BIOGRAPHICAL SKETCH

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NAME: Wood, Charles

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POSITION TITLE: Lewis Lehr/3M University Distinguished Professor / Director, Nebraska Center for Virology

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	Completion Date MM/YYYY	FIELD OF STUDY
University of Kansas, Lawrence, KS	B.A.	05/1975	Chemistry and Microbiology
Columbia University, New York, NY	Ph.D.	05/1981	Microbiology
Basal Institute of Immunology, Basal, Switzerland	Postdoctoral	06/1981	Molecular Immunology
Massachusetts Institute of Technology, Cambridge, MA	Postdoctoral	06/1983	Molecular Immunology

A. Personal Statement

I have significant research, administrative, and mentoring experience in international research focused on infectious diseases. My scientific contributions have been multifaceted and at different levels and include basic and clinical/translational research in immunology and virology as well as work in public health. A majority of my work has centered around HIV/AIDS and co-infecting viruses. I have served as the PI of several multi-center and multi-national collaborative projects, including serving as Project Director for a Center for Biomedical Research Excellence (COBRE) award with 15-year funding from the NIH National Center for Research Recourses (NCRR) to establish and sustain the Nebraska Center for Virology and serving as PI of a Fogarty International training grant on AIDS and associated malignancies. One of my largest ongoing collaborative research projects involves multiple U.S. research institutions and the University of Zambia, School of Medicine to study HIV/AIDS and Kaposi's sarcoma associated human herpesvirus (KSHV) transmission, disease pathogenesis, treatment, and prevention. Through this project, we have successfully built virology, oncology, and cancer research capacity and infrastructure on site in Zambia. Through this partnership, we are not only engaging in research but are providing training opportunities in Nebraska for Africans and vice versa, providing research and training opportunities for Nebraskan students on the ground in Africa. We are now engaging similar research and research capacity in a new partner, the Ocean Road Cancer Institute, in Dar es Salam, Tanzania, and hoping through our effort and collaborations we will help to a make a dent in fighting against the HIV/AIDS epidemic.

B. Positions and Honors

Positions and Employment

1975-1981 Graduate Research Assistant in the Laboratory of Professor Elvin A. Kabat, Department of Microbiology, Columbia University College of Physicians and Surgeons, New York, NY
1981-1983 Research Associate in the Laboratory of Professor Susumu Tonegawa, Massachusetts Institute of Technology, Cambridge, MA
1983-1985 Molecular Immunologist, Cancer Research and Molecular Biology Department; Staff Scientist (Group Leader), Abbott Labs, North Chicago, IL
1984-1985 Adjunct Assistant Professor, Department of Biochemistry, Molecular Biology and Cell Biology, Northwestern University, Evanston, IL
1985-1989 Assistant Professor, Department of Microbiology, University of Kansas, Lawrence, KS
1989-1992 Associate Professor, Department of Microbiology, University of Kansas, Lawrence, KS

1992-1996 Director, Division of Neurovirology; Associate Professor, Department of Microbiology / Immunology and Neurology, University of Miami, Miami, FL
1996- 3M/Lehr Professor, School of Biological Sciences and Department of Biochemistry, University of Nebraska-Lincoln, Lincoln, NE
2000- Director, Nebraska Center for Virology, University of Nebraska-Lincoln, Lincoln, NE
2000- Director, Fogarty International Training Program in HIV/AIDS Malignancies, University of Nebraska-Lincoln, Lincoln, NE
2003- University of Nebraska University Distinguished Professor, University of Nebraska-Lincoln, Lincoln, NE

Honors and Professional Affiliations

- NIH National Institute of Allergy and Infectious Diseases (NIAID) Review Panel Member (2003- 2008)
- Review Panel Member, California University wide AIDS Research Program (1997-current)
- Ad Hoc Member, AIDS and Related Research (AOIC) (2001-current), Ad Hoc Member, NIH National Institute of Dental and Craniofacial Research (NIDCR) AIDS Malignancies Special Panel (2001, 2002, 2003, 2004, 2005, 2006)
- Site Visit Reviewer for John's Hopkins (1998, 1999) and Princeton (2000) for the NIH National Cancer Institute (NCI) Intramural Program (2000)
- Member, AIDS and Related Research study session (1994-1999, 2008-2013)
- Ad Hoc Reviewer for USDA (1992-1995) and FDA (1990-1992)
- Member of Sigma Xi and Phi Beta Kappa
- University of Nebraska College of Arts and Sciences, Outstanding Research and Creative Achievement in Science Award (2003)
- Sigma Xi Most Outstanding Scientist Award (2005)
- Chair, special review panel (1999, 2001, 2005, 2013)
- Member of the Kansas University AIDS task force (1990-1992)
- Scientific Advisor to Kansas governor's AIDS task force (1988-1992)
- Midwestern State University Association Lecturer (1989-1990)
- Cora Downs Award for most distinguished undergraduate
- Fellow of the American Association for the Advancement of Science (AAAS) (2013)
- University of Nebraska Outstanding Research and Creativity Award (2015)
- Editorial board: *Open AIDS Journal* (Editor-in-Chief), *Current HIV Research* (Editor-in-Chief), *Open Infectious Disease Journal*, *Journal of Neurovirology*, and *Journal of Neuroimmune Pharmacology*

C. Contributions to Science

1. My earliest significant contribution to science was in the field of immunology and molecular immunology in the early 1980s. At that time, the field of immunology was primarily centered on antibodies, antibody antigen reaction, and the immunoglobulin genes that generate antibody diversity. I was fortunate to be able to work with two of the pioneers in the field: (1) the late Professor Elvin Kabat, who started the field of quantitative immunology and identified that antigen specific antibodies are in fact gammaglobulins, and (2) Professor Susumu Tonegawa, who discovered immunoglobulin gene rearrangements. My contribution to antibody-antigen reaction was to characterize the antibody combining sites of antibodies against carbohybrates. I found that the combining sites can only accommodate up to about six sugar moieties. My contribution to immunoglobulin gene rearrangement was that I was able to identify and link the antibody "D" gene to the immunoglobulin V-D-J locus, and I was the last member of the Tonegawa group to have completed the characterization of the antibody gene rearrangements.
   a. **Wood, C.**, Kabat, E.A., Murphy, L.A., and Goldstein, I.J. (1979) Immunochemical Studies of the Combining Sites of the Two Isolectins, A4 and B4, Isolated from Bandeirae simplicifolia. *Arch. Biochem. Biophys.*, 198: 1-11. PMID: 507832.
   b. **Wood, C.** and Kabat, E.A. (1981) Immunochemical Studies on Conjugates of Isomaltosyl Oligosaccharides to Lipid. I. Antigenicity of the Glycolipds and the Production of Specific Antibodies in Rabbits. *J. Exp. Med.*, 154: 432-499. PMCID: PMC2186421.
   c. **Wood, C.** and Tonegawa, S. (1983) Diversity and Joining Segments of Mouse Immunoglobulin Heavy Chain Genes are Closely Linked and in the Same Orientation: Implications for the Joining Mechanism. *Proc. Natl. Acad. Sci., U.S.A.*, 80: 3030-3034. PMCID: PMC393967.

d. Alt, F., Yoncopulas, G., Blackwell, T., **Wood, C.**, Thomas, E., Boss, M., Cottman, R., Rosenberg, N., Tonegawa, S., Baltimore, D. (1984) Ordered Rearrangement of Immunoglobulin Heavy Chain Variable Region Segments. *The EMBO Journal*, 3: 1209-1219. PMCID: PMC557501.

2. My involvement with HIV/AIDS research began over 30 years ago with my tenure at Abbott Laboratory in Chicago in 1983. Abbott was one of the three pharmaceutical companies that received the HIV-1 virus from Dr. Gallo's laboratory immediately after its discovery, and it was contracted by NIH to develop a blood test to detect antibodies against the virus. I was a member of a team of researchers from Abbott that was charged with this task, and within months, the first ELISA test for antibodies against HIV-1 was developed. It was the first blood diagnostic test adopted and widely used globally to determine HIV infection. I was then also involved in the cloning of the *gag* and *env* and in generating recombinant proteins to be used for the generation of the second generation ELISA to detect anti-HIV antibodies. I continued to characterize the immune response against HIV proteins after moving to a faculty position at the University of Kansas.
   a. Gill, J., Menitove, J., Anderson, P., Casper, J., Devare, S., **Wood, C.**, Adair, S., Casey, J., Scheffel, C., and Montgomery, R. (1986) HTLV-III Serology in Hemophiliacs: The Relationship with Immunologic Abnormalities. *J. Pediatrics*, 108: 511-516. PMID: 3083075.
   b. Dawson, G.J., Heller, J.S., **Wood, C.**, Gutierrez, R.A., Webber, J.S., Hunt, J.C., Hojvat, S.A., Senn, D., Devare, S.G., and Decker, R.H. (1988) Reliable Detection of Individuals Seropositive for HIV by Competitive Immunoassays using E. coli - Expressed HIV Structural Proteins. *J. Inf. Disease*, 157: 149-153. PMID: 3275722.
   c. Windheuser, M.J. and **Wood, C.** (1988) Characterization of Immunoreactive Epitopes of the HIV-1 p41 Envelope Protein Using Recombinant Fusion Proteins Expressed in Escherichia coli. *Gene*, 64: 107-119. PMID: 2456255.
   d. Windheuser, M., Tegtmeier, G.E., and **Wood, C.** (1989) Use of TrpE/GAG Fusion Proteins to Characterize Immunoreactive Domains on the Human Immunodeficiency Virus Type 1 (HIV-1) Core Protein. *J. Virology*, 63: 4064. PMCID: PMC251008.

3. Much of the earlier characterization of HIV-1 focused on subtype B, which was dominant in developed countries. My interest in other HIV subtypes, such as subtype C, started with my collaborations with Zambia, where subtype C is dominant. Subtype C is now responsible for over 50 percent of new infections world-wide. Our work on subtype C focused on investigating HIV transmission from mothers to infants and its rapid evolution in newborns, which produces new strains that are resistant to infants' immune system defenses. One line of research I pursue is designed to illuminate the effects and mechanisms of HIV-1 subtype C's origination and transmission, as well as its development in the nervous system. While leading my research team to investigate mother-to-child transmission of HIV, we found only a comparatively small number of HIV viruses from the complete viral swarm present within infected mothers are transmitted to their children *in utero*. To shed light on the bottleneck impeding viral transmission, our lab established the existence of the unique virological properties that facilitate the transmission of some viruses. We found that a minor population of HIV viruses have comparative growth advantages – or are more "fit" – than others, and it is these viruses that pass from mother to child prenatally. We believe that the identification and understanding of the mechanisms that foster fitness among some HIV viruses are informing new HIV/AIDS prevention and management efforts, the use of anti-retroviral therapy, and the treatment strategy of choice in many developing nations to suppress the HIV virus and inhibit disease progression.
   a. Zhang. H., Orti, G., Du, Q., He, J., Kankasa, C., Bhat, G., and **Wood, C.** (2002) Phylogenetic and phenotypic analysis of HIV-1 env gp120 in cases of subtype C mother to child transmission. *AIDS Res. & Human Retroviruses*, 18: 1415-1423. PMID: 12512513.
   b. Zhang, H., Hoffmann, F., He, J., He, X., Kankasa, C., Ruprecht, R., West, J. T., Orti, G., and **C. Wood**. (2005) Evolution of subtype C HIV-1 Env in a slowly progressing Zambian infant. *J. Retrovirology*, 2:67. PMCID: PMC1308862.
   c. Hoffman, F.G., He, X., West, J.T., Lemey, P., Kankasa, C., and **C. Wood**. (2008) Genetic variation in mother-child acute seroconverter pairs from Zambia. *AIDS*, 23; 22: 817-24. PMID: 18427199.
   d. Kong, X., West, J.T., Shea, D.M., M'soka, T.J., and **Wood, C.** (2008) The human immunodeficiency virus type 1 envelope confers higher rates of replicative fitness to perinatally transmitted viruses than to nontransmitted viruses. *J. Virol.*, 82(23): 11609-11618. PMCID: PMC2583653.

4. In parallel to our HIV-1 studies, I have led my team to conduct molecular studies to understand how KSHV can remain dormant in infected cells. My laboratory has focused on “Rta,” a key viral gene required by the virus to reactivate and cause infection. We found that Rta interacts with a number of cellular factors to regulate viral latency and lytic reactivation, including the induction of autophagy, and we were the *first* to find that Rta degrades and destroys cellular repressors, which enable the Kaposi’s sarcoma virus to be reactive. Such understanding may ultimately lead to the prevention of infection.
    a. Wang, S., Liu, S., Wu, M.H., Geng, Y., and **Wood, C.** (2001). Identification of a cellular protein that interacts and synergizes with the RTA (ORF50) protein of Kaposi's sarcoma-associated herpesvirus in transcriptional activation. *J. Virol.*, 75: 11961-11973. PMCID: PMC116091.
    b. Yang, Z., and **Wood, C.** (2007) The transcriptional repressor K-RBP modulates RTA-mediated transactivation and lytic replication of Kaposi's sarcoma-associated herpesvirus. *J. Virol.*, 81: 6294-6306. PMCID: PMC1900108.
    c. Yang, Z., Yan, Z., and **Wood, C.** (2008) Kaposi’s sarcoma-associated herpesvirus transactivator RTA promotes degradation of the repressors to regulate viral lytic replication. *J. Virol.*, 82: 3590-3603. PMCID: PMC2268447.
    d. Wen, H.J., Yang, Z., Zhou, Y., and **Wood, C.** (2010) Enhancement of autophagy during lytic replication by the Kaposi’s sarcoma-associated herpesvirus replication and transcription activator. *J. Virol.*, 84(15): 7448-7458. PMCID: PMC2897602.

5. A major portion of my work focuses on KSHV transmission. Our team, recognized for the establishment of a large Zambian cohort to study HIV and KSHV, was the *first* to establish HHV-8 can be transmitted perinatally which, together with HIV, contributes to the increase of Kaposi’s sarcoma in children in Africa. In collaboration with the U.S. CDC’s Global AIDS Program in Zambia, my team also helped determine the early childhood KSHV infection rate. We demonstrated that while KSHV perinatal transmission can occur *in utero*, most infections occur during early childhood via horizontal transmission, with KSHV seroconversion occurring even when a child’s mother or household is KSHV negative. We also found HIV-1 infected children have a five-fold higher risk for infection by KSHV compared to uninfected children, likely due to HIV-1-caused immune suppression, and that ART can reduce the risk of HIV-infected children in acquiring KSHV; thus, early childhood ART for HIV-infected children is critical to prevent disease progression and opportunistic infections. Currently, our team is leveraging this work to develop a humanized mouse model (BLT-mice) to enable us to replicate the routes by which Kaposi’s sarcoma is orally transmitted in humans, which is critical to the development and testing of interventions such as drugs or vaccines.
    a. Minhas, V., Crabtree, K.L., Chao, A., M’soka, T.J., Kankasa, C., Bulterys, M., Mitchell, C.D., and **Wood, C.** (2008) Early Children Infection by Human Herpesvirus 8 in Zambia and the Role of Human Immunodefiency Virus Type 1 Coinfection in a Highly Endemic Area. *Am. J. Epidemiol.*, 168(3): 311-320. PMCID: PMC2727264.
    b. Olp, L., Shea, D., White, M., Kankasa, C., and **Wood, C.** (2013) Early Childhood Infection of Kaposi’s Sarcoma-associated Herpesvirus in Zambian Households: A Molecular Analysis. *Int. J. Cancer*, 132(5): 1182-1190. PMCID: PMC3535687.
    c. Wang, L., Kang, G., Kumar, P., Lu, W., Li, Y., Zhou, Y., Li, Q., and **Wood, C.** (2014) Humanized-BLT Mouse Model of Kaposi’s Sarcoma-Associated Herpesvirus Infection. *Proc. Natl. Acad. Sci., USA*, 111(8): 3146-3151. PMCID: PMC3939909.
    d. Olp, L., Minhas, V., Gondwe, C., Kankasa, C., Wojcicki, J., West, J., Mitchell, C., and **Wood, C.** (2015) Effects of antiretroviral therapy on Kaposi’s sarcoma-associated herpesvirus (KSHV) transmission among HIV-infected Zambian children. *J. Natl. Cancer Inst.*, 107(10). pii: djv189. Print 2015 Oct. PMID: 26185193. [PubMed - in process].

Complete List of Published Work in MyBibliography:
http://www.ncbi.nlm.nih.gov/sites/myncbi/charles.wood.1/bibliography/41142988/public/?sort=date&direction=ascending

D. Research Support

Ongoing Research Support

NIGMS/NIH 5 P30 GM103509-05 Wood (PI) 09/16/2010-07/31/2016
Nebraska Center for Virology
The goal of this project is to develop an infrastructure between the three major research institutions in the State of Nebraska to promote collaborative research and strengthen research in the area of viral pathogenesis.
Role: PI

NIH/Fogarty 5 D43 TW001429-14 Wood (PI) 09/30/2000-05/31/2016
Programs in HIV and AIDS-Associated Diseases/Malignancies
The goal of this project is to establish a training program in the United States for Zambian and Chinese fellows on infectious disease and AIDS-associated malignancies.
Role: PI

NIMH 5 P30 MH062261-14 Fox (PI) 03/01/2011-02/29/2016
Chronic HIV infection and Aging in NeuroAIDS (CHAIN) Center
The goal of this project is to provide training regarding neurovirology.
Role: Mentor

NIH/NINDS 5 R01 NS074903-04 Wood (PI) 06/01/2011-05/31/2016
Neuropathogenesis and Neuroinvasiveness of Subtype C Human Immunodeficiency Virus
The goal of this project is to study the neuropathology of HIV infected individuals, focusing on autopsy cases.
Role: PI

NIH/NCI 1 U54 CA190155-01 Wood (PI) 09/17/2014-08/31/2019
Cancer Research International Training and Intervention Consortium (CRITIC)
The goal of this cancer consortium is to focus on the intervention of transmission and infection by two etiologic viral agents of the two most common AIDS-associated cancers, KSHV and Human Papilloma Virus, in Tanzania.
Role: PIAmfAR, Foundation for AIDs Research 109123-57-RGR Wood (PI) 12/01/2015-01/31/2017
CNS as Reservoir for Subtype C HIV-1 Infection
The goal of this project is to examine HIV latency.
Role: PI

NCI/NIH 5 R01 CA075903-15 Wood (PI) 07/01/1998-04/30/2016
Kaposi's Sarcoma and Human Herpesvirus in Africa
The goal of this project is to determine the prevalence of Kaposi's sarcoma associated herpes virus infection in Africa.
Role: PI

NIGMS/NIH 2 P20GM103427-14 Turpen (PI) 09/30/2015-04/30/2020
Nebraska Research Network in Functional Genomics
The goal of this program was to provide academic leadership with a programmatic focus on infectious disease research.
Role: Scientific Director

Completed Research Support

NIH/NIGMS 3 P20 GM103427-13S1 Turpen (PI) 09/01/2014-08/31/2015
Nebraska Research Network in Functional Genomics
The goal of this program was to provide academic leadership with a programmatic focus on infectious disease research.
Role: Mentor

NIAID/NIH 5 T32 AI060547-10 Wood (PI) 09/01/2004-08/31/2015
Research Training in Comparative Viral Pathogenesis
The goal of this project was to train graduate students and postdoctoral fellows in comparative viral pathogenesis.
Role: PI