



Peter Kao

Associate Professor of Medicine (Pulmonary and Critical Care Medicine)
Medicine - Pulmonary, Allergy & Critical Care Medicine

 Curriculum Vitae available Online

CLINICAL OFFICE (PRIMARY)

- **Pulmonary and Critical Care Clinic**

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Bio

CLINICAL FOCUS

- Pulmonary Disease
- Pulmonology (Lung) and Critical Care

ACADEMIC APPOINTMENTS

- Associate Professor, Medicine - Pulmonary, Allergy & Critical Care Medicine
- Member, Bio-X
- Member, Cardiovascular Institute

PROFESSIONAL EDUCATION

- Board Certification: Pulmonary Disease, American Board of Internal Medicine (2024)
- Fellowship: Stanford University Pulmonary and Critical Care Fellowship (1992) CA
- Residency: Stanford University Internal Medicine Residency (1990) CA
- Medical Education: Columbia University College of Physicians and Surgeons (1988) NJ
- A.B.-A.M., Harvard University , Chemistry and Physics (1979)
- Ph.D., Columbia University , Biochemistry (1986)
- M.D., Columbia University P&S , Medicine (1988)

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

RESEARCH INTERESTS:

Our research program has several active projects:

- 1.) Pulmonary Vascular Disease We are studying experimental hypertensive pulmonary vascular disease, aiming to determine the pathophysiologic mechanisms of disease progression, and to identify and develop novel antiproliferative strategies for prevention and treatment. Our group is the first

to show that hydrophobic statins such as simvastatin, effectively prevent fatal pulmonary hypertension in rats, and reverse established pulmonary hypertension with neointimal vascular occlusion. The mechanisms of simvastatin's efficacy involve inhibition of proliferation and induction of apoptosis of vascular smooth muscle cells. A translational effort to human clinical trials has been initiated at Stanford. Colleague Dr. John Faul (Assistant Professor, PCCM) is directing a randomized, placebo-controlled clinical trial of simvastatin for treatment of Primary Pulmonary Hypertension in the Stanford University Chest Clinic.

2.) Lung Inflammation and Regeneration We are funded by the NIH to study the regulation of cytokine gene expression in bronchial epithelial cells. Inflammatory cytokines contribute to host defenses against pathogens introduced through the airways. Excessive host inflammation in the airways contributes to airway diseases such as asthma and COPD, and inappropriate host inflammatory responses contribute to bronchiectasis in cystic fibrosis and in nontuberculous mycobacterial disease. Together with colleague Dr. Stephen Ruoss (Associate Professor, PCCM), we are characterizing the role of cystic fibrosis gene mutations in susceptibility to nontuberculous mycobacterial pulmonary infections.

We are characterizing lung stem cells capable of self-renewal and of promoting lung regeneration after injury. For this project, we are collaborating with Dr. Judy Shizuru (Associate Professor, Bone Marrow Transplantation, Stanford), and Dr. Chris Contag, expert in imaging (Associate Professor, Pediatrics and Microbiology, Stanford). We are using transgenic donor mice, marked with reporter genes, to identify and enriching stem cells capable of homing to and repopulating lung endothelium and epithelium. This project is funded by the Beckman Center (Stanford).

3. Lung surfactant rheology and cellular oxidative stress - We are studying the biophysical properties of lung surfactant in collaboration with Dr. Gerry Fuller, Professor of Chemical Engineering (Stanford). Dr. Fuller's group has a unique instrument capable of measuring the dynamic viscosity of surfactants. Our aims in this collaboration are to establish how hydrophobic surfactant proteins B and C contribute to lowering the surface tension and viscosity of lung surfactant in health and disease. These studies are relevant for the pathogenesis of interstitial lung diseases and pulmonary fibrosis. The studies are funded by the Bio-X Committee at Stanford.

4.) Novel Gene Regulators NF45 and NF90 We are funded by the NIH to continue studies of two novel transcription factors cloned by Dr. Peter Kao in 1994. These proteins were isolated based on the regulation of the IL-2 gene in T-lymphocytes. They are widely distributed and are now recognized to regulate transcription, mRNA splicing, nuclear export, and protein translation. In order to further characterize their biologic functions, our group is the first to generate mice with targeted disruptions (knockouts) of NF45 and NF90. Currently we are characterizing the phenotypes of these mice, focusing on changes in patterns of gene regulation.

Teaching

COURSES

2025-26

- Human Physiology: BIO 112, HUMBIO 133 (Win)

2024-25

- Human Physiology: BIO 112, HUMBIO 133 (Win)

2023-24

- Human Physiology: BIO 112, HUMBIO 133 (Win)
- Science of Medicine I: INDE 221 (Spr)

2022-23

- Human Physiology: BIO 112, HUMBIO 133 (Win)
- Science of Medicine I: INDE 221 (Spr)

GRADUATE AND FELLOWSHIP PROGRAM AFFILIATIONS

- Medicine (Masters Program)

Publications

PUBLICATIONS

- **Abnormal Lymphatic Sphingosine-1-Phosphate Signaling Aggravates Lymphatic Dysfunction and Tissue Inflammation.** *Circulation*
Kim, D., Tian, W., Wu, T. T., Xiang, M., Vinh, R., Chang, J. L., Gu, S., Lee, S., Zhu, Y., Guan, T., Schneider, E. C., Bao, E., Dixon, et al
2023
- **Calcium-Activated Big-Conductance (BK) Potassium Channels Traffic through Nuclear Envelopes into Kinocilia in Ray Electrosensory Cells.** *Cells*
Chen, A. L., Wu, T. H., Shi, L., Clusin, W. T., Kao, P. N.
2023; 12 (17)
- **Abnormal lymphatic S1P signaling aggravates lymphatic dysfunction and tissue inflammation.** *medRxiv : the preprint server for health sciences*
Kim, D., Tian, W., Wu, T. T., Xiang, M., Vinh, R., Chang, J., Gu, S., Lee, S., Zhu, Y., Guan, T., Schneider, E. C., Bao, E., Dixon, et al
2023
- **Further studies of ion channels in the electroreceptor of the skate through deep sequencing, cloning and cross species comparisons.** *Gene*
Clusin, W. T., Wu, T., Shi, L., Kao, P. N.
2019: 143989
- **Inducible expression of immediate early genes is regulated through dynamic chromatin association by NF45/ILF2 and NF90/NF110/ILF3** *PLOS ONE*
Wu, T., Shi, L., Lowe, A. W., Nicolls, M. R., Kao, P. N.
2019; 14 (4)
- **Inducible expression of immediate early genes is regulated through dynamic chromatin association by NF45/ILF2 and NF90/NF110/ILF3.** *PloS one*
Wu, T. H., Shi, L. n., Lowe, A. W., Nicolls, M. R., Kao, P. N.
2019; 14 (4): e0216042
- **Phenotypically-Silent Bone Morphogenetic Protein Receptor 2 (Bmpr2) Mutations Predispose Rats to Inflammation-Induced Pulmonary Arterial Hypertension by Enhancing The Risk for Neointimal Transformation.** *Circulation*
Tian, W. n., Jiang, X. n., Sung, Y. K., Shuffle, E. n., Wu, T. H., Kao, P. N., Tu, A. B., Dorfmueller, P. n., Cao, A. n., Wang, L. n., Peng, G. n., Kim, Y. n., Zhang, et al
2019
- **NF90/ILF3 is a transcription factor that promotes proliferation over differentiation by hierarchical regulation in K562 erythroleukemia cells** *PLOS ONE*
Wu, T., Shi, L., Adrian, J., Shi, M., Nair, R. V., Snyder, M. P., Kao, P. N.
2018; 13 (3): e0193126
- **Characteristics of the b2 Subunit of the Calcium-Activated K+ Channel in Skate Electroreceptors**
King, B. L., Kao, P., Shi, L., Clusin, W. T.
ROCKEFELLER UNIV PRESS.2017: 8A
- **Calcium activated K(+) channels in the electroreceptor of the skate confirmed by cloning. Details of subunits and splicing.** *Gene*
King, B. L., Shi, L. F., Kao, P., Clusin, W. T.
2016; 578 (1): 63-73
- **Management of High Hepatopulmonary Shunting in Patients Undergoing Hepatic Radioembolization.** *Journal of vascular and interventional radiology*
Ward, T. J., Tamrazi, A., Lam, M. G., Louie, J. D., Kao, P. N., Shah, R. P., Kadoch, M. A., Sze, D. Y.
2015; 26 (12): 1751-1760
- **Lung surfactants and different contributions to thin film stability** *SOFT MATTER*
Hermans, E., Bhamla, M. S., Kao, P., Fuller, G. G., Vermant, J.
2015; 11 (41): 8048-8057

- **Endothelial fate mapping in mice with pulmonary hypertension.** *Circulation*
Qiao, L., Nishimura, T., Shi, L., Sessions, D., Thrasher, A., Trudell, J. R., Berry, G. J., Pearl, R. G., Kao, P. N.
2014; 129 (6): 692-703
- **Functional Implications of Alternative Splicing in the Calcium-Activated BK Channel in the Ampulla of Lorenzini of the Skate**
King, B., Shi, L., Kao, P., Clusin, W. T.
CELL PRESS.2014: 155A
- **Amino Acid Sequence of the Calcium Activated Potassium Channel (BK) In the Skate, *Leucoraja Erinacea***
King, B., Clusin, W. T., Kao, P.
FEDERATION AMER SOC EXP BIOL.2012
- **NF45 and NF90 Regulate HS4-dependent Interleukin-13 Transcription in T Cells** *JOURNAL OF BIOLOGICAL CHEMISTRY*
Kiesler, P., Haynes, P. A., Shi, L., Kao, P. N., Wysocki, V. H., Vercelli, D.
2010; 285 (11): 8256-8267
- **NF90 and NF45 Regulate Interleukin-13 (IL13) Gene Transcription in Human T Cells**
Kiesler, P., Haynes, P., Shi, L., Kao, P., Wysocki, V., Vercelli, D.
FEDERATION AMER SOC EXP BIOL.2008
- **NF90 regulates inducible IL-2 gene expression in T cells** *JOURNAL OF EXPERIMENTAL MEDICINE*
Shi, L., Godfrey, W. R., Lin, J., Zhao, G., Kao, P. N.
2007; 204 (5): 971-977
- **Dynamic binding of Ku80, Ku70 and NF90 to the IL-2 promoter in vivo in activated T-cells** *NUCLEIC ACIDS RESEARCH*
Shi, L., Qiu, D., Zhao, G., Corthesy, B., Lees-Miller, S., Reeves, W. H., Kao, P. N.
2007; 35 (7): 2302-2310
- **Thrombin-activatable procarboxypeptidase B regulates activated complement C5a in vivo** *BLOOD*
Nishimura, T., Myles, T., Piliposky, A. M., Kao, P. N., Berry, G. J., Leung, L. L.
2007; 109 (5): 1992-1997
- **Aerosolized amikacin for treatment of pulmonary *Mycobacterium avium* infections: an observational case series.** *BMC pulmonary medicine*
Davis, K. K., Kao, P. N., Jacobs, S. S., Ruoss, S. J.
2007; 7: 2-?
- **Prospective analysis of cystic fibrosis transmembrane regulator mutations in adults with bronchiectasis or pulmonary nontuberculous mycobacterial infection** *CHEST*
Ziedalski, T. M., Kao, P. N., Henig, N. R., Jacobs, S. S., Ruoss, S. J.
2006; 130 (4): 995-1002
- **RNA regulator NF90 is essential for T-cell homeostasis and normal IL-2 expression** *Experimental Biology 2006 Annual Meeting*
Kao, P. N., Shi, L. F., Godfrey, W. R., Lin, J.
FEDERATION AMER SOC EXP BIOL.2006: A931-A931
- **Simvastatin enhances bone morphogenetic protein receptor type II expression** *BIOCHEMICAL AND BIOPHYSICAL RESEARCH COMMUNICATIONS*
Hu, H., Sung, A., Zhao, G. H., Shi, L. F., Qiu, D. M., Nishimura, T., Kao, P. N.
2006; 339 (1): 59-64
- **Lung surfactant gelation induced by epithelial cells exposed to air pollution or oxidative stress** *AMERICAN JOURNAL OF RESPIRATORY CELL AND MOLECULAR BIOLOGY*
Anseth, J. W., Goffin, A. J., Fuller, G. G., Ghio, A. J., Kao, P. N., Upadhyay, D.
2005; 33 (2): 161-168
- **ADAR1 interacts with NF90 through double-stranded RNA and regulates NF90-mediated gene expression independently of RNA editing** *MOLECULAR AND CELLULAR BIOLOGY*
Nie, Y. Z., Ding, L., Kao, P. N., BRAUN, R., Yang, J. H.
2005; 25 (16): 6956-6963

- **Granzyme B is dispensable for immunologic tolerance to self in a murine model of systemic lupus erythematosus** *ARTHRITIS AND RHEUMATISM*
Graham, K. L., Thibault, D. L., Steinman, J. B., Okeke, L., Kao, P. N., Utz, P. J.
2005; 52 (6): 1684-1693
- **NF90 regulates cell cycle exit and terminal myogenic differentiation by direct binding to the 3'-untranslated region of MyoD and p21(WAF1/CIP1) mRNAs** *JOURNAL OF BIOLOGICAL CHEMISTRY*
Shi, L. F., Zhao, G. H., Qiu, D. M., Godfrey, W. R., Vogel, H., Rando, T. A., Hu, H., Kao, P. N.
2005; 280 (19): 18981-18989
- **NF45/ILF2 tissue expression, promoter analysis, and interleukin-2 transactivating function** *EXPERIMENTAL CELL RESEARCH*
Zhao, G. H., Shi, L. F., Qiu, D. M., Hu, H., Kao, P. N.
2005; 305 (2): 312-323
- **Simvastatin treatment of pulmonary hypertension - An observational case series** *CHEST*
Kao, P. N.
2005; 127 (4): 1446-1452
- **Pulmonary arterial hypertension - Future directions - Report of a National Heart, Lung and Blood Institute/Office of Rare Diseases workshop** *CIRCULATION*
Newman, J. H., Fanburg, B. L., Archer, S. L., Badesch, D. B., Barst, R. J., Garcia, J. G., Kao, P. N., Knowles, J. A., Loyd, J. E., McGoon, M. D., Morse, J. H., Nichols, W. C., RABINOVITCH, et al
2004; 109 (24): 2947-2952
- **Longitudinal transcriptional analysis of developing neointimal vascular occlusion and pulmonary hypertension in rats** *PHYSIOLOGICAL GENOMICS*
Vaszar, L. T., Nishimura, T., Storey, J. D., Zhao, G. H., Qiu, D. M., Faul, J. L., Pearl, R. G., Kao, P. N.
2004; 17 (2): 150-156
- **Members of the NF90/NFAR protein group are involved in the life cycle of a positive-strand RNA virus** *EMBO JOURNAL*
Isken, O., Grassmann, C. W., Sarisky, R. T., Kann, M., Zhang, S., Grosse, F., Kao, P. N., Behrens, S. E.
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- **Simvastatin rescues rats from fatal pulmonary hypertension by inducing apoptosis of neointimal smooth muscle cells** *CIRCULATION*
Nishimura, T., Vaszar, L. T., Faul, J. L., Zhao, G. H., Berry, G. J., Shi, L. F., Qiu, D. M., Benson, G., Pearl, R. G., Kao, P. N.
2003; 108 (13): 1640-1645
- **Selective regulation of gene expression by nuclear factor 110, a member of the NF90 family of double-stranded RNA-binding proteins** *JOURNAL OF MOLECULAR BIOLOGY*
Reichman, T. W., Parrott, A. M., Fierro-Monti, I., Caron, D. J., Kao, P. N., Lee, C. G., Li, H., Mathews, M. B.
2003; 332 (1): 85-98
- **Regulation of IL-2 gene expression and nuclear factor-90 translocation in vaccinia virus-infected cells** *JOURNAL OF INTERFERON AND CYTOKINE RESEARCH*
Langland, J. O., Kao, P., Jacobs, B. L.
2003; 23 (9): 489-500
- **Emerging therapies for pulmonary hypertension - Striving for efficacy and safety** *JOURNAL OF THE AMERICAN COLLEGE OF CARDIOLOGY*
Kao, P. N., Faul, J. L.
2003; 41 (12): 2126-2129
- **Effect of a surgical aortocaval fistula on mono crotaline-induced pulmonary hypertension** *CRITICAL CARE MEDICINE*
Nishimura, T., Faul, J. L., Berry, G. J., Kao, P. N., Pearl, R. G.
2003; 31 (4): 1213-1218
- **Immunosuppressive and anti-inflammatory mechanisms of triptolide, the principal active diterpenoid from the Chinese medicinal herb *Tripterygium wilfordii* Hook. f.** *Drugs in R&D*
Qiu, D., Kao, P. N.
2003; 4 (1): 1-18

- **Simvastatin attenuates smooth muscle neointimal proliferation and pulmonary hypertension in rats** *AMERICAN JOURNAL OF RESPIRATORY AND CRITICAL CARE MEDICINE*
Nishimura, T., Faul, J. L., Berry, G. J., Vaszar, L. T., Qiu, D. M., Pearl, R. G., Kao, P. N.
2002; 166 (10): 1403-1408
- **High prevalence of autoimmune thyroid disease in pulmonary arterial hypertension** *10th Annual Meeting of the American Association of Clinical-Endocrinologists*
Chu, J. W., Kao, P. N., Faul, J. L., Doyle, R. L.
AMER COLL CHEST PHYSICIANS.2002: 1668-73
- **Radiation pneumonitis in mice: A severe injury model for pneumocyte engraftment from bone marrow** *EXPERIMENTAL HEMATOLOGY*
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- **40-O-(2-hydroxyethyl)-rapamycin attenuates pulmonary arterial hypertension and neointimal formation in rats** *AMERICAN JOURNAL OF RESPIRATORY AND CRITICAL CARE MEDICINE*
Nishimura, T., Faul, J. L., Berry, G. I., Veve, I., Pearl, R. G., Kao, P. N.
2001; 163 (2): 498-502
- **Triptolide attenuates pulmonary arterial hypertension and neointimal formation in rats** *AMERICAN JOURNAL OF RESPIRATORY AND CRITICAL CARE MEDICINE*
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- **Anti-inflammatory effects of triptolide in human bronchial epithelial cells** *AMERICAN JOURNAL OF PHYSIOLOGY-LUNG CELLULAR AND MOLECULAR PHYSIOLOGY*
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2000; 279 (5): L958-L966
- **Protein-arginine methyltransferase I, the predominant protein-arginine methyltransferase in cells, interacts with and is regulated by interleukin enhancer-binding factor 3** *JOURNAL OF BIOLOGICAL CHEMISTRY*
Tang, J., Kao, P. N., Herschman, H. R.
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- **Autoantibodies define a family of proteins with conserved double-stranded RNA-binding domains as well as DNA binding activity** *JOURNAL OF BIOLOGICAL CHEMISTRY*
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- **Erythromycin inhibits transcriptional activation of NF-kappa B, but not NFAT, through calcineurin-independent signaling in T cells** *ANTIMICROBIAL AGENTS AND CHEMOTHERAPY*
Aoki, Y., Kao, P. N.
1999; 43 (11): 2678-2684
- **Tick-borne pulmonary disease - Update on diagnosis and management** *CHEST*
Faul, J. L., Doyle, R. L., Kao, P. N., Ruoss, S. J.
1999; 116 (1): 222-230
- **Nuclear factor-90 of activated T-cells: A double-stranded RNA-binding protein and substrate for the double-stranded RNA-dependent protein kinase, PKR** *BIOCHEMISTRY*
Langland, J. O., Kao, P. N., Jacobs, B. L.
1999; 38 (19): 6361-6368
- **PG490 (triptolide) cooperates with tumor necrosis factor-alpha to induce apoptosis in tumor cells** *JOURNAL OF BIOLOGICAL CHEMISTRY*
Lee, K. Y., Chang, W. T., Qiu, D. M., Kao, P. N., Rosen, G. D.
1999; 274 (19): 13451-13455
- **Immunosuppressant PG490 (triptolide) inhibits T-cell interleukin-2 expression at the level of purine-box/nuclear factor of activated T-cells and NF-kappa B transcriptional activation** *JOURNAL OF BIOLOGICAL CHEMISTRY*
Qiu, D. M., Zhao, G. H., Aoki, Y., Shi, L. F., Uyei, A., Nazarian, S., Ng, J. C., Kao, P. N.
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1999; 115 (4): 1033-1040
- **Diaphragmatic paralysis due to Lyme disease** *EUROPEAN RESPIRATORY JOURNAL*
Faul, J. L., Ruoss, S., Doyle, R. L., Kao, P. N.
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- **CsA-sensitive purine-box transcriptional regulator in bronchial epithelial cells contains NF45, NF90, and Ku** *AMERICAN JOURNAL OF PHYSIOLOGY-LUNG CELLULAR AND MOLECULAR PHYSIOLOGY*
Aoki, Y., Zhao, G. H., Qiu, D. M., Shi, L. F., Kao, P. N.
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- **CsA-sensitive purine-box transcriptional regulator in bronchial epithelial cells contains NF45, NF90, and Ku.** *American journal of physiology. Lung cellular and molecular physiology*
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- **Potassium currents in freshly dissociated uterine myocytes from nonpregnant and late-pregnant rats** *JOURNAL OF GENERAL PHYSIOLOGY*
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- **Leukotriene B-4 mediates histamine induction of NF-kappa B and IL-8 in human bronchial epithelial cells** *AMERICAN JOURNAL OF PHYSIOLOGY-LUNG CELLULAR AND MOLECULAR PHYSIOLOGY*
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- **Leukotriene B4 mediates histamine induction of NF-kappaB and IL-8 in human bronchial epithelial cells.** *American journal of physiology. Lung cellular and molecular physiology*
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- **Analyses of the NRAMP1 and IFN-gamma R1 genes in women with Mycobacterium avium-intracellulare pulmonary disease** *AMERICAN JOURNAL OF RESPIRATORY AND CRITICAL CARE MEDICINE*
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- **DNA-dependent protein kinase interacts with antigen receptor response element binding proteins NF90 and NF45** *JOURNAL OF BIOLOGICAL CHEMISTRY*
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- **Cyclosporin A-sensitive calcium signaling represses NF kappa B activation in human bronchial epithelial cells and enhances NF kappa B activation in Jurkat T-cells** *BIOCHEMICAL AND BIOPHYSICAL RESEARCH COMMUNICATIONS*
Aoki, Y., Kao, P. N.
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- **Lymphangioliomyomatosis: New insights** *AMERICAN JOURNAL OF RESPIRATORY AND CRITICAL CARE MEDICINE*
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