Food Authority

Lunch box survey 2023 and experiment

NSW Food Authority scientists tested the temperature of lunches on a hot day in different conditions, then sent the food to the lab to look at bacteria growth.

Background

In 2009, the Food Authority's scientists investigated lunch box safety by:

- doing a survey on the sort of foods children take to school
- testing how warm sandwiches in lunch boxes get on a summer day and measuring bacteria growth.

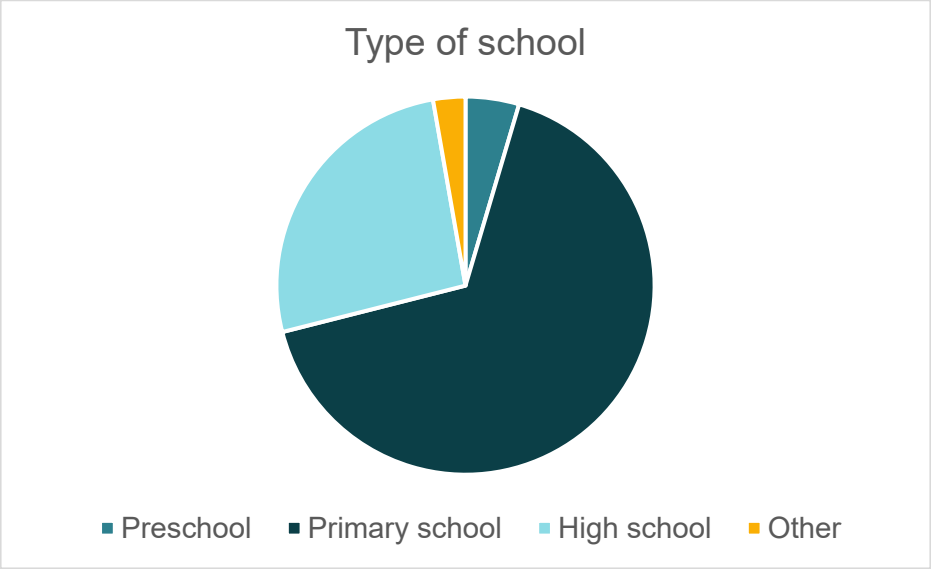
The 2009 time-temperature tests showed that keeping lunch boxes cool helped to slow down the growth of bacteria in the sandwiches.

In 2023 we repeated the online survey to see whether the foods children were taking to school had changed. We also analysed bacteria growth in a new food - cut watermelon.

Survey results

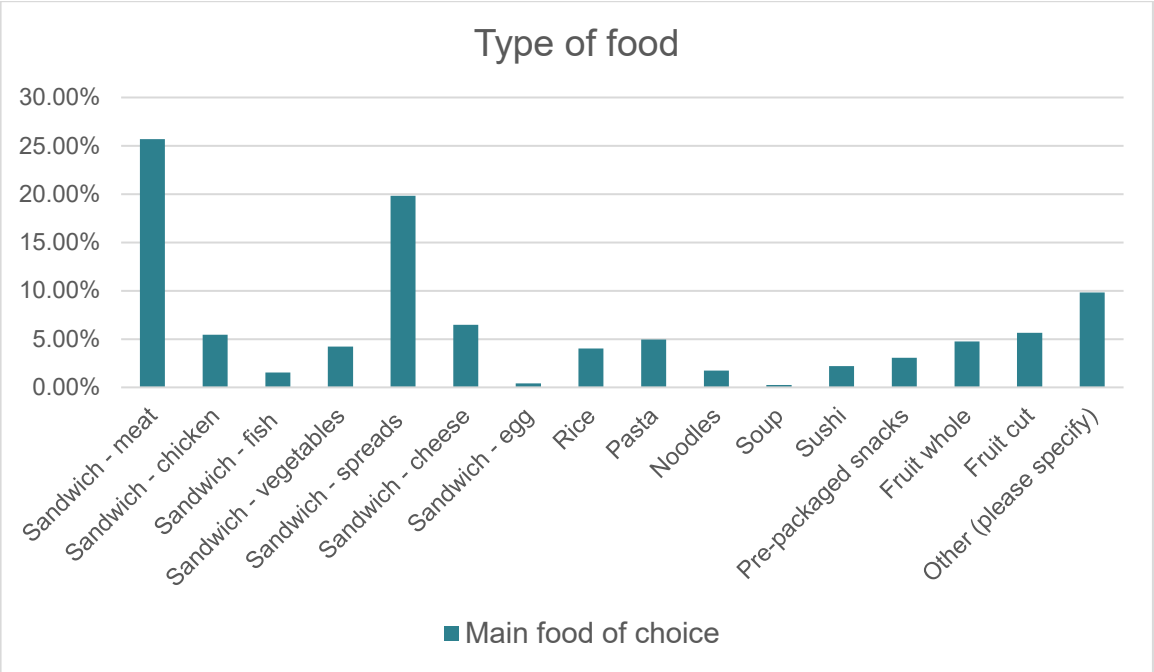
The online survey was launched at the 2023 Sydney Royal Easter Show and data collection continued until 30 June 2023. There were 2,425 responses to the survey. Most were from primary school students in greater Sydney and regional NSW.

Figure 1: Survey responses for school type



The survey indicated sandwiches were still the most common food brought to school, followed by cut fruit and pasta.

Figure 2: Survey responses for food type



Most respondents used re-usable containers to take their lunch to school and reported that containers were mostly stored in school bags left outside in the shade.

Figure 3: Survey responses for type of container

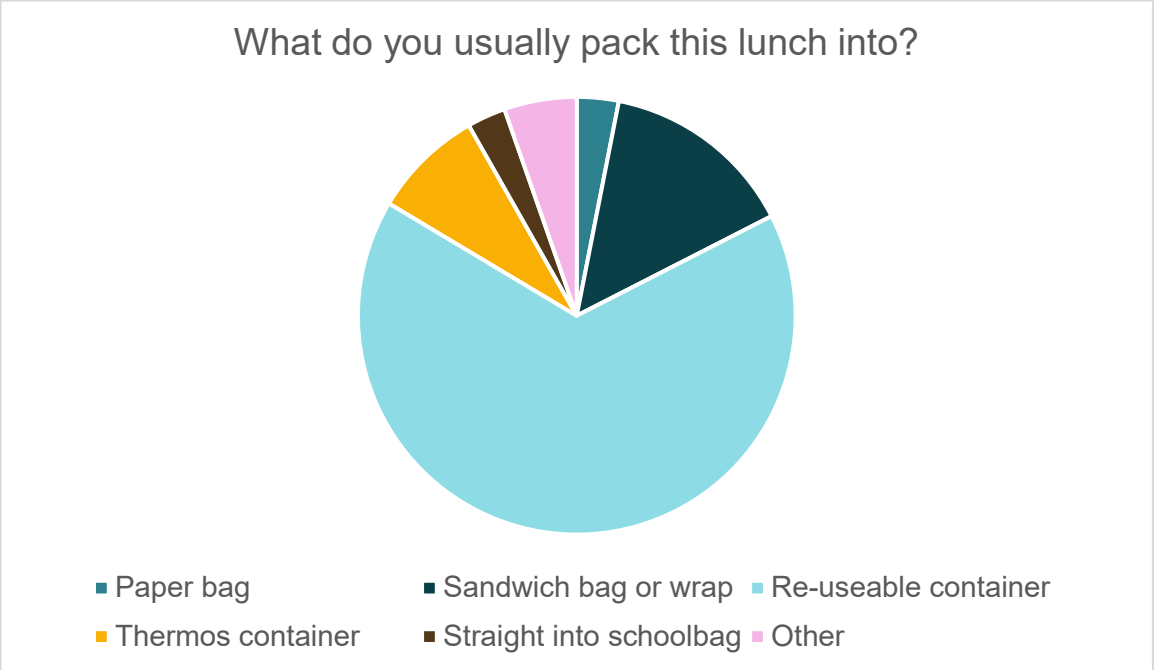
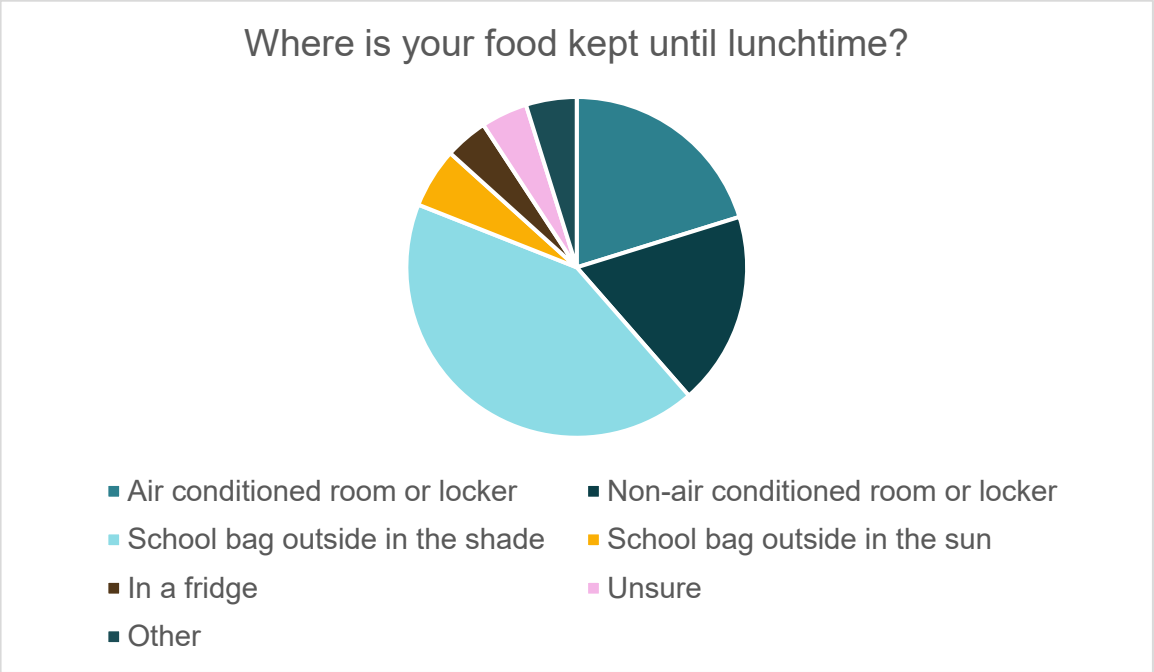
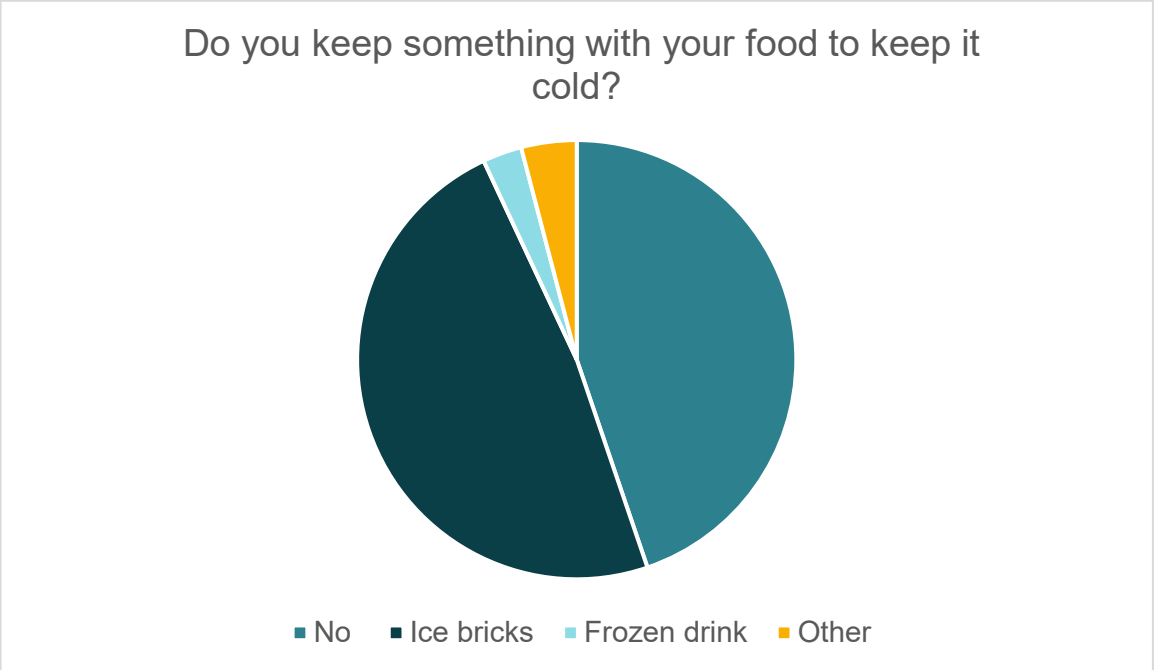


Figure 5: Survey responses on food location



About 51% of respondents said they used an ice brick or frozen drink to keep their lunch cool – a positive improvement on the 2009 survey result of 29.3%.

Figure 4: Survey responses on keeping lunch cold



Time-temperature experiment

Using the information from the survey, a time-temperature experiment was conducted.

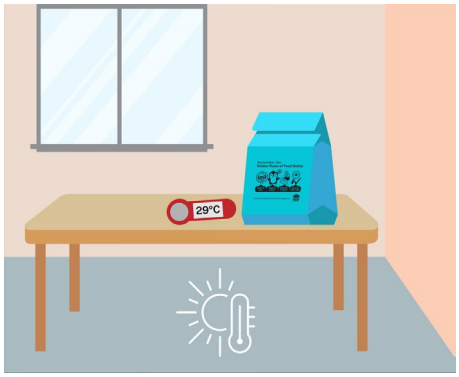
We already knew from the 2009 study that keeping sandwiches cool helped to slow down bacterial growth. For the new experiment, we extended the data to include cut fruit, using watermelon.

The time-temperature experiment was conducted when the outside temperature was above 30°C, between 8am and 2pm. The temperature of the fruit was monitored using a temperature measuring device (data logger). At the end of the experiment, fruit samples were sent to the laboratory for Standard Plate Count testing – which is a method of counting bacteria.

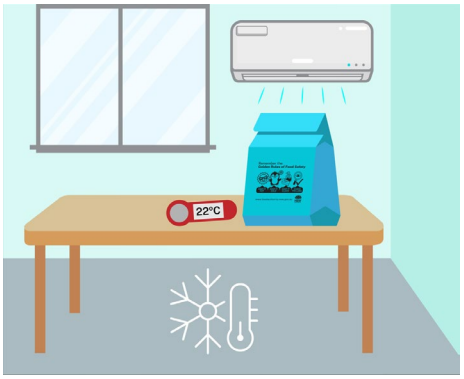
Table 1: Experiment methodology overview

Food	Preparation method	Type of container	Storage condition
Cut fruit (watermelon)	Fruit was cut the day before and stored in the refrigerator overnight.	• Sandwich bag • Re-usable container	• Outside in the shade • Non air-conditioned room • Air-conditioned room

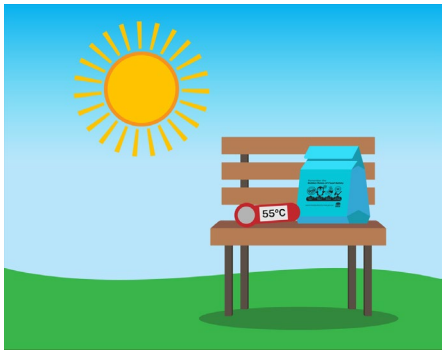
The following temperatures represent what can happen on a hot Sydney summer day (worst case):



Non air-conditioned room – 29°C



Air-conditioned room – 22°C



Outside in the sun – 55°C

Outside in the shade – 35°C

Temperature results

The temperature of the non-air-conditioned room was about 5 to 7 degrees cooler than the outside temperature. Temperature in the air-conditioned room was around 20 degrees.

The fruit stored without ice bricks reached surrounding temperatures quickly. When an ice brick was used, the temperature of the fruit was about 6 to 10 degrees lower than those without an ice brick.

No significant difference was observed in the temperature profile between fruit stored in a sandwich bag or re-usable container.

Figure 6: Temperature of cut fruit in re-usable containers

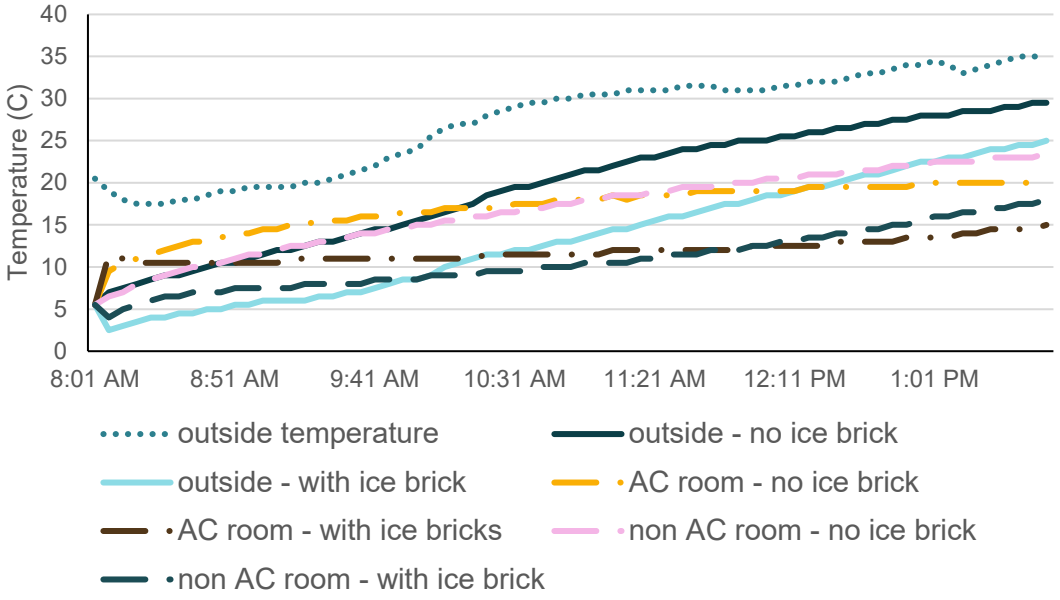
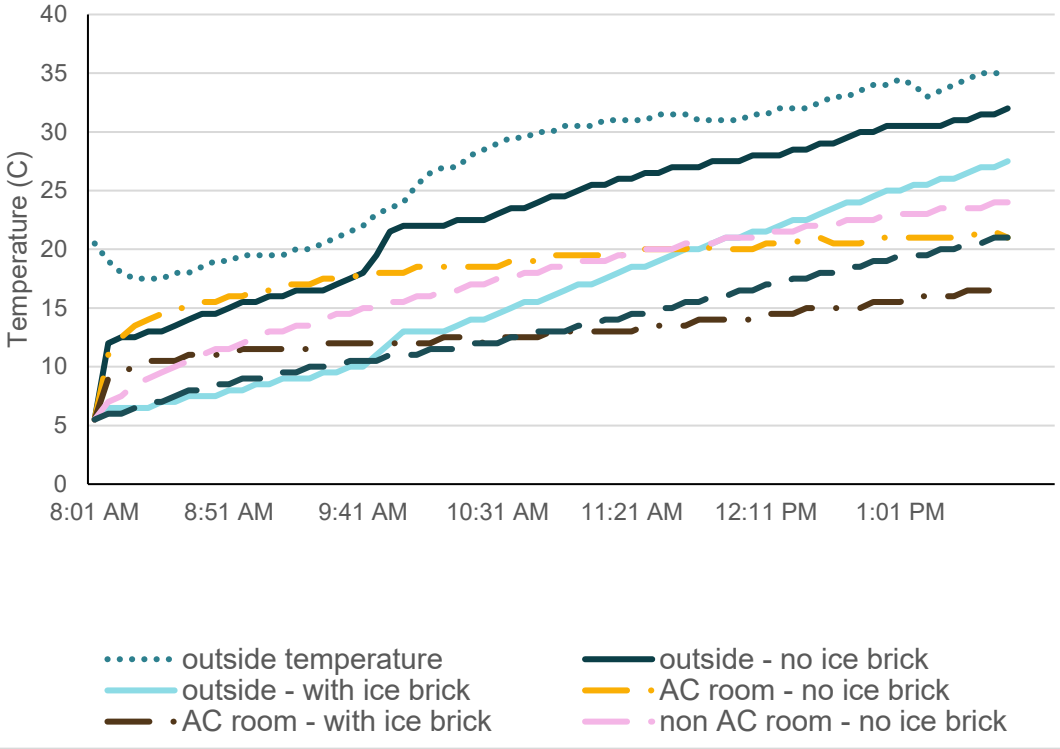


Figure 7: Temperature of cut fruit in sandwich bags



Microbiological testing results

Samples of the fruit were sent to the laboratory at the end of the experiment. The table shows how microorganisms multiplied in the test conditions compared to the control sample stored in the refrigerator the whole time.

Table 2: Microbiological growth

	Outside	Non-AC room	AC room
Control	90 cfu/g	90 cfu/g	90 cfu/g
Sandwich bag – no ice bricks	13x	11x	2.5x
Container – no ice bricks	9x	1.5x	16x
Sandwich bag – with ice bricks	2x	2x	6x
Container – with ice bricks	4x	2x	Not reported

cfu/g= colony forming units/gram

Conclusion

The microbiological results showed, in general, that at higher temperatures, more organisms grew, which was expected.

The experiment confirms the importance of keeping food cool.

An ice brick stored with the food helps, indoors is cooler than outdoors and air conditioning is cooler than no air conditioning.

More information

- Visit Lunch box science in focus
- Phone the Food Authority helpline on 1300 552 406
- Email food.contact@dpi.nsw.gov.au