rizing bills can be used to convince appropriators to put money behind an idea. "They help put you in a stronger negotiating position," says Kevin Casey, government relations head at Harvard University in Cambridge, Massachusetts.

Frist-Rockefeller also "has become a very important organizing tool" for the community, Kingscott says. It wasn't too many years ago, she notes, that the group's biweekly strategy sessions drew fewer than a dozen science politicos. "Now it's become hard to find a room large enough to hold us," says Betsy Houston of the Washington-based Federation of Materials Scientists, about meetings that regularly draw 30 or more people. The meetings have also become a staging ground for other campaigns, such as the ongoing effort to fight off proposed rules that would require scientists to turn over raw data to anyone who makes a Freedom of Information Act request (*Science*, 12 February, p. 914). Indeed, participants are making plans to continue meeting even after their work on Frist-Rockefeller is done.

Similarly, an annual science lobbying blitz sponsored by the doubling partners has proven to be increasingly popular. Late last month, for instance, more than 200 researchers from academia and industry—many of them political neophytes—came to Washington to urge lawmakers to support more federally funded research, including passage of Frist-Rockefeller. The staff meetings and briefings were "an eye-opener" for researchers who had no idea how to approach lawmakers with their concerns, says geologist Gail Ashley of Rutgers University in Brunswick, New Jersey, who represented the 16,000-member Geological Society of America.

The show of force demonstrated that "science and technology has an active political constituency," says Kingscott. The event, now in its fourth year, has also had an effect on congressional staff, who actually write most legislation, says another lobbyist. "Two years ago, if you mentioned R&D, you could just see the eyes glaze over," he says. "Not anymore. Now they are interested."

Whether friend or foe of Frist-Rockefeller, science lobbyists are hoping that interest in the bill will carry over to what promises to be an especially nasty fight over federal spending. Last week, House and Senate appropriating committees received sobering news about their allocations for the 2000 budget that begins on 1 October. Confirming a long-rumored strategy, Republican leaders gave the smaller committees—such as the one covering the Post Office—enough funds to get their work done quickly while leaving several major spending committees, including the one handling NIH, some $8 billion to $10 billion short of what the Administration has requested.

Although the allocations were made ostensibly to satisfy mandated budget caps, few observers expect the committees to impose such cuts. Instead, they say the allocations are designed to cause a budgetary "train wreck" that will force the White House and Congress to jointly take the politically unpopular step of removing the spending caps and dipping into a mounting budget surplus. A similar scenario last year produced NIH's mammoth windfall, and some science lobbyists are hoping that history will be repeated. This time, however, whether or not Frist-Rockefeller becomes law, nonbiomedical scientists are planning to be reading from the same page as their biomedical allies as they lobby for more federal research dollars. **–DAVID MALAKOFF**

TRADE POLICY

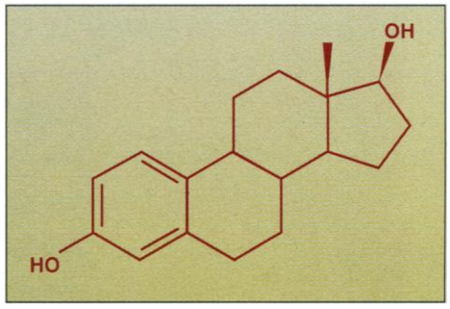
Scientific Cross-Claims Fly In Continuing Beef War

The European Union cites what it claims are new safety concerns in its long-running battle with the United States over hormone-treated beef

"In time of war, the first casualty is truth," declared American radio commentator Boake Carter back in the 1930s. In the ongoing trade war between the European Union (EU) and the United States over the safety of dosing cattle with sex hormones to make them grow faster and leaner, scientific truth may not be a casualty, but it is at least a rapidly moving target. The latest salvo comes from the European Commission, the EU's executive arm, which late last month issued a 139-page report raising what it claims are new concerns about the safety of hormone residues in beef.

Based on the work of a nine-member panel of European and U.S.-based endocrinologists, toxicologists, and other scientists, the report argues, among other things, that the residues might have cancer-causing potential. It also suggests that young children might be more sensitive to low levels of the hormones than previously thought, especially to their effects on growth and sexual development. These conclusions are themselves coming under fire, however. "The EU report is alarmist, uncritical, and selective" in its marshaling of evidence, says Melvin Grumbach, a pediatric endocrinologist at the University of California, San Francisco.

The trans-Atlantic dispute began in 1989 when the EU banned all imports of hormone-treated beef. American farmers regard the growth-promoting hormones as essential for keeping their industry profitable, and U.S. officials insist that the practice poses no health concerns for the consumer. But to the EU, even small amounts of hormone residues in beef, liver, and other food organs represent an unacceptable health risk—hence the ban.



Controversial compound. Europe is afraid estradiol residues in beef will harm consumers.

The United States and Canada filed a complaint in 1996 with the Geneva-based World Trade Organization (WTO). They contended that the EU ban is based more on a desire to protect European farmers from American imports than on scientifically valid evidence of health risks. The WTO ruled against the ban in 1997, and a WTO appeal body upheld that ruling in January 1998, asserting that although some theoretical health concerns might exist, the EU had not proven its case.

The U.S. position was further bolstered in February of this year by a report from a different group, the Joint FAO/WHO Expert Committee on Food Additives (JECFA), organized by the World Health Organization (WHO) and the United Nations' Food and Agriculture Organization (FAO). JECFA, which includes scientists from Europe and Australia as well as from the United States, reviewed the evidence for some of the hormones used in cattle and concluded that the levels of residues normally found in beef are safe.

So far, however, the EU, braced by its latest report, is hanging tough. Earlier this month, the deadline for compliance with the WTO ruling came and went. As a result, the United States and Canada are now drawing up plans to retaliate by slapping stiff tariffs

on imports of European products. But the EU is hoping that the new analysis will eventually help it either to convince the United States and Canada to compromise, or the WTO to reopen the case, or both.

The controversy concerns the use of six hormones currently approved for use in U.S. cattle: the naturally occurring sex hormones estradiol, progesterone, and testosterone, and their synthetic mimics, zeranol, melengestrol acetate, and trenbolone acetate. The hormones, which are usually administered via ear implants, cause rapid weight gain that brings cattle to market sooner and results in more tender and flavorful cuts of beef—prime reasons why some 90% of American cattle intended for slaughter are implanted.

The EU report focuses much of its attention on evidence that estradiol, and possibly some of its breakdown products, can cause cancer in humans. Indeed, recent epidemiological studies indicate that estrogens—the class of sex hormones to which estradiol belongs—increase the risk of cancer of the breast and uterine lining in postmenopausal women receiving hormone replacement therapy. Most experts assume that the carcinogenic effect of estrogens is due to their ability to induce rapid cell proliferation in estrogen-sensitive tissues such as breast and uterus. Because these so-called hormonal effects require that the estrogens bind to, and activate, specific receptors in the tissues, the hormones are assumed to have no effects below a minimum, or "threshold," level require to produce that activation.

Hold those hormones! The ear patch being placed on this animal delivers hormones that have led the European Union to ban the import of North American beef.

CREDIT: NATIONAL CATTLEMAN'S BEEF ASSOCIATION

But the EU working group concluded that estradiol and its metabolites, as well as some of the other hormones used in cattle, may also cause cancer through "genotoxic" effects in which they damage the genetic material directly. To support this hypothesis, the panel cited a study in hamsters treated with the synthetic estrogen zeranol, in which liver tumors appeared at lower doses than would be predicted if the compound was acting through hormonal mechanisms alone. It also pointed to other findings indicating that some estradiol metabolites bind to DNA, possibly causing mutations. "If you assume no threshold, you should continually be taking steps to get down to lower levels, because no level is safe," says James Bridges, a toxicologist at the University of Surrey in Guilford, United Kingdom, and a member of the working group. "The jury is still out on these hormones."

But some scientists told *Science* they do not find these arguments persuasive. Alan Boobis, a toxicologist at the Imperial College School of Medicine in London who participated in the JECFA meeting, says that although "estradiol does have some genotoxic potential ... we found no convincing evidence that the tumors produced in humans" were the result of direct gene damage. Toxicologist Stephen Sundlof, director of the U.S. Food and Drug Administration's (FDA's) Center for Veterinary Medicine, agrees. "Genotoxicity is not borne out by the human epidemiology," he says. "The increased incidence of cancer was only in hormonally sensitive tissues" such as breast and uterus.

Moreover, some researchers argue that the levels of hormone residues in beef are so low compared to normal concentrations in the human body that they pose no danger to most sectors of the population. "At certain times of the month, women are just bathed in estradiol," says John Herrman, a WHO toxicologist and JECFA member. And Gary Smith, a meat biochemist at Colorado State University in Fort Collins, says that many other foods have higher levels of various estrogenic substances than beef. "The estrogen activity in peas, butter, ice cream, wheat germ, and soybean oil can be thousands of times that of beef from cattle implanted with estrogen," he says.

But the EU working group concluded that even low hormone residue levels in beef could still be a problem for young children who have not yet reached puberty. The report cites work first reported in 1994 by pediatric endocrinologist Karen Klein, who was then at the National Institutes of Health (NIH) in Bethesda, Maryland, and her colleagues. Estradiol levels in prepubertal boys and girls are often at or near the detection limit of conventional assays, making them difficult to quantify. But the NIH team reassessed the hormone levels in children with an ultrasensitive new assay for estradiol that uses a strain of yeast genetically engineered to detect even very small amounts of the compound, thus allowing more accurate measurements. The researchers found that estradiol levels were much lower than previously thought, particularly in prepubertal boys.

Although FDA regulations make no distinction between children and adults, they are based on risk assessments that allow a maximum residue intake of 1% of the hormone production level of the most susceptible population subgroups. If the natural levels have been overestimated in young children, the EU report argues, those risk assessments could be invalid. "It appears that children might actually be exposed to higher [comparative] levels" than those assumed in FDA's calculations, says pediatric endocrinologist Niels Skakkebaek of the University of Copenhagen's Rigshospitalet medical center, who reviews the evidence for this view in the June issue of the *European Journal of Endocrinology*. But Sundlof counters that even if children are exposed to higher relative concentrations than previously thought, "the safety factors we have built in are so great, and there are so many other sources of exposure to estrogens, that the additional amount [consumed from beef] would still be very small."

Although the scientific community may be divided over the safety of hormone implants, the EU has yet another piece of ammunition in its battle to maintain the ban: According to an as yet unpublished draft report, a spot check last year of 258 meat samples from the Hormone Free Cattle program, which is run jointly by the beef industry and the U.S. Department of Agriculture (USDA), indicated that 12% of the samples had detectable levels of hormones—even though they had been certified to be from cattle raised without hormones and thus eligible for import into the EU. European officials cite this as evidence that use of the substances is poorly regulated and that consumers might be exposed to higher than allowed concentrations if the ban were lifted.

These revelations are embarrassing for U.S. officials. "If there are deficiencies in our system, we want to work with the EU to correct them," says Tim Galvin, administrator of the USDA's Foreign Agricultural Service. And EU trade officials are currently negotiating with their American and Canadian counterparts to find a compromise, which might include paying compensation to North American farmers for the revenue they are losing by not being able to sell their beef to Europe. But unless such a compromise can be reached, it would appear that all the scientific arguments in the world might not be enough to end the beef war between the two continents. **–MICHAEL BALTER**