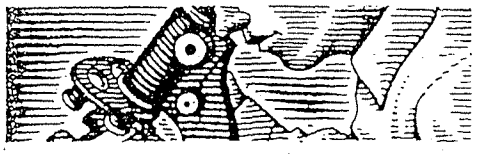
The Globe and Mail, Thurs

HEALTH



BRIEFING

940804 Ent NR

A-bomb, cancers linked

CHICAGO — A Japanese study has found higher incidences of autoimmune disease and thyroid cancers among survivors of the 1945 United States atomic bomb attack on Nagasaki, indicating that low doses of radiation can have health effects even decades later, researchers said Tuesday.

The study by the Radiation Effects Research Foundation found that of 2,587 1980s-era survivors of the blast, 447 had developed thyroid diseases, more than half of whom did not have a family history of such illnesses.

"The present study confirmed the results of previous studies by showing a significant increase in [cancers] to the thyroid and demonstrated for the first time a significant increase in autoimmune disease among atomic bomb survivors," wrote the Foundation's Shigenobu Nagataki in the Journal of the American Medical Association. *Reuter*

TABLE 3.5.3 Bruce Area Drinking Water Tritium and Gross Beta - 1992

Drinking Water Supply Plant	Annual Average Tritium Concentration		Annual Average Gross Beta Activity (Bq/L)
	Bq/L	% MPC$_w$	
Kincardine	11	0.005	0.11
Port Elgin	46	0.022	0.09

TABLE 3.5.4 Provincial Sites - Annual Average Tritium and Gross Beta Concentrations in Drinking Water - 1992

Location	Water Source	Annual Average Tritium Concentration (Bq/L)	Annual Average Gross Beta Concentration (Bq/L)
Bancroft	Clarke Lake	4.2	0.05
Belleville	Lake Ontario	6.2	0.08
Burlington	Lake Ontario	6.9	0.12
Kapuskasing	Well Water	3.9	0.06
London	Lake Huron	5.8	0.09
St. Catherines	Niagara River	4.9	0.11
North Bay	Trout Lake	4.5	0.10
Orangeville	Well Water	4.3	0.05
Ottawa	Ottawa River	7.0	0.07
Parry Sound	Georgian Bay	6.5	0.20
Sudbury	Ramsay Lake	3.9	0.06
Thunder Bay	Lake Superior	4.1	0.20
Toronto	Lake Ontario	7.7	0.10
Average ± 2 σ		5.4 ± 1.4	0.10 ± 0.05

TABLE 6.7 - MAXIMUM PERMISSIBLE RELEASE RATES (q_M-Ci$^{\psi}$/s) IN PATHWAYS FOR LIQUID EFFLUENTS RELEASED FROM CRNL

Radionuclide	Pathway (see Fig. 5.2)				
	F (Veg. Ingestion - Spray Irrigation)		G (Water Ingestion)		H (Fish Ingestion)
	Exposed Group†				
	4	5	4	5	5
H-3(HTO)	4.5E-01+	*3.2E-01	1.5E+01	6.4E+00	2.1E+02
Be-7	4.7E+04	1.4E+03	4.1E+02	*5.4E+00	1.8E+01
C-14(part.)	6.7E-03	4.5E-03	7.4E-01	3.3E-01	*2.2E-04
Na-22	1.8E+00	9.8E-01	1.6E-01	5.4E-02	*1.8E-03
-24	2.1E+03	3.3E+03	1.0E+00	7.2E-01	*2.4E-02
S-35	6.3E+01	2.1E+01	3.8E+00	7.8E-01	*2.6E-02
Sc-46	1.6E+02	4.0E+01	1.5E+00	1.7E-01	*5.6E-02
-47	7.3E+02	2.4E+02	1.6E+00	2.4E-01	*8.1E-02
Cr-51	4.2E+03	2.0E+03	3.1E+01	6.5E+00	*1.1E+00
Mn-54	1.3E+02	4.0E+01	2.8E+00	5.3E-01	*3.5E-02
Fe-59	4.0E+01	3.3E+01	3.3E-01	1.3E-01	*4.2E-02
Co-58	3.8E+01	4.1E+01	3.7E-01	1.8E-01	*6.0E-03
-60	1.1E+00	6.0E-01	4.4E-02	1.4E-02	*4.7E-04
Zn-65	1.1E+00	6.7E-01	1.5E-01	5.9E-02	*9.8E-04
As-76	2.7E+02	2.0E+02	2.2E-01	7.3E-02	*2.4E-03
Sr-89	1.4E+02	8.0E+00	2.1E-01	*6.5E-02	1.1E-01
-90	3.3E-03	*2.8E-03	7.7E-03	4.4E-03	7.3E-03
Zr-95	2.0E+02	6.4E+01	1.8E+00	2.6E-01	*8.5E-02
Nb-95	7.9E+01	6.6E+01	6.2E-01	2.4E-01	*8.1E-02
Mo-99	7.7E+01	1.0E+02	1.5E-01	9.5E-02	*3.2E-03
Ru-103	3.0E+02	1.1E+02	2.5E+00	4.2E-01	*1.4E-01
-106	6.0E+00	2.9E+00	9.4E-02	2.3E-02	*7.7E-03
Ag-108m	4.8E-01	*2.1E-01	1.3E+00	3.5E-01	1.2E+00
-110m	8.0E+00	1.9E+00	4.6E-01	*6.9E-02	2.3E-01
Sb-124	2.8E+01	1.3E+01	2.6E-01	5.5E-02	*9.2E-03
-125	3.0E+01	1.1E+01	8.5E-01	1.7E-01	*2.8E-02
Te-132	9.5E+00	1.6E+01	3.2E-02	2.7E-02	*2.2E-03
I-125	4.8E-01	8.6E-01	5.3E-03	4.9E-03	*3.2E-03
-129	1.2E-03	9.6E-04	1.3E-03	7.1E-04	*4.7E-04
-131	6.7E-01	2.0E+00	2.7E-03	3.6E-03	*2.4E-03
-133	1.9E+01	6.4E+01	1.3E-02	1.9E-02	*1.3E-02
-135	2.6E+02	8.5E+02	*5.5E-02	8.3E-02	5.6E-02
Cs-134	2.3E+00	5.0E-01	7.6E-02	1.0E-02	*6.7E-05
-137	3.8E-01	8.7E-02	9.4E-02	1.4E-02	*9.4E-05
Ba-140	1.3E+02	1.3E+02	7.3E-01	3.3E-01	*5.6E-02
La-140	3.6E+02	1.7E+02	4.4E-01	*9.5E-02	1.3E-01
Ce-141	1.6E+02	5.9E+01	1.2E+00	2.1E-01	*6.8E-02
-143	5.3E+01	2.6E+01	7.0E-01	1.7E-01	*5.6E-02
-144	1.3E+01	5.3E+00	1.5E-01	2.8E-02	*9.4E-03
Eu-152	2.3E+01	6.0E+00	6.7E-01	1.0E-01	*3.3E-02
-154	2.2E+01	4.9E+00	7.2E-01	9.9E-02	*3.3E-02
Hf-175	5.3E+02	1.4E+02	4.8E+00	5.8E-01	*1.9E-01
-181	2.4E+02	7.3E+01	2.0E+00	2.7E-01	*9.0E-02
Hg-203	5.3E+01	2.0E+01	1.1E+00	2.3E-01	*7.7E-04
Ra-226	3.5E-04	3.5E-04	9.4E-05	5.9E-05	*2.0E-05
Th-228	4.9E-04	9.7E-04	7.1E-06	7.3E-06	*2.4E-06
-232	1.3E-04	8.3E-05	1.3E-05	5.1E-06	*1.7E-06
Pa-233	2.8E+02	1.2E+02	2.1E+00	*3.8E-01	6.4E-01
U-232	1.5E-02	6.4E-03	2.4E-04	*5.0E-05	8.3E-05
-233	5.6E-01	2.7E-01	9.4E-03	*2.3E-03	3.8E-03
-234	5.6E-01	2.7E-01	9.4E-03	*2.3E-03	3.8E-03
-235	5.6E-01	2.9E-01	9.4E-03	*2.4E-03	4.1E-03
-238	6.2E-01	3.2E-01	1.0E-02	*2.7E-03	4.5E-03
Np-237	6.7E-04	3.8E-04	*1.1E-05	1.4E-05	2.4E-05
-239	1.4E+03	6.7E+02	2.3E+00	*5.0E-01	8.3E-01
Pu-238	8.3E-02	2.0E-01	1.1E-03	1.4E-03	*9.4E-04
-239	7.1E-02	1.7E-01	1.0E-03	1.3E-03	*8.5E-04
-240	7.1E-02	1.7E-01	1.0E-03	1.3E-03	*8.5E-04
-241	5.2E+00	1.5E+01	6.4E-02	8.8E-02	*5.9E-02
Am-241	6.6E-03	1.5E-02	2.0E-04	2.4E-04	*8.1E-05
Cm-242	1.1E+00	2.4E+00	1.1E-02	1.1E-02	*3.7E-03
-244	2.0E-02	4.5E-02	3.9E-04	4.9E-04	*1.6E-04

† 4 - Infants in Petawawa

5 - Adults in Petawawa

* Dominant pathway, i.e., the pathway resulting in the minimum value of q_M.

ψ 1 Ci = 37 GBq

+ 4.5E-01=4.5x10^{-1}=0.45