

Study into epilation among residents and "black rain" fallout in the Manose district of Nagasaki City following dropping of the atomic bomb

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Abstract

It became clear from the testimony of residents that a considerable amount of black rain fell in the Manose district of Nagasaki City. The Manose district is a small settlement located in a mountainous area approximately 7.5 km northwest from the hypocenter. Not only did black rain fall, but the residents experienced high incidence of epilation. Soil sampling aimed at detecting plutonium originating from the atomic blast was conducted primarily in the Manose district in July 2011. The black rain in the Manose district is a valuable incident in terms of determining the effects on the human body of low-level radiation exposure, and further analysis appears needed.

INTRODUCTION

At 11:02 am, August 9, 1945, an atomic bomb was dropped on Nagasaki, and detonated at an altitude of 500 meters. The weather in Nagasaki at that time was sunny and clear. A light wind was blowing from the southwest. Large amounts of black ash and dust from the atomic bomb were carried eastward by the wind. Residents in this district consistently reported that the bomb explosion was followed by a shock wave. After that, the sky turned black, and the sun hung reddish-black. Much ash, dust, and debris fell from the sky (Figure 1).

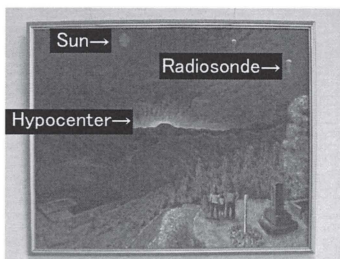


Figure 1. The picture which residents drew

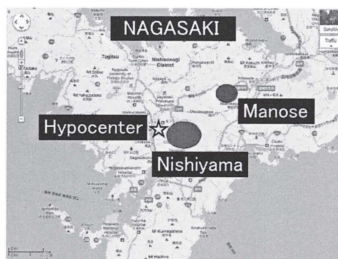


Figure 2. The map of Nagasaki

Approximately 20 minutes after the bomb was dropped, rain fell in the Nishiyama district of Nagasaki. Subsequent investigations measured high levels of radioactivity in the Nishiyama district, and amounts of lifetime radiation exposure are estimated at 200 to 400 milligrays. This corresponds to approximately 10 times the amount of radiation in the Hiroshima districts of Koi and Takasu, where black rain similarly fell following the atomic bombing there.

It has conventionally been held that, in Nagasaki, full-fledged black rain fell only in the Nishiyama district, but a recent study by the Nagasaki Doctor and Dentist Association found that fairly heavy rain also fell at the same time in the Manose district (Figure 2).

MATERIALS AND METHODS

From March 8, 2011, interview investigation was conducted to the residents in a manose area and a neighboring area who survived by the atomic bomb. It was asked whether fallout rain was caught or not after atomic bombing. Furthermore, a question was asked about the situation at that time, the time when rain began to fall, a color, and temporal duration. To the residents who experienced rain, it checked about the existence of subsequent health condition, depilation, nausea, diarrhea, and gingival bleeding.

For a ten-day period starting July 9, 2011, soil sampling was conducted by Professor Masaharu Hoshi and Associate Professor Satoru Endo of Hiroshima University and Associate Professor Toshihiro Takatsuji et al. of Nagasaki University.

To avoid effects of global fallout, this testing mainly targeted soil under the floors of old houses (Figure 3).



Figure 3. Under the floors of old houses

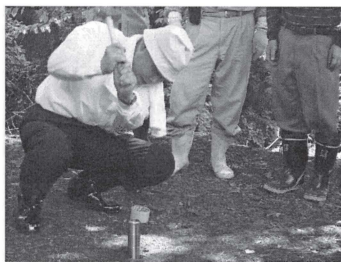


Figure 4. Another soil sampling points

The crawlspace under the floors was cramped, making it difficult to sink boring pipes, but the soil was in good condition. Areas not under floors were also sampled (Figure 4). A total of 7 samples were taken from under the floors of 3 houses.

A total of 40 samples were collected at 19 sites in the Nishiyama and Manose districts, and in adjacent districts eastward from the hypocenter. The samples were sent to Professor Masayoshi Yamamoto at Kanazawa University for the purpose of detecting plutonium..

RESULTS AND DISCUSSION

The Manose district is located in a mountainous area approximately 7.5 km northwest of the hypocenter. It is a small settlement whose residents numbered approximately 320 persons at the time of the bombing (Figure 5).

Nearly all residents were engaged in farming, and used springs or small streams as sources of water for domestic use. Terraced rice paddies and other crop fields were common, and the residents continued to

farm the paddies where black rain fell, and ingested the rice and other crops they produced (Figure 6).

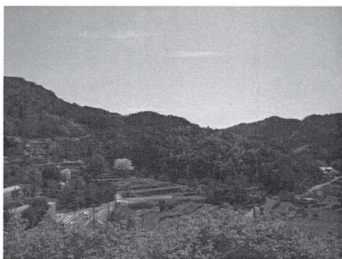


Figure 5. The manose district

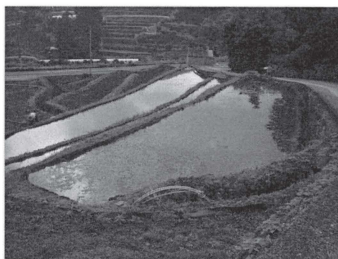


Figure 6. Terraced rice paddies

One man who was 8 years of age at the time of the bombing reported the events at the time as follows: "I was at home when the atomic bomb was dropped. I felt a powerful wind. Before long, black rain began to fall from the sky. Starting in September, I, my older brother, my mother, and my older sister experienced slight hair loss. My father lost so much hair that his scalp was visible. My father then fell ill, and after living on with occasional bouts of being bedridden, he died while in his 50s, with the cause remaining unknown."

Table 1. The interview result of the residents of the manose district

No	Age at time of bombing	black rain	Diarrhea	Nausea	Gingival bleeding	Epilation			
						Interviewee	Family	Period	Grade
1	8 m	Yes	nm	nm	nm	No	Yes	2 w	Slight
2	9 m	Yes	No	No	No	No	No		
3	11 m	Yes	No	No	No	Yes	Yes	1 y	Slight
4	10 f	Yes	uk	uk	uk	No	No		
5	14 m	Yes	uk	uk	uk	Yes	Yes	2 w	Slight
6	8 m	Yes	uk	uk	No	Yes	Yes	2 w	Slight
7	16 m	Yes	No	No	No	No	No		
8	11 m	Yes	Yes	uk	uk	Yes	Yes	1 w	Slight
9	9 m	Yes	Yes	Yes	nm	Yes	Yes	1 w	Slight
10	17 m	Yes	No	nm	nm	Yes	Yes	1 w	Slight
11	9 m	Yes	Yes	Yes	No	No	Yes	2 w	Slight
12	3 m	Yes	nm	nm	nm	nm	Yes	uk	Moderate
13	5 m	Yes	No	No	No	No	No		
14	5 f	Yes	nm	nm	nm	nm	Yes	uk	Slight

nm:no memory uk:unknown

According to tabulated figures based on interviews of 14 residents of 13 households who remembered the black rain, 6 of the 14 respondents, or 43%, experienced epilation themselves, and incidence of epilation

when family members are included was 15 of 59 persons, or 25%.

In contrast to this, in adjacent districts where no black rain fell, 3 in 99 persons, or 3%, reported incidence of epilation.

Incidence of epilation decreased with distance from the hypocenter. Incidence of 25% corresponds to 1.5 km from the hypocenter. In the Manose district, at 7.5 km from the hypocenter, effects of direct exposure to radiation are near zero, and the black rain is suspected as a cause contributing to the high incidence of epilation.

Aside from epilation, various forms of damage to health have been the subject of discussion.

Table 2. The less than 55-year-old deceased in the manose district

Death year	age	sex	Cause of death	Death year	age	sex	Cause of death		
1945	3	m	Unknown disease	1954	54	m	Liver disease		
	54	f	Unknown disease	1955	51	m	Liver cancer		
	2	f	Doubt of leukemia	1957	53	f	Lung cancer		
1946	29	f	Uterine cancer	1958	19	f	Brain disease		
	48	m	Unknown disease	1959	27	f	Brain disease		
	*	1	f	Unknown disease	1960	53	f	Uterine cancer	
1947	3	f	Unknown disease	1961	*	1	f	Leukemia	
1948	18	m	Lung cancer	1966	41	m	Hypertension		
	45	f	Apoplexy	1968	*	11	f	Leukemia	
	*	1	m	Unknown disease	1971	42	f	Uterine cancer	
1950	26	m	Unknown disease	1973	46	f	Apoplexy		
	50	f	Uterine cancer		44	m	Heart failure		
	*	1	m	Pneumonia	1975	*	4	f	Heart disease
1952	29	f	Cardiac disease	1980	54	m	Lung cancer		
1953	*	5	m	Unknown disease	1984	42	m	Liver cirrhosis	
	10	m	Doubt of leukemia	1985	44	m	Thyroid cancer		
	39	f	Pyelitis	1987	42	m	Stomach cancer		

* Children of Survivors

The result which the residents in the manose district investigated in collaboration with the Yomiuri Newspaper

The reason or reasons for the high incidence of epilation in the Manose district remain unknown, but internal exposure or beta-ray exposure via the hair is a suspected cause. The results of analysis are eagerly awaited in hopes that they will shed light on relationship between black rain and epilation in the Manose district.