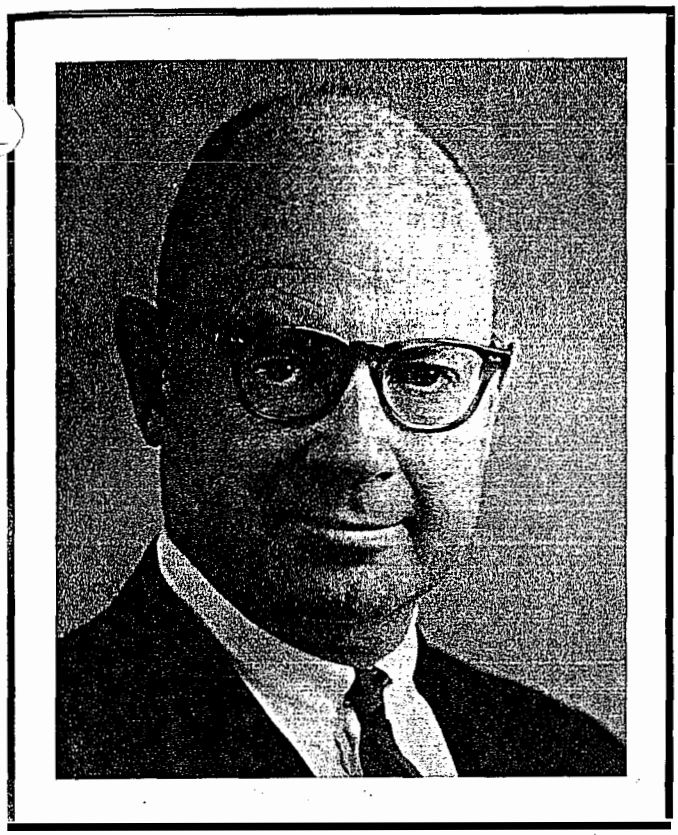

HISTORICAL, ECONOMIC AND LEGAL ASPECTS OF FLUORIDE

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Perhaps the best way I can contribute to this symposium is to make the point as strongly as I can that the only real answer to the regulation of fluoride emissions, to the economic consequences of fluoride emissions, and to the legal aspects of fluoride emissions is to obtain, assemble and disseminate substantiated data respecting the effects of fluorides on humans, animals and vegetation.

That is why I think this International Symposium is so significant. For the first time the world's experts are gathered together in one place to present scientific data gathered over a period of many years. The results, I hope, will become widely available, and I hope and believe that any question concerning fluorides will hereafter be considered and decided on the basis of the data presented to this audience. Thus, it is my expectation that subsequent considerations of regulatory standards, of economic impacts, and of claims and lawsuits involving fluorides will use these data, painstakingly gathered in so many places and presented here.

Any problem, even that of fluorides, can be dealt with by men of good will working to apply scientifically established data. When the scientific facts are known respecting what fluorides can and cannot do — then everything else falls in place. It is only when we wander around in a speculative atmosphere devoid of hard data that we have insoluble problems of a regulatory, economic, and legal nature. Then it is impossible to make forecasts and we must literally roll dice to determine results.

On the other hand, with firmly established scientific data in hand, the regulators can deal with the problem; its economics can be forecast and determined; and the courts and the lawyers can enter into determinations of a claim or lawsuit with some assurance that the proceeding will reach a logical conclusion. As in most things, the fear of the unknown is generally worse than an actuality determined by reliable scientific experimentation.

A word about my personal involvement with this subject may give meaning to my point. Prior to World War II, the aluminum smelters in this country, and indeed everywhere in the world, operated without any remedial devices or restraints. The fluorides evolved from the molten bath of cryolite in the cells or pots were freely emitted into the ambient air without any application of scrubbers, precipitators, or the like. It was not known that there was a potential problem and, for one reason or another, mostly I think because of the physical location of the smelters, there was no history of dealing with damage claims to adjudge harm to either man, animals or vegetation.

In World War II, after the German bombing of Coventry had knocked out the English aluminum production, President Roosevelt announced that America would build 50,000 planes. This was an unbelievable number and required a tremendous amount of aluminum, far more than the existing capacity could produce. Accordingly, through the government agency known as the Defense Plant Corporation, aluminum smelters were built wherever the needed electricity could be obtained. Aluminum smelting, as you know, consumes a tremendous amount of electricity as it is a process of electrolysis. As an interesting sidelight, one of the related problems was insufficient copper to use in the

bus bars that carried the electricity to the pots. As an alternative, pure silver loaned from the U. S. treasury was often used. Treasury guards patrolled the plants, and whenever an accident that chipped a piece of silver off the bus bar occurred, whistles would blow and lights would flash until each little bit of silver had been picked up from the floor.

To get on with the story, one DPC plant was built in the San Joaquin Valley of California, where the needed electricity was available. The difficulty was that, without any thought being given to the environment, this plant was put down in the middle of a ladino clover area in a territory that abounded with dairy cattle and fruit orchards. The plant was operated with green labor, and in no time at all the white alumina dust was visible on the forage and the fruit trees for miles around the plant. The farmers and the orchardists had never seen an industrial plant before, and they watched it very carefully. The dairy cows were grazing right up to the sides of the plant, and the orchards were nearby. There were, of course, no controls of any kind on this plant.

As you can expect, in no time at all there was great consternation in the San Joaquin Valley. Vigilante committees were formed, and an injunction suit was filed. In August of 1943, as a young lawyer representing Alcoa, I was sent out there to see what the problem was all about, together with a representative of the Defense Plant Corporation, Ben W. Covington. Mr. Covington was from South Carolina and, with all his southern charm and graciousness, he announced a public meeting to be held in the local high school. At this meeting, where the local people were literally hanging from the rafters, Mr. Covington said that their government had heard their plea — that they had nothing to worry about — and that Mr. Seamans would take care of the details. That's the last I ever saw of Mr. Covington, and I was left to handle the problem. I didn't even know what the problem was.

Fortunately, Dr. Francis C. Frary, who was then director of research for Alcoa, had seen Roholm's book describing some of the consequences of cryolite mining in Greenland, and this led him to wonder whether fluorides were the culprit. A young veterinarian practicing in the area named Dr. Harold J. Schmidt (owner of the famous cow, "Dusty Joe") also worked on the problem, and we finally all became convinced that there had been undue exposure to fluorides.

Because we had the injunction suit *and* other claims to handle, as soon as possible we persuaded the Defense Plant Corporation to close the San Joaquin plant. Thereafter, over a period of years we were able to settle all the cases, and thus the "Riverbank, California" nightmare came to an end. After this experience, however, knowledge quickly spread and soon we had claims and lawsuits around aluminum smelters from coast to coast. These required prodigious effort and great expenditures of time and money to settle. During the course of events, many significant and extended lawsuits were tried. Some of the more crucial were the Fraser case involving the Vancouver, Washington, plant and the Hitch case involving the Alcoa Tennessee Plant.

It soon became apparent to all of us working on this problem that two things had to be done. First, we had to design suitable remedial measures to install in the aluminum smelters. (It might be observed that once this sleeping giant was awakened, claims and lawsuits were brought against all types of plants involving fluoride emissions — steel plants, fertilizer plants, oil refineries and the like.)

Aluminum experts went promptly to work designing remedial equipment, all of which had to be built and developed somewhat by trial and error, as none existed. To buy time, we engaged in a massive settlement program around the affected plants, frequently buying easements to give us protection until the new remedial devices were designed and installed. Naturally, it was difficult to terminate annual payments and to convince landowners in the plant vicinities that the problem was over. Some persistent lawsuits had to be fought through to establish this point.

However, to get to the real point of my story, as soon as this problem was diagnosed and recognized, and we had researched the literature, we realized that there was very little solid information on the subject about what harm fluorides could do, what harm they did not do, and what the tolerance levels were for people, animals and vegetation. To close this gap and to provide solid information on which to build and to deal with this problem, research was encouraged and supported at the University of Wisconsin, Utah State, Stanford Research Institute, University of Tennessee, Kettering Institute, the Boyce Thompson Institute for Plant Research, and other noted scientific centers. Opportunities were also provided for practicing veterinarians and plant pathologist to study this subject and make firsthand observations. For example, it was apparent early on that cattle teeth provided an excellent monitor for fluoride intake, but we soon discovered that nobody really knew what "normal" cows' teeth looked like, as they had never been a special focus of emphasis with veterinarians or animal husbandry persons. A group of veterinarians, for example, were taken to a slaughter house in Kansas City, Missouri, so that they could look at the random cows' teeth as they passed through. This provided firsthand evidence that tooth irregularities and abnormalities are the norm rather than the exception and that only a special kind of tooth marking can be blamed on the ingestion of fluorides.

Slowly and methodically, various scientists, through controlled experiments and field observations, developed a substantial body of scientifically proven data. On the basis of those facts, it could be asserted with confidence that: tolerance levels were reasonably known, consequences could be foretold, and sound opinions could eventually be developed respecting what damage did and did not result from fluorides. Publications based on this slow and careful research slowly became available so that field observers could refer to scientific studies rather than guesses, and courts and juries in a contested case could rely on scientific opinions when drawing conclusions.

Now, to get back to the beginning, the only real answer to the regulation, the economic consequences, and the legal aspects of fluoride emissions is to obtain, assemble and disseminate reliable scientific data. This symposium, I am confident, will go a long way toward achieving that end.