HIV-1 Transmission During Recent Infection and During Treatment Interruptions as Major Drivers of New Infections in the Swiss HIV Cohort Study

Alex Marzel, Mohaned Shilaih, Wan-Lin Yang, Jürg Böni, Sabine Yerly, Thomas Klimkait, Vincent Aubert, Dominique L Braun, Alexandra Calmy, Hansjakob Furrer, Matthias Cavassini, Manuel Battegay, Pietro Vernazza, Enos Bernasconi, Huldrych F Günthard, Roger D Kouyos & Swiss HIV Cohort Study

BACKGROUND
Reducing the fraction of transmissions during recent human immunodeficiency virus (HIV) infection is essential for the population-level success of "treatment as prevention".

METHODS
A phylogenetic tree was constructed with 19,604 Swiss sequences and 90,994 non-Swiss background sequences. Swiss transmission pairs were identified using 104 combinations of genetic distance (1%-2.5%) and bootstrap (50%-100%) thresholds, to examine the effect of those criteria. Monophyletic pairs were classified as recent or chronic transmission based on the time interval between estimated seroconversion dates. Logistic regression with adjustment for clinical and demographic characteristics was used to identify risk factors associated with transmission during recent or chronic infection.

FINDINGS
Seroconversion dates were estimated for 4079 patients on the phylogeny, and comprised between 71 (distance, 1%; bootstrap, 100%) to 378 transmission pairs (distance, 2.5%; bootstrap, 50%). We found that 43.7% (range, 41%-56%) of the transmissions occurred during the first year of infection. Stricter phylogenetic definition of transmission pairs was associated with higher recent-phase transmission fraction. Chronic-phase viral load area under the curve (adjusted odds ratio, 3; 95% confidence interval, 1.64-5.48) and time to antiretroviral therapy (ART) start (adjusted odds ratio 1.4/y; 1.11-1.77) were associated with chronic-phase transmission as opposed to recent transmission. Importantly, at least 14% of the chronic-phase transmission events occurred after the transmitter had interrupted ART.

CONCLUSIONS
We demonstrate a high fraction of transmission during recent HIV infection but also chronic transmissions after interruption of ART in Switzerland. Both
represent key issues for treatment as prevention and underline the importance of early diagnosis and of early and continuous treatment.

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