

The lake then remained deep for several thousand years and may even have overflowed. About 5,500 BP a change in the hydrologic environment is reflected in an increase in carbonate production and the eventual coarsening of bottom sediments, culminating in the deposition of shallow facies at 3,100 BP. At 3,100 BP water level rose slightly and then fell again, maintaining this low position until about 2,000 BP. Trees found in positions of growth near and below present water level and dated at 1,890 BP (N-390) were submerged by rising waters at this time. The trees belong to the last period when water level was below that of today. The lake rose and remained deep until after European settlement. In the late nineteenth century it began to fall and in 1969 stood at its lowest level for the past 1,900 yr.

In nearby Lake Gnotuk, submerged trees have been dated at 1,865 ± 85 BP (GX-0149, E. D. Gill, personal communication). Synchronous oscillations in lakes 20 km apart provide strong evidence that the controlling factor was climate rather than local hydrologic variations. Furthermore, the major drying between 18,000 and 15,000 BP is in close agreement with evidence documented from lakes in different hydrologic settings in north Victoria and south-west New South Wales recorded by J. M. B.³ The rise at about 10,000 BP, reflecting an increase in precipitation or decrease in temperature, cannot yet be correlated accurately with events elsewhere in Australia, although Kershaw⁴ suggests a wet period in north Queensland at this time.

Effects of a Post-Glacial thermal maximum are weakly represented by a slow fall in water level and a corresponding rise in carbonate production from 5,500 to 3,100 BP. The magnitude and implied rates of these changes suggest conditions little different from those in the area today. The data therefore do not support the hypothesis of widespread Post-Glacial aridity so widely claimed in Australia⁵⁻⁷. Although temperatures from 5,500 to 3,100 BP may have been slightly higher than in the preceding interval, the degree of aridity would almost certainly not have been sufficient to cause the vegetation destruction and widespread landscape instability which are sometimes attributed to events of this time.

Conditions moderated at 3,100 BP when a slight rise of lake level occurred, but the major rise marking the beginning of the next relatively wet period did not occur until 1,900 BP.

Oscillations in Lake Keilambete can be matched in other lakes in a variety of settings in south-east Australia supporting the interpretations of the water level changes discussed here. The sequence of palaeoclimatic conditions probably has general application through south-east Australia and it may help provide a reliable basis for climatic correlations within Australia and between different continents in both hemispheres.

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Asbestos Fibres in Beverages and Drinking Water

WL

THE hazards of inhaling asbestos fibres¹⁻⁴, the high incidence of gastrointestinal cancer^{1,2,5-7} and abdominal neoplasms^{3,8,9} among asbestos workers and the fact that asbestos fibres may penetrate the mucosa of the stomach and the intestine of animals^{10,11} are known and so it is important to study the distribution of asbestos fibres in the environment. Asbestos fibres have already been found in beer¹², and the occurrence of fibres 0.5 μm in length and 0.01 μm in diameter suggests that such material may find its way through filtering systems into city drinking water supplies, and this we have been able to confirm.

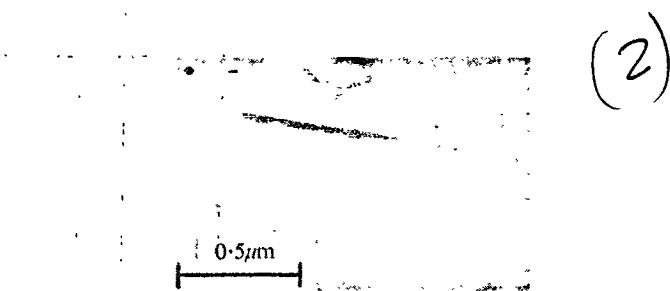


Fig. 1 Electron micrograph of asbestos fibre isolated from beer (enlarged 31,000 times).

The asbestos fibres in 400 ml. samples of beverages and water were concentrated by centrifuging in excess of 16,000g, drying at 100° C and ashing at 500° C¹². The ash was taken up in 1 ml. of distilled water and agitated in an ultrasonic vibrator to disperse the fibres and ash particles¹². Five μl. of this dispersion was evaporated with the aid of a heat lamp on 200 or 400 mesh carbon coated copper grids. Using a Siemens Elmiscop IA electron microscope at 80 kV and a magnification of 20,000, the number of fibres in each of five or ten grid holes was counted, and corrected for dilution. Precautions were taken to prevent contamination of samples from extraneous airborne fibres and no fibres were detected in distilled water

Table 1 Asbestos Fibres in Beverages and Water

Sample	Source *	No. of fibres × 10 ⁶ l. ⁻¹
Beer	Canadian 1	4.3
Beer	Canadian 2	6.6
Beer	USA 1	2.0
Beer	USA 2	1.1
Sherry	Canadian	4.1
Sherry	Spanish	2.0
Sherry	South African	2.6
Port	Canadian	2.1
Vermouth	French	1.8
Vermouth	Italian	11.7
Soft drink	Ginger ale	12.2
Soft drink	Tonic water I	1.7
Soft drink	Tonic water II	1.7
Soft drink	Orange	2.5
Tap water	Ottawa, Ottawa river (F)	2.0
Tap water	Toronto, Lake Ontario (F)	4.4
Tap water	Montreal, St Lawrence river (F)	2.4
Tap water	Hull, Quebec, Ottawa river (NF)	9.5
Tap water	Beauport, Quebec, St Lawrence river (6 km below Quebec City) (NF)	8.1
Tap water	Drummondville, Eastern Townships, Quebec, St Francois river (F)	2.9
Tap water	Asbestos, Eastern Townships, Quebec, Nicolet river (F)	5.9
Tap water	Thetford Mines, Eastern Townships, Quebec, Lac à la Truite (NF)	172.7
Melted snow	Ottawa, top 30 cm (2-3 weeks precipitation)	33.5
River water	Ottawa river, at Ottawa	9.5

* F, Filtration plant used; NF, no filtration plant used.

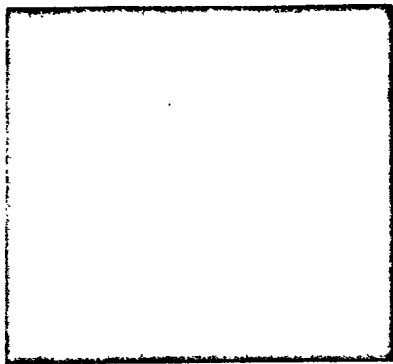


Fig. 2 X-ray diffraction pattern of asbestos fibre shown in Fig. 1.

blanks which were treated in the same manner as the liquid samples.

Twelve brands of Canadian beer, wine, sherry and port, six of American beer, six of European wine, vermouth and sherry and two of South African sherry were examined and all were found to contain asbestos fibres. Counts made on some of these brands are reported in Table 1. The fibres in Canadian beer (Fig. 1), sherry and water were identified as being chrysotile asbestos by comparing their electron diffraction pattern (Fig. 2) with that of pure chrysotile asbestos. Some of the European samples contained fibres of amphibole asbestos. Many asbestos fibres were hidden in clumps of debris such as mineral matter in water and diatomaceous earth which is used as a filtering aid in beer. As a result, the number of fibres reported in Table 1 must be considered a minimum estimate of those actually present. Most of the fibres found in Canadian beer and in filtered city water were less than 1 μm in length while most samples of wine, some American beer and unfiltered melted snow or river water also contained a considerable number of asbestos fibres ranging from 1 to 15 μm in length.

Tap water from three major Canadian cities, Ottawa, Toronto and Montreal, combined from 2.0 to 4.4 million fibres per litre. All of these cities have filtration systems and Ottawa tap water, drawn from the Ottawa river, had considerably fewer fibres than unfiltered river water. Many of Canada's major asbestos mines are located in the Eastern Townships of Quebec and filtered tap water from towns in this area did not differ greatly from that in the larger cities but unfiltered tap water in Thetford Mines, drawn from a small lake in the heart of an asbestos mining area, was exceptionally high in fibre content. The high level of asbestos fibres in melted snow in the Ottawa area gives some indication of one source of asbestos in surface waters.

The question as to the hazard of orally ingested asbestos has not yet been resolved. The amounts by weight of the asbestos found in these samples were exceedingly small—about 1 μg per 10 million fibres—obtained from counts on 1 mg samples of fibres of approximately the same size as those found in the beverages and water. Further work is required to determine the extent to which the fibres penetrate the walls of the digestive tract, the degree to which they may be transported to other organs of the body and the biological effects of their residence in various tissues. Studies of this nature are now in progress.

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BIOLOGICAL SCIENCES

Molecular Conformation of Deoxyuridine

THE structure determination of deoxyuridine was undertaken as part of a series of conformational studies of nucleic acid components. Such studies give information about the preferred conformation of nucleosides and nucleotides^{1,2}, and may clarify the conformational differences and changes that occur in nucleic acids. The conformational parameters of interest in deoxyuridine are the pucker of the sugar ring, the torsion angle of the sugar relative to the base about the glycosidic bond and the orientation of the C(5')-O(5') bond about the C(4')-C(5') bond.

In ribose and deoxyribose nucleosides, the most common type of pucker of the sugar is either C(2') endo or C(3') endo. In the deoxynucleosides the C(2') endo pucker is by far the most common. Since one of the nucleosides with a C(3') exo pucker is thymidine³ it was of particular interest to know whether deoxyuridine would also have this type of pucker. Even the same nucleoside in different environments can have a different type of pucker⁴, but these differences have only been observed in ribose nucleosides. There is therefore a need for further studies of deoxy nucleosides and nucleotides.

Crystals of deoxyuridine were obtained from aqueous solutions. The unit cell is monoclinic with dimensions $a=7.91 \text{ \AA}$, $b=6.71 \text{ \AA}$, $c=18.77 \text{ \AA}$, $\beta=96.6^\circ$ and the space group is $P2_1$. There are four molecules in the unit cell and therefore two molecules in the asymmetric unit. Intensity data were collected with a Hilger and Watts linear diffractometer using molybdenum $K\alpha$ radiation. The structure was solved by Patterson interpretation methods. The first step was the determination of the orientation of the plane of the pyrimidine bases in the unit cell using the $I(\theta, \varphi)$ function of Tollin and Cochran⁵. The orientation of the pyrimidine base within the plane was determined by means of a rotation function⁶, and the positions of the molecules relative to the 2_1 axis were found using the $Q(X_0 Z_0)$ function of Tollin⁷. Full details of the structure determination will be given elsewhere. The R factor at the present stage of refinement is 0.08.

The conformation of both molecules in the asymmetric unit is very similar. The pucker of both sugars is C(2') endo, or C(2') endo-C(3') exo with respect to the three-atom plane C(1')-O(1')-C(4'). Displacements of the C(2') atoms in molecules I and II relative to this plane are 0.508 and 0.383 \AA respectively, and of atoms C(3') they are 0.111 and 0.210 \AA respectively. Thus the sugar pucker in deoxyuridine is like that in the majority of deoxynucleosides and differs from that in thymidine.

The glycosidic torsion angle, φ_{CN} , defined by Donohue and Trueblood⁸, is -28° in molecule I and -24° in molecule II.

ANALYTICAL RESEARCH LABORATORY

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RSW	WL ✓
HYS	

Central File

REQUISITION & REPORT

0755 Alabama Talc Lot #1972
 PRODUCT 0755 Alabama Talc Lot #1971 ANAL. JOB NO. 10691

PROJECT NO. 50007 MFG. _____

DATE MFD. _____ CODE 0755 BATCH NOS. 1972, 1971 DATE SUBMTD. 2/17/72

NO. OF SAMPLES 2 SUBMITTED BY A. Leardi/R. S. Wilsher DATE RPTD. 3/2/72

DEPT: Exploratory Product Research

ANALYSIS REQUESTED IR Spectra (KBr pellets) ball mill each sample in dry
, " 95% Ethanol.

REASON FOR REQUEST To characterize Avon talcs preliminary to an
 REMARKS attempt to detect the presence of asbestos in
talc by IR. Please return copies of spectra
with this report.

						ANALYST	METHOD
IR analysis of the above two talcs show no significant differences between the two talcs.							
IR reference spectra are attached as requested.							
NOTE: No differences in IR spectra were observed previously between dry milling and 95% Ethanol milling. All samples are being only dry milled.						WL ✓	

NOTEBOOK NOS./Pg. 2029/43 APPROVED BY RAA