

## Microwave Heating as an Alternative to Conventional Drying Ovens for Histological Section Adhesion: Evaluation Across Different Tissue Types

Beatriz Anselmo <sup>1</sup>; Marisa Laranjeira <sup>\*1</sup>, Manuela Novo <sup>1,2</sup>; Amadeu Borges Ferro <sup>1</sup>

1. Escola Superior de Saúde de Lisboa, Instituto Politécnico de Lisboa, Lisboa, Portugal; 2. Hospital Professor Doutor Fernando Fonseca - Unidade Local de Saúde Amadora-Sintra, EPE, Amadora, Portugal.

Adequate adhesion of histological sections to glass slides is essential for reliable microscopic evaluation and accurate clinical diagnosis. Conventionally, section adhesion is achieved using drying ovens, a method known for its effectiveness but requires high energy consumption and substantial laboratory space. Microwave oven heating has emerged as a potential alternative, offering faster processing and lower operational costs; however, its effectiveness for slide adhesion has not been systematically validated across different tissue types. This study aimed to evaluate the feasibility of microwave heating at 800W as an alternative to conventional oven drying for histological section adhesion.

Histological sections from breast, appendix, brain and bone tissues were exposed to microwave heating at 800 W for two intervals (3 minutes 40 seconds and 4 minutes 20 seconds), with 25 slides per tissue type and exposure time. An additional 25 slides per tissue type were processed using a conventional drying oven serving as controls. Adhesion quality was assessed macroscopically by measuring the percentage of non-adhered tissue after haematoxylin and eosin (H&E) staining. Data were analysed using non-parametric statistical tests, with a significance level of  $\alpha = 0.05$ .

The breast tissue showed the best adhesion, with mean detached area of 0.14% at 3

minutes 40 seconds and 0% at 4 minutes 20 seconds. Bone tissue exhibited the highest detachment, with mean detached area of 20.08% and 25.46% in the respective microwave durations. No statistically significant differences were observed between microwave and oven drying for breast and appendix tissues, whereas bone and brain tissues showed significantly poorer adhesion with microwave treatment ( $p < 0.05$ ). Overall, the drying oven provided more consistent adhesion across tissue types, while microwave effectiveness varied according to tissue characteristics and exposure duration.

In conclusion, microwave heating may serve as a complementary method for histological section adhesion in selected tissues, particularly breast, but does not yet match the consistency of conventional drying ovens for tissues with complex structural properties such as bone and brain. Further optimisation of microwave parameters is required before routine implementation in histopathology laboratories.

**Keywords:** Histological techniques; Microwaves