# Peace of Mind That You're Always Prepared:

An Educational Series on the Value of Routine PM Service

**Part 5: Microtomy**

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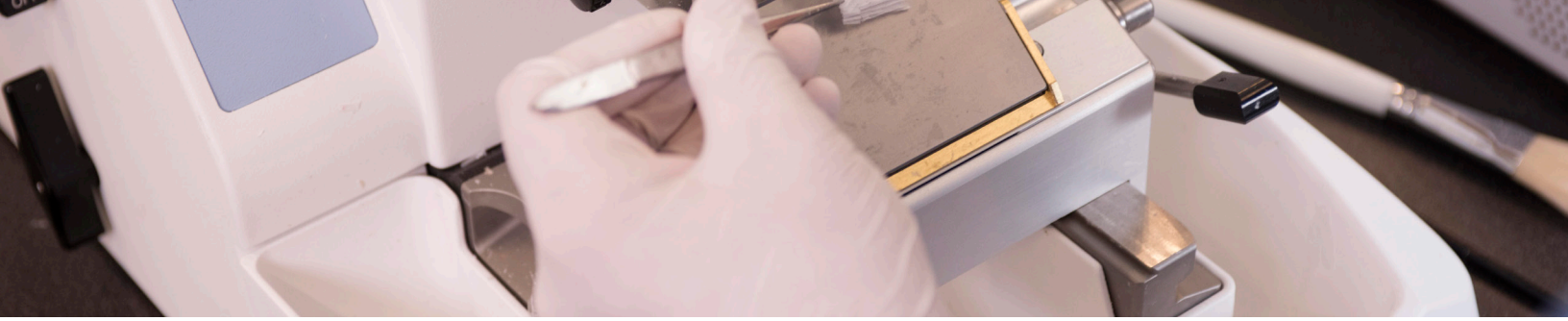

**Peace of Mind That You're Always Prepared:**

**Part 5: Microtomy**

One of the most delicate pieces of equipment in the histology laboratory is the microtome. Microtomes made in the 1940's and 1950's were entirely mechanical and were still able to be used to cut paraffin sections down to two microns thick. Daily maintenance using oil for the flywheel and grease for the advancing plate and worm screw provided a reliable machine with which to cut paraffin sections using steel microtome knives (sharpened by hand by the histologist).

Currently most histology laboratories have upgraded their microtomes. Newer microtomes still rely on the mechanical movement of the flywheel to advance the paraffin block. However, all user operations from thickness selection to paraffin block advancement are now carried out electronically. Furthermore, there are microtomes that can automatically face off a paraffin block to a pre-determined depth, preparing it for final sectioning by the histologist.

Microtome vendors usually offer a choice of controls, including separate hand and foot control units. Additionally, all tolerances within the microtome are very exacting, which allows precise section thickness and user choice of sectioning speed. Different tissue types require different speeds of microtomy. While histologists do not have to oil and grease their microtomes on a daily basis anymore, they do need to perform daily maintenance in the form of cleaning waste paraffin from the machine, especially from the block holder (chuck) and knife holder mechanism. Paraffin buildup in these areas can, over time, be a cause of "thick and thin" sections and "venetian blind" effects.

Even when a microtome is kept clean and free of paraffin debris, section thickness may begin to vary due to mechanical wear and/or electronic malfunctioning. These are the main reasons that microtomes should receive an annual preventative maintenance provided by your vendor service technician. The interior mechanical operation of the microtome must be examined for evidence of wear. Also, the service technician will use a device to measure the exact section thickness, as compared to what has been selected. Any worn parts will be replaced.

The electronic controls and operations will also be examined. Settings such as coarse trim, fine trim, block retraction, etc., must be confirmed to be fully operational, with no issues. During microtomy, the block holder cannot be allowed to "jump" ahead. This could jeopardize the integrity of the tissue within the block and put the histologist in danger of a cut finger. The service technician will also examine the various "ribbon cables" within the microtome, to determine if there is any evidence of wear. Proactive replacement of such cables should help to prevent a malfunction of the microtome.

Preventative maintenance of microtomes is imperative for histology laboratories. Different tissues are cut at different thicknesses to enable diagnoses. For example, renal biopsies are usually cut at 2 microns thickness. This enables the pathologist to assess the basement membrane within glomeruli. Surgical specimens are usually cut at four to five microns thickness for H&E staining, while a special stain for amyloid is usually cut at eight to ten microns thickness. These are very narrow tolerances and require a microtome that is at one hundred percent operation – all day, every day. As discussed above, regular periodic preventative maintenance can help to ensure accuracy of microtomy.

Periodic preventative maintenance of microtomes can also help the laboratory remain in regulatory compliance. CLIA regulations specify that the laboratory must “maintain records, equipment and facilities necessary for the proper and effective operation of the laboratory [42 U.S.C. Sec 353 (f) (B)]. Similarly, CAP checklist items require maintenance and function checks (COM.30600), function check tolerance limits (COM.30625) and instrument and equipment records (COM.30675). In addition, microtome maintenance is specifically referred to (ANP.23400).

The microtome preventative maintenance should include a check on the tissue float bath, used to float out paraffin ribbons. All electrical connections should be checked to prevent an electrical shock hazard to laboratory personnel. As with embedding equipment, the temperature control switch should be checked for accuracy of a digital read out. If using a regular non-mercury thermometer, there should be records of calibration with a thermometric standard device (NIST). This will also ensure that this equipment remains in compliance with regulatory agencies (CAP: ANP.23350, COM.30700, COM.30725, COM.30750).

Regulatory requirements should go hand in hand with common sense to make certain that microtomes and tissue float baths receive annual preventative maintenance. This will ensure the high accuracy required during microtomy to produce optimal slides, as well as facilitate the smooth flow of specimens through the histology laboratory.

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Clifford Chapman has over 40 years experience managing both private reference and teaching hospital pathology laboratories in the Boston area, including Massachusetts General Hospital, Pathology Services, Children’s Hospital Boston, and StrataDx.

He also has over 25 years experience presenting lectures, workshops, teleconferences and webinars at the local, regional and national level for the Massachusetts Society for Histotechnology, Region I Histology and National Society for Histotechnology.

Clifford is a specialist in histological techniques, quality management, laboratory workflow and laboratory safety. He is an author and co-author of over thirty scientific publications, including his most recent book “Dermatopathology Laboratory Techniques”. Clifford is currently the Technical Specialist at StrataDx and works as a consultant at Medi-Sci Consultants.