

# How cold are the Christmas buffet dishes?

**QUESTION:** It's soon time for us to have our Christmas buffet and some of the dishes of food on the table should be kept chilled. Does that really work?

Anna W

**ANSWER:** It's time again for the Christmas buffet and some of the dishes of food must be kept warm and others must be kept cold. It is not difficult in terms of heat technology to keep food warm but unfortunately it is not so easy to keep dishes on the buffet table at a low temperature.

One effective method of keeping food cold is to place the dishes of cold food on a bed of crushed ice. The ice melts but as long as pieces of ice remain in the mixture of ice and water, the temperature is 0 °C. Heat is transferred to the food and the serving dishes via natural convection from the air in the room and radiation from the room itself. The heat transfer inside the food and the serving dishes occurs via conduction, and the heat is then transferred further to the bed of ice. Lamps nearby the buffet table and heat from the guests also heat up the food. See Figure 1.

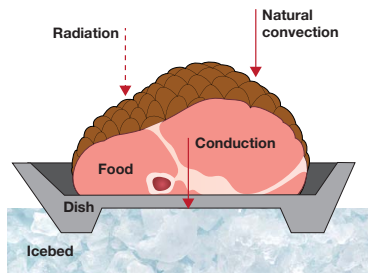


Figure 1. The bed of ice chills the entire bottom of the serving dish.

Another way to keep food cold is to place the serving dish on a cold tray. The heat transfer from the serving dish to the tray is not as efficient as the heat transfer from the serving dish to the ice bed. In the air gap that can exist between the serving dish and the tray, the heat transfer occurs mainly via conduction. See Figure 2. Even if the serving dish has a flat bottom, the contact between the dish and the tray is not perfect. We can regard this as a kind of contact resistance between the serving dish and the tray. The food can therefore become somewhat warmer than in the previous case with the bed of ice. If the moisture in the air condenses on the tray and serving dish, this will increase the heat transfer to the tray.

The tray can be kept cold in various ways. One method is to chill it with a refrigerating machine. Another method is for the tray to contain a phase change material with a suitable melting point. As long as the material continues to melt, it will maintain the melting temperature. For example, you could use a suitable salt, a wax mixture, or water as a phase change material. One disadvantage of using phase change materials is that the tray must be chilled at regular

intervals so that the material resolidifies. How long the tray then remains cold depends on such factors as the amount of phase change material, the type of material and the amount of heat being supplied. If you only use a cold metal tray, it must be chilled often in order to work properly.

One less effective method is to put the serving dish directly on to table. In this case, even if

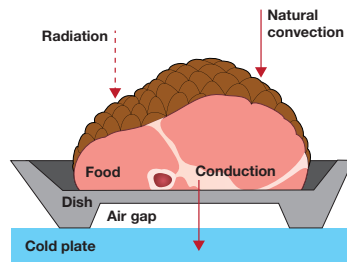



Figure 2. An air gap reduces the heat transfer to the tray.

you place the dish onto an insulating cork mat, heat from the table will also be transferred to the dish and food by conduction and the food will quickly warm up.

If the food and the serving dish are at refrigerator temperature from the beginning, it is often not difficult to keep the food cold for a limited period of time if the serving dish is placed on a cold surface. For example, when you use a bed of ice, the bottom of the serving dish has a temperature of 0 °C as long as all the ice has not melted. The recommended temperature inside a refrigerator is 4 – 5 °C. It is important that both the food and the serving dishes are at refrigerator temperature from the start and not at room temperature. In the latter case it will take time before the food cools down to refrigerator temperature, and in the worst case the cooling process is so slow that it does not occur at all while the food is on the table.

Questions should be of general interest and be about temperature measurement techniques and/or heat transfer.

**QUESTIONS?**  
**ANSWERS!**

If you measure the temperature of the food, you must do so at various places within the food and at various times. The food's temperature varies because the heat transfer inside the food and to/from the food varies both according to the position and over time. The influence of the contact resistance on the heat flow can be significant. 

If you have questions or comments, contact Dan Loyd, LiU, [dan.loyd@liu.se](mailto:dan.loyd@liu.se)