aug 1;146:104319.

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72. #, Luo LX#, Liu ZQ, Wong VKW, Lu LL, Xie Y, Zhang N, Qu YQ, Fan XX, Li Y, Huang M, Xiao DK, Huang J, Zhou YL, He JX, Ding J, Yao XJ* , Ward DC* , Liu L*. Inhibition of KRAS-dependent lung cancer cell growth by deltarasin: blockage of autophagy increases its cytotoxicity. *Cell Death & Disease*.2018 Feb 13;9(2):1-5.
73. Fan XX#, #, Xie Y, Liu ZQ, Zheng YF, Yao XJ, Lu LL, Wu JL, He JX, Yuan ZW, Fu JJ, Wei CL, Huang J, Xiao DK, Luo LX, Jiang ZB, Zhou YL, Kam RK, Liu L. Suppression of Lipogenesis via Reactive Oxygen Species-AMPK Signaling for Treating Malignant and Proliferative Diseases. *Antioxidants & Redox Signaling*.2018 Feb 10;28(5):339-57.
74. Dai X, Li GP, Yang XQ, Wang XY, Wu J, * . Effects of Lyn kinase on EGFR signaling pathway in lung adenocarcinoma/Lyn. *China Oncology*.2018 Feb 7;28(1):43-9.
75. Su X, Li T, Liu Z, Huang Q, Liao K, Ren R, Lu L, Qi X, Wang M, Chen J, Zhou H, , Pan HD, Liu J, Wang H, Huang L, Liu L. Licochalcone A activates Keap1-Nrf2 signaling to suppress arthritis via phosphorylation of p62 at serine 349. *Free Radical Biology & Medicine*.2018 Feb 1;115:471-83.
76. Lv S, Ji L, Chen B, Liu S, Lei C, Liu X, Qi X, Wang Y, , Wang H, Zhang L, Yu X, Liu Z, Wei Q, Lu L. Histone methyltransferase KMT2D sustains prostate carcinogenesis and metastasis via epigenetically activating LIFR and KLF4. *Oncogene*.2018

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from the parent roots of *Aconitum carmichaelii*. *Tetrahedron letters*. 2017 Apr 19;58(16):1622-6.

91. Luo LX, Fan XX, Li Y, Peng X, Ji YC, Hsiao WW, Liu L*, XJ* Yao. Identification

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traditional Chinese medicine in developing a new generation of medicine.
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- 120.Wang TY, Zhou H, Wong YF, Wu PK, Hsiao WL, *, Liu L*. The Predicted Proteomic Network Associated with the Antiarthritic Action of Qingfu Guanjiesshu in Collagen-II

Book Chapters:

1. Ahmed Y. Ali, Lee Farrand, Ji Young Kim, Sanguine Byun, Elaine Lai-Han Leung, Hyong Joo Lee and Benjamin K. Tsang. Chapter for “New Perspectives in Chemoresistant Ovarian Cancer”, *Ovarian Toxicology*. 2012 (Accepted)
2. Ronald R. Fiscus, Elaine L. Leung, Janica C. Wong and Mary G. Johlfs. Chapter for “ Ovarian Cancer/Book 1 ”, ed. Samir Farghaly, INTECH Open Access Publisher, Rijeka, Croatia, Accepted – August 16, 2011, Scheduled Publication – October 2011. Nitric oxide/protein kinase G-Ia promotes c-Src activation, proliferation and chemoresistance in ovarian cancer

Patents:

1. A novel treatment of Gefitinib-resistant non-small-cell lung cancer using sanguinarine. , Fan XX, Liu L. (US patent provisional filed; Australia patent awarded for 8 years-2014100435)
2. The new application of an alkaloid derived from a Chinese herbal for treatment of cancer by inhibiting cholesterol synthesis and fatty acid oxidation. , Fan XX, Liu L, Wu JL. (US patent provisional filed; Australia patent awarded for 8 years-2014100831)
3. Methods for Novel Drug Discovery, Treatment and Selective Targeting for Gefitinib-Resistant Non-Small-Cell Lung Cancer Harboring T790M Mutation. , Liu L and Fan XX (US patent awarded-US 9439898 B2; Australia patent awarded for 8 years-2014100614)
4. The application of (Z) 3,4,5,4'-tetramethoxystilbene (TMS) in Gefitinib-resistant non-small-cell lung cancer cells. , Fan XX, Liu L and Jiang ZB (US patent-awarded-9597299; Australia patent awarded for 8 years-2015100187)
5. Oncogene ROS1 kinase inhibitor. Yao XJ, , Luo LX, Zhou YL and Liu L. (US patent awarded-9526722B1; Australia patent awarded for 8 years-2015100840)
6. Identification of new AMPK activator for treatment of lung cancer. , Yao XJ, Wong VKW, Liu L and Chen X (US patent awarded-US 9364469 B1; Australia patent awarded for 8 years-2015101612)
7. Identification of New Chemical Structure as AMPK Activator for Treatment at EGFR^{L858R/T790M} Double Mutation Non-Small Cell Lung Cancer. (Method to treat lung cancer) Liu L, , Yao XJ, Wong VKW and Chen Ci (US patent awarded- Patent No. 9,855,250 B1)
8. Identification of new role of mitoxantrone as a direct ROS1 oncogenic kinase inhibitor. Yao XJ, , Luo LX, Hsiao WL and Liu L (US patent awarded for 8 years-US 9522125 B1; Australia patent awarded for 8 years- 2015101712)
9. C498-0065, a novel ROS1 inhibitor, demonstrates potent inhibition activity against ROS1 fusion oncokinase. Yao XJ, , Luo LX and Liu L (US patent awarded-9782400B2; Australia patent awarded for 8 years- 2015101598)
10. PDEd inhibitor for the treatment of cancer. Yao XJ, , Luo LX and Liu L (US patent awarded US 2017/0135979A1; Australia patent awarded for 8 year-2015101666)
11. ALK kinase inhibitor and its use. Yao XJ, , Luo LX and Liang L (US patent filed; Australia patent awarded for 8 year- 2016101467)
12. Hydroxynaphthoquinone compounds (shikonin) for treating of non-small cell lung cancer. Liu L, , Li X, Fan XX (US patent awarded 15/186,795; Australia patent awarded for 8 year-2016100891)
13. Methods for treating lung cancer (PKM2 activator). Liu L, **Leung EL**, Yao XJ and Li RZ (US patent awarded-9744145, Australia patent awarded for 8 year- 2017100105)
14. Methods of identifying a gene associated with a disease or pathological condition of the disease. Liu L, , Yao XJ, Li Y and Pan HD.(US Patent No. 15/647,414 filed on 12 July 2017; Australia patent awarded for 8 year-2017100960)
15. Bufadienolide for treatment of non-small cell lung cancer. Liu L, , Yao XJ, Li RZ and Fan XX. (US patent field, Australia awarded for 8 years-2017100644)

16. Method for treating cancer (BPTF small molecule). , Xiao XJ, Liu L, Xu JH, Li Y and Wang QQ (US patent filed, Australia patent awarded for 8 years-2018100077)
17. Method of treating cancer (PRMT5). Yao XJ, , Liu L, Wang QQ, Xu JH & Li Y. (US patent filed, Australia patent awarded for 8 years-2018100078)
18. Method of treating cancer (KRAS SOS inhibitor 1). Yao XJ, , Liu L, Fan XX, Xie C. (US patent awarded 15/84046).
19. Method of treating lung cancer (KRAS SOS inhibitor 2). Yao XJ, , Liu L, Fan XX, Xie C. (US patent awarded 15/84047)
20. Combinational treatment of Ras-positive diseases with PDE delta inhibitor and direct autophagy inhibitor. Liang Liu, Ward DC, , Yao XJ, Wong VKW, Luo LX. (US patent awarded US9861623B1)

Research Grants/Projects

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| 2020-2023 | Dr. Neher's Biophysics Laboratory for Innovative Drug Discovery |
| 2019-2022 | Modulation of gut microbiota to enhance efficacy of anti-PD1 immunotherapy in non-small cell lung cancer |
| 2018 | Targeting T cell metabolic checkpoint to restore anti-cancer activity using Chinese herbal medicine |
| 2016-2019 | Role and therapeutic intervention of reactive oxygen species and redox balance in regulation of non-small cell lung cancer |
| 2015-2016 | Next Seq™ 500 Next generation DNA sequencer |
| 2015-2016 | Next Seq™ 500 Next generation DNA sequencer work station |
| 2014-2015 | Identification of novel metabolic biomarkers associated with lung adenocarcinoma target-based therapy resistance for network-based drug discovery with Chinese herbal medicine |
| 2013-2015 | Investigation on the novel candidate anti-cancer drug from Chinese herbal medicine by modulating metabolic profiles of cancer cells |

Academic and Professional Membership

- Macau Life Science Institute / Honorary Advisor
- The Speciality Committee on Immunology of Traditional Chinese Medicine of the World Federation of Chinese Medicine Societies / Executive Council

Professional Qualifications and Awards

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| 2018 | Science and Technology Award of Higher Education of China (First Class), Ministry of Education, China |
| 2018 | Zhong Zhu Medicine & Life Science Excellent Teacher Award (Research Award-Special Class) |
| 2017 | Zhong Zhu Medicine & Life Science Excellent Teacher Award (Research Award-Special Class) |
| 2015 | Science and Technology Award of Higher Education of China (First Class), Ministry of Education, China 2014 |
| 2014 | Macau Science and Technology Award (Natural Science Second Prize 2014) |

2013

Macau Bank of China Research Award