



HISTOPATHOLOGY - FIRST COURSE

LAB -12- AUTOMATION IN THE HISTOLOGY DEPARTMEN

Sawa University

جامعة ساوة الاهلية

College of health and medical techniques

كلية التقنيات الصحية والطبية

Department of Medical Laboratories

قسم تقنيات المختبرات الطبية

Third Stage

المرحلة الثالثة

محاضرة رقم 12

Lecture No. 1

الجانب العملي

Practical

تدريسيين المادة : م.م هبه صاحب صادق
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INTRODUCTION:

Automation in histology uses machinery and software to streamline lab processes like tissue processing, staining, embedding, and analysis, increasing efficiency and accuracy while reducing human error. Key benefits include faster turnaround times, improved consistency, reduced manual labor, and enhanced safety. Automation also supports [digital pathology](#) and [artificial intelligence \(AI\)](#) for image analysis, allowing for more complex tasks and improved diagnostic capabilities.

Areas of automation

Tissue processing: Automated processors can handle the steps of fixation, dehydration, and infiltration, often allowing processes to run overnight.

Staining: Automated systems can perform routine staining like hematoxylin and eosin (H&E), as well as special stains and immunohistochemistry (IHC).

- **Embedding:** Robotic systems can automate the embedding of tissue blocks in paraffin, saving significant time and improving consistency.

- **Cutting (Microtomy):** Automated microtomes can trim blocks and cut sections with adjustable speed and precision.
- **Analysis:** Digital pathology uses automated image acquisition and AI-based algorithms to analyze slides, which can improve diagnostic accuracy and efficiency in tasks like cancer detection.
- **Workflow and tracking:** Automated systems like [barcode scanning](#) and [Laboratory Information Management Systems \(LIMS\)](#) track specimens, reduce errors, and streamline data management.

Benefits of automation

- **Increased efficiency:** Automation allows for simultaneous processing of multiple samples, speeding up turnaround times.
- **Improved accuracy and consistency:** Automated systems reduce human error and provide more reproducible results than manual methods.
- **Enhanced safety:** Enclosed automated systems minimize the handling of hazardous reagents and tissue specimens.

- **Reduced manual labor:** Automation frees up skilled histotechnicians from repetitive tasks, allowing them to focus on more complex, value-added work.

Challenges of automation

- **Initial investment:** The cost of acquiring and implementing automated systems can be high.
- **Integration:** Integrating new technology with existing systems can be complex.

- **Training:** Staff require training to operate and

— maintain new automated equipment and software.

- **Resistance to change:** Adapting to new processes can be uncomfortable for staff who are used to traditional methods.

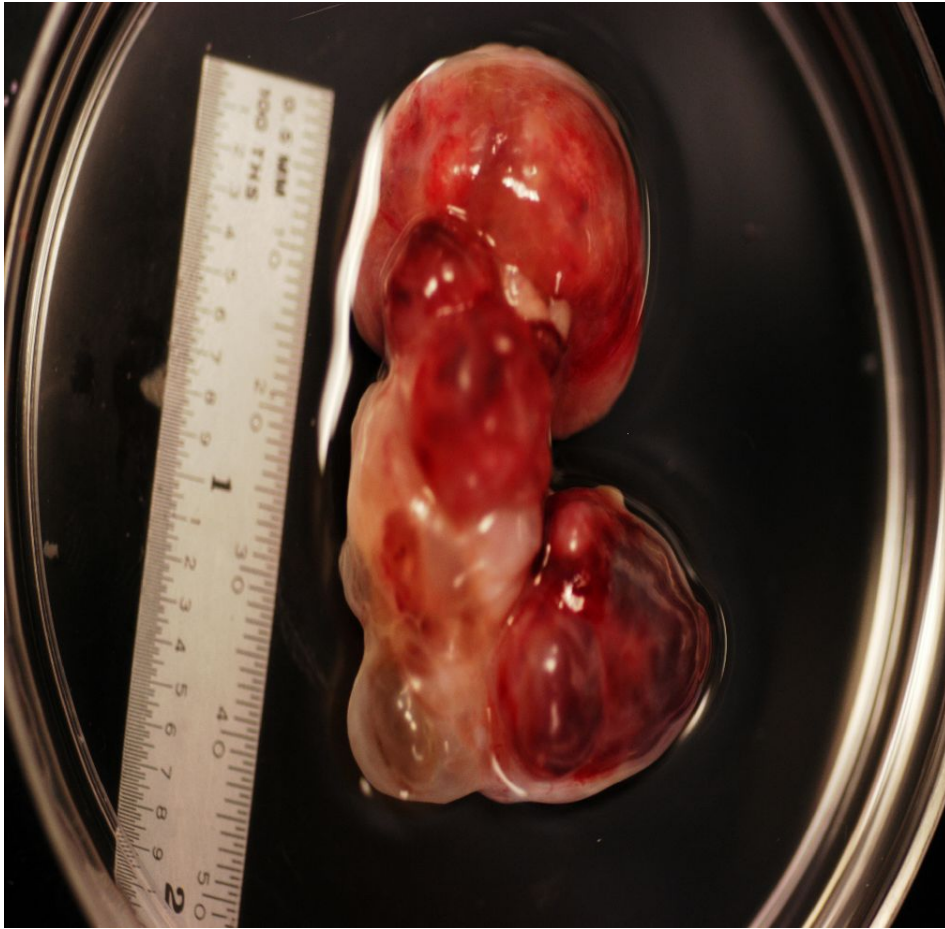
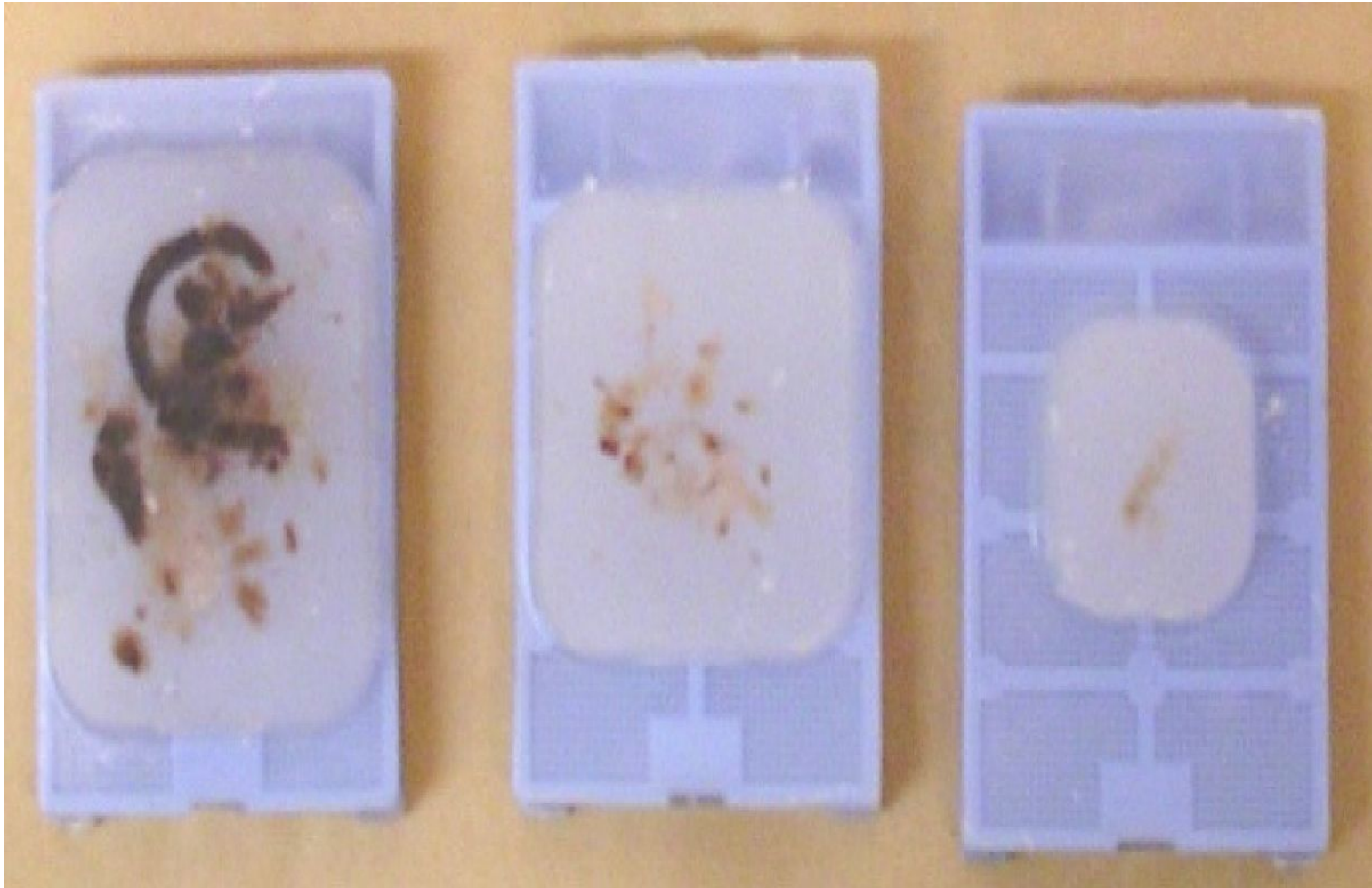


Fig. 2. A large gross specimen (left) is cut into smaller pieces and placed into cassettes (right) for further processing.



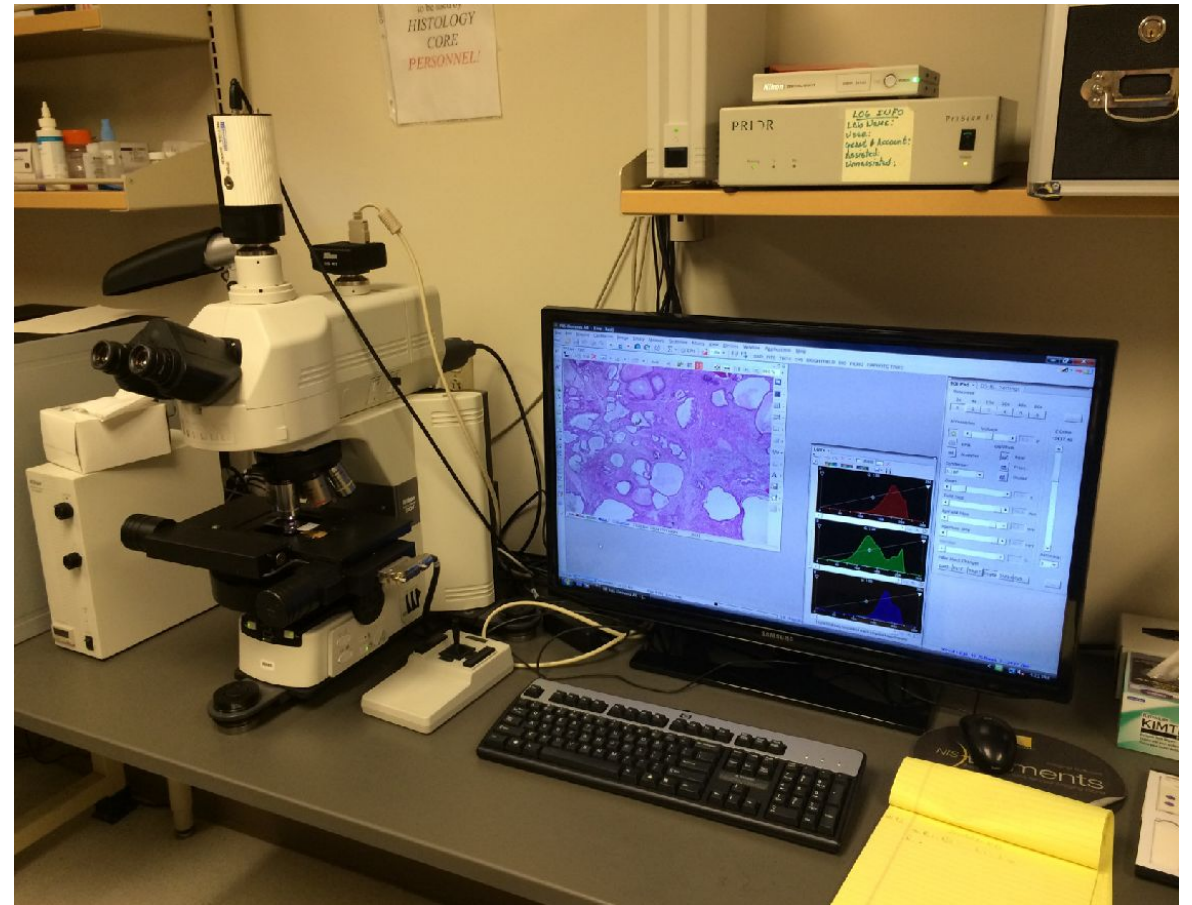
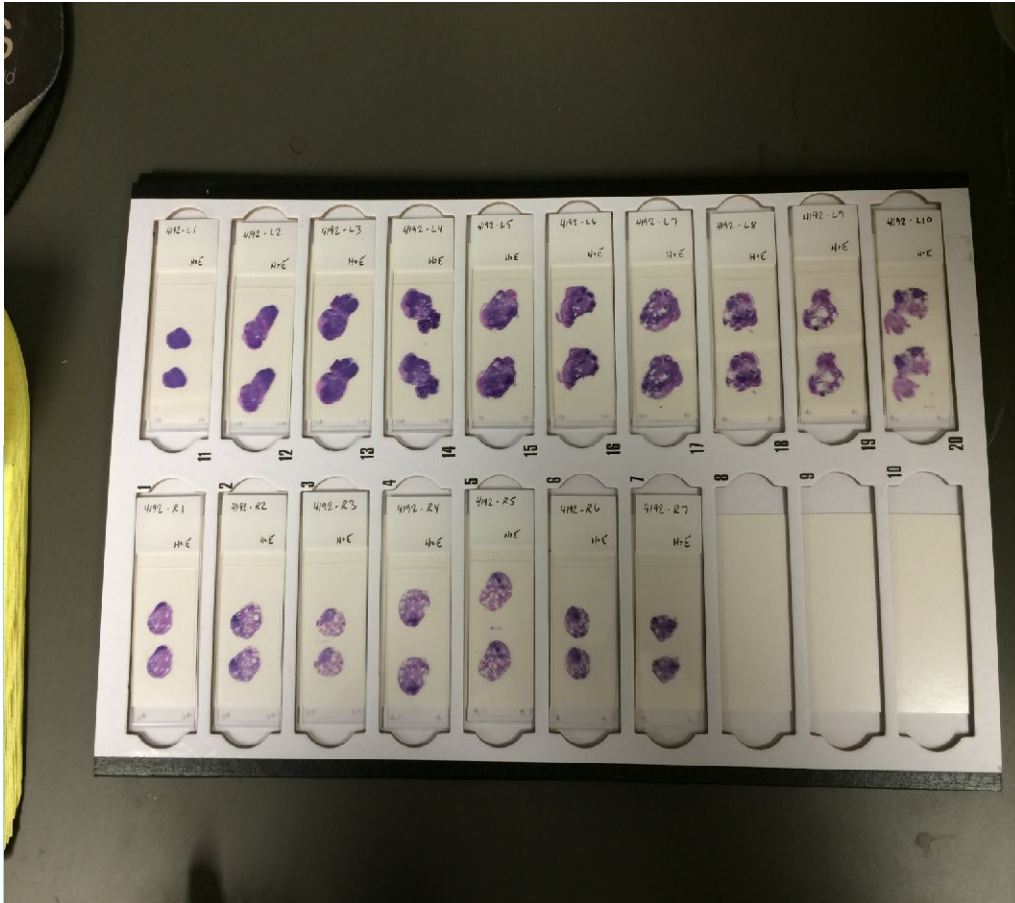
(left) Paraffinized tissue is oriented and embedded into a block of paraffin. (right) Tissue blocks after embedding.



(left) During sectioning, the the tissue block is sliced into 3–4 μm sections, which remain connected in a ribbon. (right) Collecting a ribbon from the water bath with a glass slide.

*Specimen Types and Handling

- *Tumor Specimens*: Handle with care, ensuring adequate sampling for diagnosis
- *Frozen Sections*: Use cryostat and proper fixation techniques
- *Small Biopsies*: Handle gently, using specialized techniques
- *Large Specimens*: Use proper dissection and sampling techniques



(left) Histology slides after staining. (right) Visualization setup including a microscope with attached camera and desktop computer.



Automated tissue processor



References

- [1] Bancroft JD, Gamble M. Theory and Practice of Histological Techniques. 7th ed. Churchill Livingstone; 2013.
- [2] Rosai J. Rosai and Ackerman's Surgical Pathology.

Any questions?

*Thank
You*