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Short Communication

# Analyze the Role of the "5-Steps Rule" Guidelines in Stimulating the Drug Development (Short Communication)

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## Short Communication

About 10 years ago a very important paper on "Some remarks on protein attribute prediction and pseudo amino acid composition" was published [1]. In that paper, the "5-steps rule" or "5-step rules" has been proposed. Since it has the following notable advantages:

a. Crystal clear in logic development.

b. Completely transparent in operation.

c. Easily to repeat the reported results by other investigators.

d. With high potential in stimulating other sequence-analyzing methods.

e. Very convenient to be used by the majority of experimental scientists.

Ever since then, a series of papers by using the "5-steps rule" or "5-step rules" [1] have been published for developing drugs against various diseases [2-51]. It has also stimulated the eight masterpieces papers [52-59] by the then Chairman of Nobel Prize Committee.

## Reference

1. Chou KC (2011) Some remarks on protein attribute prediction and pseudo amino acid composition. J Theor Biol 273(1): 236-247.
2. Butt AH, Khan YD (2018) Prediction of S-Sulfenylation Sites Using Statistical Moments Based Features via Chou's 5-Step Rule. International Journal of Peptide Research and Therapeutics 17: 711-738.
3. Awais M, Hussain W, Khan YD, Rasool N, Khan SA, et al. (2019) iPhosH-PseAAC: Identify phosphohistidine sites in proteins by blending statistical moments and position relative features according to the Chou's 5-step rule and general pseudo amino acid composition. IEEE/ACM Trans Comput Biol Bioinform 19: 1-21.
4. Barukab O, Khan YD, Khan SA, Chou KC (2019) iSulfoTyr-PseAAC: Identify tyrosine sulfation sites by incorporating statistical moments via Chou's 5-steps rule and pseudo components. Current Genomics. 20(4): 306-320.
5. Butt AH, Khan YD (2019) Prediction of S-Sulfenylation Sites Using Statistical Moments Based Features via Chou's 5-Step Rule. International Journal of Peptide Research and Therapeutics 19: 71-82.
6. Chen Y, Fan X (2019) Use Chou's 5-Steps Rule to Reveal Active Compound and Mechanism of Shuangsheng Pingfei San on Idiopathic Pulmonary Fibrosis. Current Molecular Medicine 19: 511-563.
7. Du X, Diao Y, Liu H, Li S (2019) MsDBP: Exploring DNA-binding Proteins by Integrating Multi-scale Sequence Information via Chou's 5-steps Rule. Journal of Proteome Research 18: 3119-3132.
8. Dutta A, Dalmia A, A R, Singh KK, Anand A (2019) Using the Chou's 5-steps rule to predict splice junctions with interpretable bidirectional long short-term memory networks. Comput Biol Med 116: 103558.
9. Ehsan A, Mahmood MK, Khan YD, Barukab OM, Khan SA, et al. (2019) iHyd-PseAAC (EPSV): Identify hydroxylation sites in proteins by extracting enhanced position and sequence variant feature via Chou's 5-step rule and general pseudo amino acid composition. Current Genomics 20(2): 124-133.
10. Hussain W, Khan SD, Rasool N, Khan SA, Chou KC (2019) SPalmitoylC-PseAAC: A sequence-based model developed via Chou's 5-steps rule and general PseAAC for identifying S-palmitoylation sites in proteins. Anal Biochem 568: 14-23.
11. Hussain W, Khan YD, Rasool N, Khan SA, Chou KC (2019) SPrenylC-PseAAC: A sequence-based model developed via Chou's 5-steps rule and general PseAAC for identifying S-prenylation sites in proteins. J Theor Biol 468: 1-11.
12. Jun Z, Wang SY (2019) Identify Lysine Neddylation Sites Using Bi-profile Bayes Feature Extraction via the Chou's 5-steps Rule and General Pseudo Components. Current Genomics 20(8): 592-601.
13. Khan S, Khan M, Iqbal N, Hussain T, Khan SA, et al. (2019) A Two-Level Computation Model Based on Deep Learning Algorithm for Identification of piRNA and Their Functions via Chou's 5-Steps Rule. Human Genetics 19: 756-799.

14. Khan ZU, Ali F, Khan IA, Hussain Y, Pi D (2019) iRSpot-SPI: Deep learning-based recombination spots prediction by incorporating secondary sequence information coupled with physio-chemical properties via Chou's 5-step rule and pseudo components. Chemometrics and Intelligent Laboratory Systems 189: 169-180.

15. Lan J, Liu J, Liao C, Merkler DJ, Han Q, et al. (2019) A Study for Therapeutic Treatment against Parkinson's Disease via Chou's 5-steps Rule. Current Topics in Medicinal Chemistry 19: 2318-2333.

16. Le NQK (2019) iN6-methylat (5-step): identifying DNA N (6)-methyladenine sites in rice genome using continuous bag of nucleobases via Chou's 5-step rule. Molecular genetics and genomics 294: 1173-1182.

17. Le NQK, Yapp EKY, Ho QT, Nagasundaram N, Ou YY, et al. (2019) iEnhancer-5Step: Identifying enhancers using hidden information of DNA sequences via Chou's 5-step rule and word embedding. Anal Biochem 571: 53-61.

18. Le NQK, Yapp EKY, Ou YY, Yeh HY (2019) iMotor-CNN: Identifying molecular functions of cytoskeleton motor proteins using 2D convolutional neural network via Chou's 5-step rule. Anal Biochem 575: 17-26.

19. Liang R, Xie J, Zhang, Zhang M, Huang H, et al. (2019) Identifying Cancer Targets Based on Machine Learning Methods via Chou's 5-steps Rule and General Pseudo Components. Current Topics in Medicinal Chemistry 19: 2301-2317.

20. Liang Y, Zhang S (2019) Identifying DNase I hypersensitive sites using multi-features fusion and F-score features selection via Chou's 5-steps rule. Biophys Chem 253: 106227.

21. Liu Z, Dong W, Jiang W, He Z (2019) csDMA: an improved bioinformatics tool for identifying DNA 6 mA modifications via Chou's 5-step rule. Sci Rep 9(1): 1-9.

22. Malebary SJ, Rehman MSU, Khan YD (2019) iCrotoK-PseAAC: Identify lysine crotonylation sites by blending position relative statistical features according to the Chou's 5-step rule. PLoS One 14(11): e0223993.

23. Nazari I, Tahir M, Tayari H, Chong KT (2019) iN6-Methyl (5-step): Identifying RNA N6-methyladenosine sites using deep learning mode via Chou's 5-step rules and Chou's general PseKNC. Chemometrics and Intelligent Laboratory Systems 19: 1-39.

24. Ning Q, Ma Z, Zhao X (2019) dForml (KNN)-PseAAC: Detecting formylation sites from protein sequences using K-nearest neighbor algorithm via Chou's 5-step rule and pseudo components. J Theor Biol 470: 43-49.

25. Tahir M, Tayara H, Chong KT (2019) iDNA6mA (5-step rule): Identification of DNA N6-methyladenine sites in the rice genome by intelligent computational model via Chou's 5-step rule. CHEMOLAB 189: 96-101.

26. Wiktorowicz A, Wit A, Dziewierz A, Rzeszutko L, Dudek D, et al. (2019) Calcium Pattern Assessment in Patients with Severe Aortic Stenosis Via the Chou's 5-Steps Rule. Current Pharmaceutical Design 25: 6-31.

27. Yang L, Lv Y, Wang S, Zhang Q, Pan Y, et al. (2019) Identifying FL11 subtype by characterizing tumor immune microenvironment in prostate adenocarcinoma via Chou's 5-steps rule. Genomics 112(2): 1500-1515.

28. Akbar S, Rahman AU, Hayat M, S M (2020) cACP: Classifying anticancer peptides using discriminative intelligent model via Chou's 5-step rules and general pseudo components. Chemometrics and Intelligent Laboratory 196: 103912.

29. Akmal MA, Hussain W, Rasool N, Khan YD, Khan SA, et al. (2020) Using Chou's 5-steps rule to predict O-linked serine glycosylation sites by blending position relative features and statistical moment. IEEE/ACM Trans Comput Biol Bioinform 2020: 1-12.

30. Bouziane H, Chouarfia A (2020) Use of Chou's 5-steps rule to predict the subcellular localization of gram-negative and gram-positive bacterial proteins by multi-label learning based on gene ontology annotation and profile alignment. J Integr Bioinform.

31. Charoenkwan P, Schaduangrat N, Nantasenamat C, Piacham T, Shoombuatong W (2020) iQSP: A Sequence-Based Tool for the Prediction and Analysis of Quorum Sensing Peptides via Chou's 5-Steps Rule and Informative Physicochemical Properties. Int J Mol Sci 21(1): 75.

32. Charoenkwan P, Schaduangrat N, Nantasenamat C, Piacham T, Shoombuatong W, et al. (2020) iQSP: A Sequence-Based Tool for the Prediction and Analysis of Quorum Sensing Peptides via Chou's 5-Steps Rule and Informative Physicochemical Properties. Int J Mol Sci 21(1): 75.

33. Chen Y, Fan X (2020) Use of Chou's 5-Steps Rule to Reveal Active Compound and Mechanism of Shuangshen Pingfei San on Idiopathic Pulmonary Fibrosis. Curr Mol Med 20: 220-230.

34. Dobosz R, Mucko J, Gawinecki R (2020) Using Chou's 5-Step Rule to Evaluate the Stability of Tautomers: Susceptibility of 2-[(Phenylimino)-methyl]-cyclohexane-1,3-diones to Tautomerization Based on the Calculated Gibbs Free Energies. Energies 13(1): 183.

35. Du L, Meng Q, Jiang H, Li Y (2020) Using Evolutionary Information and Multi-Label Linear Discriminant Analysis to Predict the Subcellular Location of Multi-Site Bacterial Proteins via Chou's 5-Steps Rule. IEEE Access 8: 56452-56461.

36. Dutta A, Dalmia A, A. R, Singh KK, Anand A (2020) Using the Chou's 5-steps rule to predict splice junctions with interpretable bidirectional long short-term memory networks. Comput Biol Med 116: 103558.

37. Ju Z, Wang SY (2020) Prediction of lysine formylation sites using the composition of k-spaced amino acid pairs via Chou's 5-steps rule and general pseudo components. Genomics 112: 859-866.

38. Kabir M, Ahmad S, Iqbal M, Hayat M (2020) iNR-2L: A two-level sequence-based predictor developed via Chou's 5-steps rule and general PseAAC for identifying nuclear receptors and their families. Genomics 112(1): 276-285.

39. Khan YD, Amin N, Hussain W, Rasool N, Khan SA, et al. (2020) iProtease-PseAAC(2L): A two-layer predictor for identifying proteases and their types using Chou's 5-step-rule and general PseAAC. Anal Biochem 588: 113477.

40. Lin W, Xiao X, Qiu W, Chou KC (2020) Use Chou's 5-Steps Rule to Predict Remote Homology Proteins by Merging Grey Incidence Analysis and Domain Similarity Analysis. Natural Science 12(3): 181-198.

41. Lu W, Song Z, Ding Y, Wu H, Cao Y, et al. (2020) Use Chou's 5-Step Rule to Predict DNA-Binding Proteins with Evolutionary Information. BioMed Research International 2020: 6984045.

42. Nguyen D, Ho-Quang T, Nguyen Quoc Khanh L, Dinh-Phan V, Ou YY (2020) Use Chou's 5-steps rule with different word embedding types to boost performance of electron transport protein prediction model. IEEE/ACM Trans Comput Biol Bioinform.

43. Pandey RP, Kumar S, Ahmad S, Vibhuti A, Raj VS, et al. (2020) Use Chou's 5-steps rule to evaluate protective efficacy induced by antigenic proteins of Mycobacterium tuberculosis encapsulated in chitosan nanoparticles. Life Sci 256: 117961.

44. Roy T, Bhattacharjee P (2020) A LabVIEW-based real-time modeling approach via Chou's 5-steps rule for detection of abnormalities in cancer cells. Gene Reports pp. 100788.

45. So C, Yang B (2020) Use Chou's 5-Step Rule to Classify Protein Modification Sites with Neural Network. Scientific Programming 2020.

46. Song C, Yang B (2020) Use Chou's 5-Step Rule to Classify Protein Modification Sites with Neural Network. Scientific Programming 2020: 8894631-8894637.

47. Vishnoi S, Garg P, Arora P (2020) Physicochemical n-Grams Tool: A tool for protein physicochemical descriptor generation via Chou's 5-step rule. Chem Biol Drug Des 95: 79-86.

48. Vundavilli H, Datta A, Sima C, Hua J, Lopes R, et al. (2020) Using Chou's 5-steps rule to Model Feedback in Lung Cancer. IEEE Journal of Biomedical and Health Informatics 21: 1-24.

49. Yang L, Lv Y, Wang S, Zhang Q, Pan Y, et al. (2020) Identifying FL11 subtype by characterizing tumor immune microenvironment in prostate adenocarcinoma via Chou's 5-steps rule. Genomics 112(2): 1500-1515.

50. Zhang S, Xue T (2020 Use Chou's 5-steps rule to identify DNase I hypersensitive sites via dinucleotide property matrix and extreme gradient boosting. Molecular genetics and genomics.

51. Zhang Z, Wang L (2020) Using Chou's 5-steps rule to identify N (6)-methyladenine sites by ensemble learning combined with multiple feature extraction methods. J Biomol Struct Dyn 18: 1-11.

52. Chou KC, Forsen S (1980) Diffusion-controlled effects in reversible enzymatic fast reaction system: Critical spherical shell and proximity rate constants. Biophysical Chemistry 12(3-4): 255-263.

53. Chou KC, Forsen S (1980) Graphical rules for enzyme-catalyzed rate laws. Biochem J 187(3): 829-835.

54. Chou KC, Forsen S, Zhou GQ (1980) Three schematic rules for deriving apparent rate constants. Chemica Scripta 16: 109-113.

55. Chou KC, Li TT, Forsen S (1980) The critical spherical shell in enzymatic fast reaction systems. Biophysical Chemistry 12(3-4): 265-269.

56. Li TT, Chou KC, Forsen S (1980) The flow of substrate molecules in fast enzyme-catalyzed reaction systems. Chemica Scripta 16: 192-196.

57. Chou KC, Carter RE, Forsen S (1981) A new graphical method for deriving rate equations for complicated mechanisms. Chemica Scripta 18: 82-86.

58. Chou KC, Chen NY, Forsen S (1981) The biological functions of low-frequency phonons: 2. Cooperative effects. Chemica Scripta 18: 126-132.

59. Chou KC, Forsen S (1981) Graphical rules of steady-state reaction systems. Can J Chem 59(4): 737-755.



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