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USING HAIR TO MANAGE HIV/AIDS AND PREDICT TREATMENT SUCCESS

UCSF researchers have found that examining levels of antiretroviral drugs in hair samples taken from HIV patients on therapy strongly predicts treatment success.

The findings, published in the February 20 issue of *AIDS*, note that the levels of antiretrovirals found in the hair of patients on treatment correlated strongly with levels of HIV virus circulating in patients' blood.

"High levels of antiretrovirals in hair correlated with success in HIV viral suppression in treatment and did so better than any of the other variables usually considered to predict response," said the study's primary investigator, Monica Gandhi, MD MPH, assistant professor of medicine at UCSF's Positive Health Program at San Francisco General Hospital.

Typically, clinicians rely on either self-report by patients, pill counts or expensive medication dispensing devices to monitor how well patients are taking their pills as directed. These methods are highly patient dependent and have not been good predictors of treatment success.

Clinicians can draw blood and then measure plasma levels of medications, but since a single plasma level represents medication exposure only hours prior to the blood draw, this method has also not been a good predictor of viral suppression, according to Gandhi. Single drug levels can vary day-by-day for a single patient and may reflect improved pill-taking by patients just before clinic visits, she said.

Hair, which grows at a rate of about a centimeter a month, gives a reading of drug levels that reflects the rate of pill consumption sustained by patients over weeks, not days. Assessing an average level of drug exposure over time may be more predictive of treatment response than the "snapshot" of exposure provided by a single plasma level of medication, Gandhi said.

"Hair sampling for antiretroviral levels could become a new standard to look at how much drug a patient is getting—an equivalent in HIV clinical care of measuring hemoglobin A1C, the method used in diabetes to monitor average blood glucose levels," said study co-investigator, Ruth M. Greenblatt, MD, UCSF professor of clinical pharmacy and principal investigator of the Women's Interagency HIV study.

Researchers took 10 strands of hair from patients on HIV therapy from the back of the head. They cut the hair sample close to the scalp underneath the top layer of hair, marked the part farthest from the scalp with tape and wrapped the strands in aluminum foil. The sample was then stored at room temperature in a plastic bag until it was analyzed.

"This is a painless, bloodless, biohazard-free, method of collecting a stable specimen from HIV patients that may allow for the monitoring of levels of antiretroviral drugs absorbed over time and the prediction of treatment success," said Gandhi. "Our next step is to test this method in resource-limited settings where blood collection and viral load monitoring may be expensive and difficult. Not only could this method help in measuring pill-taking, but its strong correlation with viral suppression could allow its use as an inexpensive, non-invasive method of monitoring treatment success in particularly challenging settings."

Researchers from this group are also collaborating with public health researchers in testing hair to monitor pill-taking in clinical trials of single or dual antiretrovirals in high risk, HIV negative individuals to prevent infection with HIV (pre-exposure prophylaxis, known as PrEP, trials).

The 224 patients in this study were drawn from the Women's Interagency HIV study, an ongoing multi-center, prospective study of HIV-infected and at risk uninfected women established in 1994.

“Women taking antiretroviral medications may have more adverse events than men taking these regimens. The safety trials of these medications were conducted in trials consisting largely of men, and the highest tolerable amount of drug in order to successfully suppress HIV is usually recommended. One foreseeable use of this technique may be to fine-tune the amount of drug prescribed. We could measure drug levels in hair, find the level correlating with viral suppression, and then reduce the amount of drug prescribed if it was at a point exceeding the level needed for viral control, hopefully reducing toxicities,” said Gandhi.

Co-authors include Niloufar Ameli and Yong Huang from the UCSF Department of Clinical Pharmacy; Peter Bacchetti, UCSF Department of Epidemiology and Biostatistics; Stephen J. Grange, Johns Hopkins' Bloomberg School of Public Health; Kathryn Anastos, Albert Einstein College of Medicine; Alexandra Levine, City of Hope National Medical Center; Charles L. Hyman, SUNY Downstate Medical Center; Mardge Cohen, Cook County Bureau of Health Services; and Mary Young, Georgetown University Medical Center.

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UCSF's Positive Health Program at San Francisco General is affiliated with the AIDS Research Institute (ARI) at UCSF. UCSF ARI houses hundreds of scientists and dozens of programs throughout UCSF and affiliated labs and institutions, making ARI one of the largest AIDS research entities in the world.

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