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Irritant Gases Associated with Red Tide

by

Robert M. Ingle

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Red Tide Project

Florida State Board of Conservation
Charlie Bevis, Supervisor

Coral Gables
Florida

F. G. Walton Smith
Director

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SUMMARY

1. Irritant effects to the nose and throat associated with Red Tides are temporary. No after-effects have been reported.
2. Irritant effects are present only when Red Tide occurs and even then do not appear unless wind-related waves with associated water vapor and droplets exist. Naturally, on some occasions, droplets will retain in suspension in the air for a short time after the wind that created them has subsided.
3. Because irritant [INDECIPHERABLE] probably either as particles or droplets carried by wind when thrown into the air by spray, it does not usually go far inland beyond the beaches.
4. There is not evidence that the irritating effects are caused by a military gas or any other man-made product.

Odorless, colorless gases irritating to the eyes, nose, and throat, commonly occur in conjunction with outbreaks of Red Tide. The origin of these gases has been a point of great interest and conjecture, especially with the people along the lower west coast of Florida who are more commonly exposed to the various Red Tide manifestations.

One persistent rumor continues to disturb a great many persons of the Red Tide areas. That rumor is that the associated with Red Tide are the result of dumping of some noxious materials (either poisonous gases or some other harmful product) in the water off the west coast of Florida.

So much interest has been evidenced in this topic, and so many unfounded fears have been generated, that a clear exposition of the known facts seems to be desirable.

Listed below are facts which are pertinent to the question of the origin of irritant gases commonly associated with the Red Tide.

- 1) The irritant gases have not yet been found to exist unless Red Tide is also present.
- 2) If samples of Red Tide water are heated, or agitated, irritant gases are given off. If such water is allowed to remain quiet, and cool, the gas is not given off. Pure sea water, heated or agitated, gives off no irritating gas.
- 3) Even in Red Tide areas in the Gulf of Mexico no irritant gases have been reported during spells of extremely calm weather. The gases may have been noticed before others at such times, but several scientific workers have made a special point of mentioning that the irritant effects seemed to be closely correlated with wind.
- 4) Prior to 1947, the last outbreak of Red Tide occurred in 1916. This outbreak was reported by Harden Taylor (1917). Part of his report is quoted below.

'While on the beach I felt a slight tendency to sneeze and cough: shortly afterwards my attention was called to the action of the dog which was sneezing violently and seemed to be in acute asphyxiation. I carried him back and the same thing happened again. I then

noticed that my lungs were feeling sore and that my breathing was labored in much the same manner as when I board ships after fumigation, except that I noticed no odor... For the past few days the beach has been lined with tarpon, jewfish, grouper, and many varieties of top fish which seemed to escape the first attack. The gas was very violent this time and many people telephoned for medical assistance for 'cold in the head', sore throats, 'cold in the chest', etc.... I myself have suffered quite acutely for the past five days, but the worst of the gas seems to be going now."

In discussing the 1916 outbreak of Red Tide and irritant gases, Dr. Paul S. Galtsoff (1948) remarks as follows:

"It appears highly improbable that any ammunition or poisonous gases could have been dumped into the Gulf water in 1916 when the menace of World War I threatened the country. The symptoms described in the above quoted letter are identical with those observed during the last outbreak of red water (in 1947),"

5) According to Woodcock (1948) who studied the irritant effects of Red Tide from a different stand points, there is a probability that the irritant agent is transported as a liquid, or a solid, than as a gas. Woodcock sprayed water containing 15 to 56 million Red Tide organisms into the noses of experimental subjects. This water produced the same irritation as the Red Tide gas. Cotton about one inch thick, held over the nose and mouth, kept the irritants out.

Woodcock collected on glass slides droplets of vapor from Red Tide water and normal sea water. The droplets of the contaminated sample differed substantially from those of the normal. According to Paul Galtsoff (1948) who viewed the droplets, those emanating from Red Tide water contained "small, slightly greenish granules, in shape and coloration similar to the granules found in *Gymnodinium brevis* (Red Tide organism) preserved in formalin. The granules inside the droplets were about 1 or 2 microns (1/25,000 inch) in diameter."

Small particles have been noted to be carried in sea vapor previously. Zobell (1942) found marine bacteria air-borne considerable distances inland.

6) There seems to be no evidence to support the contention that poisonous gases might have brought about the growth of *Gymnodinium brevis* thus explaining the fact the Red Tide and noxious gases occur simultaneously. Belief in this theory is further discouraged by the fact that poisonous gases, active enough to harm higher animals would very likely prove to be just as poisonous to lower forms such as *Gymnodinium*. This would tend to kill off large organism rather than give it any stimulation.

7) Blooms of the type of organism that causes Red Tides are, unfortunately, too common and widespread to be restricted to the dumping grounds of scrap war material. Hundreds of outbreaks of similar "Red Tides" must have occurred in various parts of the world in the past 150 years, The scientific literature on the subject is voluminous.

8) The particles and debris of Red Tide water were made into a crude extract by dissolving the material in ethyl alcohol which was then evaporated away. This extract was proven to be lethal for fish in concentrations as low as one part per thousand (1/1,000).

The toxicity of the extract at this concentration appeared to be temporary and did not seem to cause permanent damage. Fish which appeared to be dead (but which still retained some life), could be revived by placing them in pure sea water.

The toxic extract prepared from Red Tide particulate material has not been definitely shown to be the same substance which causes irritation of the nose and throat, but the evidence suggests that such a connection is at least plausible.

9) The toxicity of "Red Tides" in general has been well established all over the world. Usually fish mortalities are catastrophic and other animals succumb in high numbers. A corollary of the tendency of these small animals to produce poisons is found in the fact that shell fish that eat them frequently accumulate so much of the harmful ingredients that they too may become poisonous to humans. Thus, blooms of this type of organism have so infected edible clams in various parts of the world that a great many human deaths have resulted. One researcher, working with the poison of one of the related "Red Tide" groups of animals found that the toxin produced had ten times the potency of strychnine when administered to mice.

It should be pointed out that the clams usually incriminated in the poisoning of humans are not found in Florida, nor have the small "Red Tide" organisms ultimately responsible for the poison been shown to exist here. Florida's "Red Tide" producer seems to limit its offensiveness as noted in this report.

10) In the face of all the foregoing evidence, there is no single fact that supports the view that the irritating gases of the Red Tide are due to the dumping of noxious scrap war material or other man made substance off the west coast of Florida.

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