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METHODS

Ideal Cooling Process for Paraffin-Embedded Tissues

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Back in the seventies everybody was convinced that it was no longer necessary to cool paraffin-embedded tissues, because of the new advances in the production of paraffin. The reason for this assumption was the addition of plastic polymers and dimethyl sulfoxide. The quality of tissue sectioning improved because of these additives. The daily routine in the histology laboratories shows that it is impossible to produce good quality cutting without cooling. Cooling the paraffin by means of cooling plates or ice dishes creates drastic improvement; the cutting quality improves and it is much easier. Both improvements speed up the process and save time for the technicians and the physician. Long-term study indicates that not only the temperature but also the methodology of cooling and the cooling rate are playing a decisive role in the cutting quality. (Pathology Oncology Research Vol 10, No 3, 172–173)

Keywords: sectioning, paraffin block, cooling technique

Introduction

Back in the seventies everybody was convinced that it was no longer necessary to cool paraffin-embedded tissues, because of the new advances in paraffin production. The reason for this assumption was the addition of plastic polymers and dimethyl sulfoxide. The quality of tissue sectioning improved because of these additives.[1] The daily routine in histology laboratories shows, that it is impossible to produce good quality cutting without cooling the blocks. Cooling the paraffin by means of cooling plates or ice dishes creates drastic improvements. The cutting quality improves and it is much easier. Both improvements speed up the process and save time for the technicians and the physician.

Long-term study shows that not only the temperature but also that the method of cooling and the cooling rate are important. The ideal cutting temperature should be between –4°C and –8°C (in the centre of the paraffin block). This temperature should be achieved as quickly as possible. If the cooling process takes too long, or if the paraffin block is cooled only from one side, it may create tension and/or ice crystals in the paraffin block.[2] Rapid cooling by means of ice dishes or flat cooling plates is not possible. One possibility is the use of a cooling plate with counter-sunk bottom and a cooling capacity of –35°C with insulated walls similar to those of a chest freezer. This kind of cooling plate allows the cooling of the paraffin block from all sides. The cooling process is thus much faster, the structure of the paraffin block is homogeneous and the ice crystals are very small. This method saves time and improves the cutting quality considerably.

Experiments in cooling paraffin blocks with temperatures of –60°C and lower have been abandoned because of the enormous technical demands and cost. It is absolutely necessary to cool the centre of the paraffin block as quickly as possible. The main problem is the insulation of warm air around the paraffin block.

Figure 1. indicates that if ice dishes were used, the temperature of the paraffin block was only +10.1°C after 10 minutes. After 36 minutes the temperature of the paraffin block was still +7.6°C, far from the ideal –4–8°C. If a flat cooling plate with a cooling capacity of –10°C is used, slightly better results could be achieved. The temperature of the paraffin block was +8.3°C after 10 minutes and after 36 minutes it was +3.7°C. However, the time consumed was not efficient and it was still impossible to reach the necessary temperature of –4 to –8°C.

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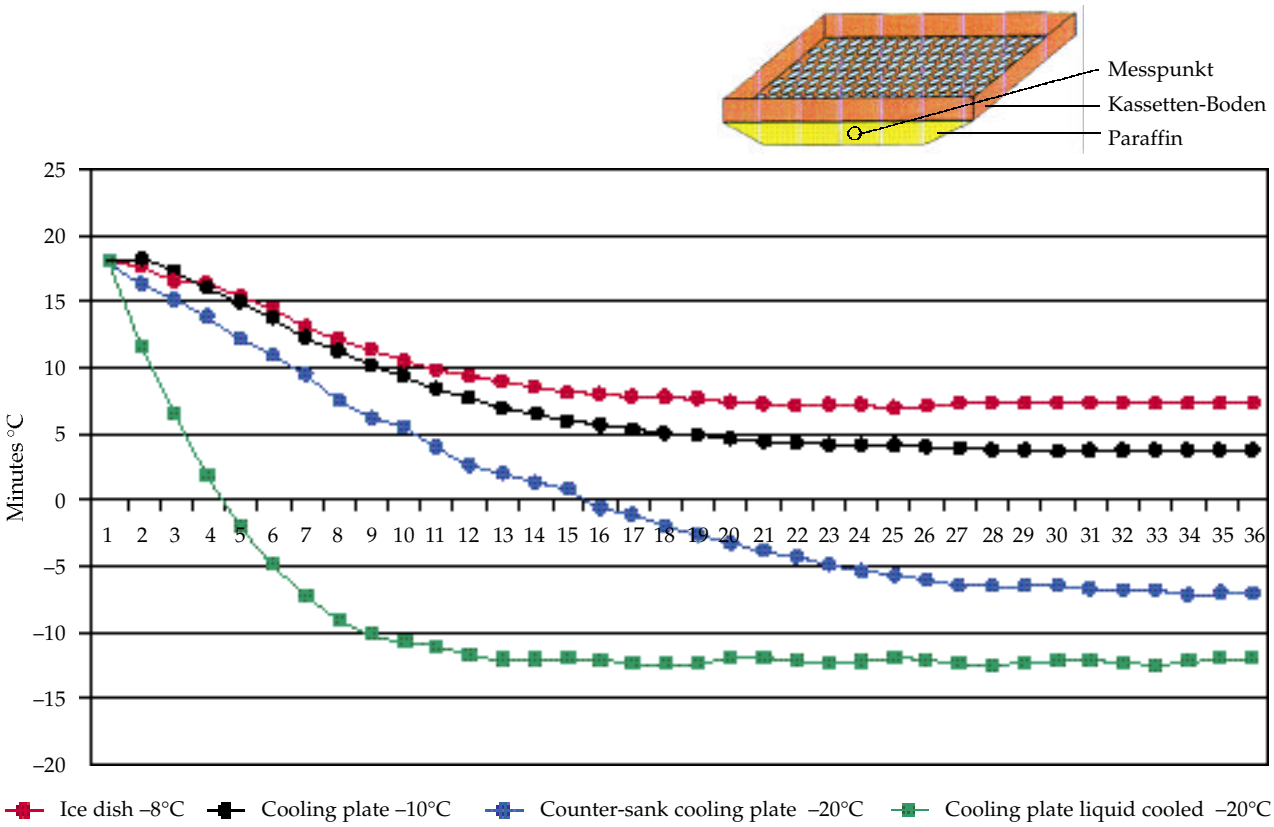

Figure 1. *Cooling procedure of paraffin embedded tissue. Test conditions: Room temperature +21°C. Measuring point is the middle of the paraffin embedded tissue*

The use of a cooling plate with counter-sunk bottom similar to that of a chest freezer was also not efficient. After 10 minutes the temperature reached +4°C and the necessary –4°C was reached only after 21 minutes. The best available technology is a cooling plate with a counter-sunk bottom, similar to that of a chest freezer, with a liquid coolant in it, which is automatically moved. It is very important to move the liquid coolant in order to constantly flush the paraffin block with the liquid. As a liquid, 40% alcohol can be used which is almost odourless and non-toxic. The ideal cutting temperature of –5°C will be achieved after 5 minutes and the paraffin embedded tissue will have the best consistency for perfect cutting results.

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