hand. He conceded, "There were certain portions of the testimony that I would have to consider personally as not being sufficient." He went on to explain that, if an assumed value involving a heat transfer coefficient—as specified by the criteria—were inaccurate by the relatively small amount of 20 percent, then emergency core cooling systems in a number of reactors might not be able to prevent melting of the core in the event of a major water leak.

Lauben had raised what was to become a central question in the hearing: AEC doctrine holds that unknowns in reactor behavior can be offset by conservative engineering assumptions. But can one always be sure what "conservative" means?

Cyril G. Lawson, an authority in core cooling problems from Oak Ridge National Laboratory, elaborated the point:

> The assertion is that conservative assumptions are made where possible, and this is true. But there are some areas where, in my opinion, we don't know whether the assumption we are making is conservative or not because we don't know what is occurring physically.

As to whether backup cooling systems would or would not perform as they were supposed to, Lawson said that both possibilities were equally speculative. No one, he said, had ever tabulated the "conservatisms" and "unconservatisms" presumed to exist in ECCS design, "so the net conservatism is unknown."

On 9 March, Phillip L. Rittenhouse, another safety researcher from Oak Ridge, pointed to what he felt were serious technical deficiencies in the interim criteria. Then he startled the hearing by asserting that a great many of his colleagues in the national laboratories and the AEC headquarters staff shared his reservations about the reliability of backup cooling equipment. Cherry asked who these colleagues were. Rittenhouse read into the record the names of 28 persons, including Lauben, Lawson, William B. Cottrell, the director of nuclear safety programs at Oak Ridge, his assistant David O. Hobson, and ten top officials of the Aerojet Nuclear Corporation, which manages the safety research program at the National Reactor Testing Station in Idaho. Significantly, Aerojet Nuclear is responsible for running most of the AEC's emergency core cooling research, much of which has yet to be completed.

Doom Spelled for Vampires

There was bad news for the vampire bat at a press conference called last week by John A. Hannah, administrator of the Agency for International Development (AID).

Hannah announced the development of a new means—economical, lethal, species-specific, and ecologically unassailable—of doing away with droves of the tiny flying mammals, which have harassed generations of Latin American livestock and caused countless cattle deaths from rabies. Rabies carried by these bats has also killed some people, and there is evidence that the bats carry the virus of Venezuelan equine encephalomyelitis, which killed thousands of horses last year.

The bats in question are *Desmodus rotundus*, one of three major types of bats. Unlike the other species, which are, respectively, insectivorous and frugivorous, and unlike the vampire bats that prey on birds, the *Desmodus rotundus* like mammalian blood, particularly that of docile and easy-to-locate cattle. The territory of these bats stretches from central Mexico to northern Argentina, and they are responsible for 1 million cattle deaths, amounting to $250 million worth of meat and milk, each year.

Various quite unsuccessful methods have been used to combat their oft-diseased bite. These include vaccination of cattle, which is expensive and of limited effectiveness; electric night lighting or netting around corrals; fumigation or destruction of roosts (a practice that can result in the destruction of multitudes of good bats sharing the same cave or abandoned well); and the application of a strychnine and honey syrup to bites to poison those bats returning to the scene of an earlier meal.

Intensive research on the problem by AID, the Department of the Interior, and the Mexican department of agriculture began in 1968. Scientists carried out detailed observations of the vampire bats' flight, feeding, and domestic habits and their reactions to various drugs. Basic research was done at the Interior Department's Fish and Wildlife Research Center in Denver, and field studies were carried out in Mexico and Brazil.

Scientists finally located two circumstances that fit together to spell doom for the vampires. One is that this species has an extremely low tolerance for anticoagulant drugs of the kind used to treat heart disease in human beings. The other is that bats are constantly grooming and licking themselves and their neighbors in the roost. So a mixture of petroleum jelly and anticoagulant was made and spread on the backs of captured bats.

The results were startling. In test populations of cattle, there was a 96 to 100 percent reduction in bat bites in 2 weeks. Every bat applied with the deadly mixture was responsible for the deaths of perhaps 2 or 3 dozen of the bats he roosted and preened with. The results were equally effective when an anticoagulant was injected in the stomachs of cattle. For several days, the cattle's blood contained enough anticoagulant to kill their predators. The drug has no adverse effects on cattle because of their bulk, but the vampire bat, which is 3 inches long and weighs 1 ounce, experiences a lingering death from hematomas, internal hemorrhaging, failure of the circulatory system, or, if he survives the initial impact, insufficient strength to go out for food.

Nelson Kverno, a biologist at the Denver Research Center, said Latin American cattle breeders are already tooling up for the new treatment and that it has such an immediate and devastating effect on bat populations that it will only have to be used once every 3 to 8 years, at a cost of 1 or 2 cents per bat killed. Officials disavowed any intention (or capability) of wholesale eradication of the vampire, "a very exciting little animal," as Kverno called it, merely of reducing the population in cattle-raising areas. AID is touting the $800,000 project as an extraordinary example of efficient, economical applied research—the total cost is about 0.3 percent of the annual damages caused by the bats.—C.H.