notes that lymphotoxin-secreting cells are susceptible to that protein's lethal effects, provided that there are not many potential target cells around to absorb the lymphotoxin.

Gideon Berke of the Weizmann Institute in Rehovot, Israel, has also found that the MTOC of killer cells reorients toward the targets, but he proposes another possible explanation. He points out that the microtubules participate in cell movements as well as in secretion. The reorientation of the MTOC might thus have more to do with the migration of killer cells towards their targets or with the folding of the membrane at the point of contact than with release of cytocidal materials.

Berke is somewhat skeptical about suggestions that killer cells act by secreting proteins onto their targets. "I do not discount the observation that cytocidal material can be extracted from killer cells," he explains, "but there is a need to prove the material is secreted and deposited on [target] cell membranes." Even Henkart concedes that direct proof of a transfer of material from killer to target is lacking, primarily because the experiments are technically difficult.

Moreover, Berke has been unable to detect ring-shaped lesions in killer cell targets like those seen by the other investigators. "I have done an extensive search for those rings and could not detect them in over 2000 targets examined," Berke maintains, even though he could see them in cells under attack by complement. The reason for this discrepancy in results is unclear. However, Henkart suggests that ring formation may not be absolutely necessary for cell-killing. Insertion of the pore-forming proteins into the membrane and lymphotoxin uptake may do sufficient damage even without formation of complete rings.

More work will be needed to pin down once and for all the role played by protein secretion in cell killing. Investigators are also interested in clarifying the relations among the assorted cytolytic proteins. The gene cloning now being avidly pursued in the various laboratories will help in this regard. Certainly the possible connection between the proteins and cancer and AIDS will not diminish interest in them. ■

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ADDITIONAL READING

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Weather Balloons at Venus

Starting on page 1407 of this issue, Soviet and French researchers describe how they dropped two instrumented Teflon balloons into the middle of the cloud layer enshrouding Venus and, with the help of American scientists, recovered 46 hours of meteorological data from each of them. Before the arrival of the balloons on 11 and 15 June of last year, the sum total of Venusian meteorological observations came from 15 probes that plunged from the top to the bottom of the atmosphere in an hour or less. From more or less constant altitudes starting at about 54 kilometers, the VEGA balloons provided wind, temperature, and pressure information whose preliminary analysis reveals far more blustery conditions than anticpated. VEGA 2 may even have been thumped by ripples caused by some of Venus's highest mountains.

Earth has nothing like the layer of the atmosphere in which the VEGA balloons flew, but then the Venusian atmosphere bears only a topsy-turvy resemblance to Earth's. Both begin to cool with increasing altitude above the surface, but Earth's atmosphere ends up being hottest where it is thinnest, at its top, whereas Venus's is hottest at the bottom, where carbon dioxide traps solar energy through the greenhouse effect.

Sitting above most of this hot atmosphere are the clouds, ranging between altitudes of about 48 and 60 kilometers. Within them is a planet-wide, 50-kilometer-thick layer traversed by the VEGA balloons that is curiously well mixed. Above and below that layer the atmosphere is stable and tends to resist vertical motion and the resulting turbulent mixing. Before these VEGA missions, researchers guessed that the clouds' absorption of thermal radiation from the underlying 700 K atmosphere led to heating, convection, and stirring that formed the mixed layer, somewhat the way the sun warms Earth's surface and produces puffy mounds of convective, cumulus clouds on a summer day. Alternatively, a sharp enough increase with altitude of the east-to-west global wind, which reaches 360 kilometers per hour at 60 kilometers, might mix the atmosphere through turbulence.

VEGA experimenters may have been looking for a bit of extra vertical motion and turbulence, but the typical vertical winds encountered of 2 to 4 kilometers per hour were more than anyone had bargained for, according to Richard E. Young of the NASA Ames Research Center in Mountain View, California. Calculations using convection theory predicted just such winds, which tends to support a convective origin for the mixed layer, but Young for one did not expect vertical winds as strong as those found only around terrestrial storms to prevail planet-wide on Venus.

Even stronger buffeting awaited VEGA 2 near the end of its active life. As it passed 50 kilometers above Aphrodite, one of the highest mountainous terrains on Venus, VEGA 2 encountered vertical winds as fast as 11 kilometers per hour. VEGA experimenters suspect that winds blowing over the 5-kilometer-high mountains created atmospheric waves above and downstream of the mountains that propagated all the way to the balloon level. Such propagating waves, including those created by convection at the balloon level, can influence the atmosphere far from their origins.

The VEGA balloons also made the first in situ observations of "weather" at Venus. The Pioneer Venus orbiter has returned images of waves propagating through the clouds, but the 6.5°C temperature difference found between the two balloons, whose paths straddled the equator, is the first in situ evidence that eddies as large or larger than those on the daily weather map affect the Venus atmosphere. On Earth, such eddies help carry heat from the equator to the poles. Further analysis of all the VEGA data should help clarify how the heat transport problem is solved on Venus.

A couple of phenomena failed to make an appearance. The cloud particle detector on each balloon's instrument package failed to detect any break in the clouds at that level, although the balloons may simply have remained within the same cloudy air mass throughout. And the lightning sensors found no detectable lightning around or beneath them even when passing over areas suspected of being prone to lightning generation. ■ RICHARD A. KERR