Curriculum Vitae
YANGUANG (CARTER) CAO, PhD

A. PERSONAL

Yanguang (Carter) Cao Ph.D.
Assistant Professor at UNC at Chapel Hill
Division of Pharmacotherapy and Experimental Therapeutics
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B. EDUCATION

2009-2013	Postdoc Fellow, Department of Pharmaceutical Science, State University of New York at Buffalo.
2006-2009	Doctor of Philosophy, Pharmaceutical Sciences, China Pharmaceutical University.
2004-2009	Master in Pharmacokinetics, School of Pharmacy, China Pharmaceutical University.
2000-2004	Bachelor in Pharmacology, School of Pharmacy, China Pharmaceutical University

C. PROFESSIONAL EXPERIENCE

Positions and Appointments

2015-Now	Assistant Professor, University of North Carolina at Chapel Hill
2015-Now	Member at Lineberger Cancer Center, UNC at Chapel Hill
2015-2019	Early Career Reviewer (ECR) at the Center for Scientific Review (CSR), NIH
2015-Now	Adjunct Assistant Professor at University at Buffalo, SUNY
2013-2015	Research Assistant Professor, University at Buffalo, Buffalo, NY.
2012-2013	Teaching Assistant, Pharmaceutical Science, University at Buffalo, Buffalo, NY
2005-2006	Teaching Assistant, Pharmaceutical Sciences, China Pharmaceutical University

D. HONORS

2019	UNC ESOP Academic Excellence Award
2017	ACoP8 Quality Abstract Award

2016 Outstanding Investigator Award – NIH-NIGMS MIRA Award

2016 ACoP7 Quality Abstract Award

2015 Researcher in Quantitative Methods and Modeling in Regulatory Science – US. FDA

2009 Top Graduate Student, China Pharmaceutical University, Nanjing, China

E. BIBLIOGRAPHY and PRODUCTS OF SCHOLARSHIP

Book Chapter:

1. Cao Y, Jusko WJ. Mechanistic Physiologically Based Pharmacokinetic: Models in Development of Therapeutic Monoclonal Antibodies. In: Zhou H, Theil F-P, eds. ADME and Translational Pharmacokinetics / Pharmacodynamics of Therapeutic Proteins: Applications in Drug Discovery and Development. Hoboken, New Jersey: John Wiley & Sons; 2015:159-172.

Refereed Papers/Articles. # corresponding author

1. Konicki R, Weiner D, Patterson H, Gonzalez D, Kashuba, A, Cao Y, Powell R, Rivaroxaban Precision Dosing Strategies for Real World Atrial Fibrillation Patients. *Clinical and Translational Science*. 2020 (in press)
2. Zhou J, Liu Y, Zhang Y, Li Q, Cao Y#. Modeling tumor evolutionary dynamics to predict clinical outcomes for patients with metastatic colorectal cancer: a retrospective analysis. *Cancer Res*. 2019 (in press).
3. McSweeney MD, Price LSL, Wessler T, Ciociola EC, Herity LB, Piscitelli JA, DeWalle AC, Harris TN, Chan AKP, Saw RS, Hu P, Jennette JC, Forest MG, Cao Y, Montgomery SA, Zamboni WC, Lai SK. Overcoming anti-PEG antibody mediated accelerated blood clearance of PEGylated liposomes by pre-infusion with high molecular weight free PEG. *J Control Release*. 2019. 311-312:138-146.
4. Yuan D, Rode F, Cao Y#. A systems pharmacokinetic/pharmacodynamic model for concizumab to explore the potential of anti-TFPI recycling antibodies. *Eur J Pharm Sci.* 2019
5. Tang Y, Parag-Sharma K, Amelio AL, Cao Y#. A Bioluminescence Resonance Energy Transfer-Based Approach for Determining Antibody-Receptor Occupancy In Vivo. *iScience*. 2019;15:439-451. ***Highlighted*** *in Drug Discovery News.* https://www.ddn-news.com/index.php?newsarticle=13559.
6. He H, He H, Liu C, Liu Y, Liu X, Wu Y, Fan J, Zhao L, Cao Y#. Mathematical modeling of the heterogeneous distributions of nanomedicines in solid tumors. *Eur J Pharm Biopharm*. 2019. *142:153-164.*
7. Zhao P, Wang P, Dong S, Zhou Z, *Cao Y*, Yagita H, He X, Zheng SG, Fisher SJ, Fujinami RS, Chen M. Depletion of PD-1-positive cells ameliorates autoimmune disease. *Nat Biomed Eng*. 2019;3(4):292-305.
8. He H, Yuan D, Wu Y, Cao Y#. Pharmacokinetics and Pharmacodynamics Modeling and Simulation Systems to Support the Development and Regulation of Liposomal Drugs. *Pharmaceutics*. 2019;11(3).
9. McSweeney MD, Wessler T, Price LSL, Ciociola EC, Herity LB, Piscitelli JA, Zamboni WC, Forest MG, Cao Y#, Lai SK. A minimal physiologically based pharmacokinetic model that predicts anti-PEG IgG-mediated clearance of PEGylated drugs in human and mouse. *J Control Release*. 2018;284:171-178.

10. Liu C, He H, Su M, Cao Y#. Dynamic Metrics-based Biomarkers to Predict Responders to Checkpoint Immunotherapy. *Br J Cancer* 2018; 120(3):346-355
11. Beaudoin JJ, Bezencon J, Cao Y, Mizuno K, Roth SE, Brock WJ, Brouwer KLR. Altered Hepatobiliary Disposition of Tolvaptan and Selected Tolvaptan Metabolites in a Rodent Model of Polycystic Kidney Disease. *Drug Metab Dispos*. 2018 (in press)
12. Yuan D, He H, Wu Y, Fan J, Cao Y#. Physiologically Based Pharmacokinetic Modeling of Nanoparticles. *J Pharm Sci*. 2018. 108(1):58-72
13. Li X, Jusko WJ, Cao Y#. Role of Interstitial Fluid Turnover on Target Suppression by Therapeutic Biologics Using a Minimal Physiologically Based Pharmacokinetic Model. *J Pharmacol Exp Ther*. 2018 Oct;367(1):1-8
14. Maas B, Cao Y#. A Minimal Physiologically-Based Pharmacokinetic Model to Investigate FcRn-Mediated mAb Salvage: Effect of Kon, Koff, Endosome Trafficking, and Animal Species. *mAbs.* 2018; 10(8):1322-1331.
15. Pearce NF, Giblin EM, Buckthal C, Ferrari A, Powell JR, Cao Y, Patterson JH. Precision Drug Dosing: A Major Opportunity for Patients and Pharmacists. *Pharmacotherapy.* 2018;1:107–112.
16. Yuan D, Rode F, Cao Y#. A Minimal Physiologically Based Pharmacokinetic Model with a Nested Endosome Compartment for Novel Engineered Antibodies. *AAPS J.* 2018;20(3):48.
17. McSweeney MD, Wessler T, Price LSL, Ciociola EC, Herity LB, Piscitelli JA, Zamboni WC, Forest MG, Cao Y#, Lai SK. A minimal physiologically based pharmacokinetic model that predicts anti-PEG IgG-mediated clearance of PEGylated drugs in human and mouse. *J Control Release.* 2018;284:171-178.
18. He H, Liu C, Wu Y, Zhang X, Fan J, Cao Y#. A Multiscale Physiologically-Based Pharmacokinetic Model for Doxorubicin to Explore its Mechanisms of Cytotoxicity and Cardiotoxicity in Human Physiological Contexts. *Pharmaceutical Research.* 2018;35(9):174.
19. He H, Cao Y#. Chemotherapeutic dosing implicated by pharmacodynamic modeling of in vitro cytotoxic data: a case study of paclitaxel. *J Pharmacokinet Pharmacodyn.* 2017;44(5):491-501.
20. Gonzalez D, Rao GG, Bailey SC, Brouwer KLR, Cao Y, Crona DJ, Kashuba ADM, Lee CR, Morbitzer K, Patterson JH, Wiltshire T, Easter J, Savage SW, Powell JR. Precision Dosing: Public Health Need, Proposed Framework, and Anticipated Impact. *Clin Transl Sci.* 2017;10(6):443-454.
21. Ramakrishnan V, Yang QJ, Quach HP, Cao Y, Chow EC, Mager DE, Pang KS. Physiologically-Based Pharmacokinetic-Pharmacodynamic Modeling of 1alpha,25-Dihydroxyvitamin D3 in Mice. *Drug Metab Dispos.* 2016;44(2):189-208.
22. Liu D, Song H, Song L, Liu Y, Cao Y, Jiang J, Hu P. A unified strategy in selection of the best allometric scaling methods to predict human clearance based on drug disposition pathway. *Xenobiotica.* 2016;46(12):1105-1111.
23. Zhao J, Cao Y, Jusko WJ. Across-Species Scaling of Monoclonal Antibody Pharmacokinetics Using a Minimal PBPK Model. *Pharm Res.* 2015;32(10):3269-3281.
24. Wang X, DuBois DC, Cao Y, Jusko WJ, Almon RR. Diabetes disease progression in Goto-Kakizaki rats: effects of salsalate treatment. *Diabetes Metab Syndr Obes.* 2014;7:381-389.
25. Cao Y, Jusko WJ. Incorporating target-mediated drug disposition in a minimal physiologically-based pharmacokinetic model for monoclonal antibodies. *J Pharmacokinet Pharmacodyn.* 2014;41(4):375-387.
26. Cao Y, Jusko WJ. Survey of monoclonal antibody disposition in man utilizing a minimal physiologically-based pharmacokinetic model. *J Pharmacokinet Pharmacodyn.* 2014;41(6):571-580.
27. Cao Y, Balthasar JP, Jusko WJ. Second-generation minimal physiologically-based pharmacokinetic model for monoclonal antibodies. *J Pharmacokinet Pharmacodyn.* 2013;40(5):597-607.

28. Cao Y, Jusko WJ. Applications of minimal physiologically-based pharmacokinetic models. *J Pharmacokinet Pharmacodyn.* 2012;39(6):711-723.
29. Cao Y, Gao W, Jusko WJ. Pharmacokinetic/pharmacodynamic modeling of GLP-1 in healthy rats. *Pharm Res.* 2012;29(4):1078-1086.
30. Cao Y, DuBois DC, Almon RR, Jusko WJ. Pharmacokinetics of salsalate and salicylic acid in normal and diabetic rats. *Biopharm Drug Dispos.* 2012;33(6):285-291.
31. Cao Y, Dubois DC, Sun H, Almon RR, Jusko WJ. Modeling diabetes disease progression and salsalate intervention in Goto-Kakizaki rats. *J Pharmacol Exp Ther.* 2011;339(3):896-904.
32. Zhou J, Zhang J, Cao Y, Chen Y, Yu D, Liu X. Effect of acute myocardial ischemia on methylation of danshensu in rats. *J of Chin Pharm Univer.* 2009;40(1):72-76.
33. Yu D, Chai J, Cao Y, Chen Y, Liu X. Effects of salvianolic acid B on the pharmacokinetics of danshensu in Danshen injection in rats. *J of Chin Pharm Univer.* 2009;40(3):258-262.
34. Ma C, Zhang S, Cao Y, Zhang L, Tang Y, Liu X. Regulation of Danshen injection on cardiac energy metabolism in rats. *J of Chin Pharm Univer.* 2009;47(2):157-161.
35. Chen Y, Cao Y, Zhou J, Liu X. Mechanism-based pharmacokinetic-pharmacodynamic modeling of bidirectional effect of danshensu on plasma homocysteine in rats. *Pharm Res.* 2009;26(8):1863-1873.
36. Cao YG, Zhang L, Ma C, Chang BB, Chen YC, Tang YQ, Liu XD, Liu XQ. Metabolism of protocatechuic acid influences fatty acid oxidation in rat heart: new anti-angina mechanism implication. *Biochem Pharmacol.* 2009;77(6):1096-1104.
37. Cao Y, Chai JG, Chen YC, Zhao J, Zhou J, Shao JP, Ma C, Liu XD, Liu XQ. Beneficial effects of danshensu, an active component of Salvia miltiorrhiza, on homocysteine metabolism via the trans-sulphuration pathway in rats. *Br J Pharmacol.* 2009;157(3):482-490.
38. Hao K, Chen Y, Cao Y, Liu X, Wang G. Pharmacokinetic-pharmacodynamic model of telmisartan in insulin-resistance rats. *J of Chin Pharm Univer.* 2008;39(5):422-427.
39. Cao YG, Zhang M, Yu D, Shao JP, Chen YC, Liu XQ. A method for quantifying the unstable and highly polar drug nafamostat mesilate in human plasma with optimized solid-phase extraction and ESI-MS detection: more accurate evaluation for pharmacokinetic study. *Anal Bioanal Chem.* 2008;391(3):1063-1071.
40. Cao YG, Chen YC, Hao K, Zhang M, Liu XQ. An in vivo approach for globally estimating the drug flow between blood and tissue for nafamostat mesilate: the main hydrolysis site determination in human. *Biol Pharm Bull.* 2008;31(11):1985-1989.
41. Liu X, Chen Y, Hao K, Cao Y, Yu D. Recent advances in pharmacokinetic-pharmacodynamic modeling and its applications in drug research and development. *J of Chin Pharm Univer.* 2007;38(6):481-488.
42. Hao K, Chen YC, Cao YG, Yu D, Liu XQ, Wang GJ. Pharmacokinetic-pharmacodynamic modeling of telmisartan using an indirect response model in spontaneously hypertensive rats. *Acta Pharmacol Sin.* 2007;28(5):738-743.
43. Chen Y, Cao Y, Hao K, Liu X, Wang G. Program design of indirect pharmacokinetic and pharmacodynamic model. *J of Chin Pharm Univer.* 2007;38(1):55-59.
44. Cao YG, Liu XQ, Chen YC, Hao K, Wang GJ. Warfarin maintenance dose adjustment with indirect pharmacodynamic model in rats. *Eur J Pharm Sci.* 2007;30(2):175-180.

Abstracts *(Since 2015)*

1. Yuan D, Rode F, Cao Y. Mechanistic Small Systems Model to Explore the Pharmacokinetics and Pharmacodynamics of Concizumab. ACoP9; October 7-10, 2018; San Diego, CA

2. Ito K, Cao Y, Brouwer KLR. Development of a Minimal PBPK Model to Assess Hepatic Disposition of 99Mtechnetium-mebrofenin in Non-Alcoholic Steatohepatitis (NASH) Patient. Poster Session presented at: American Society for Clinical Pharmacology & Therapeutics 2018 Annual Meeting. Orlando, FL. March 21-24, 2018.
3. Beaudoin J, Bezencon, J, Cao Y, Mizuno K, Roth S, Brouwer KLR. Altered Hepatobiliary Disposition of Tolvaptan and Generated Metabolites in a Rodent Model of Polycystic Kidney Disease. Poster Session presented at: 21st North American ISSX Meeting. Providence, RI. September 24-28, 2017.
4. Mick E, Cao Y. A Systems Pharmacology Approach to Support Translational Research in Immuno-Oncology and Its Combinations with Chemotherapy. Podium Session presented at: The American Conference on Pharmacometrics 2017 (ACoP8). Fort Lauderdale, FL. October 15-18, 2017.
5. Liu C, Cao Y. Dynamic Metrics-based Biomarker to Predict Responders to Tumor Checkpoint Immunotherapy. Podium Session presented at: The American Conference on Pharmacometrics 2017 (ACoP8). Fort Lauderdale, FL. October 15-18, 2017.
6. Maas B, Cao Y. A Minimal Physiologically-Based Pharmacokinetic Model to Investigate FcRn-Mediated mAb recycling. Podium Session presented at: The American Conference on Pharmacometrics 2017 (ACoP8). Fort Lauderdale, FL. October 15-18, 2017.
7. He H, Cao Y. Physiologically-based Pharmacokinetic Model for Doxorubicin. Poster Session presented at: The American Conference on Pharmacometrics 2016 (ACoP7). Bellevue, WA. October 22-28, 2017.

F. GRANTS

Funded grants

External

After joining UNC (since 2015)

1. NHLBI-1R01HL141934 PI: Lai SK $36,805 (Cao Total) 05/01/18-04/30/22
   Title: Overcoming anti-PEG immunity to restore prolonged circulation and efficacy of PEGylated therapeutics
   Role: Co-Investigator (5%) + one co-mentoring postdoc

2. NCI - 1R01CA233904 PI: Li Z $128,250 (Cao Total) 10/01/18-09/30/23
   Development of IDO PET agents for immunotherapy
   Role: Co-I, 10% Effort + 50% Postdoc Fellow

3. R35GM119661, Suppl Adm. Equipment $104,935 (Total)
   Optimizing antibody-based therapy through a system platform of pharmacokinetics-pharmacodynamics-immunodynamics
   Role: PI, 0% Effort

2. NIGMS-R35GM119661, MIRA $1,854,683 (Total) 08/01/16-07/31/21
   Title: Optimizing antibody-based therapy through a system platform of pharmacokinetics-pharmacodynamics -immunodynamics.
   Role: PI (51%)

3. NIGMS-R35GM119661, Diversity Suppl $187,047 (Total) 12/01/17-11/30/19
   Title: Optimizing antibody-based therapy through a system platform of pharmacokinetics-pharmacodynamics –immunodynamics

Role: PI (0 %)

4. FDA1U01FD005206(02-04), NIH/FDA (NCE) $505,008 (Total) 08/01/15-05/31/18
   Title: Physiologically-based Pharmacokinetic Model for Drugs encapsulated In Liposomes
   Role: PI (20%)

5. FDA 1U01FD005206-S1, NIH/FDA (NCE) $95,397 (Total) 09/01/16-05/31/18
   Title: Physiologically-based Pharmacokinetic Model for Drugs encapsulated In Liposomes-Admin Supplement
   Role: PI (0%)

Internal

1. Eshelman Innovation Institute (Tier 3) PI: Lai SK $500,000 (Total) 5/18-5/20
   Project: In Vivo Engineering of T-cells for CAR-T-Based Therapy
   Role: Co-I

2. Eshelman Innovation Institute (Tier 3) PI: Gonzalez $500,000 (Total) 10/18-9/20
   Project: Precision Dosing of Direct Oral Anticoagulants
   Role: Co-I

3. Eshelman Innovation Institute (Tier 1) $50,000 (Total) 5/18-5/19
   Project: A Novel Format of Bispecific Antibody: Unlease the Hidden Power of TNF-α Trimerization to Overcome Anti-Canter Resistance
   Role: PI

4. Eshelman Innovation Institute (Tier 1) $50,000 (Total) 5/17-5/18
   Project: A Companion Diagnostics for Checkpoint Immunotherapy: Beyond Static Biomarkers
   Role: PI

5. UNC at Chapel Hill Junior Faculty Development Award $7,500 (Total) 12/16-12/17
   Role: PI