Depression doesn't speed AIDS onset, death

Symptoms of depression that often strike people infected with HIV, the AIDS-causing virus, appear to have little effect on when they develop the disease or how long they live, two new studies find.

"The development of HIV-related physical symptoms increases the likelihood of depression, but . . . depressive symptoms do not in themselves increase the progression of HIV disease," argues an editorial written by physician Samuel Perry and psychologist Baruch Fishman, both at Cornell University Medical College in New York City.

Both studies and the editorial appear in the Dec. 1 JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION.

One of these studies, by Jeffrey H. Burack and his colleagues at the University of California, San Francisco, extends and revises findings first reported at the VIII International Conference on AIDS in Amsterdam in 1992 (SN: 7/25/92, p.53).

Initially, Burack and his co-workers found that after three years, depressed patients had twice the death rate of a nondepressed group. But in the new report they note that after 66 months, "neither overall depression nor affective depression was significantly associated with earlier AIDS diagnosis or earlier mortality."

The researchers emphasize a finding unique to their study, which suggests that depression affects the immune system. They found that over the course of the study, the number of CD4 immune cells declined less rapidly in the 227 nondepressed subjects than in the 50 volunteers who reported suffering from symptoms of depression when they started the study. Declining CD4 cell counts indicate that the HIV infection is progressing.

The CD4 cell counts of depressed volunteers declined between 34 and 38 percent faster than those of the nondepressed subjects, the researchers found. The team is now investigating why CD4 cell counts drop faster in depressed AIDS patients.

But in actual numbers, these differences in CD4 cell declines are quite small, Perry and Fishman note in their editorial. And while statistically significant, the declines may be the result of chance or the method they used to measure CD4 cells.

"It's not clinically meaningful," agrees Robert H. Remien, a psychologist at Columbia University.

Indeed, an eight-year study involving 365 depressed and 1,858 nondepressed volunteers failed to confirm the San Francisco findings. Constantine G. Lyketsos of the Johns Hopkins University School of Medicine in Baltimore and his colleagues found similar rates of CD4 cell decline among depressed and nondepressed participants in the Multicenter AIDS Cohort Study, they report. But they, too, found "no evidence that depressive symptoms independently prognosticate worse outcomes in HIV infection."

The differences between the two studies' findings concerning depression and the decline in the number of CD4 cells probably stem from "some difference in the sample," says Donald Barrett, a coauthor of the Burack study and a statistician and sociologist at the University of California, San Francisco.

The volunteers in the Lyketsos study had lower CD4 counts to begin with, which suggests that they were less healthy, Barrett says. "In a less healthy sample, there's less room for CD4 cells to decline," he notes.

Lyketsos says that Burack's finding may have been caused by chance, as that group measured CD4 cell decline less often and had fewer subjects than his study did.

Lyketsos and his colleagues emphasize that their findings on depression and HIV should not halt further research on the topic. In fact, "there may be some subtypes of depression that may be more related to survival" than other types, Lyketsos explains. — *T. Adler*

Thin-film solar cells boost efficiency

In small villages throughout the developing world, electricity is a scarce commodity. Lacking overhead power lines, or any access to a large power source, villagers in India, Africa, South America, and Eastern Asia often rely on precarious diesel generators to light a few lamps, pump a well, or cool their perishable foods. Even the sun's boundless energy proves limited without an efficient means of capturing and storing power for use when needed.

Recent improvements in solar-power technology may make sun-derived energy more available to a host of potential users.

Rommel Noufi, a chemist at the National Renewable Energy Laboratory in Golden, Colo., reports the highest confirmed conversion efficiency — 15.9 percent — for a polycrystalline thin-film solar cell. The new film comes from many subtle improvements in the design and manufacture of a particular type of copper indium gallium diselenide material, which has been under study for nearly a decade. Noufi detailed the advance this week in Boston at a meeting of the Materials Research Society.

"We achieved such high efficiencies because we've finally acquired a deep enough fundamental understanding of this material, and the processes for making it, to make a road map of the reaction pathways," Noufi says. "What we've lacked until recently is a rich picture of the material's mechanisms. Now we have a specific chemical pathway for a high-quality material."

"Our biggest challenge now is to look at enough reaction pathways to develop a universal understanding of photovoltaic materials so that we can reach even higher efficiencies," he adds. For this type of multilayered device, the theoretical limit for efficiency is roughly 23 percent.

Other types of photovoltaic material, notably single-crystal materials, have achieved higher efficiencies, in some cases near 30 percent. But these remain expensive to make and thus aren't useful for many applications in which cost per watt is a significant factor, Noufi says. The chief advantage of the new material is that it can be mass-produced at low cost in large quantities — which could significantly increase its use in poor, remote regions.

"The fact that a polycrystalline thin-film material is getting so close in efficiency to single-crystal materials, for much less cost, is a significant achievement," says Bulent M. Basol, a chemist at International Solar Electric Technology in Inglewood, Calif. "A photovoltaic cell with 30 percent efficiency for $20 per watt may be good for a few applications but not for most. Some of the newer single-crystal photovoltaic cells cost about $4 or $5 per watt, but that is still too expensive."

"But this kind of thin film, produced in large volumes, could cost less than $1 per watt, which would make it useful to a wide range of applications that today are not cost-effective," says Basol. "So from an industrial point of view, this could be a big breakthrough."

Polycrystalline thin-film photovoltaic devices have great potential for use in remote sites, according to Basol. In space, for example, the cells could power satellites, unmanned explorers, or roving vehicles. On Earth, they could help run irrigation systems, provide additional power for trains or telephone systems, pump wells, or just keep a village lighted.

"In Africa, a village may need electrification for a few homes, or a lantern, or a refrigeration unit. Something as small as this can really improve people's lives. But what always stops these simple, immediate applications is the cost per watt. It's just been too expensive. Now, maybe, this will change," says Basol. — *R. Lipkin*