Pumping Iron: Too Weak to Slow Warming

Scientists who released a half ton of iron into the Pacific Ocean report that the metal had a fertilizing effect, producing a bumper crop of tiny plants in a largely barren region 500 kilometers south of the Galápagos Islands. But this plankton bloom did not absorb much carbon dioxide from the atmosphere, deflating suggestions that nations might rely on this so-called Geritol therapy in an emergency to avert future greenhouse warming.

"If people are considering iron fertilization as a way to mitigate increased levels of carbon dioxide, this experiment does not give us promising results," says Kenneth Coale of Moss Landing (Calif.) Marine Laboratories, one of the 14 institutions that mounted the expedition late last year. The team reported its results in detail last week at the Ocean Sciences Meeting in San Diego.

Coale and his colleagues conducted the experiment to test a theory raised 4 years ago by the late John Martin of the Moss Landing labs, who tried to explain why the Antarctic and other ocean areas lack abundant plant life even though they have large supplies of nutrients. Martin proposed that low iron concentrations within the open ocean limited the growth of phytoplankton, preventing these tiny plants from making use of available nutrients. Iron is an essential element for plant growth.

As a corollary, Martin suggested that adding iron to unproductive but nutrient-rich areas would enhance plant photosynthesis, thereby drawing carbon dioxide out of the atmosphere and limiting its climatic effect. He also hypothesized that during the ice ages, additional iron in the ocean helped cool the globe.

To test Martin's hypothesis, the researchers pumped 480 kilograms of iron into a region three-fourths the size of Manhattan. Over the next 9 days, they found a substantial increase in biological productivity. "The response to the iron was dramatic and fast and unambiguous. It was an overwhelming confirmation of the iron hypothesis," says Richard T. Barber of Duke University Marine Laboratory near Beaufort, N.C.

The concentration of chlorophyll — a pigment important in photosynthesis — tripled and the amount of biomass doubled in the surface waters, indicating that phytoplankton increased in abundance and grew faster. Still, the surge did not reach the level some expected. In theory, the experiment provided enough iron for plants to use up all available nitrate nutrients, which would have produced a 10-fold increase in biomass, says Coale.

Although it enhanced growth, the iron had only an anemic effect on carbon dioxide. The concentration of carbon dioxide in the water decreased, but by only one-tenth the predicted maximum if phytoplankton growth had reached its full potential, says Kim Van Scoy of the Plymouth Marine Laboratory in England.

The researchers have several ideas to explain the modest response. Although phytoplankton did grow more than usual, plant-eating plankton also increased in number. These grazers kept the iron-fertilized crop in check.

The investigators also noticed that iron concentrations in the water decreased, indicating that some iron attached to larger particles and dropped out of the surface waters, thus limiting the fertilizing effect. "What this experiment tells us is that if we want to create a drawdown [of carbon dioxide], it would require continuous fertilization, which I think is totally unfeasible. Not only that, it would be totally irresponsible," says Coale, who like others worries about the implications of seeding the seas.

The experiment did not disprove Martin's ice age theory, Coale says. During glacial epochs, iron-rich dust blowing off the arid continents could have caused a continual fertilization, thus cooling the world, he explains.

François Morel of the Massachusetts Institute of Technology questions that theory. Although the experiment showed that iron helped plants in the tropics, he remains unconvinced that deficiencies in this metal limit productivity in other ocean areas, such as the Antarctic.

— R. Monastersky

Real males that lactate: A batty story

How's this for a gender-bender? Scientists have discovered the first case of a male mammal that produces milk in the wild.

Charles M. Francis, a research associate affiliated with the Wildlife Conservation Society in New York City, stumbled upon this strange case while on a field trip to Malaysia. After capturing a number of fruit bats in nets stretched across the rain forest canopy, he realized that the males, although perfectly normal in every other way, had noticeable mammary glands.

"My initial thought was that they were freak bats," recalls Francis. After netting more of the animals, he realized that the males of this species, *Dyacopterus spadiceus,* or Dayak for short, expressed a small amount of milk.

Francis sent tissue samples from three male and two female bats to Thomas H. Kunz at Boston University. Kunz examined the tissue under a microscope and found that male mammary tissue looked very similar to female breast sections.

The researchers noted that tissue obtained from the testes of two male bats appeared normal. Such findings leave open the possibility that these bats sire and suckle their own offspring, Francis says. They describe their findings in the Feb. 24 NATURE.

There have been a few reports of lactation in domesticated male animals. However, those cases appear to result from severe inbreeding, Kunz says. Certain pathological conditions may cause human males to produce milk, the authors add.

Francis

A Dayak fruit bat in its treetop home.

Not much is known about these fruit bats. The authors wonder whether the bats practice monogamy, in which a male and female pair up — generally for life — and raise a family together. Most mammals are polygamous, Kunz notes. If these bats are monogamous, the male might gain an evolutionary advantage by helping its partner with wet-nursing duties, he speculates.

There is an alternative explanation for the milk production, however. These fruit bats may eat some plants that contain high concentrations of phytoestrogens, natural hormonelike substances that may spur the growth of male breast tissue and even trigger a small amount of milk production, the authors add.

— K.A. Fackelmann