

Elaine, Lai-Han Leung



Position :

Associate Professor, State Key Laboratory for Quality Research in Chinese Medicine,

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

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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).

Teaching and Research Areas :

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

Academic Qualifications

- 2006.07 **Doctor of Philosophy in Physiology**
Department of Physiology, The Chinese University of Hong Kong
Department of Obstetrics & Gynecology and Cellular & Molecular Medicine,
University of Ottawa
- 2003.08 **Master of Philosophy in Biochemistry**
Department of Biochemistry, The Chinese University of Hong Kong
- 2001.08 **Bachelor of Science (Hons)**
Molecular Biotechnology Programme, Department of Biology and Department of
Biochemistry, The Chinese University of Hong Kong

Teaching Experiences

- 2019.9- Present **Executive Director** /Dr. Neher's Biophysics Laboratory for Innovative Drug Discovery
- 2015.9-Present **Associate Professor** /State Key Laboratory of Quality Research in Chinese Medicine,
Macau Institute for Applied Research in Medicine and Health, Macau University of
Science and Technology
Visiting Professor /Department of Internal Medicine, Taihei Hospital, Hubei
- 2017.10-Present **Adjunct Professor** /The first Affiliated Hospital of Guangzhou medical University
- 2017.11-Present **Project consultant** /Janssen Pharmaceuticals Inc (Pharmaceutical companies of
Johnson & Johnson)
- 2013.7-2015.8 **Assistant Director** /Macau Institute for Applied Research in Medicine and Health,
Macau University of Science and Technology
- 2011.9-2013.6 **Assistant Professor** /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 **Post-doctoral Research Fellow** /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 **Post-doctoral Fellow** /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, **Leung EL**, 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*, **Lai-Han Leung E***. "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*, **Leung EL***. "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*, **Leung EL***. "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*, **Leung EL***. "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, **Leung EL**, 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, **Leung EL***, Wu Q*. " β -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, **Leung EL***, 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, **Leung EL**, 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, **Leung EL**, 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*, **Leung EL***. 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*, **Leung EL***. 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 **Leung EL***. 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* & **Leung EL***. 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 **Leung EL***. 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, **Leung EL***, 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. **Leung EL#**, 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*, **Leung EL***. 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. **Leung EL**, 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. **Leung EL***, 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, **Leung EL***, 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 B, Zhu L, **Leung EL***, Wei H*. Microbiome technology empowers the development of traditional Chinese medicine. *Sci China Life Sci*.2020 Nov;63(11):1759-61.
23. Chen B, Zhang RN, Fan X, Wang J, Xu C, An B, Wang Q, Wang J, **Leung EL***, Sui X*, Wu Q*. Clinical diagnostic value of long noncoding RNAs in colorectal Cancer: A systematic review and meta-analysis. *Journal of Cancer*.2020;11(18):5518.
24. Hussain S, Xie YJ, Li D, Malik SI, Hou JC, **Leung EL***, Fan XX*. Current strategies against COVID-19. *Chinese Medicine*.2020 Dec;15(1):1-2.
25. Wang Z, Wu W, Guan X, Guo S, Li C, Niu R, Gao J, Jiang M, Bai L, **Leung EL**, Hou Y, Jiang Z, Bai G. 20 (S)-protopanaxatriol promotes the binding of P53 and DNA to regulate the antitumor network via multiomic analysis. *Acta Pharmaceutica Sinica B*.2020 Feb 5.
26. Huang J, Jiang Z, Wang Y, Fan X, Cai J, Yao X, Liu L, Huang J, He J, Xie C, Wu Q*, Cao Y*, **Leung EL***. Modulation of gut microbiota to overcome resistance to immune checkpoint blockade in cancer immunotherapy. *Current Opinion in Pharmacology*.2020

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27. Luo S, Xu J, Jiang Z, Liu L, Wu Q, **Leung EL***, 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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33. You H, Zhang YZ, Lai HL, Li D, Liu YQ, Li RZ, Khan I, Hsiao WW, Duan FG, Fan XX, Yao XJ, Cao YB, Wu QB*, **Leung EL***, Wang MF*. Prognostic significance of tumor poliovirus receptor and CTLA4 expression in patients with surgically resected non-small-cell lung cancer. *Journal of Cancer Research and Clinical Oncology*.2020 Apr 4:1-0.
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35. **Leung EL*** & Wu QB*. Association of Dietary Fiber and Yogurt Consumption With Lung Cancer Risk. *JAMA Oncology*.2020 May 1;6(5):788-.
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37. Fan XX, Xu MZ, **Leung EL**, Cai J, Yuan Z & Liu L. ROS-Responsive Berberine Polymeric Micelles Effectively Suppressed the Inflammation of Rheumatoid Arthritis by Targeting Mitochondria. *Nano-Micro Letters*.2020 Mar;12(1):1-4.
38. Mok SW, Wong VK, Lo HH, de Seabra Rodrigues Dias IR, **Leung EL**, Law BY, Liu L. Natural products-based polypharmacological modulation of the peripheral immune system for the treatment of neuropsychiatric disorders. *Pharmacology & Therapeutics*.2020 Apr 1;208:107480.

39. Liu Y, Chen X, Choi YJ, Yang N, Song Z, Snedecor ER, Liang W, **Leung EL**, Zhang L, Qin C, Chen J. GORAB promotes embryonic lung maturation through antagonizing AKT phosphorylation, versican expression and mesenchymal cell migration. *FASEB Journal*.2020 Apr;34(4):4918-33.
40. Chen H, Yao X, Li T, Lam CW, Zhang R, Zhang H, Wang J, Zhang W, **Leung EL***, Wu Q*. Compound Kushen injection combined with platinum-based chemotherapy for stage III/IV non-small cell lung cancer: A meta-analysis of 37 RCTs following the PRISMA guidelines. *Journal of Cancer*.2020;11(7):1883.
41. **Leung EL*** & Wu QB*. Commentary on Ge et al. "Insomnia and risk of mortality from all-cause, cardiovascular disease, and cancer: Systematic review and meta-analysis of prospective cohort studies. *Sleep Medicine Reviews*.2020 Jan 8;50:101257.
42. Li JX, Huang JM, Jiang ZB, Li RZ, Sun A, **Leung EL*** & Yan PY*. Current clinical progress of PD-1/PD-L1 immunotherapy and potential combination treatment in non-small cell lung cancer. *INTEGRATIVE CANCER THERAPIES*.2019 Dec;18:1534735419890020.
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44. Chen H#, Yao X#, Li T, Lam CW, Zhang H, Wang J, Zhang W, **Leung EL***, Wu Q*. Compound Kushen injection plus platinum-based chemotherapy for stage IIIB/IV non-small cell lung cancer: A protocol for meta-analysis of randomized clinical trials following the PRISMA guidelines. *Medicine (Baltimore)*.2019 Dec;98(52).
45. **Leung EL*** & Wu QB*. The evidence strength of a meta-analysis of aspirin for primary prevention of cancer. *Journal of Cancer Research and Clinical Oncology*.2020 Aug;146(8):2173-5.
46. Duan FG#, Wang MF#, Cao YB, Dan Li, Li RZ, Fan XX, Khan I, Lai HL, Zhang YZ, Hsiao WW, Yao XJ, Wu QB, Liu L*, Tang YJ*, **Leung EL***. MicroRNA-421 confers paclitaxel resistance by binding to the KEAP1 3'UTR and predicts poor survival in non-small cell lung cancer. *Cell Death & Disease*.2019 Oct 28;10(11):1-4.
47. Wang Y#, Tang C#, Yao S, Lai H, Li R, Xu J, Wang Q, Fan XX, Wu QB, **Leung EL***, Ye Y*, Yao X*. Discovery of a novel protein kinase C activator from *Croton tiglium* for inhibition of non-small cell lung cancer. *Phytomedicine*.2019 Dec 1;65:153100.
48. Chen H#, Yao X#, Liu Z#, Li T, Xu C, Wang J, Sui X*, **Leung EL***, Wu Q*. Efficacy and safety of Shenqi Fuzheng injection combined with platinum-based chemotherapy for stage III/IV non-small cell lung cancer: A protocol for systematic review and meta-analysis of randomized controlled trials. *Medicine (Baltimore)*.2019 Sep;98(39).
49. Wu Q*, Chen H, Yao X, Li T, Xu C, Wang J, Sui X*, **Leung EL***. Long-term aspirin use for cancer primary prevention: A protocol for updated systematic review and subgroup meta-analysis of randomized clinical trials. *Medicine (Baltimore)*.2019 Sep;98(39).
50. Pan HD#, Xiao Y#, Wang WY, Ren RT, **Leung EL*** & Liu L*. Traditional Chinese Medicine as a Treatment for Rheumatoid Arthritis-From Empirical Practice to Evidence-based Therapy. *Engineering*.2019 Oct 1;5(5):895-906.
51. Zhang J#, Yang C#, Wei D#, Li H#, **Leung EL**, Deng Q, Liu Z, Fan XX*, Zhang Z*. Long-term

- 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.
52. Zhang Y#, Han CY#, Duan FG, Fan XX, Yao XJ, Parks RJ, Tang YJ, Wang MF, Liu L, Tsang BK*, **Leung EL***. p53 sensitizes chemoresistant non-small cell lung cancer via elevation of reactive oxygen species and suppression of EGFR/PI3K/AKT signaling. *Cancer Cell International*.2019 Dec;19(1):188.
53. Pan H, Guo R, Ju Y, Wang Q, Zhu J, Xie Y, Zheng Y, Li T, Liu Z, Lu L, Li F, Tong B, Xiao L, Xu X, **Leung EL**, Li R, Yang H, Wang J, Zhou H, Jia H, Liu L. A single bacterium restores the microbiome dysbiosis to protect bones from destruction in a rat model of rheumatoid arthritis. *Microbiome*.2019 Dec 1;7(1):107.
54. Jin N#, Bi A#, Lan X#, Xu J, Wang X, Liu Y, Wang T, Tang S, Zeng H, Chen Z, Tan M, Ai J, Xie H, Zhang T, Liu D, Huang R, Song Y, **Leung EL**, Yao X, Ding J, Geng M*, Lin SH*, Huang M*. Identification of metabolic vulnerabilities of receptor tyrosine kinases-driven cancer. *Nature communications*.2019 Jun 20;10(1):1-5.
55. Tian G#, Wu C#, Li J#, Liang B#, Zhang F, Fan X, Li Z, Wang Y, Li Z*, Liu D*, **Leung EL***, Chen J*. Network pharmacology based investigation into the effect and mechanism of Modified Sijunzi Decoction against the subtypes of chronic atrophic gastritis. *Pharmacological Research*.2019 Jun 1;144:158-66.
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58. **Leung EL#**, Luo LX#, Li Y, Liu ZQ, Li LL, Shi DF, Xie Y, Huang M, Lu LL, Duan FG, Huang JM, Fan XX, Yuan ZW, Ding J, Yao XJ*, Ward DC* & Liu L* . Identification of a new inhibitor of KRAS-PDE δ interaction targeting KRAS mutant non-small cell lung cancer. *International journal of cancer*.2019 Sep 1;145(5):1334-45.
59. **Leung EL*** & Wu QB*. Concurrent use of herbal products with prescription drugs is a double-edged sword and evidence-based medicine contributes to reshaping the practice. *Pharmacological Research*.2017;2:101-7.
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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. **Leung EL**, 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. **Leung EL**, 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. **Leung EL**, 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. **Leung EL**, 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, **Leung EL**, 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. **Leung EL**, 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, **Leung EL**, 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, **Leung EL**, 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, **Leung EL**, 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, **Leung EL**, 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, **Leung EL**, 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, **Leung EL**, 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, **Leung EL**, 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, **Leung EL**, Yao XJ, Li RZ and Fan XX. (US patent field, Australia awarded for 8 years-2017100644)

16. Method for treating cancer (BPTF small molecule). **Leung EL**, 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, **Leung EL**, 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, **Leung EL**, Liu L, Fan XX, Xie C. (US patent awarded 15/84046).
19. Method of treating lung cancer (KRAS SOS inhibitor 2). Yao XJ, **Leung EL**, 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, **Leung EL**, 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