

WEI-SHAU HU, PH.D.

BIBLIOGRAPHY

Peer-Reviewed Research Publications:

1. Li, C., R.C. Burdick, K. Nagashima, **W.-S. Hu**, and V.K. Pathak. 2021. HIV-1 cores retain their integrity until minutes before uncoating in the nucleus. *Proc. Natl. Acad. Sci. USA* 118:e2019467118. PMCID: [PMC7958386](#).
2. Rawson, J.M.O., A. Duchon, O.A. Nikolaitchik, V.K. Pathak, and **W.-S. Hu**. 2021. Development of a cell-based luciferase complementation assay for identification of SARS-CoV-2 3CL^{pro} inhibitors. *Viruses* 13:173. PMID: [33498923](#).
3. Umunnakwe, C.N., A. Duchon, O.A. Nikolaitchik, S.A. Rahman, Y. Liu, J. Chen, S. Tai, V.K. Pathak, and **W.-S. Hu**. 2021. Specific guanosines in the HIV-2 leader RNA are essential for efficient viral genome packaging. *J. Mol. Biol.* 433:166718. PMID: [33221337](#).
4. Chen, J., C. Umunnakwe, D.Q. Sun, O.A. Nikolaitchik, V.K. Pathak, B. Berkhout, A.T. Das, and **W.-S. Hu**. 2020. Impact of nuclear export pathway on cytoplasmic HIV-1 RNA transport mechanism and distribution. *mBio* 11:e01578-20. PMCID: [PMC7667035](#).
5. Nikolaitchik, O.A., X. Somoulay, J.M.O. Rawson, J.A. Yoo, V.K. Pathak, and **W.-S. Hu**. 2020. Unpaired guanosines in the 5' untranslated region of HIV-1 RNA act synergistically to mediate genome packaging. *J. Virol.* 94:e00439-20. PMID: [32796062](#).
6. Chen, J., Y. Liu, B. Wu, O.A. Nikolaitchik, P.R. Mohan, J. Chen, V.K. Pathak, and **W.-S. Hu**. 2020. Visualizing the translation and packaging of HIV-1 full-length RNA. *Proc. Natl. Acad. Sci. USA* 117:6145-6155. PMCID: [PMC7084099](#).
7. Burdick, R.C., C. Li, M. Munshi, J.M.O. Rawson, K. Nagashima, **W.-S. Hu**, and V.K. Pathak. 2020. HIV-1 uncoats in the nucleus near sites of integration. *Proc. Natl. Acad. Sci. USA* 117:5486-5493. PMCID: [PMC7071919](#). ([Article awarded 2020 Cozzarelli Prize](#))
8. Katusiime, M.G., E.K. Halvas, I. Wright, K. Joseph, M.J. Bale, B. Kirby-McCullough, S. Engelbrecht, W. Shao, W.-S. Hu, M.F. Cotton, J.W. Mellors, M.F. Kearney, and G.U. van Zyl. 2020. Intact HIV proviruses persist in children seven to nine years after initiation of antiretroviral therapy in the first year of life. *J. Virol.* 94:e01519-19. PMCID: [PMC6997763](#).
9. Shao, W., J. Shan, **W.-S. Hu**, E.K. Halvas, J.W. Mellors, J.M. Coffin, and M.F. Kearney. 2020. HIV proviral sequence database: A new public database for near full-length HIV proviral sequences and their meta-analyses. *AIDS Res. Hum. Retroviruses* 36:1-3. PMCID: [PMC6944138](#).
10. Delviks-Frankenberry, K.A., D. Ackerman, N.D. Timberlake, M. Hamscher, O.A. Nikolaitchik, **W.-S. Hu**, B.E. Torbett, and V.K. Pathak. 2019. Development of lentiviral vectors for HIV-1 gene therapy with Vif-resistant APOBEC3G. *Mol. Ther. Nucleic Acid* 18:1023-1038. PMCID: [PMC6889484](#).

11. Patro, S.C., L.D. Brandt, M.J. Bale, E.K. Halvas, K.W. Joseph, W. Shao, X. Wu, S. Guo, B. Murrell, A. Wiegand, J. Spindler, C. Raley, C. Hautman, M. Sobolewski, C.M. Fennessey, **W.-S. Hu**, B. Luke, J.M. Hasson, A. Niyongabo, A.A. Capoferri, B.F. Keele, J. Milush, R. Hoh, S.G. Deeks, F. Maldarelli, S.H. Hughes, J.M. Coffin, J.W. Rausch, J.W. Mellors, and M.F. Kearney. 2019. Combined HIV-1 sequence and integration site analysis informs viral dynamics and allows reconstruction of replicating viral ancestors. *Proc. Natl. Acad. Sci. USA* **116**:25891-25899. PMCID: [PMC6925994](#).
12. Rawson, J.M.O., O.A. Nikolaitchik, B.F. Keele, V.K. Pathak, and **W.-S. Hu**. 2018. Recombination is required for efficient HIV-1 replication and the maintenance of viral genome integrity. *Nucleic Acids Res.* **46**:10535-10545. PMCID: [PMC6237782](#).
13. Comas-Garcia, M., T. Kroupa, S.A.K. Datta, D.P. Harvin, **W.-S. Hu**, and A. Rein. 2018. Efficient support of virus-like particle assembly by the HIV-1 packaging signal. *eLife* **7**: e38438. PMCID: [PMC6092119](#).
14. Liu, Y., J. Chen, O.A. Nikolaitchik, B.A. Desimmie, B. Busan, V.K. Pathak, K.M. Weeks, and **W.-S. Hu**. 2018. The roles of five conserved lentiviral RNA structures in HIV-1 replication. *Virology* **514**:1-8. PMCID: [PMC5766380](#).
15. Burdick, R.C., K.A. Delviks-Frankenberry, J. Chen, S.K. Janaka, J. Sastri, **W.-S. Hu**, and V.K. Pathak. 2017. Dynamics and regulation of nuclear import and nuclear movements of HIV-1 complexes. *PLoS Pathog.* **13**:e1006570. PMCID: [PMC5578721](#).
16. Liu, Y., O.A. Nikolaitchik, S.A. Rahman, J. Chen, V.K. Pathak, and **W.-S. Hu**. 2017. HIV-1 sequence necessary and sufficient to package non-viral RNAs into HIV-1 particles. *J. Mol. Biol.* **429**:2542-2555. PMCID: [PMC6771289](#).
17. Dilley, K.A., O.A. Nikolaitchik, A. Galli, R.C. Burdick, L. Levine, K. Li, A. Rein, V.K. Pathak, and **W.-S. Hu**. 2017. Interactions between HIV-1 Gag and viral RNA genome enhance virion assembly. *J. Virol.* **91**:e02319-16. PMCID: [PMC5533913](#).
18. Desimmie, B.A., J.L. Smith, H. Matsuo, **W.-S. Hu**, and V.K. Pathak. 2017. Identification of a tripartite interaction between the N-terminus of HIV-1 Vif and CBF β that is critical for Vif function. *Retrovirology* **14**:19. PMCID: [PMC5356271](#).
19. Desimmie, B.A., R.C. Burdick, T. Izumi, H. Doi, W. Shao, W.G. Alvord, K. Sato, Y. Koyanagi, S. Jones, E. Wilson, S. Hill, F. Maldarelli, **W.-S. Hu**, and V.K. Pathak. 2016. APOBEC3 proteins can copackage and comutate HIV-1 genomes. *Nucleic Acids Res.* **44**: 7848-7865. PMCID: [PMC5027510](#).
20. Delviks-Frankenberry, K.A., O.A. Nikolaitchik, R.C. Burdick, R.J. Gorelick, B.F. Keele, **W.-S. Hu***, and V.K. Pathak*. 2016. Minimal contribution of APOBEC3-induced G-to-A hypermutation to HIV-1 recombination and genetic variation. *PLoS Pathog.* **12**:e1005646. PMCID: [PMC4871359](#). (*Joint corresponding author)

21. Chen, J., S.A. Rahman, O.A. Nikolaitchik, D. Grunwald, L. Sardo, R.C. Burdick, S. Plisov, E. Liang, S. Tai, V.K. Pathak, and **W.-S. Hu**. 2016. HIV-1 RNA genome dimerizes on the plasma membrane in the presence of Gag protein. *Proc. Natl. Acad. Sci. USA* **113**:E201-E208. PMID: [PMC4720333](#).
22. Sardo, L., S.C. Hatch, J. Chen, O. Nikolaitchik, R.C. Burdick, D. Chen, C.J. Westlake, S. Lockett, V.K. Pathak, and **W.-S. Hu**. 2015. Dynamics of HIV-1 RNA near the plasma membrane during virus assembly. *J. Virol.* **89**:10832-10840. PMID: [PMC4621114](#).
23. Shunaeva, A., D. Potashnikova, A. Pichugin, A. Mishina, A. Filatov, O. Nikolaitchik, **W.-S. Hu**, and D. Mazurov. 2015. Improvement of HIV-1 and human T cell lymphotropic virus type 1 replication-dependent vectors via optimization of reporter gene reconstitution and modification with intronic short hairpin RNA. *J. Virol.* **89**:10591-10601. PMID: [PMC4580202](#).
24. Nikolaitchik, O., B. Keele, R. Gorelick, W.G. Alvord, D. Mazurov, V.K. Pathak, and **W.-S. Hu**. 2015. High recombination potential of subtype A HIV-1. *Virology* **484**:334-340. PMID: [PMC6258064](#).
25. Chen, J., D. Grunwald, L. Sardo, A. Galli, S. Plisov, O.A. Nikolaitchik, D. Chen, S. Lockett, D.R. Larson, V.K. Pathak, and **W.-S. Hu**. 2014. Cytoplasmic HIV-1 RNA is mainly transported by diffusion in the presence or absence of Gag protein. *Proc. Natl. Acad. Sci. USA Plus* **111**:E5205–E5213. PMID: [PMC4260538](#).
26. Sato, K., J.S. Takeuchi, N. Misawa, T. Izumi, T. Kobayashi, Y. Kimura, S. Iwami, A. Takaori-Kondo, **W.-S. Hu**, K. Aihara, M. Ito, D.S. An, V.K. Pathak, and Y. Koyanagi. 2014. APOBEC3D and APOBEC3F potently promote HIV-1 diversification and evolution in humanized mouse model. *PLoS Pathog.* **10**:e1004453. PMID: [PMC4199767](#).
27. Nikolaitchik, O.A., and **W.-S. Hu**. 2014. Deciphering the role of the Gag-Pol ribosomal frameshift signal in HIV-1 RNA genome packaging. *J. Virol.* **88**:4040-4046. PMID: [PMC3993742](#).
28. Burdick, R.C., **W.-S. Hu**, and V.K. Pathak. 2013. Nuclear import of APOBEC3F-labeled preintegration complexes. *Proc. Natl. Acad. Sci. USA Plus* **110**:E4780-E4789. PMID: [PMC3856795](#).
29. Delviks-Frankenberry, K., T. Paprotka, O. Cingöz, S. Wildt, **W.-S. Hu**, J.M. Coffin, and V.K. Pathak. 2013. Generation of multiple replication competent retroviruses through recombination between PreXMRV-1 and PreXMRV-2. *J. Virol.* **87**:11525-11537. PMID: [PMC3807343](#).
30. Hatch, S.C., L. Sardo, J. Chen, R. Burdick, R. Gorelick, M.J. Fivash, Jr., V.K. Pathak, and **W.-S. Hu**. 2013. Gag-dependent enrichment of HIV-1 RNA near the uropod membrane of polarized T cells. *J. Virol.* **87**:11912-11915. PMID: [PMC3807364](#).
31. Izumi, T., R. Burdick, M. Shigemi, S. Plisov, **W.-S. Hu**, and V.K. Pathak. 2013. Mov10 and APOBEC3G localization to processing bodies is not required for virion incorporation and antiviral activity. *J. Virol.* **87**:11047-11062. PMID: [PMC3807276](#).

32. Nikolaitchik, O.A., K.A. Dilley, W. Fu, R.J. Gorelick, S.-H.S. Tai, F. Soheilian, R.G. Ptak, K. Nagashima, V.K. Pathak, and **W.-S. Hu**. 2013. Dimeric RNA recognition regulates HIV-1 genome packaging. *PLoS Pathog.* **9**:e1003249. PMCID: [PMC3605237](#).
33. Chaipan, C., J.L. Smith, **W.-S. Hu**, and V.K. Pathak. 2013. APOBEC3G restricts HIV-1 to a greater extent than APOBEC3F and APOBEC3DE in human primary CD4+ T cells and macrophages. *J. Virol.* **87**:444-453. PMCID: [PMC3536366](#).
34. Cingoz, O., T. Paprotka, K.A. Delviks-Frankenberry, S. Wildt, **W.-S. Hu**, V.K. Pathak, and J.M. Coffin. 2012. Characterization, mapping, and distribution of the two XMRV parental proviruses. *J. Virol.* **86**:328-338. PMCID: [PMC3255884](#).
35. Dilley, K.A., N. Na, O.A. Nikolaitchik, J. Chen, A. Galli, and **W.-S. Hu**. 2011. Determining the frequency and mechanisms of HIV-1 and HIV-2 RNA copackaging by single-virion analysis. *J. Virol.* **85**:10499-10508. PMCID: [PMC3187483](#).
36. Paprotka, T., K.A. Delviks-Frankenberry, O. Cingöz, A. Martinez, H.-J. Kung, C.G. Tepper, **W.-S. Hu**, M.J. Fivash, Jr., J.M. Coffin, and V.K. Pathak. 2011. Recombinant origin of the retrovirus XMRV. *Science* **333**:97-101. PMCID: [PMC3278917](#).
37. Josefsson, L., M.S. King, B. Makitalo, J. Brännström, W. Shao, F. Maldarelli, M.F. Kearney, **W.-S. Hu**, J. Chen, H. Gaines, J.W. Mellors, J. Albert, J.M. Coffin, and S.E. Palmer. 2011. Majority of CD4+ T cells from peripheral blood of HIV-1-infected individuals contain only one HIV DNA molecule. *Proc. Natl. Acad. Sci. USA* **108**:11199-11204. PMCID: [PMC3131354](#).
38. Ni, N., O.A. Nikolaitchik, K.A. Dilley, J. Chen, A. Galli, W. Fu, V.V.S.P. Prasad, R.G. Ptak, V.K. Pathak, and **W.-S. Hu**. 2011. Mechanisms of human immunodeficiency virus type 2 RNA packaging: Efficient trans packaging and selection of RNA copackaging partners. *J. Virol.* **85**:7603-7612. PMCID: [PMC3147938](#).
39. Nikolaitchik, O.A., A. Galli, M.D. Moore, V.K. Pathak, and **W.-S. Hu**. 2011. Multiple barriers to recombination between divergent HIV-1 variants revealed by a dual-marker recombination assay. *J. Mol. Biol.* **407**:521-531. PMCID: [PMC3065980](#).
40. Chaipan, C., K.A. Dilley, T. Paprotka, K.A. Delviks-Frankenberry, N.J. Venkatachari, **W.-S. Hu**, and V.K. Pathak. 2011. Severe restriction of xenotropic murine leukemia virus-related virus replication and spread in cultured human peripheral blood mononuclear cells. *J. Virol.* **85**:4888-4897. PMCID: [PMC3126174](#).
41. Burdick, R., J.L. Smith, C. Chaipan, Y. Friew, J. Chen, N.J. Venkatachari, K.A. Delviks-Frankenberry, **W.-S. Hu**, and V.K. Pathak. 2010. P body-associated protein Mov10 inhibits HIV-1 replication at multiple stages. *J. Virol.* **84**:10241-10253. PMCID: [PMC2937795](#).
42. Galli, A., M. Kearney, O.A. Nikolaitchik, S. Yu, M.P.S. Chin, F. Maldarelli, J.M. Coffin, V.K. Pathak, and **W.-S. Hu**. 2010. Patterns of human immunodeficiency virus type 1 recombination ex vivo provide evidence for coadaptation of distant sites, resulting in purifying selection for intersubtype recombinants during replication. *J. Virol.* **84**:7651-7661. PMCID: [PMC2897624](#).

43. Hussein, I.T.M., N. Ni, A. Galli, J. Chen, M.D. Moore, and **W.-S. Hu**. 2010. Delineation of the preferences and requirements of the human immunodeficiency virus type 1 dimerization initiation signal by using an *in vivo* cell-based selection approach. *J. Virol.* **84**:6866-6875. PMCID: [PMC2903283](#).
44. Paprotka, T., N.J. Venkatachari, C. Chaipan, R. Burdick, K.A. Delviks-Frankenberry, **W.-S. Hu**, and V.K. Pathak. 2010. Inhibition of xenotropic murine leukemia virus-related virus by APOBEC3 proteins and antiviral drugs. *J. Virol.* **84**:5719-5729. PMCID: [PMC2876585](#).
45. Moore, M.D., O.A. Nikolaitchik, J. Chen, M.L. Hammarskjöld, D. Rekosh, and **W.-S. Hu**. 2009. Probing the HIV-1 genomic RNA trafficking pathway and dimerization by genetic recombination and single virion analyses. *PLoS Pathog.* **5**:e1000627. PMCID: [PMC2757677](#).
46. Chen, J., O. Nikolaitchik, J. Singh, A. Wright, C.E. Bencsics, J.M. Coffin, N. Ni, S. Lockett, V.K. Pathak, and **W.-S. Hu**. 2009. High efficiency of HIV-1 genomic RNA packaging and heterozygote formation revealed by single virion analysis. *Proc. Natl. Acad. Sci. USA* **106**: 13535-13540. PMCID: [PMC2714765](#).
47. Friew, Y.N., V. Boyko, **W.-S. Hu**, and V.K. Pathak. 2009. Intracellular interactions between APOBEC3G, RNA, and HIV-1 Gag: APOBEC3G multimerization is dependent on its association with RNA. *Retrovirology* **6**:56. PMCID: [PMC2700067](#).
48. Russell, R.A., M.D. Moore, **W.-S. Hu**, and V.K. Pathak. 2009. APOBEC3G induces a hypermutation gradient: Purifying selection at multiple steps during HIV-1 replication results in levels of G-to-A mutations that are high in DNA, intermediate in cellular viral RNA, and low in virion RNA. *Retrovirology* **6**:16. PMCID: [PMC2657108](#).
49. Moore, M.D., W. Fu, F. Soheilian, K. Nagashima, R.G. Ptak, V.K. Pathak, and **W.-S. Hu**. 2008. Suboptimal inhibition of protease activity in human immunodeficiency virus type 1: Effects on virion morphogenesis and RNA maturation. *Virology* **379**:152-160. PMCID: [PMC2577075](#).
50. Chen, J., V.K. Pathak, W. Peng, and **W.-S. Hu**. 2008. Capsid proteins from human immunodeficiency virus type 1 and simian immunodeficiency virus SIVmac can coassemble into mature cores of infectious viruses. *J. Virol.* **82**:8253-8261. PMCID: [PMC2519672](#).
51. Nikolaitchik, O.A., R.J. Gorelick, M.G. Leavitt, V.K. Pathak, and **W.-S. Hu**. 2008. Functional complementation of nucleocapsid and late domain PTAP mutants of human immunodeficiency virus type 1 during replication. *Virology* **375**:539-549. PMCID: [PMC2459335](#).
52. Chin, M.P., S.-K. Lee, J. Chen, O.A. Nikolaitchik, D.A. Powell, M.J. Fivash, Jr., and **W.-S. Hu**. 2008. Long-range recombination gradient between HIV-1 subtypes B and C variants caused by sequence differences in the dimerization initiation signal region. *J. Mol. Biol.* **377**:1324-1333. PMCID: [PMC2706499](#).
53. Chullapalli, V., I.B. Hogue, V. Boyko, **W.-S. Hu**, and A. Ono. 2008. Interaction between the human immunodeficiency virus type 1 Gag matrix domain and phosphatidylinositol-(4,5)-bisphosphate is essential for efficient Gag-membrane binding. *J. Virol.* **82**:2405-2417. PMCID: [PMC2258911](#).

54. Motomura, K., J. Chen, and **W.-S. Hu**. 2008. Genetic recombination between human immunodeficiency virus type 1 (HIV-1) and HIV-2, two distinct human lentiviruses. *J. Virol.* **82**:1923-1933. PMCID: [PMC2258735](#).
55. Fu, W., V.V.S.P. Prasad, J. Chen, O. Nikolaitchik, and **W.-S. Hu**. 2007. Molecular mechanisms of simian immunodeficiency virus SIVagm RNA encapsidation. *Virology* **363**: 210-219. PMCID: [PMC2920611](#).
56. Chin, M.P., J. Chen, O.A. Nikolaitchik, and **W.-S. Hu**. 2007. Molecular determinants of HIV-1 intersubtype recombination potential. *Virology* **363**:437-446. PMID: [17336363](#).
57. Thomas, D.C., Y.A. Voronin, G.N. Nikolenko, J. Chen, **W.-S. Hu**, and V.K. Pathak. 2007. Determination of the ex vivo rates of human immunodeficiency virus type 1 reverse transcription by using novel strand-specific amplification analysis. *J. Virol.* **81**:4798-4807. PMCID: [PMC1900155](#).
58. Lee, S.K., V. Boyko, and **W.-S. Hu**. 2007. Capsid is an important determinant for functional complementation of murine leukemia virus and spleen necrosis virus Gag proteins. *Virology* **360**:388-397. PMCID: [PMC2706498](#).
59. Moore, M.D., W. Fu, O. Nikolaitchik, J. Chen, R.G. Ptak, and **W.-S. Hu**. 2007. Dimer initiation signal of human immunodeficiency virus type 1: Its role in partner selection during RNA copackaging and its effects on recombination. *J. Virol.* **81**:4002-4011. PMCID: [PMC1866129](#).
60. Xu, H., E. Chertova, J. Chen, D.E. Ott, J.D. Roser, **W.-S. Hu**, and V.K. Pathak. 2006. Stoichiometry of the antiviral protein APOBEC3G in HIV-1 virions. *Virology* **360**:247-256. PMID: [17126871](#).
61. Boyko, V., M. Leavitt, R. Gorelick, W. Fu, O. Nikolaitchik, V.K. Pathak, K. Nagashima, and **W.-S. Hu**. 2006. Coassembly and complementation of Gag proteins from HIV-1 and HIV-2, two distinct human pathogens. *Mol. Cell* **23**:281-287. PMID: [16857594](#).
62. Chen, J., D. Powell, and **W.-S. Hu**. 2006. High frequency of genetic recombination is a common feature of primate lentivirus replication. *J. Virol.* **80**:9651-9658. PMCID: [PMC1617242](#).
63. Nikolaitchik, O., T.D. Rhodes, D. Ott, and **W.-S. Hu**. 2006. Effects of mutations in HIV-1 *gag* gene on RNA packaging and recombination. *J. Virol.* **80**:4691-4697. PMCID: [PMC1472086](#).
64. Fu, W., Q. Dang, K. Nagashima, E.O. Freed, V.K. Pathak, and **W.-S. Hu**. 2006. Effects of Gag mutation and processing on retroviral dimeric RNA maturation. *J. Virol.* **80**:1242-1249. PMCID: [PMC1346957](#).
65. Chen, J., T.D. Rhodes, and **W.-S. Hu**. 2005. Comparison of the genetic recombination rates of human immunodeficiency virus type 1 in macrophages and T cells. *J. Virol.* **79**:9337-9340. PMCID: [PMC1168728](#).

66. Chin, M.P.S., T.D. Rhodes, J. Chen, W. Fu, and **W.-S. Hu**. 2005. Identification of a major restriction in intersubtype recombination. *Proc. Natl. Acad. Sci. USA* **102**:9002-9007. PMCID: [PMC1157039](#). PMID: [15210704](#).
67. Lee, S.-K., K. Nagashima, and **W.-S. Hu**. 2005. Cooperative effect of Gag Proteins p12 and capsid during early events of murine leukemia virus replication. *J. Virol.* **79**:4159-4169. PMCID: [PMC1061564](#).
68. Chen, J., Q. Dang, D. Unutmaz, V.K. Pathak, F. Maldarelli, D. Powell, and **W.-S. Hu**. 2005. Mechanisms of nonrandom human immunodeficiency virus type 1 infection and double infection: Preference in virus entry is important but is not the sole factor. *J. Virol.* **79**:4140-4149. PMCID: [PMC1061529](#).
69. Rhodes, T.D., O. Nikolaitchik, J. Chen, and **W.-S. Hu**. 2005. Genetic recombination of human immunodeficiency virus type 1 in one round of viral replication: The effect of genetic distance, target cells, accessory genes, and lack of high negative interference in crossover events. *J. Virol.* **79**:1666-1677. PMCID: [PMC544095](#).
70. Svarovskaia, E.S., H. Xu, J.L. Mbisa, R. Barr, R.J. Gorelick, A. Ono, E.O. Freed, **W.-S. Hu**, and V.K. Pathak. 2004. Human APOBEC3G is incorporated into HIV-1 virions through interactions with viral and nonviral RNAs. *J. Biol. Chem.* **279**:35822-35828. PMID: [15210704](#).
71. Dang, Q., J. Chen, D. Unutmaz, J.M. Coffin, V.K. Pathak, D. Powell, V.N. KewalRamani, F. Maldarelli, and **W.-S. Hu**. 2004. Nonrandom HIV-1 infection and double infection via direct and cell-mediated pathways. *Proc. Natl. Acad. Sci. USA* **101**:632-637. PMCID: [PMC327199](#).
72. Rhodes, T.D., H.L. Wargo, and **W.-S. Hu**. 2003. High rates of human immunodeficiency virus type 1 recombination: Near-random segregation of markers 1 kilobase apart in one round of viral replication. *J. Virol.* **77**:11193-11200. PMCID: [PMC224990](#).
73. Cheslock, S.R., D.T.K. Poon, W. Fu, T.D. Rhodes, L.E. Henderson, K. Nagashima, C.F. McGrath, and **W.-S. Hu**. 2003. Charged assembly helix motif in murine leukemia virus capsid: An important region for virus assembly and particle size determination. *J. Virol.* **77**:7058-7066. PMCID: [PMC156152](#).
74. Fu, W., and **W.-S. Hu**. 2003. Functional replacement of nucleocapsid flanking regions by heterologous counterparts with divergent primary sequences: Effects of chimeric nucleocapsid on the retroviral replication cycle. *J. Virol.* **77**:754-761. PMCID: [PMC140598](#).
75. Zhang, W.H., C.K. Hwang, **W.-S. Hu**, R.J. Gorelick, and V.K. Pathak. 2002. Zinc finger domain of murine leukemia virus nucleocapsid protein enhances the rate of viral DNA synthesis in vivo. *J. Virol.* **76**:7473-7484. PMCID: [PMC136396](#).
76. Beasley, B.E., and **W.-S. Hu**. 2002. *cis*-Acting elements important for retroviral RNA packaging specificity. *J. Virol.* **76**:4950-4960. PMCID: [PMC136156](#).
77. Dang, Q., and **W.-S. Hu**. 2001. Effects of homology length in the repeat region on minus-strand DNA transfer and retroviral replication. *J. Virol.* **75**:809-820. PMCID: [PMC113977](#).

78. Cheslock, S.R., J.A. Anderson, C.K. Hwang, V.K. Pathak, and **W.-S. Hu**. 2000. Utilization of nonviral sequences for minus-strand DNA transfer and gene reconstitution during retroviral replication. *J. Virol.* **74**:9571-9579. PMCID: [PMC112388](#).
79. Anderson, J.A., V.K. Pathak, and **W.-S. Hu**. 2000. Effect of the murine leukemia virus extended packaging signal on the rates and locations of retroviral recombination. *J. Virol.* **74**:6953-6963. PMCID: [PMC112212](#).
80. Certo, J.L., T. Kabdulov, M.P. Paulson, J.A. Anderson, and **W.-S. Hu**. 1999. Nucleocapsid domain is responsible for the ability of spleen necrosis virus (SNV) Gag polyprotein to package both SNV and murine leukemia virus RNA. *J. Virol.* **73**:9170-9177. PMCID: [PMC112950](#).
81. Yin, P.D., and **W.-S. Hu**. 1999. Insertion of sequences into the 3' untranslated region of a replication-competent spleen necrosis virus vector disrupts env gene expression. *Arch. Virol.* **144**:73-87. PMID: [10076510](#).
82. Certo, J.L., B.F. Shook, P.D. Yin, J.T. Snider, and **W.-S. Hu**. 1998. Nonreciprocal pseudotyping: Murine leukemia virus proteins cannot recognize spleen necrosis virus RNA. *J. Virol.* **72**:5408-5413. PMCID: [PMC110171](#).
83. Bowman, R., **W.-S. Hu**, and V.K. Pathak. 1998. Relative rates of retroviral reverse transcriptase template switching during RNA- and DNA-dependent DNA synthesis. *J. Virol.* **72**:5198-5206. PMCID: [PMC110097](#).
84. Anderson, J.A., E.H. Bowman, and **W.-S. Hu**. 1998. Retroviral recombination rates do not increase linearly with marker distance and are limited by the size of the recombining population. *J. Virol.* **72**:1195-1202. PMCID: [PMC124596](#).
85. Anderson, J.A., R.J. Teufel II, P.D. Yin, and **W.-S. Hu**. 1998. Correlated template switching events during minus-strand DNA synthesis: A mechanism for high negative interference during retroviral recombination. *J. Virol.* **72**:1186-1194. PMCID: [PMC124595](#).
86. Yin, P.D., and **W.-S. Hu**. 1997. RNAs from genetically distinct retroviruses can copackage and exchange genetic information in vivo. *J. Virol.* **71**:6237-6242. PMCID: [PMC191891](#).
87. Delviks, K.A., **W.-S. Hu**, and V.K. Pathak. 1997. Ψ^- vectors: Murine leukemia virus-based self-inactivating and self-activating retroviral vectors for human gene therapy. *J. Virol.* **71**:6218-6224. PMCID: [PMC191887](#).
88. **Hu, W.-S.**, E.H. Bowman, K.A. Delviks, and V.K. Pathak. 1997. Homologous recombination occurs in a distinct retroviral subpopulation and exhibits high negative interference. *J. Virol.* **71**:6028-6036. PMCID: [PMC191860](#).
89. Yin, P.D., V.K. Pathak, A.E. Rowan, R.J. Teufel II, and **W.-S. Hu**. 1997. Utilization of non-homologous minus-strand DNA transfer to generate recombinant retroviruses. *J. Virol.* **71**:2487-2494. PMCID: [PMC191361](#).

90. Bowman, E.H., V.K. Pathak, and **W.-S. Hu**. 1996. Efficient initiation and strand transfer of polypurine tract-primed plus-strand DNA prevents strand transfer of internally initiated plus-strand DNAs. *J. Virol.* **70**:1687-1694. PMCID: [PMC189992](#).
91. **Hu, W.-S.**, and Temin, H.M. 1992. Effect of gamma-irradiation on retroviral recombination. *J. Virol.* **66**:4457-4463. PMCID: [PMC241254](#).
92. **Hu, W.-S.**, and Temin, H. M. 1990. Genetic consequences of packaging two RNA genomes in one virion: Pseudodiploidy and high rate of recombination. *Proc. Natl. Acad. Sci. USA* **87**:1556-1560. PMCID: [PMC53514](#).
93. **Hu, W.-S.**, and Temin, H. M. 1990. Retroviral recombination and reverse transcription. *Science* **250**:1227-1233. PMID: [1700865](#).
94. Gomez-Pedrozo, M., **W.-S. Hu**, and C.-K.J. Shen. 1988. Recombinational resolution in primate cells in two homologous human DNA segments with a gradient of sequence divergence. *Nucleic Acids Res.* **16**:11237-11247. PMCID: [PMC339007](#).
95. **Hu, W.-S.**, and C.-K.J. Shen. 1987. Reconstruction of human α thalassemia-2 genotype in monkey cells. *Nucleic Acids Res.* **15**:2989-3007. PMCID: [PMC340711](#).
96. Shen, C.-K.J., and **W.-S. Hu**. 1986. DNA supercoiling of recombinant plasmids in mammalian cells. *Proc. Natl. Acad. Sci. USA* **83**:641-1645. PMCID: [PMC323139](#).
97. Fanning, T. G., **W.-S. Hu**, and R.D. Cardiff. 1985. Analysis of tissue-specific methylation patterns of mouse mammary tumor virus DNA by two-dimensional Southern blotting. *J. Virol.* **54**:726-730. PMCID: [PMC254858](#).
98. **Hu, W.-S.**, T.G. Fanning, and R.D. Cardiff. 1984. Mouse mammary tumor virus: Specific methylation patterns of proviral DNA in normal mouse tissues. *J. Virol.* **49**:66-71. PMCID: [PMC255425](#).

Invited Book Chapters, Reviews, and Commentaries:

1. Kuzembayeva, M., K.A. Dilley, L. Sardo, and **W.-S. Hu**. 2014. Life of Psi: How full-length HIV-1 RNAs become packaged genomes in the viral particles. *Virology* **454-455**:362-370. PMCID: [PMC6258065](#).
2. Chen, J., O.A. Nikolaitchik, K.A. Dilley, and **W.-S. Hu**. 2013. Packaging of the HIV-1 RNA genome. In: *Advances in HIV-1 Assembly and Release* (E.O. Freed, ed.). Springer International Publishing, Switzerland. pp. 55-73.
3. Hughes, S.H., and **W.-S. Hu**. 2011. HIV-1 reverse transcription. *Cold Spring Harb. Perspect. Med.* **2**:a006882. PMCID: [PMC3475395](#).
4. Delviks-Frankenberry, K.A., A. Galli, O. Nikolaitchik, H. Mens, V.K. Pathak, and **W.-S. Hu**. 2011. Mechanisms and factors that influence high frequencies of retroviral recombination. *Viruses* **3**:1650-1680. PMCID: [PMC3187697](#).

5. Moore, M.D., M.P.S. Chin, and **W.-S. Hu**. 2009. HIV-1 recombination: An experimental assay and a phylogenetic approach. In: HIV Protocols, Second Edition (V. Prasad and G. Kalpana, eds.). Humana Press, Inc. pp. 87-105. PMCID: [PMC6785042](#).
6. Moore, M.D., and **W.-S. Hu**. 2009. HIV-1 RNA dimerization: It takes two to tango. AIDS Rev. **11**:91-102. PMCID: [PMC3056336](#).
7. **Hu, W.-S.**, T. Rhodes, Q. Dang, and V. Pathak. 2003. Retroviral recombination: Review of genetic analyses. Front. Biosci. **8**:D143-D155. PMID: [12456341](#).
8. Svarovskaia, E.S., S.R. Cheslock, W.-H. Zhang, **W.-S. Hu**, and V.K. Pathak. 2003. Retroviral mutation rates and reverse transcriptase fidelity. Front. Biosci. **8**:D117-D135. PMID: [12456349](#).
9. **Hu, W.-S.**, and V.K. Pathak. 2000. Design of retrovirus-based vectors and helper cells for gene therapy. Pharmacol. Rev. **52**:493-511. PMID: [11121508](#).
10. Pathak, V.K., and **W.-S. Hu**. 1998. Mutation, recombination, and dynamics of HIV-1 in vivo. In: Human Immunodeficiency Viruses: Biology, Immunology, and Molecular Biology (N. Saksena, ed.). Medical Systems SpA. pp. 299-330.
11. Pathak, V.K., and **W.-S. Hu**. 1997. "Might as well jump!" Template switching by retroviral reverse transcriptase, defective genome formation, and recombination. Invited review. Sem. Virol. **8**:141-150.
12. **Hu, W.-S.**, V.K. Pathak, and H.M. Temin. 1993. Retroviral recombination. In: Reverse Transcriptase (S. Goff and A.M. Skalka, eds.). Cold Spring Harbor Laboratory Press, Cold Spring Harbor, New York. pp. 251-274.
13. Pathak, V.K., **W.-S. Hu**, and H.M. Temin. 1991. Hypermutation and other variation in retroviruses. In: Somatic Hypermutation in V-regions (E.J. Steele, ed.). CRC Press, Boca Raton, Florida. pp. 149-158.
14. Temin, H.M., M. Hannink, **W.-S. Hu**, and V.K. Pathak. 1991. Retrovirus variation and regulation of *c-rel*. In: Viruses That Affect the Immune System (H.Y. Fan, I.S.Y. Chen, N. Rosenberg, and W. Sugden, eds.). American Society for Microbiology, Washington, D.C. pp. 135-141.
15. Marks, J.M., J.-P. Shaw, C. Perez-Stable, **W.-S. Hu**, M.T. Ayers, C. Shen, C.-K.J. Shen. 1986. The primate α -globin gene family: Paradigm of the fluid genome. Cold Spring Harb. Symp. Quant. Biol. **51**:499-508. PMID: [2884069](#).