

BIOGRAPHICAL SKETCH

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NAME Eric J. Arts	POSITION TITLE		
eRA COMMONS USER NAME ericjarts	Associate Professor		
EDUCATION/TRAINING (<i>Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.</i>)			
INSTITUTION AND LOCATION	DEGREE (if applicable)	YEAR(s)	FIELD OF STUDY
University of Western Ontario, Ontario, Canada	B.Sc	1990	Micro & Immunology
McGill University, Montreal, Quebec, Canada	Ph.D.	1994	Micro & Immunology
Case Western Reserve University, Cleveland, Ohio	PDF	1994-97	Molecular Virology and Biochemistry

A. Positions and Honors

1986-1990 B.Sc. research project at the University of Western Ontario (with Anthony Ridgway)
1990-1994 Ph.D. research project at McGill AIDS Centre, Montreal (with Mark Wainberg)
1994-1996 PDF research project on HIV reverse transcriptase at CWRU (with Stuart LeGrice)
1990-1996 Supported by an AIDS Ph.D. and PDF fellowship from Health Canada
1997 - Asst. Prof., Dep. Medicine, Div. Infectious Diseases, CWRU; Dept. Pharmacology
1999-2002 Director of the Developmental Core for the Center for AIDS Research
2002 - Director of the CFAR Uganda Laboratory Core
2002 - Associate Professor and Adjunct appointment, Dept of Molecular Biology and Microbiology
2003 - Award of Tenure

Editorial Boards

Section Editor - *Drug Resistance Updates*, Editorial board - *AIDS Reviews; Retrovirology; Journal of Virology*
Grant review committees

- *Permanent member*: ADDT Study Section, CSR, NIH (2004-2009)
- *Chairperson/reviewer*: SEP HIV-1 transmission, NIAID, NIH (2006); SEP Drug resistance and HIV Infection, NIAID (2004), NIH
- *Reviewer*: Virology and Viral Pathogenesis, Canadian Institutes of Health Research (CIHR) (2000,2003,2004, 2005); SEP CFAR competitive supplements in AIDS, NIAID, NIH (2003); SEP Innovations in HIV-1 research, NIAID, NIH (2001,2002); SEP Novel and Integrated HIV-1 Therapies, NIAID, NIH (2001,2002)

B. Publications (selected from 76 since 1993)

5. **Arts, E.J.**, X. Li, Z. Gu, M.A. Parniak, L. Kleiman and M.A. Wainberg. 1994. Comparison of deoxyoligonucleotide and tRNA^{Lys,3} as primers in an endogenous HIV-1 in vitro reverse transcription/template switching reaction. *J. Biol. Chem.* 269: 14672-14680.
13. Gu, Z., **E. J. Arts**, M. A. Parniak, and M. A. Wainberg. 1995. K65R mutant HIV-1 reverse transcriptase shows decreased chain termination by 2',3'-dideoxycytidine-5'-triphosphate and other drugs. *Proc. Natl. Acad. Sci. USA.* 92: 2760-2764.
18. **Arts, E. J.**, S. Stretor, X. Li, T. North, R. S. Goody, B. Ehresmann, M. A. Wainberg, and S. F. J. Le Grice. 1996. Specific tRNA^{Lys,3} - HIV-1 RNA interactions inhibits the initiation of (-) DNA synthesis by lentiviral but not HIV-1 reverse transcriptase. *Proc. Natl. Acad. Sci. USA.* 93: 10063-10068.
19. **Arts, E. J.**, M. Ghosh, P. S. Jacques, B. Ehresmann, and S. F. J. Le Grice. 1996. Restoration of tRNA^{Lys,3}-primed (-) strand DNA to an HIV-1 reverse transcriptase mutant with tRNA/DNA chimeras: tRNA-viral RNA duplexes and initiation of viral replication. *J. Biol. Chem.* 271: 9054-9061.
20. **Arts, E. J.**, J. P. Marois, Z. Gu, S. F. J. LeGrice, and M. A. Wainberg. 1996. The effects of 3'-deoxynucleotide 5'-triphosphate concentrations on chain termination activities of nucleoside analogs during human immunodeficiency virus type 1 reverse transcription of (-) strong-stop DNA. *J. Virol.* 69: 712-720.

26. **Arts, E.J.**, M.E. Quiñones-Mateu, J.L. Albright, J-P. Marios, and M.A. Wainberg. 1998. A unique mechanism for AZT resistance and evidence for AZT-mediated cross-resistance to other nucleoside analogs by AZT-resistant HIV-1. *J. Virol.* 72: 4858-4865.
27. Quinones-Mateu, M.E., J.L. Albright, A. Mas, V. Soriano, and **E.J. Arts**. 1998. Pol gene quasi-species in patients infected with HIV-1 group O: An evolutionary and drug resistance study using genotypic and heteroduplex tracking analyses. *J. Virol.* 72:9002-9015.
30. Torre, V.S., A.J. Marozsan, J.L. Albright, K.R. Collins, O. Hartley, R. E. Offord, M.E. Quinones, and **E.J. Arts**. 2000. Variable sensitivity of CCR5-tropic HIV-1 to AOP-RANTES. *J. Virol.* 74: 4868-4876.
33. Quinones-Mateu, M.E., S.C. Ball, A.J. Marozsan, V.S. Torre, J.L. Albright, G. Vanham, G. Van Der Groen, R.L. Colebunders, and **E.J. Arts**. 2000. A dual infection/competition assay shows a correlation between ex vivo HIV-1 fitness and disease progression. *J. Virol.* 74: 9222-9233
36. Menéndez-Arias, L., A. Abraha, M.E. Quiñones-Mateu, A. Mas, M.J. Camarasa, and **E. J. Arts**. 2001. Functional characterization of chimeric reverse transcriptases with polypeptide subunits of highly divergent group O and M HIV-1 strains. *J. Biol. Chem.* 276: 27470-27479.
37. Marozsan, A.J., V. Torre, M. Johnson, S.C. Ball, J.V. Cross, D.J. Templeton, M.E. Quinones-Mateu, R.E. Offord, and **E.J. Arts**. 2001. Mechanisms involved in stimulation of human immunodeficiency virus type 1 replication by aminooxypentane RANTES. *J. Virol.* 75: 8624-8638.
38. Lederman, M., D. Mosier, **E. Arts**, N. Letvin, C. Flexner, A. Blauvelt, S. Cairns, S. Bridges, N. Sarver, R. Offord, and the IP/CP chemokine receptor inhibitor team. 2001. Rationale for testing chemokine inhibitors (Virustats) for prevention of HIV-1 transmission. *AIDS* 15:S57.
39. Collins, K.R., M.E. Quinones-Mateu, M. Wu, H. Luzze, J.L. Johnson, C. Hirsch, Z. Toossi, and **E. J. Arts**. 2002. Human immunodeficiency virus type 1 (HIV-1) quasispecies at the sites of Mycobacterium tuberculosis infection contribute to systemic HIV-1 heterogeneity. *J. Virol.* 76: 1697-1709.
42. Quinones-Mateu, M. E., Y. Gao, S.C. Ball, A.J. Marozsan, A. Abraha, and **E.J. Arts**. 2002. In vitro intersubtype recombinants of human immunodeficiency virus type 1: Comparison to recent and circulating in vivo recombinant forms. *J. Virol.* 76:9600-9613.
45. Ball, S.C., A. Abraha, K.R. Collins, A.J. Marozsan, M.E. Quinones-Mateu, A. Penn-Nicholson, M. Murray, N. Richard, M. Lobritz, P. A. Zimmerman, T. Kawamura, A. Blauvelt, and **E.J. Arts**. 2003. Comparing the ex vivo fitness of CCR5-tropic human immunodeficiency virus type 1 isolates from subtypes B and C. *J. Virol.* 77:1021-1038.
46. **Arts, E.J.** and M.E. Quinones-Mateu. 2003. Sorting out the complexities of HIV-1 fitness. *AIDS* 17:780-781.
47. Marozsan, A.J. and **E.J. Arts**. 2003. Analysis of gene products from diverse human immunodeficiency type 1 isolates through a yeast-based recombination system. *J. Virol. Meth.* 111:111-120.
48. Richard, N., M. Juntilla, K. Demers, E. Paxinos, J. Galovich, C. Petropoulos, C. Kityo, P. Mugenyi, C. Whalen, and **E.J. Arts**. 2004. Emergence and intrinsic antiretroviral resistance of human immunodeficiency virus type 1 isolates from Uganda. *AIDS Res. Hum. Retroviruses* 20:355-364.
49. Gao, Y., E. Paxinos, J. Galovich, C. Petropoulos, H. Baird, K. Demers, C. Kityo, P. Mugenyi, and **E.J. Arts**. 2004. Characterization of a subtype D HIV-1 isolate obtained from an untreated individual that is highly resistant to non-nucleoside RT inhibitors. *J. Virol.* 78:5390-5401.
50. Kawamura, T., S.E. Bruce, A. Abraha, M. Sugaya, O. Hartley, R.E. Offord, **E.J. Arts**, P.A. Zimmerman, and A. Blauvelt. 2004. PSC-RANTES blocks R5 HIV infection of Langerhans cells isolated from individuals with a variety of CCR5 diplotypes. *J. Virol.* 78: 7602-7609.
51. Marozsan, A.J., E. Fraundorf, A. Abraha, H. Baird, D. Moore, R. Troyer, I. Nankja, and **E.J. Arts**. 2004. Relationship between capsid protein levels and reverse transcriptase activity with infectious titer of diverse human immunodeficiency virus type-1 isolates. *J. Virol.* 78: 11130-11141.
52. Bajunirwe, F., I. Massaquoi, S. Asiimwe, M.R. Kanya, **E.J. Arts**, and C.C. Whalen. 2004. Effectiveness of nevirapine and zidovudine in a pilot program for the prevention of mother-to-child transmission of HIV-1 in Uganda. *African Health Sciences* 4:146-153.
53. Marozsan, A.J., D. Moore, M. Lobritz, E. Fraundorf, A. Abraha, J.D. Reeves, and **E.J. Arts**. 2005. Differences in the fitness of two diverse wild-type HIV-1 isolates are related to the efficiency of cell binding and entry. *J. Virol.* 79: 7121-7134.

54. Baird, H., A.J. Marozsan, M.M. Lederman, A. Landay, D. Mildvan, D.R. Kuritzkes, H.A. Kessler, and **E.J. Arts**. 2005. Monitoring processed, mature human immunodeficiency virus type 1 particles immediately following treatment with a protease inhibitor-containing treatment regimen. *AIDS Res. and Therapy* 2:2.
55. Troyer, R.M., K.R. Collins, A. Abraha, E. Fraundorf, D.M. Moore, R.W. Krizan, Z. Toossi, R.L. Colebunders, M.A. Jensen, J.I. Mullins, G. Vanham, and **E.J. Arts**. 2005. Impact of ex vivo HIV-1 fitness and genetic diversity on disease progression. *J. Virol.* 79: 9006-9018.
56. Ariën, K.K., A. Abraha, L. Heyndrickx, M.E. Quinones-Mateu, L. Kestens, G. Vanham, and **E.J. Arts**. 2005. The replicative fitness of HIV-1 group M, group O, and HIV-2 isolates. *J. Virol.* 79: 8979-8990.
57. Ariën, K.K., R.M. Troyer, Y. Gali, L. Heyndrickx, L. Kestens, R. Colebunders, **E.J. Arts**, and G. Vanham. 2005. Fitness of early and recent HIV-1 isolates in the epidemic: evidence for attenuation. *AIDS* 19:1555-1564.
58. Toossi, Z., H. Mayanja-Kizza, J. Baseke, P. Peters, M. Wu, A. Abraha, H. Aung, A. Okwera, C. Hirsch, and **E. Arts**. 2005. Inhibition of human immunodeficiency virus-1 (HIV-1) by beta-chemokine analogues in mononuclear cells from HIV-1-infected patients with active tuberculosis. *Clin. Exp. Immunol.* 142:327-332.
59. Moore, D., **E.J. Arts**, Y. Gao, and A.J. Marozsan. 2005. Cloning of HIV-1 genes and genomic segments into expression vectors or HIV-1 full length clones using yeast recombination/gap repair. *Methods Mol. Biol.* 304:369-385.
60. Abraha, A., R. Troyer, M.E. Quinones-Mateu, and **E.J. Arts**. 2005. Measuring HIV-1 fitness using dual virus competitions. *Methods Mol. Biol.* 304:355-368.
61. Baird, H.A., R. Galetto, Y. Gao, E. Simon-Loriere, M. Abreha, J. Archer, J. Fan, D.L. Robertson, **E.J. Arts**, and M. Negroni. 2006. Sequence determinants of breakpoint location during HIV-1 intersubtype recombination. *Nucleic Acids Res.* 34:5203-5216.
62. Quinones-Mateu, M.E., and **E.J. Arts**. 2006. Virus fitness: concept, quantification, and application to HIV population dynamics. *Curr. Top. Microbiol. Immunol.* 299:83-140.
63. Baird, H.A., Y. Gao, M. Lalonde, R. Galetto, V. Giacomoni, M. Abreha, M. Negroni, and **E.J. Arts**. 2006. Influence of sequence identity and unique breakpoints on the frequency of intersubtype HIV-1 recombination. *Retrovirology* 3:91. (17 pages)
64. Ariën, K.K., G. Vanham, and **E.J. Arts**. 2007. Is HIV-1 evolving to a less virulent form? *Nature Rev. Microbiol.* 5:141-151.
65. Henry, K.R., J. Weber, M.E. Quiñones-Mateu, and **E.J. Arts**. 2007. The impact of viral and host elements on HIV fitness and disease progression. *Cur. HIV/AIDS Reports* 4:36-41.
66. Weber, J., K.R. Henry, **E.J. Arts**, and M.E. Quiñones-Mateu. 2007. Viral fitness: Relation to drug resistance mutations and mechanisms involved: NRTI mutations. *Cur. Opin. HIV and AIDS.* 2: 2:81-87.
67. Tebit, D.M., I. Nankya, **E.J. Arts**, and Y. Gao. 2007. HIV diversity, recombination and disease progression: How does fitness "fit" into the puzzle?. *AIDS Rev.* 9:75-87.
68. Lobritz, M.A., A. J. Marozsan, R. M. Troyer, and **E.J. Arts**. 2007. Natural variation in the V3 crown of human immunodeficiency virus Type 1 affects replicative fitness and entry inhibitor sensitivity. *J. Virol.* 81:8258-8269.
69. Anastassopoulou, C.G., A.J. Marozsan, A. Matet, A.D. Snyder, **E.J. Arts**, S.E. Kuhmann, and J.P. Moore. 2007. Escape of human immunodeficiency virus type 1 from a small molecule CCR5 inhibitor is not associated with a fitness loss. *PLoS Pathog.* 3(6): e79 (11 pages).
70. Lalonde, M.S., R.M. Troyer, A.R. Syed, S. Bulime, K. Demers, F. Bajunirwe, and **E.J. Arts**. 2007. A sensitive oligonucleotide ligation assay for low-level detection of nevirapine resistance mutations in HIV-1 quasispecies. *J. Clin. Microbiol.* 45:2604-2615.
71. Liu, Y., J. McNevin, H. Zhao, D.M. Tebit, M. McSweyn, A.K. Ghosh, D. Shriner, **E.J. Arts**, M.J. McElrath, and J.I. Mullins. 2007. Evolution of HIV-1 CTL epitopes: Fitness-Balanced Escape. *J Virol.* 81: 12179-12188.
72. Troyer, R.M., M.S. Lalonde, F. Bajunirwe, E. Fraundorf, K.R. Demers, F. Kyeyune, C.C. Whalen, P. Mugenyi, **E.J. Arts**. 2008. A radiolabeled oligonucleotide ligation assay demonstrates the low frequency of nevirapine resistance mutations in HIV-1 quasispecies of NVP-treated and untreated mother-infant pairs from Uganda. *AIDS Res. Hum. Retroviruses.* 24: 235-250.
73. Ndembu, N., A. Abraha, H. Pilch, H. Ichimura, D. Mbanya, L. Kaptue, R. Salata, and **E.J. Arts**. 2008. Molecular characterization of HIV-1 and HIV-2 in Yaounde, Cameroon: Evidence of major drug resistance mutations in newly diagnosed non-B infected patients. *J. Clin. Microbiol.* 46:177-184.

74. Quinones-Mateu, M.E., D.M. Moore-Dudley, O. Jegede, J. Weber, and **E.J. Arts**. 2008. HIV-1 drug resistance and fitness. *Adv. Pharmacology* 56: 257-296.
75. Gao, Y., M. A. Lobritz, J. Roth, M. Abreha, I. Nankya, D. M. Moore, A. Abraha, K. R. Nelson, S.L. Gerson, and **E.J. Arts**. 2008. Targets of siRNA restriction during HIV-1 replication. *J. Virol.* 82:2938-51.
76. Gao, Y., I. Nankya, A. Abraha, R.M. Troyer, K. Nelson, A. Rubio, and **E.J. Arts**. 2008. Virtual TCID50 method for HIV-1. *Methods Mol. Biol.* In press.

C. Research Support

RESEARCH PROJECTS ONGOING OR COMPLETED DURING THE LAST 3 YEARS ONGOING

AI49170-01 (Arts) 10/01/02 – 09/31/12
R01 NIAID, NIH
Impact of HIV-1 fitness on disease progression
This application builds upon recent results suggesting that HIV-1 fitness may be accurate predictor of disease progression. In addition, HIV-1 fitness may differ between subtypes and have an impact on the global epidemic.

N01-HD-0-3310-502-02 (Salata) 10/1/00-9/30/10
NICHD, NIH Hormonal Contraception and Risk of HIV Acquisition
Ancillary study (Arts) 10/1/00 – 9/31/10
NICHD, NIH
Analysis of viral fitness and host immune response in women newly infected with non-clade B HIV-1
Ancillary study (Morrison) 10/1/00 – 9/31/10
NICHD, NIH
Effect of hormonal contraception on HIV genital shedding among women with primary HIV infection

AI36219 (Lederman) 4/1/99 – 3/31/09
NIH
Center for AIDS Research
Director of the Uganda Laboratory Core of the CFAR.
Supervise the laboratory activities and provide services from a molecular virology, immunology, and bacteriology laboratory at the Joint Clinical Research Centre, Kampala, Uganda.

AI57005-01 (Mullins) 10/01/03 - 9/30/08
P01, NIAID, NIH
Seattle Primary Infection Program: Immunology and Virology of Acute HIV Infection
Project 3 (Arts)
Impact of viral population changes and escape on viral disease

AI058894-01 (Mullins) 5/01/04 - 4/30/08
R01, NIAID, NIH
HIV-1 and Host Cell Changes in Disease Progression
(Co-investigator: Arts - subcontract)

Subcontract to CHAVI (Arts) 09/01/07 – 10/31/08
L01 NIAID, NIH contract (Haynes)
Development of pathogenic R5 tropic SHIVs using a pool of SHIVs harboring different subtype B *env* genes

AI70090 (Varani) 6/15/07-5/31/12
R01 NIAID, NIH
New Inhibitors of HIV Replication