Pertussis Vaccine, 1 Pediatrics 437 (1948). However, the fact that an encephalopathy can be caused by pertussis vaccine would not mean that liability would be incurred for breach of warranty in the instant case. Rather, the finding of an implied warranty breach is predicated on the fact that by manufacturing Quadrigen in the method chosen by defendant, the changes of contracting an encephalopathy were enhanced.

Aside from the clinical and laboratory studies of the benzethonium chloride preserved Quadrigen *which, in my opinion, indicate a defect in defendant's product,* the earliest literature which noted a problem with Quadrigen was published in 1960. Massachusetts Department of Public Health, Pertussis Immunization, 263 New England Journal of Medicine 410 (Aug. 25, 1960). The investigation indicated by this group "established that the potency of the pertussis-vaccine component in the quadruple antigen products * * * was relatively unstable." Pittman, Instability of Pertussis-Vaccine Component in Quadruple Antigen Vaccine, 181 Journal of the Am. Medical Ass'n 113 (1962). It is interesting to note this Pittman article points out that with the adoption of a unit of potency in 1953 with an upper limit placed on potency, no cases of fatal encephalopathy due to pertussis vaccine were reported to DBS although "occasional nonfatal neurological reactions" continued to occur. Id. at 114. Dr. Pittman hypothesized that "the preservative and the tissue-cell enzymes present" in the quadruple antigen vaccines "may be factors which contribute to instability." Id. at 118.

In 1964, a study was made with bordetella pertussis cells which showed that various substances influenced leakage from the bacterial cell. Niwa, Yamadeya & Kuwajima, Leakage of Cell Components of Bordetella Pertussis, 88 Journal of Bacteriology 809–10 (1964). Although benzethonium chloride was not used in that study, certain chemical substances similar thereto were employed (TR 1529–30).

Finally, in 1965, in an article co-authored by Dr. Pittman, it was stated:

"*Recent work has shown that pertussis vaccine in DTP–P*[*diphtheria-tetanus-pertussis-polio vaccine*] *preserved with benzethonium chloride is unstable in potency * * *. This surface-acting preservative, no doubt, contributed to the greater toxicity of DTP–P * * * by favoring the leaching of the toxin from the bacterial cell.* It is well known that alkalinity favors lysis and thereby promotes toxicity." Pittman & Cox, Pertussis Vaccine Testing for Freedom-from-Toxicity, 13 Applied Microbiology 447, 453 (1965). (Emphasis added.)

When testifying at her deposition, Dr. Pittman attempted to water down her statement by contending that she considered this statment to be a mere hypothesis (Pittman deposition of Nov. 17, 1967, at 83 (hereinafter referred to as "Pittman I")), but that it was based on scientific experimental data (id. at 83–84). The statement in her article, written when she was not involved in the instant litigation, seems far more significant than her later attempt to diminish its importance. Dr. Pittman, throughout her testimony, appears to consider the instant litigation a personal attack and an indictment of DBS as well (Pittman deposition of Nov. 27, 1967, at 214–15 (hereinafter referred to as "Pittman II")).

Dr. Pittman also testified that leakage would be immediately ascertainable in the toxicity tests conducted by the defendant and DBS (Pittman I, at 79–80). However, she later stated she had absolutely no idea as to the extent of leakage or how long it would take (Pittman II, at 79–81), so it is most difficult to see how she could predict with any certainty that the toxicity tests would reveal the leakage phenomenon.

The foregoing documents lend significant credence to the testimony of one of plaintiffs' expert witnesses, Dr. Lapin, who stated that in his opinion Quadrigen was toxic and that the administration of the vaccine to the infant plaintiff caused the injury involved in this litigation. Coupled with this is the complete failure of defendant to offer any reasonable alernative cause of Eric Tinnerholm's injury.

The "defect" involved was, in my opinion and as already stated hereinbefore, the leakage of endotoxins from within the bacterial cell and it has been shown by a preponderance of the credible evidence that such defect was the proximate cause of the injury.

Nor can defendant argue that this was a marked improvement over Triogen so that it should be shielded from liability even if the above finding is correct. I will state now, and will have occasion to reiterate later that no need justified a risk of marketing Quadrigen at an early date. Other products which performed the same function as the indicated vaccine without the danger involved were on the market and readily available to the medical profession. Although there is