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The effect of light on cells in fluorescent solution after addition of potassium cyanide.

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Since potassium cyanide inhibits certain oxidative processes in living matter such as respiration in plants and animals, the segmentation of fertilized egg cells, etc., behaving in this regard like an atmosphere of hydrogen, it might be expected that the destructive action of light upon cells suspended in fluorescent solutions, an action that is in part at least one of oxidation, would be diminished or obliterated by the addition of potassium cyanide to such solutions. On the contrary, the addition of very small quantities of potassium cyanide to sea water containing fluorescent substances (eosin, methylene blue, neutral red and combinations of these) causes a marked acceleration of the destructive action of visible light rays upon star-fish eggs immersed in these solutions. The chemical character of the fluorescent substances being different, it is evident that the chemical character of the fluorescent substance does not influence the action of potassium cyanide. But if star-fish eggs in such solutions be deprived of oxygen, by substituting for air an atmosphere of hydrogen, they no longer undergo deterioration under the action of light and this result remains uninfluenced by the addition of potassium cyanide to the solution. It asserts this accelerating action only if added to eggs in fluorescent solutions exposed to light. If the cells were first immersed in a solution of potassium cyanide in the dark and afterwards transferred to the fluorescent solution in the light, potassium cyanide did not show any effect. Also control experiments in which

small amounts of acid, alkali or certain alkaloids took the place of potassium cyanide showed no such results.

It would seem therefore that the oxidative processes, which perhaps in combination with other chemical processes, take place through the action of light upon cells in fluorescent solution, must be of a different character from the oxidative processes taking place in respiration and in cell division, since the former are accelerated instead of, like the latter, being inhibited by the action of potassium cyanide. Since in a hydrogen atmosphere the addition of potassium cyanide does not cause this specific effect, the action of potassium cyanide in markedly increasing the destructive action of light cannot be a primary one but can only follow or accompany the primary oxidation processes. In contradistinction to the oxidative processes of respiration these oxidative processes are not prevented or inhibited by potassium cyanide.

As to the way in which potassium cyanide produces this accelerating effect upon the action of light in fluorescent solution, there may be a number of explanations suggested. It is conceivable that the potassium cyanide accelerates certain oxidative processes in the protoplasm. Analogies for such an accelerating action exist in the behavior of potassium cyanide toward certain inorganic catalysers. According to Loevenhart and Kastle potassium cyanide accelerates the splitting action of copper or iron on hydrogen peroxide. On the other hand, potassium cyanide not only inhibits the action of ferments like catalase and oxidative ferments but also hydrolytic catalysers. Potassium cyanide might therefore in the cases which we are considering, exert an influence on hydrolytic processes which are perhaps secondary to the primary oxidations caused by light. But it is also conceivable that the potassium cyanide does not produce its effect by acting directly upon the cell protoplasm but that, through its addition to the fluorescent substance it brings about some change in the character of the radiant energy whereby the disorganizing oxidation is accelerated. Whichever of these explanations may prove to be the correct one it is certain that under the conditions of these experiments potassium cyanide does not prevent oxidative processes in the cells.