

## 【取扱い嚴重注意】

平成24年5月22日

## 聴取結果書

東京電力福島原子力発電所における事故調査・検証委員会事務局

局員 三田 浩平

平成24年2月6日、東京電力福島原子力発電所における事故調査・検証のため、関係者から聴取した結果は、下記のとおりである。

## 記

## 第1 被聴取者、聴取日時、聴取場所、聴取者等

## 1 被聴取者

スウェーデン大使館公使 ヘンリック・グルーデモ

## 2 聴取日時

平成24年2月6日午前10時00分から同日午前11時30分まで

## 3 聴取場所

スウェーデン大使館

## 4 聴取者

事故調査委員会事務局 寺岡参事官補佐、三田主査、仁保主査

## 5 ICレコーダーによる録音の有無等

 あり なし

## 第2 聴取内容

避難勧告、安定ヨウ素剤の配付等について  
別紙のとおり

## 第3 特記事項

特になし

【取扱い厳重注意】

別紙

被聴取者から、スウェーデンの避難及び安定ヨウ素剤に関する指示に関する時系列（別添1）と安定ヨウ素剤の服用指示の経緯を示す文書（別添2）の提出があった。

以下、補足説明を記載する。

- スウェーデン大使館は、3月19日から同月30日まで、およそ400名に対して安定ヨウ素剤を配付した。

以上

Notes by

Embassy of Sweden, Feb. 6, 2012

all travel

Non-essential travel

### Rekommenderade skyddsåtgärder för svenska medborgare som vistas i Japan eller planerar att resa till Japan

resp. authority

Datum	Ansvarig myndighet	Rekommendation	Angivet skäl för rekommendation
12 mars 2011	SSM	<ul style="list-style-type: none"> <li>Svenskar i Japan ska följa rekommendationerna från Japanska myndigheter.</li> </ul>	Strålsäkerhetsskäl - radiation reasons
13 mars 2011	UD	<ul style="list-style-type: none"> <li>Avrådan från icke nödvändiga resor till prefekturerna Aomori, Iwate, Miyagi, Fukushima och Ibaraki. <u>non-essential travel</u></li> </ul>	Naturkatastrofen - Natural disaster
15 mars 2011	UD och SSM	<ul style="list-style-type: none"> <li>Avrådan från icke nödvändiga resor till Tokyo och den nordöstra delen av landet (regionerna Tohoku och Kanto).</li> </ul>	Strålsäkerhetsskäl och naturkatastrofen
16 mars 2011	UD och SSM	<ul style="list-style-type: none"> <li>Avrådan från alla resor till Japan. <u>Recommendation to avoid all travel to Japan</u></li> <li>Alla svenskar inom en radie på 80 km från Fukushima Daiichi uppmanas att lämna området. <u>requested to leave area</u></li> </ul>	Strålsäkerhetsskäl
19 mars 2011	UD och SSM	<ul style="list-style-type: none"> <li>Alla svenskar som vistas inom en radie av 250 km från Fukushima Daiichi uppmanas att ta joutabletter. <u>Should take iodine pills</u></li> <li>Den som är orolig och vill vara säker på att inte påverkas av ett utsläpp bör överväga att lämna Japan eller bege sig till delar av Japan som ligger utanför 250-kilometersområdet.</li> <li>Vid ett nedfall rekommenderas den som befinner sig i 250-kilometersområdet att stanna inomhus med stängda fönster och avstängd ventilation.</li> <li>I övrigt ska svenskar som vistas i Japan följa de svenska och japanska myndigheternas rekommendationer.</li> <li>Svenskar ska inte vistas inom en zon på 80 km från Fukushima Daiichi. <u>not within 80km</u></li> </ul>	Strålsäkerhetsskäl Follow JP advice
29 mars 2011	UD och SSM	<ul style="list-style-type: none"> <li>Det finns inte längre någon anledning att äta joutabletter för svenskar i Japan. <u>no longer iodine tablet</u></li> <li>Avrådan från icke nödvändiga resor till Japan. <u>avoid non-essential travel to JP</u></li> <li>Svenskar ska inte vistas inom en zon på 80 km från Fukushima Daiichi.</li> </ul>	Strålsäkerhetsskäl
12 april 2011	UD och SSM	<ul style="list-style-type: none"> <li>Avrådan från icke nödvändiga resor till prefekturerna Miyagi, Fukushima, Yamagata, Niigata, Tochigi, Gunma, Ibaraki och Saitama. <u>avoid travel these pref</u></li> <li>Svenskar ska inte vistas inom en zon på 80 km från Fukushima Daiichi.</li> </ul>	Strålsäkerhetsskäl
16 maj 2011	UD och SSM	<ul style="list-style-type: none"> <li>Avrådan från alla resor inom en radie av 80 km från Fukushima Daiichi. <u>avoid travel within 80km</u></li> <li>Svenskar i Japan som befinner sig i prefekturerna Fukushima, Ibaraki, Tochigi, Yamagata och Miyagi bör vara uppmärksamma på utvecklingen vid Fukushima Daiichi samt följa råd från svenska och japanska myndigheter om läget på anläggningen försämrats.</li> </ul>	Strålsäkerhetsskäl

CFM prof. above; Follow advice of SE and JP authorities.

スウェーデン-9A  
05/02/12 → 7:01

Not be written so low  
and within the "debatable zone"

10 oktober 2011	UD och SSM	<ul style="list-style-type: none"> <li>Svenskar ska inte vistas inom en zon på 80 km från Fukushima Daiichi.</li> <li>Svenska medborgare avråds helt från att vistas i en zon med en radie om 30 kilometer från kärnkraftverket Fukushima Dai-ichi samt i de områden på större avstånd än 30 kilometer från Fukushima Dai-ichi där japanska myndigheter rekommenderat evakuering.</li> </ul>	Strålsäkerhetsskäl
21 december 2011	UD och SSM	<ul style="list-style-type: none"> <li>Svenska medborgare i Japan uppmanas att följa rekommendationer från japanska myndigheter angående strålskyddskonsekvenser av olyckan i kärnkraftverket Fukushima Dai-ichi. Strålsäkerhetsmyndigheten anser därmed att det inte längre behövs några särskilda rekommendationer för svenska medborgare i Japan angående strålskyddskonsekvenser av olyckan i kärnkraftverket Fukushima Dai-ichi.</li> </ul>	Strålsäkerhetsskäl

Follow JP advice,  
no specific other  
recommendations needed.

(Motivated following  
cold shut-down declaration)

### **Iodine prophylaxis for Swedish citizens in Japan in March 2011**

Monitoring results released by NISA to the IAEA/ENAC emergency web site on March 14 showed dose rates measured on March 13 at monitoring posts around the Fukushima Dai-ichi NPP that were fluctuating in the order of 4 – 400  $\mu\text{Sv/h}$ . A peak value reached 1558  $\mu\text{Sv/h}$  at monitoring point MP4 on March 13 at 13:32. It was also reported that iodine-131 had been detected in air filters. From the events of hydrogen explosions in reactor number 1 and 3, SSM calculated that the core damage in these reactors probably was at least 10 %. From this and from the reported monitoring data, SSM roughly estimated that the release of iodine to the atmosphere could be in the order of 0,1 – 1 per cent of the core inventories of reactor number 1 and 3.

SSM applied the decision schemes for Swedish reactor accidents on the situation in Japan. The schemes had been calculated using a Gaussian dispersion model, a one-hour release duration, a release height of 100 m and neutral weather conditions with a wind speed of 6 m/s. From these schemes SSM estimated that a 50 mGy thyroid dose to a one year old child with no respiratory protection would be obtained out to a distance of 8 km from the release point for a 0.1 % release and out to at about 30 km for a 1 % release. The evacuation distance proclaimed by Japanese authorities was 20 km. The need for intake of stable iodine tablets would thus not extend very far beyond the evacuation distance. SSM, therefore, concluded that the Japanese protective actions were adequate and recommended Swedish citizens in Japan to follow news reports and adhere to the protective measures proclaimed by the Japanese authorities.

In the evening of March, 15 (Swedish time), SSM had obtained and analyzed more monitoring results from Japan. From these figures SSM made the judgment that the release of radioactive iodine could have been in the order of 1 - 10 %. Presuming a one-hour release of 10 % of the core inventory of radioactive iodine, SSM estimated that the thyroid dose to a one year old child without any protection could reach 50 mGy at distances 150 – 200 km. NISA reported on the status of Fukushima Dai-ichi NPP that the fuel rods in the spent fuel pool in unit 4 were being heated and that a fire had broken out. NISA also presumed that radionuclides were released to the atmosphere. The radiation level between units 3 and 4 was reported to be 400 mSv/h. If the spent fuel pools would run dry, very high radiation levels combined with a large release of radionuclides to the atmosphere could be expected. SSM judged that this could severely hamper the work with seawater pumping to reactor units 1, 2 and 3. All workers except those who were engaged in the operation of seawater cooling pumps had been evacuated. From these reports SSM concluded that the situation was far from under control and that a large release of radionuclides from the reactor containments and from the spent fuel pools could not be ruled out. Radioactive iodine from the reactor cores could lead to problems with high thyroid doses at quite large distances.

In the afternoon of March 16, SSM informed the Swedish Ministry for Foreign Affairs of the situation. The question of iodine prophylaxis for Swedish citizens in Japan was raised. At 21:30 on March, 16 (Swedish time) SSM decided to send iodine tablets to the Swedish embassy in Tokyo with the intention that tablets should be distributed to Swedish citizens. During the night, 4000 packages of tablets were taken out from the Swedish central emergency storage and put on air cargo to Tokyo. Each packet contained 10 tablets of 65 mg potassium iodide. The tablet dosage was

according to the standard recommendations by WHO (1989). During the night SSM prepared instructions saying that the tablets should be handed out by the Swedish embassy in Tokyo and that the tablets should be taken according to the dosage described on the packet and at times and in areas that SSM would give information on at a later stage. The embassy should keep records with contact information to all people who obtained tablets.

While the tablets were on their way to Japan, SSM discussed how to provide timely information to Swedish citizens where and when iodine tablets should be taken. To be effective, the tablets must be taken before the radioactive cloud arrives. The most important question was: Would it be possible for SSM to provide information in time to the people residing in areas that could be affected by a release so that they could take tablets before the radioactive cloud arrives. SSM made dispersion prognoses with three hours intervals that could show which areas that could be affected. It was, however, deemed very uncertain if information on a possible large release would be reported in time to allow SSM to send a warning message to the Swedish Embassy in Tokyo and that the embassy would be able to send SMS-messages in time to Swedish citizens. The delay time in the international reporting was experienced such that SSM judged it unlikely to be able to send a warning message in time. After thorough discussions with medical experts from the National Board of Health and Welfare it was decided to recommend intake of one dose of iodine tablets directly when the tablets were obtained at the Swedish embassy. People had to go to the embassy to fetch tablets and could therefore, in a worst case scenario, be exposed to a radioactive cloud. The instructions to immediately take a first tablet dosage were in full accordance with the Swedish policy for iodine prophylaxis in case of a threat of a large release from a Swedish NPP.

Wide experience of stable potassium intake exists for people in different age groups. The side effects are so limited that stable iodine is justified to avert even quite low radiation doses to the thyroid gland (WHO, 1989, Ogris and Ecker, 1991). For an assumed release fraction of 30 % of the iodine inventory from Fukushima Dai-ichi NPP unit 2 and 3, SSM calculated the distance within which intake of stable iodine would be justified. For a one hour release, a child of one year of age and no respiratory protection, the distance within which 50 mGy to the thyroid gland could be the result from inhalation was calculated to 250 km. This includes the city of Tokyo. Therefore, SSM decided to recommend intake of iodine tablets within a distance of 250 km from Fukushima Dai-ichi NPP at the time when tablets should become available.

A second question was how to proceed with iodine prophylaxis if the release threat would continue for days and weeks. For nuclear accidents in Sweden only one dosage of tablets should be taken. After that, evacuation should be undertaken if the threat persists. This was not necessarily a possible choice for Swedish citizens in Japan outside the 80 km distance. Therefore, additional administration of stable iodine could be necessary in the coming days. One dose will provide almost full protection of the thyroid gland for 24 hours. (TMT-handbook, 2009). For longer terms the protection is gradually reduced. Typically a second dosage should be taken after 24 - 48 hours to provide a continuous protection. Since the situation in Japan could go on for weeks it was judged by SSM and the medical experts, that additional administration of iodine tablets after the first dosage could be necessary. This could, however, led to increased

risk of adverse side effects, especially if several dosages should be taken. Some compromise between the need for ongoing protection and the possible increased risk from intake of stable iodine with time had to be made. After discussions with the medical expert from the National Board of Health and Welfare, it was decided to recommend a 72 hour (three days) period between additional intakes of stable iodine. Pregnant women and mothers with breast-feed children were advised to take only one dosage. A telephone number to the medical expert in Sweden was provided so that anyone who had questions or experienced any adverse effects could get direct medical advice. A new information leaflet was written and sent to the Swedish Ministry for Foreign Affairs to be forwarded the Swedish embassy in Tokyo. The leaflet arrived at the embassy late on Sunday, March 20 (Japanese time).

On Saturday, March, 19 in the late afternoon (Swedish time) SSM informed the radiation safety authorities in Denmark, Norway and Finland concerning the Swedish recommendations for administering iodine tablets to Swedish citizens in Japan.

The shipment of iodine tablets arrived at the Swedish embassy in Tokyo on Sunday, March, 20 (Japanese time). The same day, a total of 60 packets were fetched by Swedish citizens at the embassy. The embassy had a list of 699 Swedish citizens in Japan. About 300 were in the Tokyo area. During the following days further Swedish citizens fetched packets.

取り出す

The half-life of iodine-131 is eight days. At the time when SSM recommended intake of iodine tablets, iodine-131 was the main contributor to the thyroid dose. In an eight-day period the possible thyroid dose would decrease to 50 %. This corresponds to a reduction in the maximum distance for intake of stable iodine from 250 km to about 180 km presuming the same weather situation. Thus, after one week, Tokyo would be beyond the distance where iodine tablets would be needed. In 24 days (three half lives of iodine-131) the distance where tablets would be needed would be reduced to 80 km, the recommended evacuation distance for Swedish citizens. Taking into account the possible increase in negative side effects with repeated intake of stable iodine, SSM decided on March 29, after consulting the medical expert, to recommend cessation of iodine tablet intake. Swedish citizens in Japan could therefore at most have taken three dosages of iodine tablets presuming that the recommendations were followed. Most citizens have probably taken two dosages or less. A follow-up study to quantify the actual intake and identify any adverse side effects is currently ongoing.

#### References

E.Ogris, W.Ecker, Kaliumjodidbevorratung, Information für Ärzte und Apotheker, Österreichische Ärztezeitung, 46/1, 12; 1991.

TMT Handbook, Triage, monitoring and treatment of people exposed to ionizing radiation following a malevolent act, Østerås, Norway, 2009.

WHO. Guidelines for iodine prophylaxis following nuclear accidents, World Health Organization, Regional Office for Europe, United Nations; 1989.