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RADIATION INJURY DUE TO RADIOACTIVE FALLOUT

by

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On 1 March 1954, 23 fishermen were injured by the radioactive fallout. All fishermen were suffering from the acute radiation sickness. Since the accident, we have much learned about the radioactive fallout injury upon the human body.

Twenty-three were on board a small fishing boat and fishing tunas and sharps. Early in the morning, fleecy cloud was spread over and white ashes were falling down. The ashes covered the sea surface and also the deck of the boat. The deck looked white as if it had been covered by frost. The white ashes were continuously falling in 5 hours. Some crew complained of nausea and lost of their appetite. They gave up their fishing and sailed on their way back, owing to a lack of fuel oil.

In 3 days some of the fishermen noticed that their faces, necks and hands became reddish and swollen. Some had itching feeling or small vesicles. In several more days, their faces changed into darker colour. They were ordered to wash their bodies in bath, it was, of course, faulty, because there was not enough supply of water in such a small boat. Their return voyage took 2 weeks to their mother port - Yaizu, Shizuoka Prefecture (about 100 miles from Tokyo).

Radioactivity of the fishing boat was surveyed for the first time on 17 March. An enormous amount of radioactivity was found on the boat. For instance, the radioactivity on the boat deck was 110 milliroentgen per hour (including beta and gamma rays) and that of the crews' quarter 80 milliroentgen per hour. These activities are really 40 to 60 times of the international maximal permissible dose in a living place.

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A main component of the white ashes was calcium compound. Twenty-three radioactive nuclides (fission products) were detected in the white ashes: e.i. Sr-89, Sr-90, Y-90, Y-91, Zr-95, Nb-95m, Nb-95, Ru-103, Ru-106, Rh-106, Te-129m, Te-129, Te-132, I-131, I-132, Ba-140, La-140, Ce-141, Ce-144, Pr-144, Pr-143, Nd-147, Pm-147. Besides the above mentioned fission products, the following 4 radioactive elements were also confirmed: S-35, Ca-45, U-237, Pu-239. It was also assumed that a large component of the radioactivity of the ashes would be based on the activated rare earth elements.

The causes of the radiation injury of the fishermen are supposed to be: (1) an external exposure to the ashes, which are adhering to their skin surface (mainly by beta rays), (2) an external exposure to their hair, clothes and boat, etc. (mainly by gamma rays) and (3) an internal exposure to the fission products, which might enter their bodies through their skin, respiratory as well as digestive passages (beta and gamma rays). It was estimated that the dose of external exposure might be about 200 to 400 r in 2 weeks on the boat.

When the fishermen came back, only the skin lesion was observed. With the lapse of time, however, the clinical pictures of blood damage had gradually come up: in 4 - 6 weeks, extreme leucopenia (around 2,000), decrease of bone marrow cells (under 50,000) and platelets (under 10,000). Hematologically all were pan-myelophthisis. Some complained of fever and hemorrhagic signs. Aspermia was also confirmed. Hairs of the head and nape, where some amount of the falling ashes adhered, began to fall off and in 3 to 4 weeks complete epilation occurred.

Since the beginning of May (in 3 months after the fishermen received the ashes), their clinical features turned generally for the better. The blood pictures also improved gradually, about the half of the fishermen showed 6,000 - 7,000 in their white blood counts. Thrombcytes increased also. The number of bone marrow cells, too, increased gradually, but quite slower.

Some jaundice cases were observed from the middle of May and in the following 3 months 17 cases of jaundice out of 23 fishermen were reported. All fishermen, both with jaundice and without jaundice, were showing more or less a positive disturbance of their liver function.

After 6 - 8 months all clinical features became gradually favorable. However, their clinical figures give, in general, an impression that they are rather milder, but more lasting, in comparison with those of Hiroshima or Nagasaki cases.

In their treatment, the first step taken was to remove all radioactive substances from the skin surface, mainly by mechanical methods. At the same time, we endeavored to help and promote the remaining natural healing power; the main therapeutic procedures are (1) a sufficient rest and (2) good nourishment, if necessary, (3) blood transfusion or plasma infusion and (4) anti-biotics.

One case died of a liver disorder (a heavy jaundice and hepatic coma) in the 7th month. The case had a distinct leucopenia (until 1,950) in 4 to 6 weeks and his white blood count recovered to 5,000 - 6,000 after 3 months. At the end of August 1954, he was attacked by his third jaundice. Suddenly he suffered from a hepatic coma about one week. In spite of regaining of his consciousness, heavy jaundice, oedema, ascites and pneumonia, etc. came up. The patient died.

The cause of the death is surely an intensive disorder of the liver. With regard to the cause of the liver disorder, there might be three possibilities (1) serum hepatitis, caused by blood transfusion, (2) degeneration of the liver, caused by destructed debris of other radio-sensitive cells, due to radiation injury, and (3) primary radiation injury. The real cause of the liver disorder cannot now be decided scientifically. It may be, however, considered that the above mentioned possible factors are equivalently active and they form a cause in combination. We would like to imagine in our medical common sense that there might be some relationship between radioactive ashes and liver disorder.

Now one year after the accident, the condition of 22 other fishermen are showing signs of improvement and a favorable turn for recovery. A few of them show, however, still some degree of disturbance of the liver function and are receiving treatment. Some anxiety, therefore, over their prognosis is yet existing in some extent.

This report presents in a summarized form the substance of the following reports:

1. Dr. Tsuzuki, Masao. Medical Consideration on Radiation Injury due to Bikini-Fallout.

2. Dr. Ooi, Shunryo. Dr. Tsuge, Yukio. Initial Symptoms of Bikini Patients.

3. Dr. Kikuchi, Takehiko. Physical and Biological Studies on Radioactive Fallout from Bikini.

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4. Dr. Kimura, Kenjiro. Radio-chemical Analysis of Falling Dusts on Fishing Boat "Fukuryu-maru".

5. Dr. Nakaidzumi, Masanori. Radio-medical Consideration on Bikini Patients.

6. Dr. Miyoshi, Kazuo, Dr. Koyama, Yoshiyuki and Dr. Kumatori, Toshiyuki. Clinical and Hematological Observations on the Radiation Sickness caused by the Fallout at Bikini.

7. Dr. Shimizu, Kentaro. Surgical Consideration on Bikini Patients.

8. Dr. Okamoto, Jujiro. Radiological Observations on Bikini Patients.

9. Dr. Miyake, Masashi and Dr. Ohashi, Seiichi. Pathological Findings of a Bikini Patient.

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