May's voting record, was the support of Senator Jackson, who has now been mentioned as a possible presidential contender in 1972. Jackson is beloved in his home state for a number of reasons, among them being his seat on the Joint Committee on Atomic Energy ("When Hanford wants something, they go to Scoop Jackson to get it," one staffer said).

McCormack staffers claim that he did not get into office on Jackson's coattails, and that he might have won even without the Senator's support. Whether or not this is so there is little question that McCormack owes some portion of his political life to Jackson.

But in 1972, McCormack will be running on his own record. Whether he stands a chance of succeeding Daddario as a "friend of science" in Congress, then, is a question which could be decided at the polls.

—DEBORAH SHAPLEY

Fish Flour: Protein Supplement Has Yet to Fulfill Expectations

Fish flour, or fish protein concentrate (FPC), was hailed during the days of the New Frontier as the possible miracle solution to the world's nutrition problems. Since then, its development has bogged down in a morass of economic and technical realities, and interest in the product has been kept alive in the United States almost solely by continuing research efforts on the part of the federal government. The day private enterprise will decide to undertake a serious commitment seems distant.

Fish protein concentrate is a refined version of fish meal, which has long been produced in massive quantities for animal feed. In 1950, the VioBin Corporation of Monticello, Illinois, came up with a process to make FPC palatable to human beings, and the government has further developed it. Although FPC potentially comes in many forms, the basic product at present is a fine, grayish powder made from grinding up whole fish and extracting the fats and water from the proteinaceous material with a solvent of isopropyl alcohol. The result is almost completely tasteless and odorless and is extremely high in animal proteins: Government scientists say that 10 grams of FPC a day could fill the animal protein needs of the average human being.

Furthermore, the stuff is stable, it does not require refrigeration, and its characterlessness renders it inoffensive as an additive to a variety of foods. It was for these reasons, in addition to the general belief that the world's supply of fish was inexhaustible (FPC usually contains the kinds of fish that ordinarily would not find their way to the dinner table), that FPC caused such a stir.

However, because of the expense involved in its production and the general unavailability of FPC—only two companies in the world are set up for commercial manufacture—international agencies concerned with spreading nourishment to the world's starving millions have bypassed it in favor of other sources of protein, such as the cheap and adaptable soy bean. In the United States, incentives for manufacturing the product have been hobbled by strict regulations levied by the Food and Drug Administration, as well as by fish flour's lack of versatility and the uncertain economics involved in manufacturing it.

Excitement about FPC may be justified, but the fact that it was premature has most recently been documented by the collapse of Alpine Marine Protein Industries, Inc., of New Bedford, Massachusetts. The company was set into operation 3 years ago with "great visions," according to its director Henry De Sandre, about turning seemingly abundant supplies of East Coast hake into a commodity that could be marketed experimentally at home and sold to underdeveloped countries abroad.

Alpine, a subsidiary of Alpine Geophysical Associates, was given a contract with the Agency for International Development (AID) to produce some 2 million pounds of FPC (at $0.42 per pound) for distribution in Chile and other Latin American countries, where it would be used on an experimental basis in pasta and bread products. But problems plagued the operation from the start. Hake, the only fish Alpine was licensed to use, proved to be sporadically available (for one thing, the Russians have been moving in on the fishing grounds), and the company, which uses the VioBin process, was unable to meet stringent FDA standards relating to protein quality and microorganism content. Only about 20 percent of the contracted amount was found acceptable by AID, and the deal was canceled.

The Alpine people are now suing VioBin, which built the New Bedford plant, for having misrepresented the adequacy of its process, and VioBin has repossessed the plant. VioBin's president Ezra Levin, the 79-year-old "grandfather of FPC," stoutly defends his process (which varies somewhat from the government's) and says Alpine's problems are Alpine's fault. Thus has ended the only commercial venture to make FPC in the United States.

Meanwhile, the government has been plugging along in its research and has come up with a basic product that satisfies all government requirements. The research, conducted within the National Marine Fisheries Service (NMFS) of the Commerce Department at the University of Maryland, has benefited from the hoopla that attended FPC in the early 1960's—it is now being funded at the rate of $2 million per year. Last April, the NMFS opened the government's first experimental $2 million plant in Aberdeen, Washington. The plant is expected to grind up 50 tons a day of boned hake, which, minus fat and water, will produce about 7 tons of FPC. The purpose of the plant, according to George M. Knobl, who runs the Maryland research program, will be to supply FPC to domestic companies interested in experimental marketing and to agencies who want to distribute it abroad. But its primary raison d'être, says Knobl, will be to furnish a demonstration of how to run an FPC plant, in order to encourage private firms to get into the act.

In part because of squeamishness

within the FDA, FPC has had a difficult history over the last decade. To be produced economically here, the substance must be made from whole fish, including heads, tails, viscera, and sometimes bones. But the FDA in 1962 refused to hear of such a product, which it labeled "filthy," unless the fish were cleaned and eviscerated. Finally in 1967, after pressure from Congress and a favorable report from a committee of the National Academy of Sciences, the FDA certified the product as nutritious and safe; however, it categorized FPC as an additive rather than as a food, which meant that FPC, unlike other protein supplements, is surrounded by a forest of restrictions that are normally applied to potentially toxic chemical additives. Among these restrictions is the stipulation that children under 8 should not consume more than 20 grams daily (fluoride, which is concentrated in fish bones, can, in great quantities, mottle young teeth).

But the real rub has been the provision that fish flour can only be sold in packages of 1 pound or less. This rule has had the desired effect of keeping FPC out of processed foods because no food manufacturer wants to buy it in 1-pound lots. It is for this reason that Ezra Levin says "the FDA is responsible for FPC's failing in the U.S."

In fact, the FDA has not singlehandedly accomplished this feat; but its restrictions have succeeded in turning FPC into what one government researcher calls "a much more emotional issue than *any* protein supplement should be." The rationale for the FDA policy is that it takes the cultural and esthetic inclinations of the American public, as well as considerations of health, into account in decision-making. Virgil Wodicka, director of the Bureau of Foods, agrees that gelatin made from hooves or sausage made with ears and snouts might also be psychologically repellent, but says that these products have been around for a long time and are culturally acceptable. The idea of eating whole fish, though, is new, and the FDA, as "technical representative of the consumer," believes in protecting its charges from surprises.

But FPC has many other problems. Although a couple of hundred tons of FPC have been shipped to Latin America (the packaging restriction is void outside the country), an AID official points out that its cost keeps it out of competition with vegetable and milk proteins, even though vegetables don't have certain essential amino acids. A pessimistic view of FPC's ability to compete in the marketplace is also expressed in a 1970 report prepared at the Massachusetts Institute of Technology for the National Council on Marine Resources and Engineering Development. The AID and the U.N. agencies concerned with nutrition want to encourage some fish-rich and protein-poor countries to develop a degree of nutritional independence by building their own FPC factories, but until successful large-scale projects have been established elsewhere, these agencies have little to offer in the way of guidance.

Domestic food-distribution programs are even less interested in FPC. An employee of the Office of Economic Opportunity notes that it would be impolitic to distribute a normally unavailable "test food" to the nation's poor, and besides, he says, soy is "cheaper and just as good." A scientist at the Department of Agriculture believes that FPC has been ignored "for good reason" and believes its usefulness will be limited to countries low in indigenous sources of protein.

The chief disadvantage of FPC, and one that government scientists are now working to ameliorate, is its lack of "functional" properties. That is, it has nothing to recommend it as a flavoring, texturizer, binder, or preservative, unlike soy and milk products, which have been incorporated into various foods that have a character of their own. If poured into a glass of Kool-Aid, for

New Security Rules for Rand

The Pentagon last week released a memorandum spelling out stringent new rules governing access by Rand Corporation researchers to classified information at Rand's Santa Monica and Washington offices. The action was attributed to the compromise of Rand-held classified materials at the time Daniel Ellsberg was employed at Rand in the late 1960's (*Science*, 23 July).

The provision of the memo that has had greatest immediate effect on Rand is the requirement that all top secret and "special access" documents be removed from individual offices and safes and stored centrally in a secure room and be used under supervision in an adjoining reading room.

Potentially more serious for Rand and other contract research organizations is a revamping of "need to know" procedures by which federal agencies make classified information available to think tanks and other contractors. The new Pentagon memo signed by Air Force Secretary Robert C. Seamans, Jr., specifies that "Revalidation of Rand's need to know will be accomplished after certification by user agencies." This means that agencies must review the documents they have made available to Rand researchers and must justify in detail that access. Of broader significance is a government-wide order with White House authority behind it directing federal agencies to determine and list which individuals inside and outside government have access to top secret documents. The implications are that clearance will be less easy in the future and central control tighter.

At Rand, Air Force security officers have been supervising transfer of top secret documents from individual offices and safes to a central repository and have also been overseeing an inventory of documents. The Seamans memo noted that Rand held 5000 top secret and special access documents and 153,000 secret documents in Santa Monica. Rand, which began its own inventory before the Air Force moved in, has been reducing its holdings of classified material not currently being used.

According to Rand officials, Defense Secretary Melvin R. Laird ordered that changes in security procedures be implemented in a way which would not interfere with research at Rand. Research is said to be going on relatively unhindered, and the burden of complying with new security procedures, including a major change in document record keeping, is falling on Rand administrative staff and secretaries—J.W.

instance, FPC would simply lie on the top.

The scope of FPC's future role also hangs on the world's fish supply. J. W. Devanney, who headed the M.I.T. study, is among the most pessimistic about FPC's future. He believes the world's fish resources are already reaching the state of maximum annual exploitation without being depleted. But estimates vary widely. A 1968 government report speculated that the annual world fish harvest of 64 million metric tons could safely be expanded to 180 million, and other scientists, basing their estimates on improved fishing techniques, believe the potential harvest is far higher.

Because of the present uncertainties, it is perhaps understandable that American food processors, many of whom displayed avid interest in the new product during the early 1960's, are waiting for someone else to show them it's worthwhile. H. M. Burgess, director of technical applications for General Foods, says interest in the food industry is "rather minimal at the moment." It was "one of those things that look awfully attractive on the surface," but "limitations have emerged" which were not previously apparent—as Alpine's rocky experiment amply demonstrates. Burgess believes that a change in FDA regulations might give companies an incentive for exploring the field and that an American market for FPC would begin in "so-called poor man's food," finding its public through the same channels—Indian reservations, urban ghettos, and school lunch programs—that General Foods has been using to try out a low-cost pasta rich in vegetable protein.

Devanney of M.I.T. believes, to the contrary, that FPC may only be able to find acceptance as a specialty item, incorporated into cocktail snacks, medical diets, and pet food (item: the M.I.T. report says fish protein in pet food should be top quality, since an estimated 25 percent of American pet food is consumed by people).

Other ideas are cherished by the National Biscuit Company, which is, at present, the only American firm actively interested in FPC. Nabisco has formed a development corporation with a Swedish company, Astra Nutrition, that is presently manufacturing a high quality product, EFP-90 (with over 90 percent protein), from cleaned and eviscerated fish. Nabisco-Astra is approaching the market as a whole—that is, it is working on a product which, from the standpoint of cost, palatability, and versatility, would find a market both in underdeveloped and in highly industrialized countries. Being "clean," the product would not be snagged by FDA restrictions in the United States. Nabisco-Astra is now test-marketing Astra products here, and Harry Watson, the corporation's vice president, says Nabisco may eventually develop a separate line of high-protein bread and cereal products.

Otherwise, prospects for a domestic market for FPC seem to be at an impasse—the FDA is waiting for business to beat its doors down asking for looser restrictions, and business is waiting for the government to show that it's worth the trouble.

Despite limited efforts to exploit the world's fish in this form (Cardinal Proteins, Inc., in Nova Scotia is the only other commercial firm working on it), Knobl believes that "the day will come" when the needs of the exploding population will force a heavy reliance on FPC. He argues that present production is too experimental to be damned on the basis of not being cheap enough to compete with other protein supplements.

On the regulatory front, Knobl says, overcautiousness by the government has been "very, very frustrating," but adds that there are signs that the FDA is coming around. Last year, the agency allowed sardines and menhaden (an oily fish used almost exclusively for animal feed meal) to be added to the list of acceptable fish, and West Coast anchovy may soon join this select company. As the number of acceptable species increases, the advantages to the fishing industry may become greater, and the resulting political pressures may help things along. More important, the FDA has finally taken under consideration a petition submitted 2 years ago by Alpine, which asks, among other things, that the 1-pound packaging limitation be removed. Wodicka, who believes FPC should be allowed to stand or fall on its own merits, says "the petition is likely to be favorably considered."

Making FPC functional remains the chief goal of American researchers. Knobl's team has already demonstrated in its test kitchens that the stuff can be palatably cooked into breads, pastas, cereals, and cookies, in ratios ranging from 5 to 25 percent FPC (*Science* sampled an FPC pretzel and found it tastier and crunchier than normal pretzels. The bread was unexciting but breadlike). The NMFS is experimenting with numerous forms of FPC, such as pastes and wettable powders, and Knobl believes that other properties could be built into FPC. These properties might, for example, give an FPC product a longer shelf life or decrease brittleness, thus enabling cracker-type products to maintain their integrity during shipping.

The immediate future of FPC in overfed countries like the United States—which already produces 4 times as much protein as the population needs—is chancy; but FPC seems bound for a significant place in the world food picture. Nabisco's Watson points out that it will not be long before we are all eating things whose protein sources—seaweed, grass, molds, petroleum and sewage—are "far less pleasing" than dead fish.

—CONSTANCE HOLDEN

APPOINTMENTS

Robert Zeppa, cochairman, surgery department, School of Medicine, University of Miami, to chairman of the department. . . . **Paul P. Giffin**, professor of orthopedics, Medical School, George Washington University, to chairman, orthopedic surgery department, School of Medicine, Vanderbilt University. . . . **Billy R. Wilson**, research professor, entomology and economic zoology department, Rutgers University, to chairman of the department. . . . **Donald G. Schmalberger**, associate professor of astronomy, State University of New York, Albany, to chairman, astronomy and space science department at the university. . . . **William D. Romey**, executive director, earth science education program, American Geological Institute, to chairman, geology department, St. Lawrence University. . . . **Anthony Kales**, professor of psychiatry, University of California, Los Angeles, to chairman, psychiatry department, College of Medicine, Milton S. Hershey Medical Center, Pennsylvania State University. . . . **William B. Schwartz**, professor of medicine, School of Medicine, Tufts University, to chairman, medicine department at the medical school. . . . **Joseph Daniel**, associate professor of molecular, cellular, and developmental biology, University of Colorado, to chairman, zoology and entomology department, University of Tennessee, Knoxville.