Osteosarcoma is a primary bone cancer that usually affects young adults. Primary bone cancer, or cancer that starts in the bone, is very rare. Less than one per cent of people with bone cancer have primary bone cancer. The causes of primary bone cancer are not known and epidemiological studies show no clear association between fluoride in drinking water and osteosarcoma.

In Australia, an average of nine to ten cases of osteosarcoma are diagnosed each year in children under the age of 15. In Victoria, an average of two to three cases are diagnosed each year.

A comparison in the occurrence of osteosarcoma is best expressed as a rate. The table below shows some comparative rates.

<table>
<thead>
<tr>
<th>Locality</th>
<th>Rate*</th>
<th>Locality</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Melbourne**</td>
<td>2.5</td>
<td>Hong Kong</td>
<td>2.6</td>
</tr>
<tr>
<td>Rural and Regional Victoria</td>
<td>3.7</td>
<td>Denmark</td>
<td>1.8</td>
</tr>
<tr>
<td>Victoria***</td>
<td>2.9</td>
<td>Finland</td>
<td>3.2</td>
</tr>
<tr>
<td>Queensland**</td>
<td>4.5</td>
<td>France</td>
<td>2.7</td>
</tr>
<tr>
<td>New South Wales***</td>
<td>2.9</td>
<td>Italy</td>
<td>3.9</td>
</tr>
<tr>
<td>Australia***</td>
<td>2.2</td>
<td>Netherlands</td>
<td>2.9</td>
</tr>
<tr>
<td>International***</td>
<td>2.7</td>
<td>Sweden</td>
<td></td>
</tr>
<tr>
<td>Canada</td>
<td>2.9</td>
<td>Switzerland</td>
<td>2.5</td>
</tr>
<tr>
<td>USA</td>
<td>3.3</td>
<td>UK England &amp; Wales</td>
<td>2.6</td>
</tr>
<tr>
<td>Japan</td>
<td>2.3</td>
<td>UK Scotland</td>
<td>1.9</td>
</tr>
</tbody>
</table>

* The number of cases per year per million children under the age of 15.
** Fluoridated in 1977.
*** Approximately 90 per cent of Victorians have water with either naturally occurring or added fluoride.
Research summary

- A review of worldwide studies by The International Agency for Research on Cancer (IARC) concluded there was no evidence of an increase in cancer rates associated with fluoride in drinking water.5
- Three small case control studies of osteosarcoma (McGuire et al. 1995, Gelberg et al 1995, Moss et al 1995) were reviewed by the Australian National Health and Medical Research Council in 1999. None of these studies found any evidence of fluoride increasing the risk of osteosarcoma.7
- The York Review (2000), a systematic review of 214 studies of varying quality, found no clear association between fluoridation of water and osteosarcoma.8
- A study by Hoover, Devesa, Cantor and Fraumeni found no relationship between osteosarcoma and fluoridation. This study was significant because of the large numbers involved (125,000 incident cancers, and 2.3 million cancer deaths).9
- In 2002 the British Medical Research Council agreed that overall, evidence does not suggest that artificially fluoridated water increases the risk of cancer.10
- A review of fluoride by the Scientific Panel on Dietetic Products, Nutrition and Allergies published by the European Food Safety Authority in 2005, found no increased risk of cancer from drinking fluoridated water.11
- A 2008 study conducted in Australia which examined carcinogenic risk in developed countries found that there was a significant body of evidence demonstrating that the consumption of optimally-fluoridated water was not associated with carcinogenic risk.12

Harvard study

In April 2006, a paper by Bassin, Wypij, Davis and Mittelman, ‘Age-specific fluoride exposure in drinking water and osteosarcoma (United States)’ was published in the journal Cancer Causes Control.13 The lead author, Elise Bassin, was studying at the Department of Oral Health Policy and Epidemiology, Harvard University School of Dental Medicine.

The paper presented partial findings of a 15-year study of fluoride and osteosarcoma by the Harvard School of Dental Medicine in collaboration with the National Institute of Environmental Health Sciences, National Cancer Institute and National Institute of Dental and Craniofacial Research.

The 15-year study started in 1992 and examined osteosarcoma cases that existed between 1989 and 1992, and new cases diagnosed between 1993 and 2000, all identified from 11 hospitals throughout the United States.

Bassin et al explored age and gender-specific effects of fluoride levels in drinking water and the incidence of osteosarcoma, using the cases identified between 1989 and 1992 that were younger than 20 years old (103 cases) and comparing them to 215 matched controls.

Each of the cases was interviewed to determine residential history, use of mouth rinses and fluoride supplements, with the amount of fluoride in drinking water being the main exposure of interest. Drinking water included the public supply, bottled and well water.

The researchers then estimated the level of fluoride consumed at each age, based on an estimate of the concentration of fluoride in public drinking water supplies (data on fluoride concentrations was obtained from the Centers for Disease Control and Prevention’s 1985 and 1992 Fluoridation Census), estimates of bottled water levels and samples from well water.

Bassin et al concluded that their exploratory analysis found an association between osteosarcoma and fluoride in drinking water in males, but not in females. They also concluded that further studies were required to confirm or refute the findings, particularly using a biomarker such as fluoride levels in bone and considering genetic conditions (there are several genetic conditions for which an increased risk of osteosarcoma is well documented).14
Review of Bassin et al's paper

In a letter to the editor of the journal Cancer Causes Control,16 published in the same edition as the Bassin et al paper, study supervisor Prof Chester Douglass advised readers to be cautious when interpreting the findings. He stated:

- The preliminary findings from the overall analysis of the cases identified between 1993 and 2000 (second set of cases) did not show an association between osteosarcoma and fluoride in drinking water.
  - The cases had been identified from the same hospitals within the same orthopaedic departments and the same pathology departments diagnosing osteosarcoma, and similar methods of fluoride exposure.
- Bone specimens were also provided by many of the cases – preliminary analysis of bone specimens suggested fluoride level in the bone is not associated with osteosarcoma.

Some of the limitations noted by Bassin et al in their paper included:13

- The estimates of fluoride in drinking water at each residence did not reflect the actual consumption of fluoride.
- The study did not obtain biologic markers for fluoride uptake in bone.
- The actual amount of fluoride in a fluoridated supply may vary (within guideline levels).
- Natural fluoride levels can vary over time (the researchers thought this unlikely for the time spent at each residence).
- There was a lack of data on other potential confounders.
- Fluoride may not be the causative agent – another factor in drinking water may be correlated with the presence of fluoride.
- Data to assess fluoride exposure from diet, industrial sources or other sources such as pesticides was not available – cases may have been exposed to other unknown factors such as contaminants or carcinogens in the bottled or well water, with the fluoride in these products or natural sources irrelevant, regardless of the concentration.

Following the full analysis of both sets of cases, advice from Prof Douglass in 2010 confirmed that the full data did not show an association between osteosarcoma and fluoride in drinking water.16 These findings have been submitted for publication.

References