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# Counting the costs of a contamination incident

**The full damage done when animal feed was contaminated with PBB in Michigan six years ago is still unreckoned**

**"PBB: An American Tragedy"** by Edwin Chen, Prentice-Hall, Englewood Cliffs, N.J., 1979, 329 pages, $10.95

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The introduction of polybrominated biphenyls (PBB), a fire retardant, into dairy cattle feed in 1973 set off a major contamination of farm animals and people in Michigan. Today, six and a half years later, Michigan Chemical, the corporation that accidentally shipped the PBB to a Farm Bureau Services' feed mill in place of the desired nutritional supplement, magnesium oxide, no longer manufactures chemicals in Michigan. Tens of millions of dollars in damages have been paid by insurers for the manufacturer and the feed company, many claims against the companies are still in the courts, and the nature and degree of PBB-mediated impairment of human health are still being debated. This environmental accident emphasizes the vulnerability of the population to chemical contamination and the difficulties associated with efforts to protect people against such incidents.

Edwin Chen in "PBB: An American Tragedy" has undertaken the difficult task of describing a major environmental contamination episode whose precise contours are as yet uncertain. He was aware that "accounts of such still-unfolding events ... would benefit from the passage of time" but felt that he had to "sacrifice the perspective time lends" and write his book now because "too many questions remain unanswered and many more are simply unanswerable."

Chen, a reporter for the *Detroit News*, has constructed a dramatic picture of the events in the PBB contamination incident which took place between September 1973 and mid-1979. The book beautifully conveys the emotionally charged atmosphere in which individuals tried to manage the impact of this episode on their lives and on the institutions and groups to which they belonged. From what I know of the events and of the actions taken by individuals, the narrative is comprehensive and the facts are correct. The book's liberal spreading of responsibility for the actions and inaction of many individuals and organizations also appears justified. The text clearly demonstrates Chen's investigative acumen.

The lead statement in the book's introduction that "many top U.S. scientists and public health experts privately are predicting a sharp rise in Michigan's cancer rates fifteen to twenty years from now as perhaps the most alarming consequences of the state's PBB contamination" signals the undercurrent of tragedy that permeates the book.

The tone of the book is set in its first chapter. A vivid description is given of a bloody dissection to remove a dead calf from a cow's birth canal because the calf was too large for the mother to deliver normally. This calving problem was only one of the abnormalities by which Michigan farmers became aware that the specter of PBB contamination had reached their farms. In the next chapter, the young farmer who first became aware of a problem with his dairy herd relives the period of nearly eight months in which he tried to get various agencies to help him discover why his cows were starving themselves to death and tells how he finally realized, through a series of fortuitous circumstances, that he had given his cows a feed mixture containing PBB.

In subsequent chapters, the author describes relevant events which took place at the manufacturing plant, at the feed mill, at Michigan State University, at state and federal agencies, in the state legislature, and on Michigan farms as the dimensions of the problem continually expanded and the immensity of the contamination became apparent.

The story then continues with descriptions of health effects individuals claimed were caused by PBB, of epidemiological studies conducted to investigate these claims, of efforts made to lower the "action level" for PBB (the level above which contaminated food cannot be marketed) so farm products with *low levels* of contamination would not reach the table, and of the studies which indicated that most Michigan residents had a detectable burden of PBB in their fat. The reader is able to sense the drama of the scenes and the attitudes of the actors as the unfortunate saga of the PBB accident spread across the state, creating consternation on the farms, uncertainty among the people, and frustration in government.

Although the reader may be unsympathetic with the book's bias in favor of the farmers and against nearly all of the institutions that played a role in the contamination and its aftermath, Chen's presentation appears to support his views that the episode is an "example of how the government not only failed to protect and help the people but, instead, inflicted further suffering" and that "government, university, and corporation officials steadfastly downplayed the significance of the accident."

The author's bias will not deter those readers who are interested in a chronicle of the contamination and its subsequent ramifications. The perceptive reader should recognize any overstatement that occurs. However, the reader who is interested in understanding the factors which shaped the events will have to cull the relevant information from the text. The book's value for the scholar would have been enhanced by a more chronologically organized exposition of the underlying reasons that caused individuals to do and say what they



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did in specific instances. Only in this way can the book serve to focus attention on those deficiencies in surveillance, communication, and regulation that allowed this accident to happen and to reach such proportions.

For example, why did the Michigan Department of Agriculture continually downplay the extent of the contamination? The book quotes an internal department memo: "the economic loss to the dairy industry could be disastrous. Because of the legal implications of this case, we have been guarded in the release of any information to the outside." Also quoted is a press release that stated, "there is little need for concern about the public milk supply." These quotations paint the department as insensitive to the public health. Not explicitly emphasized are the facts that when those statements were made no one realized the ubiquity of the contamination and there was uncertainty about the human health effects from PBB.

The book also recounts criticism of the Food & Drug Administration for setting a tolerance level for PBB although PBB is a suspected carcinogen. Not clearly stated is the fact that PBB was not a suspected carcinogen when the "action level" was initially set. In regard to toxic agents other than carcinogens and radiation, most toxicologists accept the threshold concept—that there is a dose below which toxicity is not seen because the organism accommodates the environmentally induced stress. Based upon this concept, it was appropriate to follow established procedures and set an "action level." Only late in 1975, after a similar substance, polychlorinated biphenyl (PCB), was shown to be carcinogenic when fed at high levels to rodents, did PBB become suspect as a carcinogen and only recently have actual data on the carcinogenicity of PBB in animals become available. It was in May 1976, on the basis of possible carcinogenicity, that Gov. William G. Milliken's scientific advisory panel on PBB recommended lowering the "action level" for PBB to the minimal point of reliable and reproducible detection.

As a final example, why do scientists who have studied effects of PBB in cattle continue to argue that low levels of the material can be tolerated, whereas those who have used rodents, birds, fish, or nonhuman primates disagree? It may not be, as charged, that the former have connections with Michigan Chemical, Farm Bureau Services, or the state's agricultural department. It simply may be that cattle are less sensitive to low levels of PBB than are rodents, birds, and nonhuman primates. This possibility receives no attention.

Chen cannot be faulted for taking a position on the issues and strongly supporting his view. That is the prerogative of an author. In one aspect, however, Chen appears to have overstated his case and in so doing has misled his readers and done a disservice to science and its practitioners. Toward the end of the book, in summarizing the evidence regarding the effects of PBB on human health, he states that "even today—more than five years and a dozen health studies after the PBB blunder came to light—scientists continue to bicker over the chemical's effects, if any, on human health. But two things are clear. One is that contradictory studies will continue to proliferate for at least another generation. The other is that the conclusions of such studies will be uncannily predictable: It depends on who does them. Studies done by, for, or in collaboration with the Michigan Department of Public Health will find little, if any, major health problems attributable to PBB—even when enlarged livers are found. On the other hand, studies done by independent scientists such as Doctor Selikoff, will find significant medical problems that cannot be explained by anything but PBB."

It is worth noting in this context that after an extensive, million-dollar study of a randomly selected sample of the Michigan population completed in late 1979, Irving J. Selikoff and his colleagues at New York's Mount Sinai School of Medicine have not been able unequivocally to link any human health effect to a body burden of PBB. This does not say that there are no health effects of PBB, but only that the relationship has not been proven. The written report of every clinical study done to date echoes this conclusion, regardless of who did the work or who paid for it. In the absence of a sign or symptom uniquely associated with exposure to PBB, the only scientifically reliable way to demonstrate that a health effect was caused by PBB is to show a relationship between the appearance and/or severity of the effect and the level of body burden of this substance.

Scientists continue to bicker about the human health effects of PBB because the available scientific data are equivocal. There is no dispute about the impairment of human health in the Yusho incident in Japan, where exposure to PCB was very high, or about the causal relationship between vinyl chloride and angiosarcoma in the livers of occupationally exposed humans or even about the toxicity of high doses of PBB in cattle. However, establishing that a nonspecific human symptomatology is the result of an exposure to a relatively low dose of an environmental chemical in an uncontrolled human "experiment" has been and will continue to be a very difficult scientific problem.

An understanding of this difficulty requires a perspective which Chen has sacrificed in his decision to record the events as seen through the eyes of the participants. □

**Geophysical and Geochemical Techniques for Exploration of Hydrocarbons and Minerals.** Marshall Sittig, editor. ix + 300 pages. Noyes Data Corp., Mill Rd. at Grand Ave., Park Ridge, N.J. 07656. 1980. $40.

**Lignite Technology.** Perry Nowacki, editor. x + 228 pages. Noyes Data Corp., Mill Rd. at Grand Ave., Park Ridge, N.J. 07656. 1980. $42.

**Membrane and Ultrafiltration Technology: Recent Advances.** Jeanette Scott, editor. xii + 404 pages. Noyes Data Corp., Mill Rd. at Grand Ave., Park Ridge, N.J. 07656. 1980. $48.

**Modern Aspects of Electrochemistry.** No. 13. B. E. Conway, J. O'M. Bockris, editors. xi + 430 pages. Plenum Press, 227 West 17th St., New York, N.Y. 10011. 1979. $42.50.

**Official Methods of Analysis of the AOAC.** 13th Ed. 1038 pages. Association of Official Analytical Chemists, 1111 North 19th St., Suite 210, Arlington, Va. 22209. 1980. $78.

**Organic Reactions.** Vol. 26. William G. Dauben et al. vii + 488 pages. John Wiley & Sons Inc., 605 Third Ave., New York, N.Y. 10016. 1979. $32.

**Peat: Industrial Chemistry and Technology.** Charles H. Fuchsman. xviii + 279 pages. Academic Press, 111 Fifth Ave., New York, N.Y. 10003. 1980. $28.

**Physical Chemistry of Fast Reactions.** Vol. 2, Reaction Dynamics. Ian W. M. Smith, editor. xiii + 277 pages. Plenum Press, 227 West 17th St., New York, N.Y. 10011. 1980. $32.50.

**Processing of Man-Made Fibres.** V. Usenko. 428 pages. Imported Publications Inc., 320 West Ohio St., Chicago, Ill. 60610. 1979. $9.00.

**Product Safety and Liability: A Desk Reference.** John Kolb, Steven S. Ross. xi + 686 pages. McGraw-Hill Book Co., 1221 Ave. of the Americas, New York, N.Y. 10020. 1980. $29.50.

**Reaction Injection Molding.** Walter E. Becker, editor. xi + 316 pages. Van Nostrand Reinhold Co., 450 West 33rd St., New York, N.Y. 10001. 1979. $24.50.

**Separation Processes.** 2nd Ed. C. Judson King. xxv + 850 pages. McGraw-Hill Book Co., 1221 Ave. of the Americas, New York, N.Y. 10020. 1980. $27.95.

**Solar-Electric Research and Development.** Robert E. Bailey. xv + 372 pages. Ann Arbor Science Publishers, P.O. Box 1425, Ann Arbor, Mich. 48106. 1980. $29.50.

**Structure and Bonding.** Vol. 38. J. D. Dunitz et al. 120 pages. Springer-Verlag New York Inc., 175 Fifth Ave., New York, N.Y. 10010. 1980. $35.20.



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