Biomedicine

Compound kills lethal pneumonia bug

Animal studies show a new drug kills *Pneumocystis carinii,* the protozoa-like parasite that causes a sometimes-fatal pneumonia that strikes about 70 percent of AIDS patients. The research suggests this compound may safely prevent and treat *P. carinii* pneumonia.

The Food and Drug Administration has approved trimethoprim-sulfamethoxazole and pentamidine for treatment of *P. carinii* pneumonia, but some people with AIDS must stop taking these drugs due to serious side-effects. Neither drug kills the parasite outright, and thus many people with *P. carinii* pneumonia get successful treatment only to suffer another bout months later.

Now Walter T. Hughes at the St. Jude Children's Research Hospital in Memphis, Tenn., reports that 100 milligrams per kilogram of hydroxynaphthoquinone daily for six weeks blocked *P. carinii* pneumonia in 90 percent of rats vulnerable to the disease because scientists gave them immunosuppressive drugs during the same six-week period. Immunosuppressive therapy allows latent *P. carinii* present in most healthy rats to flourish and cause pneumonia. Indeed, control rats receiving immunosuppressive drugs but no other treatment for six weeks all developed this deadly pneumonia. The team reports its study of roughly 250 rats in the February ANTIMICROBIAL AGENTS AND CHEMOTHERAPY.

The researchers found the drug cured rats with already established *P. carinii* pneumonia and reported results that suggest hydroxynaphthoquinone killed the protozoa-like microbe in all the immunosuppressed rats.

The team is finishing a small Food and Drug Administration Phase I human study of the drug's safety. Although the results of that study are preliminary, Hughes says they hint that the new compound safely prevents *P. carinii* pneumonia in HIV-infected people. The team now plans to study the drug's ability to combat *P. carinii* pneumonia in AIDS patients.

Seizure drug lowers IQ in children

A widely used drug thought to prevent fever-induced seizures in infants and young children can lower scores on intelligence quotient tests, according to a new scientific report. The authors of the report believe doctors should stop prescribing the drug, phenobarbital, for young children.

Jacqueline R. Farwell of the University of Washington School of Medicine in Seattle and Deborah G. Hirtz of the National Institute of Neurological Disorders and Stroke in Bethesda, Md., studied 217 children between 8 and 36 months of age who had had at least one fever-induced seizure in the past and were at high risk of having another such seizure. The researchers randomly assigned children to a treatment group that got 4 to 5 milligrams per kilogram of phenobarbital daily or to a control group getting placebo pills.

After two years of treatment, the researchers found children taking phenobarbital had a mean IQ test score 8.4 points lower than children taking the placebo. The team discontinued medication and placebo for six months and repeated the testing, finding children in the treatment group had a mean IQ 5.2 points lower than controls. In addition, the researchers found children taking phenobarbital were just as likely to suffer another fever-induced seizure as their untreated peers, indicating the drug is ineffective at preventing fever-induced seizures.

"I think [phenobarbital] should not be used for febrile seizures," Farwell says. Fever-induced seizures afflict about 3 to 4 percent of all young children. In most cases such seizures don't cause any damage, but they are frightening to parents, Hirtz says. The researchers plan to follow the children in the study to see whether differences in cognitive performance persist over time.

Space Sciences

Exiting ions of Venus' ionosphere

Data from various spacecraft, primarily the Pioneer Venus Orbiter, have identified "holes" in Venus' ionosphere, indicating regions with reduced numbers of hydrogen and oxygen ions. Theorists have wondered whether the ions move either up or down through the holes, and they have proposed answers on both sides of the question. Now two researchers report evidence from Pioneer Venus data that the ions seem to move out.

The clue that led to this conclusion, strangely, came from Saturn's big moon Titan, says Richard E. Hartle of NASA's Goddard Space Flight Center in Greenbelt, Md. In 1980, the Voyager 2 spacecraft flew past Titan and detected ions flowing outward along the "tail" of its weak magnetic field. The masses of the ions indicated that "we could be seeing something of ionospheric origin," Hartle says. Hartle notes that the ions could have come from external sources, but he says the observation brought to mind the matter of inward and outward flow through ionospheric holes on Venus, whose magnetic field is also very weak.

Earth, too, has ionospheric holes, but Hartle says they are localized processes, dominated by variations in the ionosphere's chemistry, and seem to have no significant upward or downward ion motion. This is also true of artificially produced holes created by dumping clouds of water vapor or chemicals from satellites, or by the exhaust of ascending rockets.

Inspired by Titan, Hartle and Goddard colleague Joseph M. Grebowsky went back through the Pioneer Venus data in search of ionospheric holes that might show signs of ions flowing up or down. The search revealed two such holes, detected on May 18 and 19, 1980. Both times, the spacecraft's orbit carried it on a sloping path through the hole, entering at an altitude of about 300 kilometers and leaving at about 140 km. And both times, more ions were counted at the greater height.

This suggests the ions were indeed moving up, Grebowsky says, though he acknowledges that the conclusion, reported in the recently released Jan. 1 JOURNAL OF GEOPHYSICAL RESEARCH, is tentative. More research will be needed (as well as more data, perhaps from Japan's proposed Venus ionosphere satellite) to distinguish actual upward ion flow from mere differences in the numbers of ions at different altitudes.

Hartle and Grebowsky are now working on the question of whether the ions flow outward only through the holes or from much of Venus' ionosphere. Another question is whether the holes served as an escape route for some of the water believed to have existed in the planet's early history.

"There is not enough flow through the holes to account for much water," Hartle says, although he adds that the effect could have been larger if the escape hatch turns out to include most of the ionosphere.

Tubing in Earth's magnetosphere

Duane H. Pontius Jr. and Richard A. Wolf of Rice University in Houston urge more researchers to examine existing spacecraft data for evidence of tubes in the magnetosphere of Earth. Such tubes would be created by the movement of "bubbles" containing a reduced number of high-energy (kilovolt) particles and formed by the bunching-together of lines in the tail of the field, the authors write in the January GEOPHYSICAL RESEARCH LETTERS.

The bubbles, the authors hypothesize, would be moving "uptail," or toward the Earth, along the field lines at speeds of about 1,000 kilometers per second, creating short-lived regions that are essentially tubes. Several satellites have taken measurements down the geotail, but the idea is "to encourage people who watch this data to look for these things," the researchers write.