

# POST-MORTEM MICROSCOPIC CHANGES IN SELECTED RAT TISSUES:

BETRAYERS OF FORENSIC, TOXICOLOGIC AND  
DIAGNOSTIC PATHOLOGISTS

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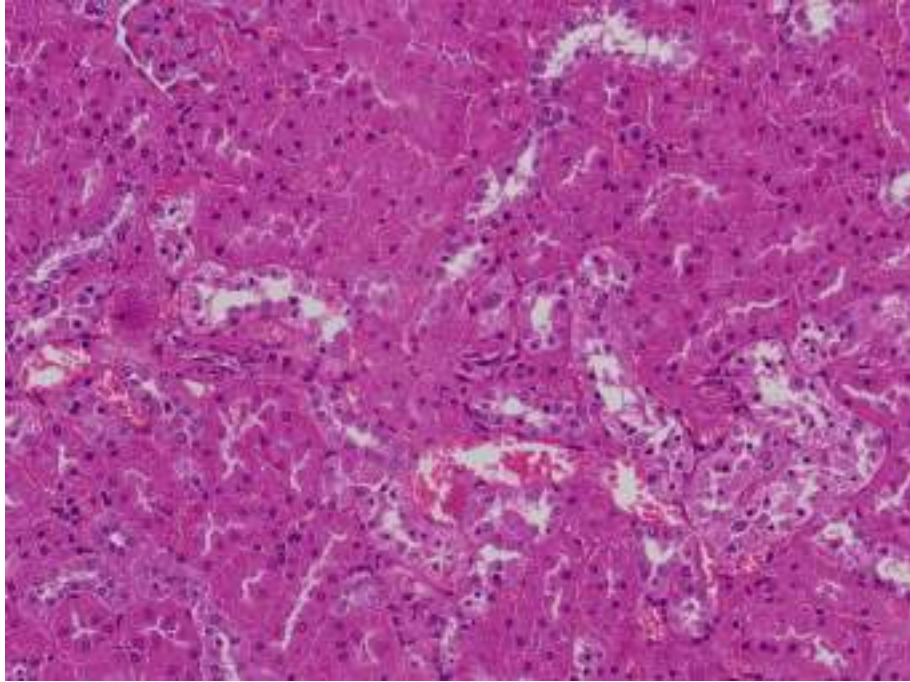
K. Weber, R. de Miguel, A. Domènech, R. Kreutzer, F.J. Mayoral, P. Ortega, Y. Okazaki,

L. Polledo, T. Razinger, O. Richard, R. Sánchez

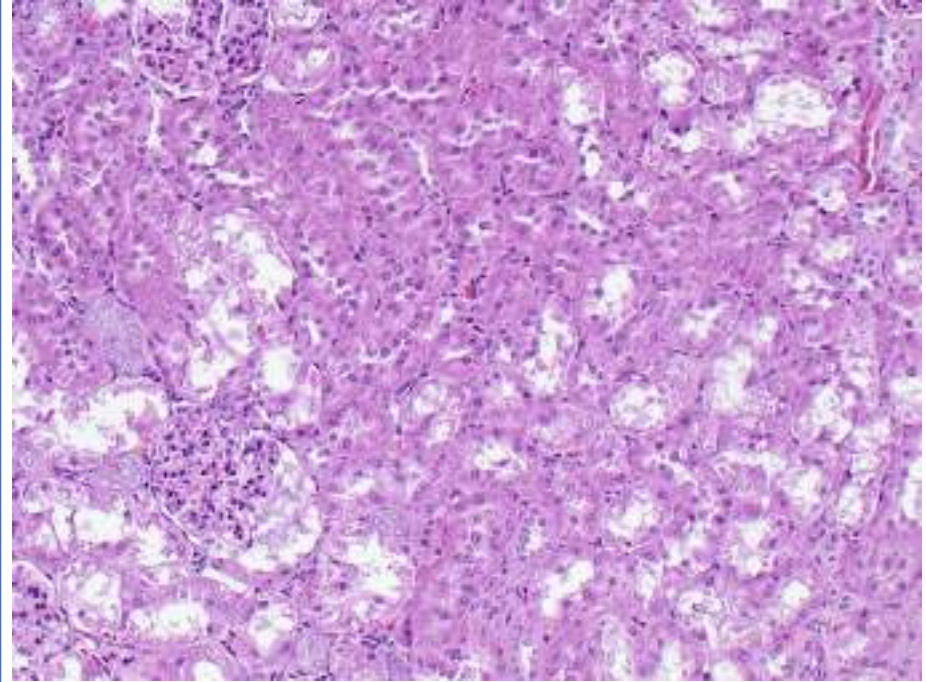


# POST-MORTEM ALTERATION OR REAL LESIONS?

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**AUTOLYSIS (4h) in Distal Convoluted Tubules**



**NECROSIS in Proximal Convoluted Tubules**

# AIM

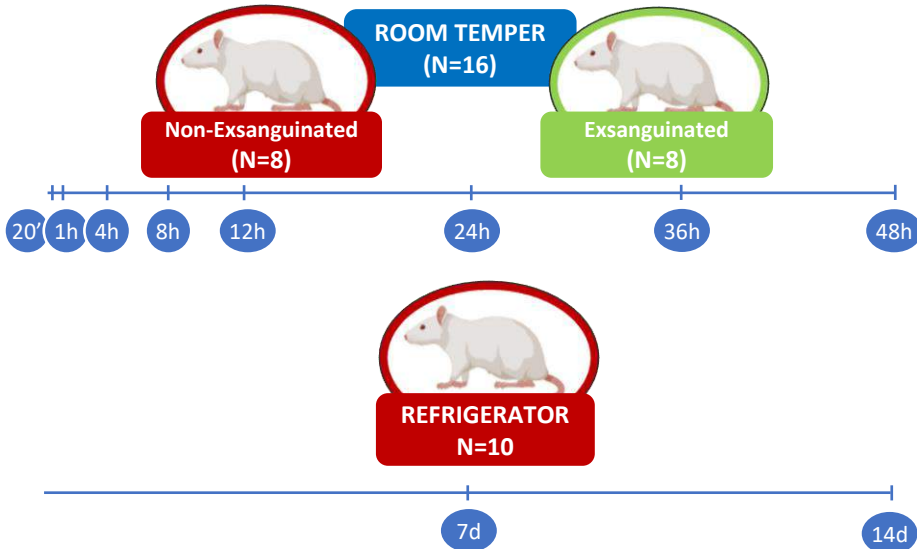
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TO DESCRIBE THE MICROSCOPIC CHANGES  
IN RAT TISSUES AFTER  
DELAYED POSTMORTEM FIXATION

TO ANALYZE THE IMPACT OF  
EXSANGUINATION AND COOLING

# MATERIAL & METHODS

## ANIMALS: Wistar Han Rats



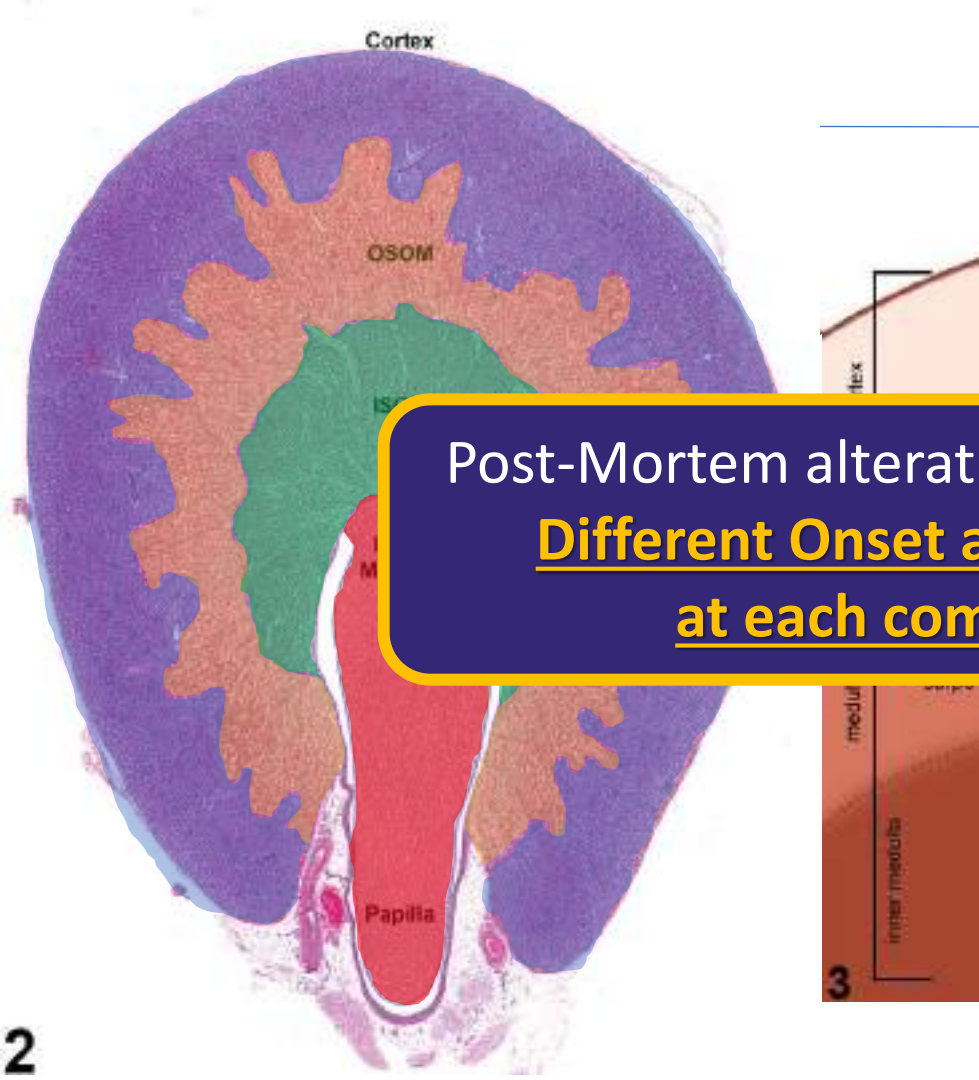
## TISSUES

- KIDNEYS
  - LIVER
  - DIGESTIVE SYSTEM
- 
- H&E Stain  
+  
Digital Scan

## HISTOLOGICAL EVALUATION (Digital Slides)



# KIDNEYS

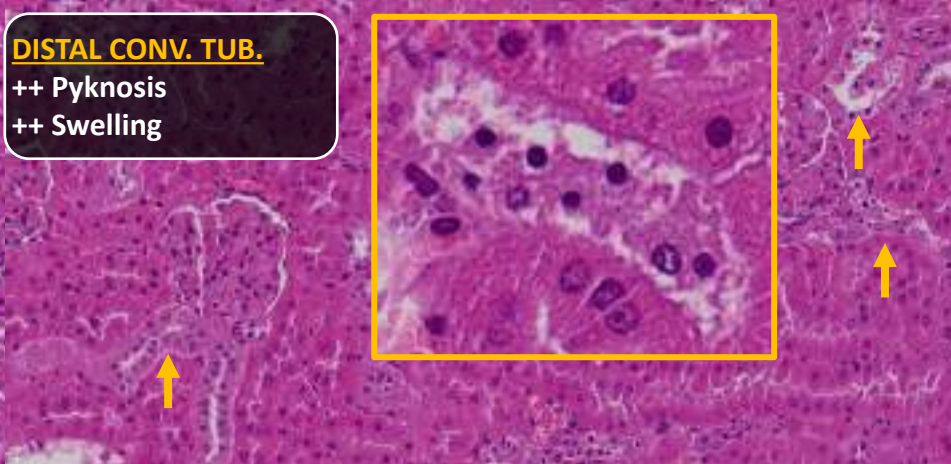


Post-Mortem alterations in Rat Kidneys:  
Different Onset and Progression  
at each compartment

- Glomerulus
- Proximal Convoluted Tubule
- Pars Recta
- Thin Descending Tubule
- Thin Ascending Tubule
- Thick Ascending Tubule
- Distal Convoluted Tubule
- Connecting Tubule
- Collecting Duct

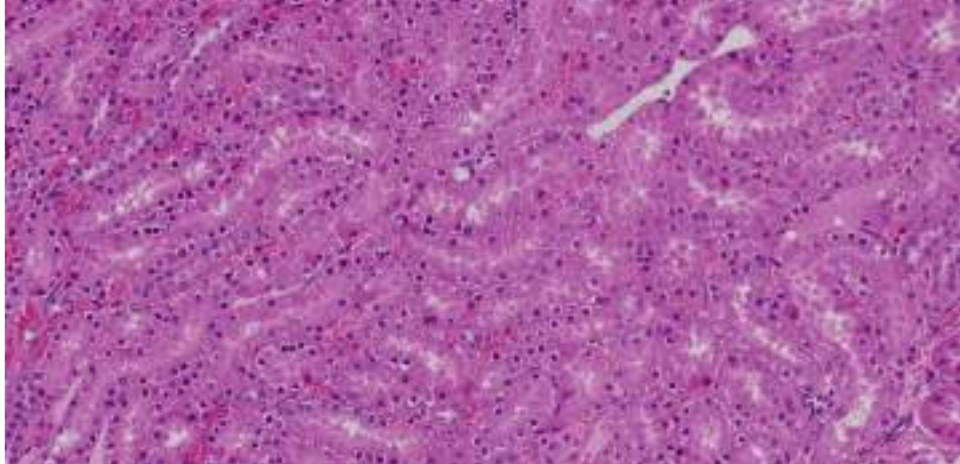


**DISTAL CONV. TUB.**  
++ Pyknosis  
++ Swelling

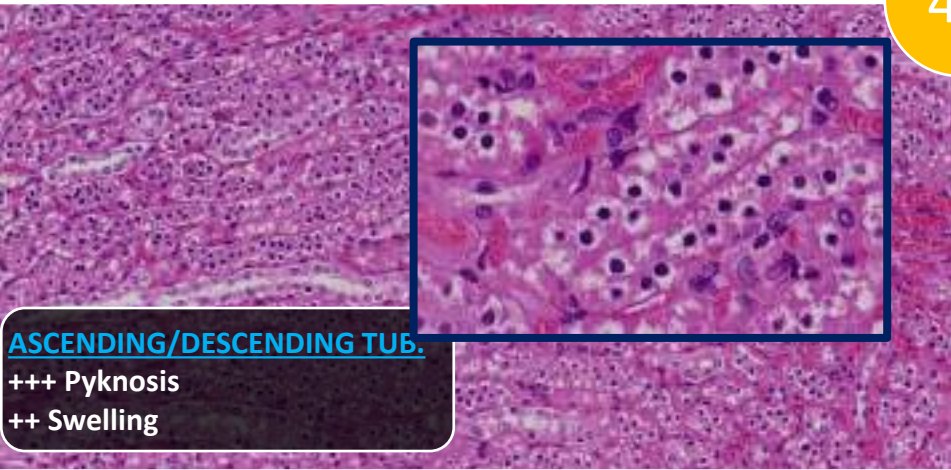


**CORTEX**

4h

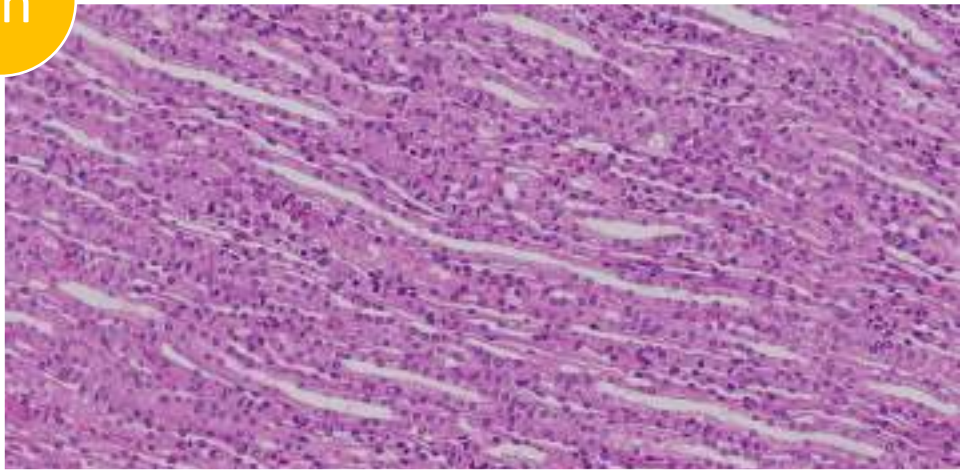


**OUTER STRIPE – OUTER MEDULLA**



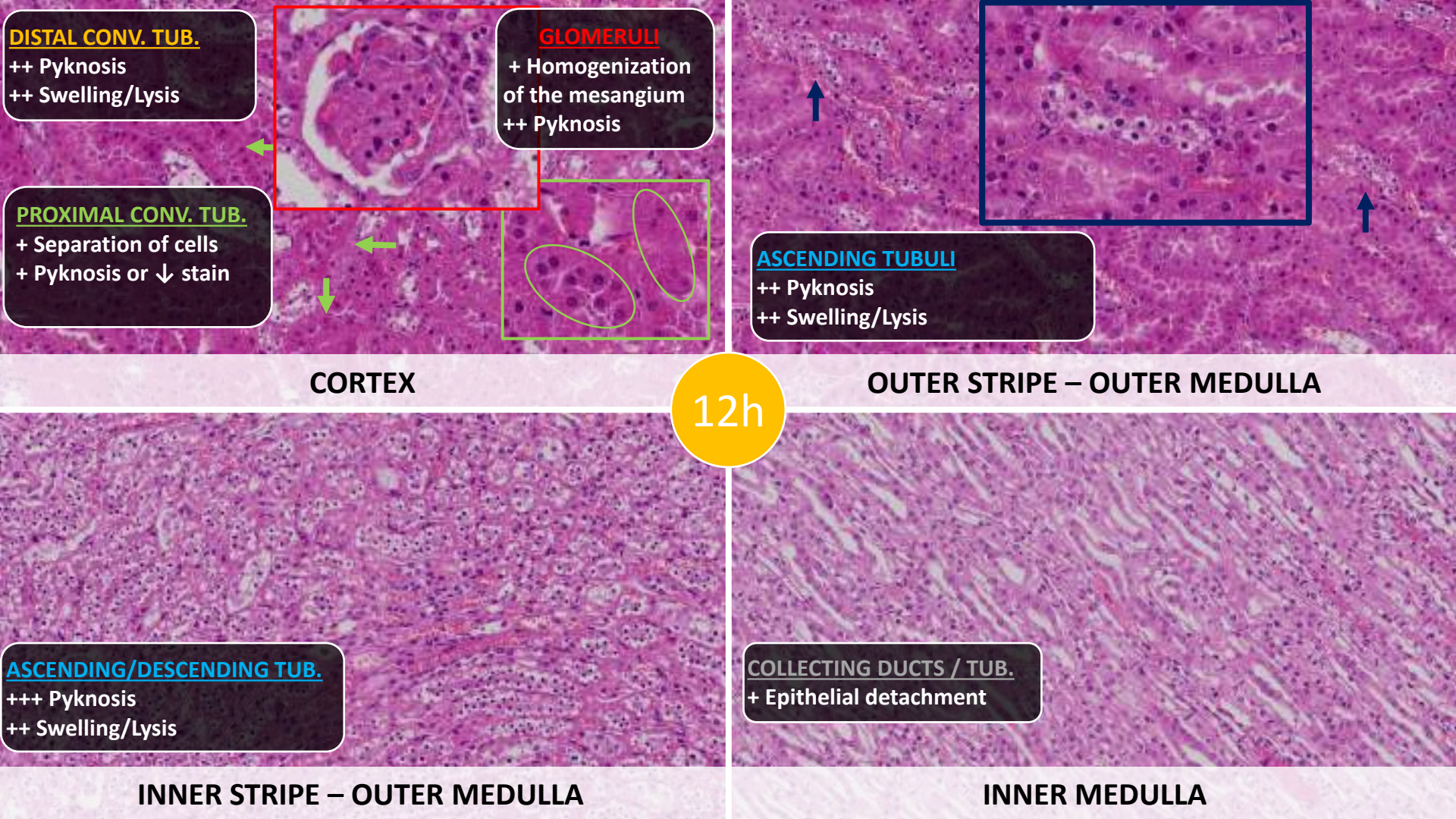
**ASCENDING/DESCENDING TUB.**  
+++ Pyknosis  
++ Swelling

**INNER STRIPE – OUTER MEDULLA**



**INNER MEDULLA**





**DISTAL CONV. TUB.**  
++ Pyknosis  
++ Swelling/Lysis

**GLOMERULI**  
+ Homogenization of the mesangium  
++ Pyknosis

**PROXIMAL CONV. TUB.**  
+ Separation of cells  
+ Pyknosis or ↓ stain

**ASCENDING TUBULI**  
++ Pyknosis  
++ Swelling/Lysis

**ASCENDING/DESCENDING TUB.**  
+++ Pyknosis  
++ Swelling/Lysis

**COLLECTING DUCTS / TUB.**  
+ Epithelial detachment

12h

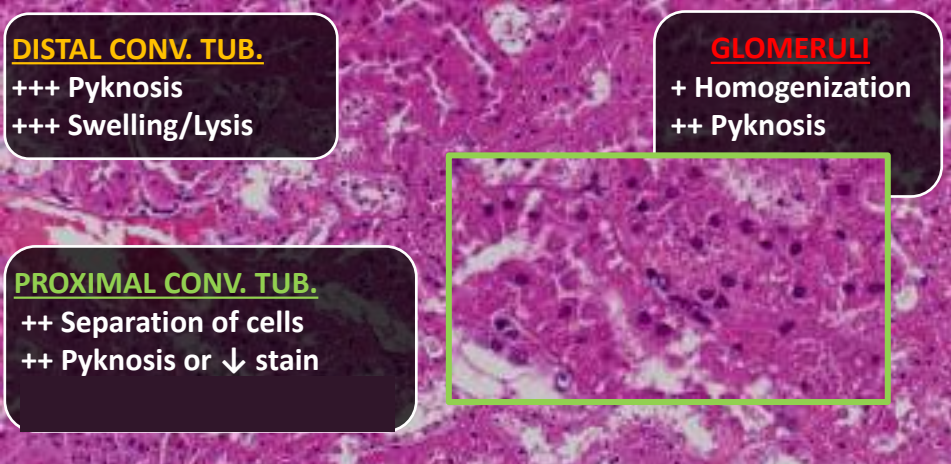
CORTEX

OUTER STRIPE – OUTER MEDULLA

INNER STRIPE – OUTER MEDULLA

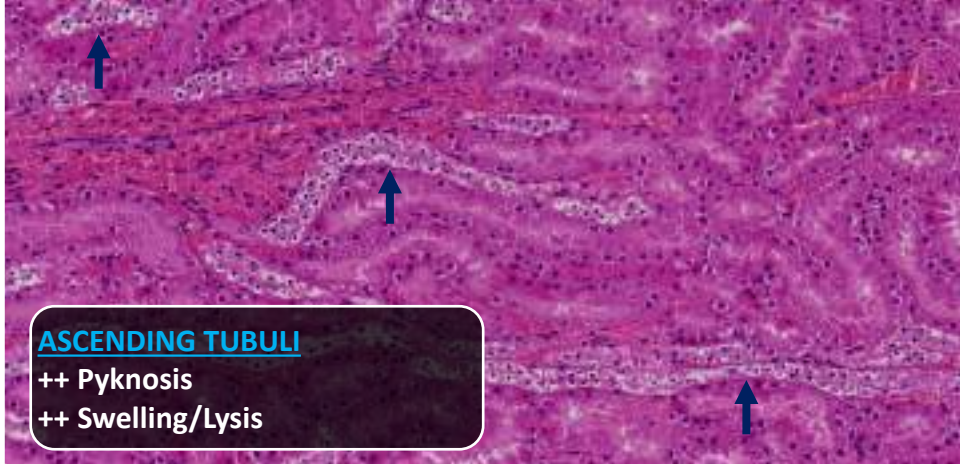
INNER MEDULLA



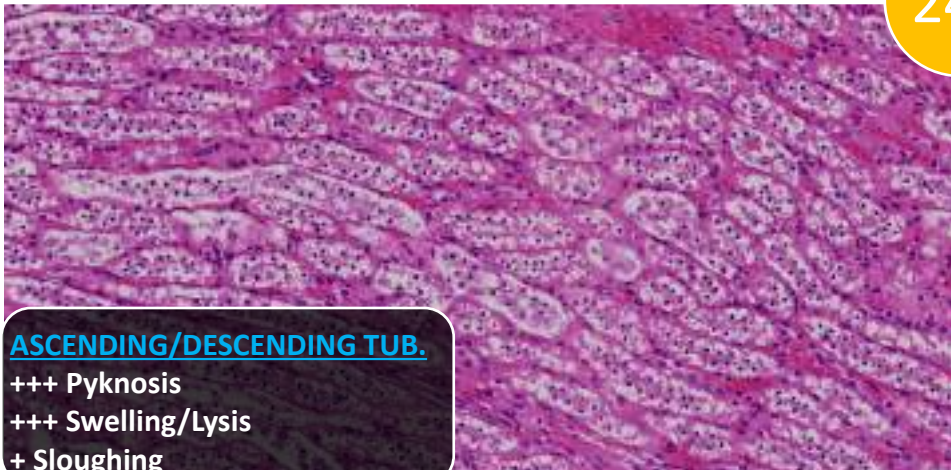


CORTEX

24h



OUTER STRIPE – OUTER MEDULLA



INNER STRIPE – OUTER MEDULLA



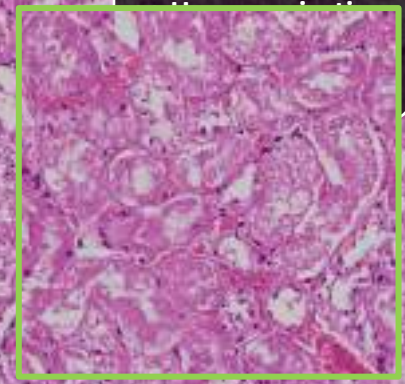
INNER MEDULLA



**DISTAL CONV. TUB.**

- +++ Pyknosis
- +++ Swelling/Lysis

**GLOMERULI**



**PROXIMAL CONV. TUB.**

- +++ Coalescence of cells
- +++ Pyknosis or ↓ stain
- ++ Swelling / Lysis
- ++ Ghost appearance of tubuli

**CORTEX**

**ASCENDING TUBULI**

- +++ Pyknosis
- +++ Swelling/Lysis

**OUTER STRIPE – OUTER MEDULLA**

**48h**

**ASCENDING/DESCENDING TUB.**

- +++ Pyknosis
- +++ Swelling/Lysis
- ++ Sloughing

**INNER STRIPE – OUTER MEDULLA**

**COLLECTING DUCTS / TUB.**

- +++ Epithelial detachment

**INNER MEDULLA**





**INNER STRIPE –  
OUTER MEDULLA**

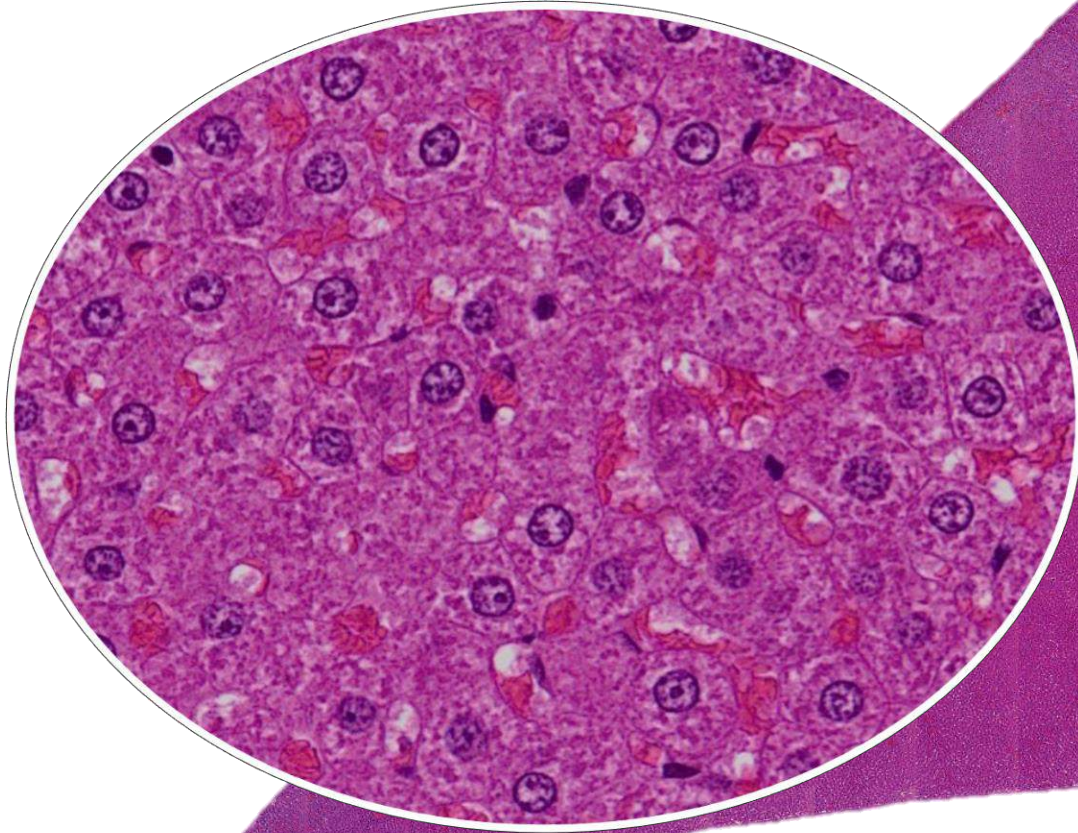
**OUTER STRIPE –  
OUTER MEDULLA**

**CORTEX**



# LIVER

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The amount of glycogen and fat within hepatocytes could be playing an unknown role in post-mortem alterations

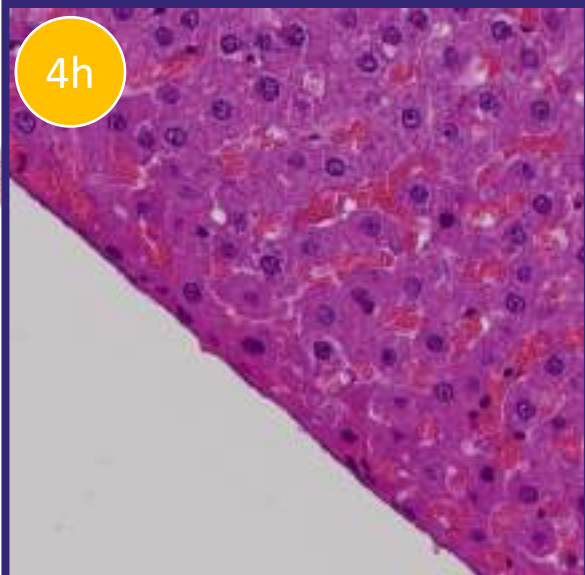


# LIVER

**Visceral Surface was more affected**  
by post-mortem alterations than Diaphragmatic surface

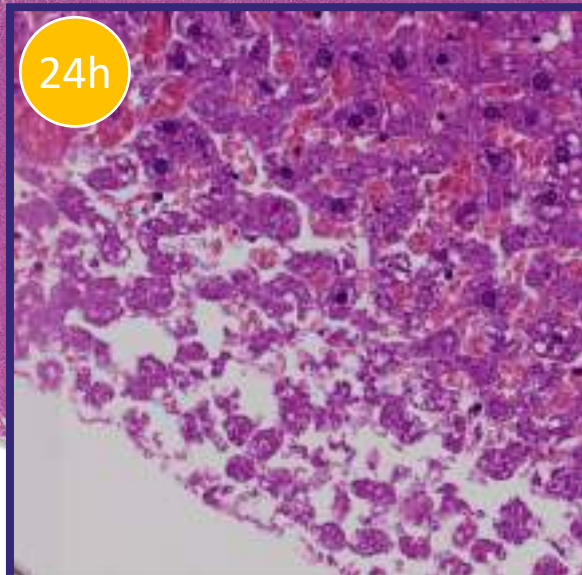
36h

4h



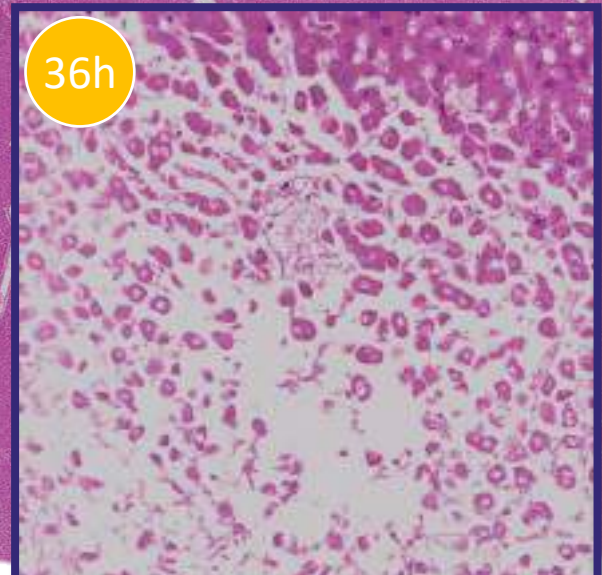
+ Pyknosis  
+ Hypereosinophilic cytoplasm

24h



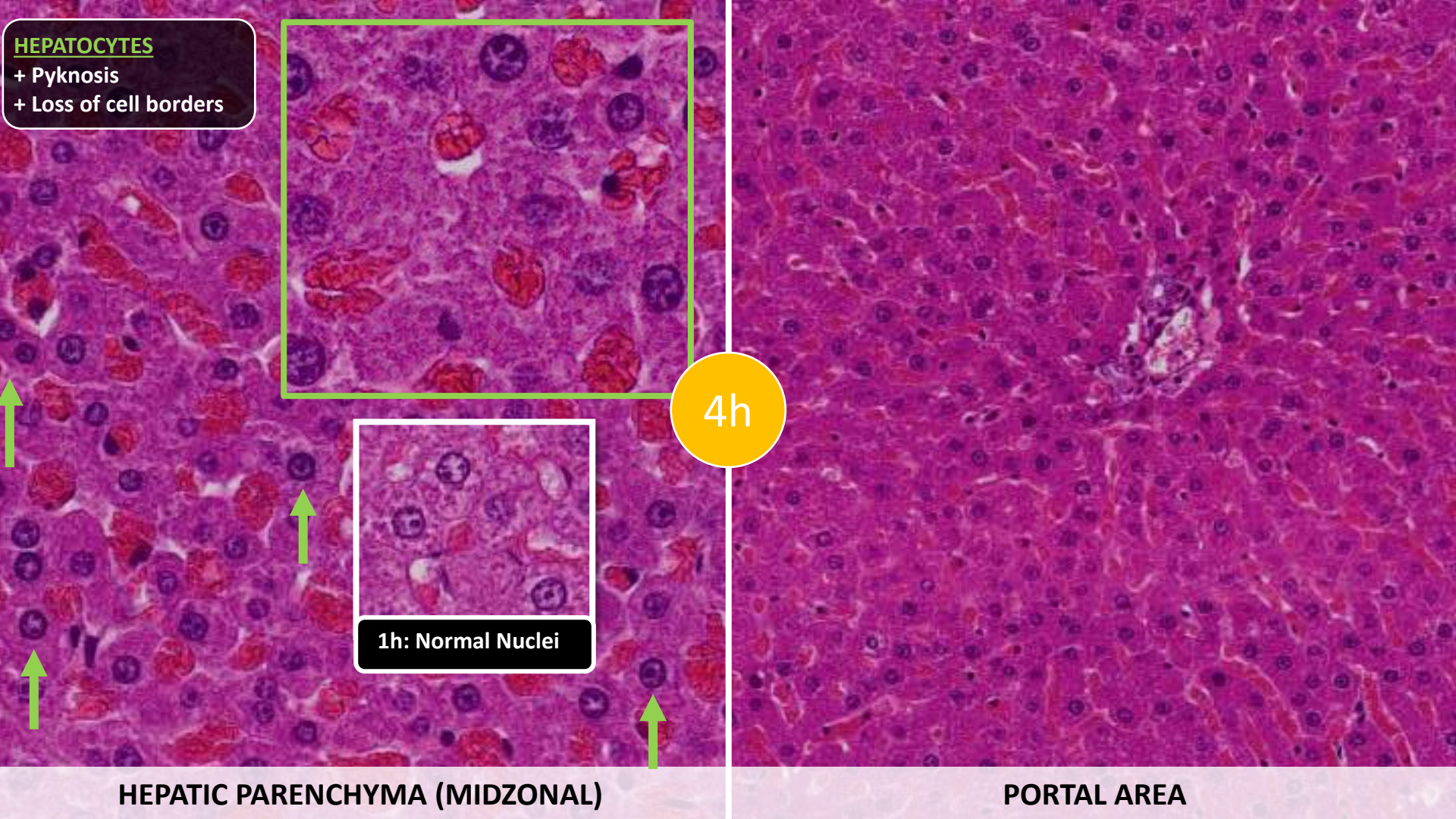
++ Ghost cells

36h



+++ Ghost cells





**HEPATOCTES**  
+ Pyknosis  
+ Loss of cell borders

4h

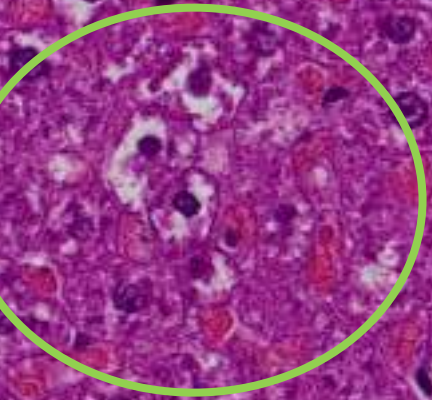
1h: Normal Nuclei

HEPATIC PARENCHYMA (MIDZONAL)

PORTAL AREA

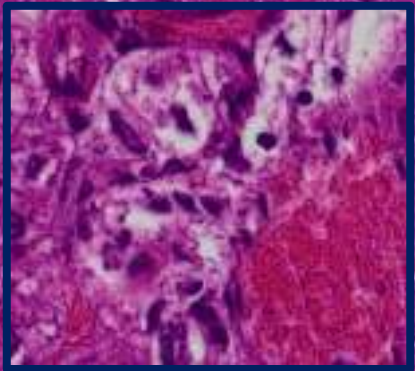
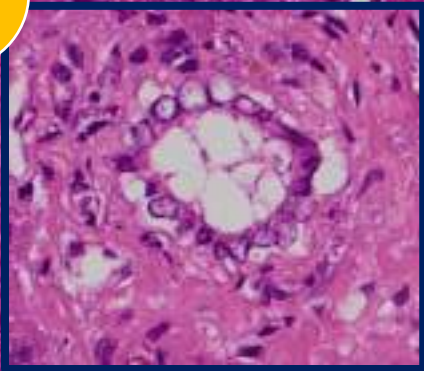


**HEPATOCYTES**  
+ Pyknosis  
++ Loss of cell borders  
++ Perinuclear halo  
++ Cytoplasmic loss of granularity



24h

**BILE DUCTS**  
++ Swelling & Detachment  
+++ Pyknosis  
++ Cell Lysis



HEPATIC PARENCHYMA (MIDZONAL)

PORTAL AREA



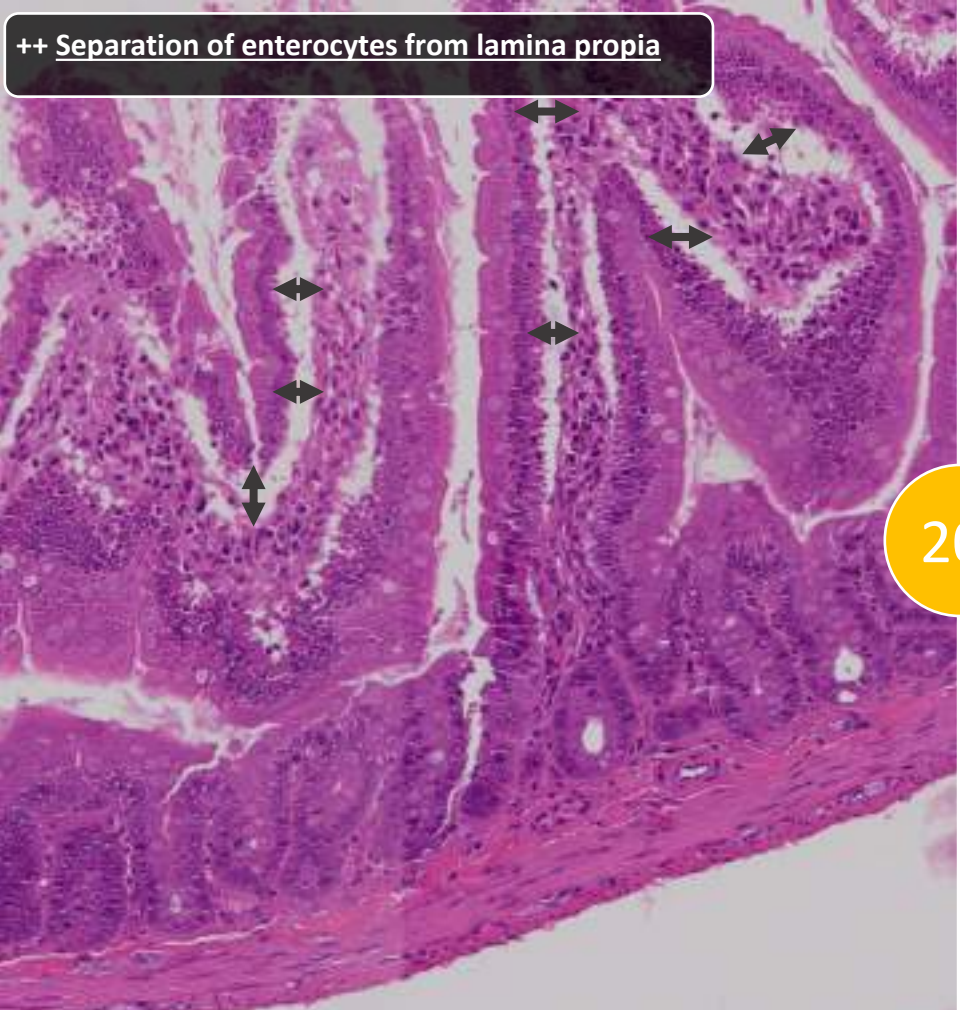
# SMALL & LARGE INTESTINE

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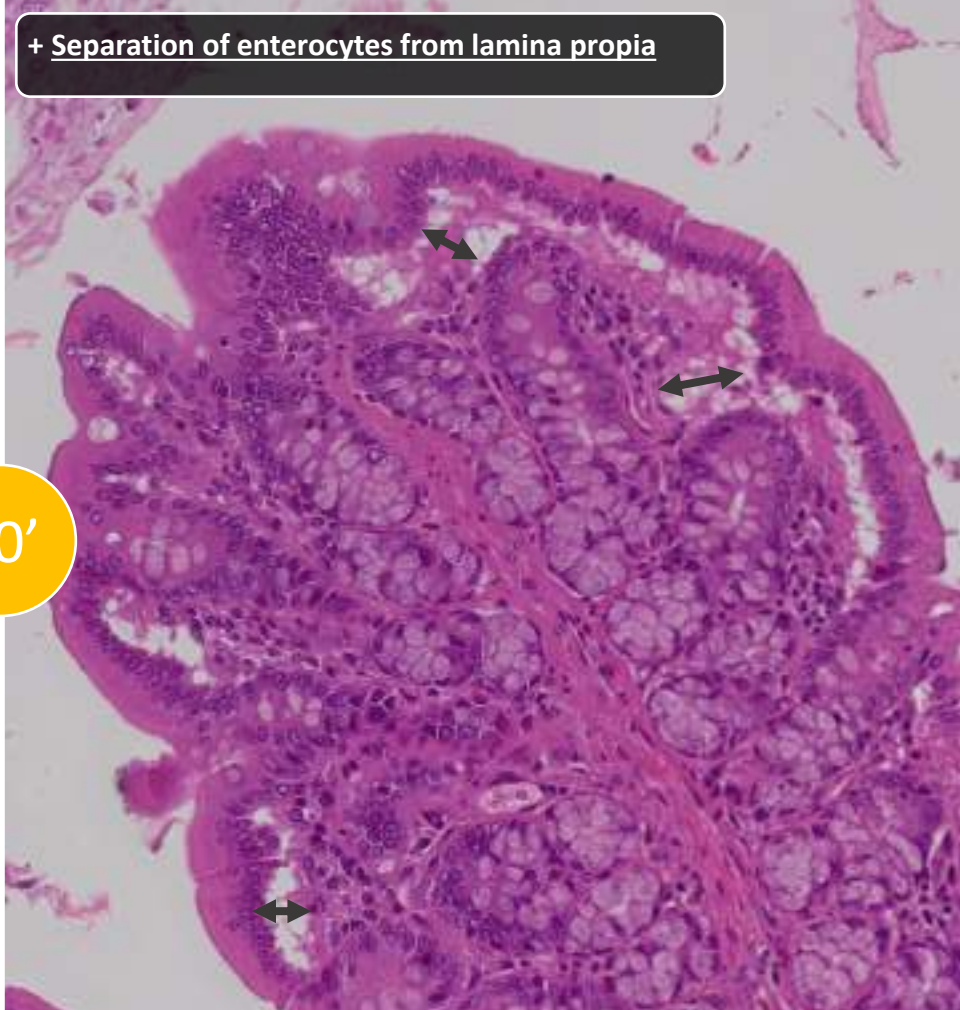
Small Intestine: Duodenum = Jejunum = Ileum

Large Intestine: Cecum > Colon > Rectum

**Intestines were the first tissues displaying post-mortem alterations**



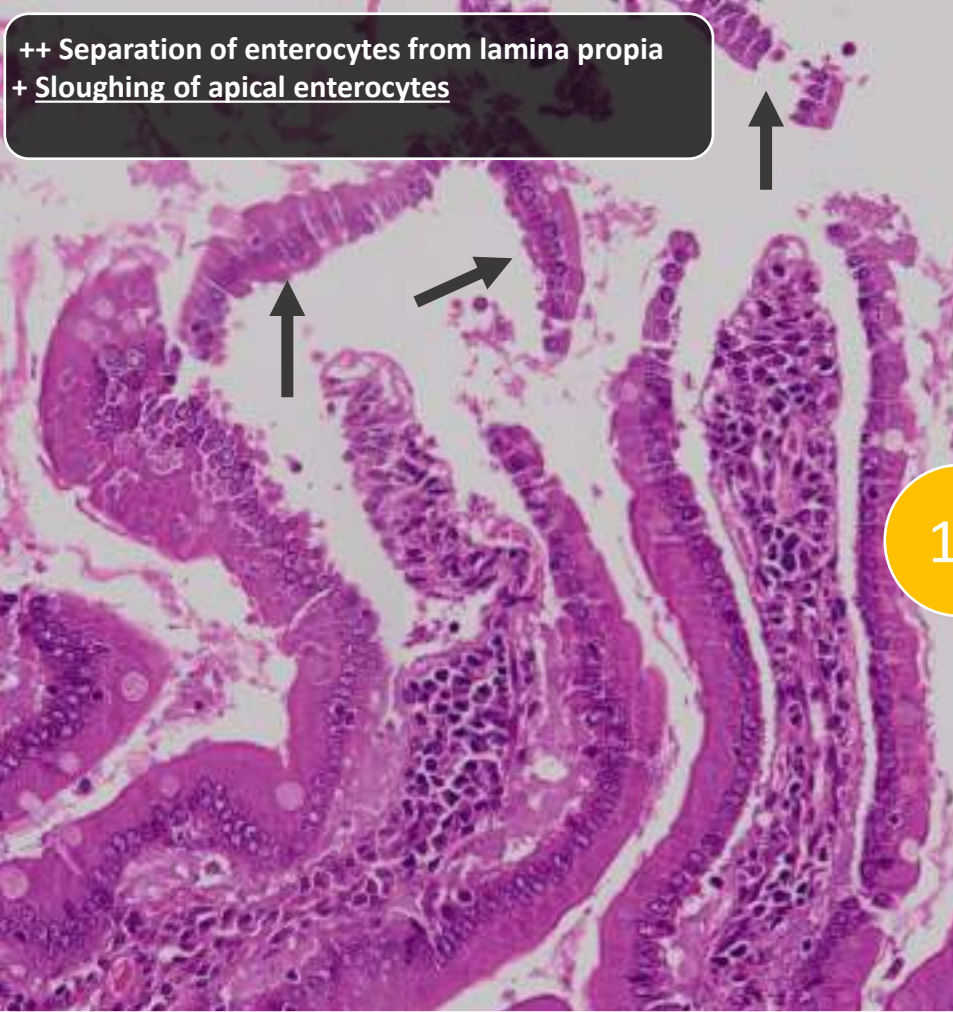
**SMALL INTESTINE**



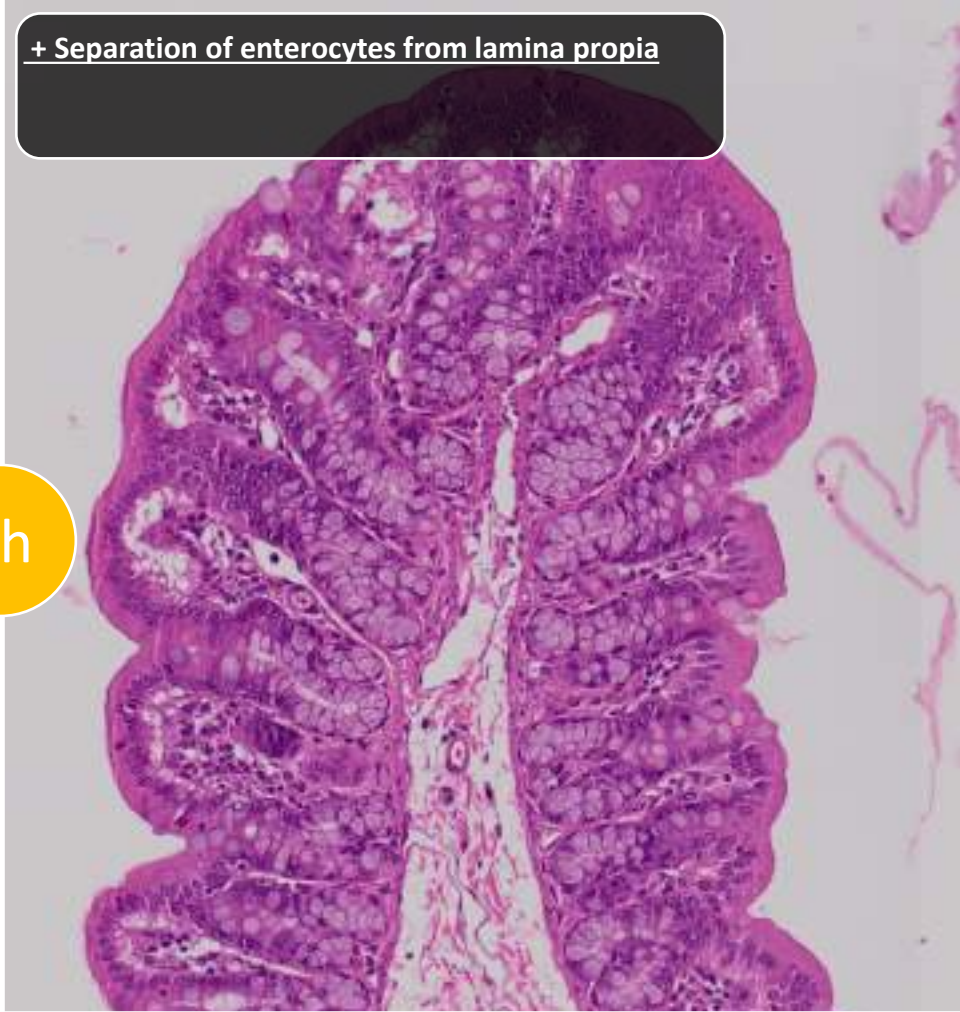
**LARGE INTESTINE**

20'





**SMALL INTESTINE**

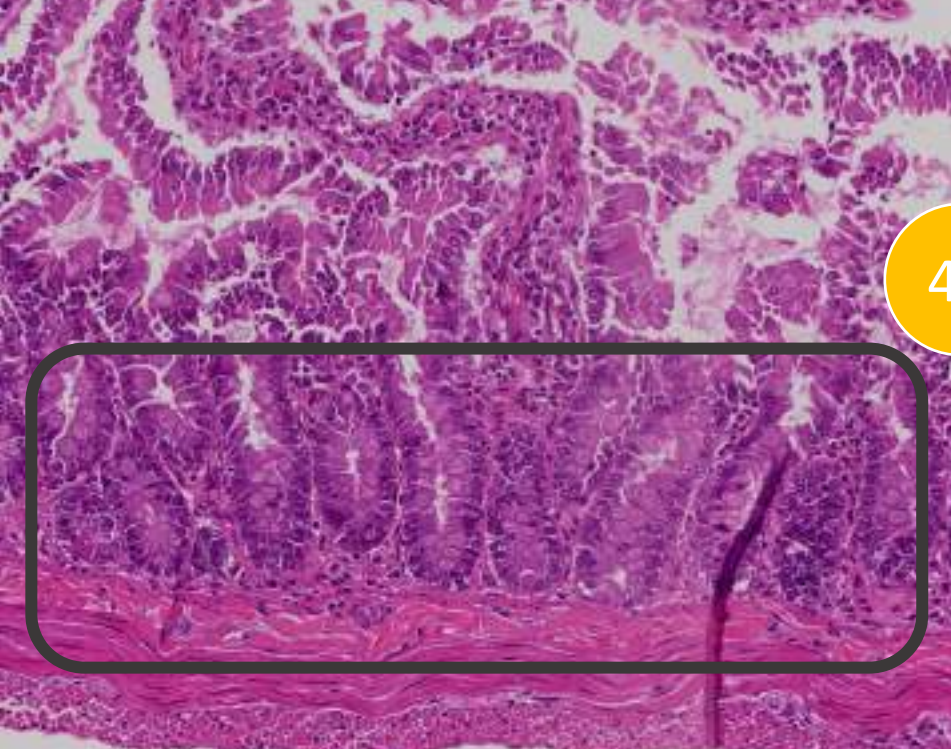


**LARGE INTESTINE**

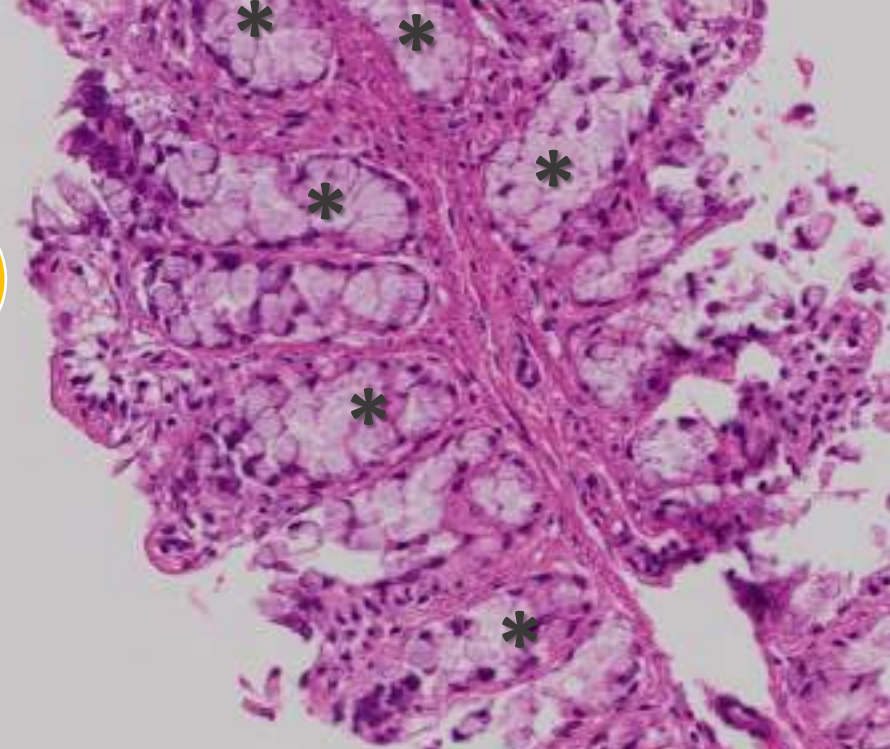


**Crypts were more resistant than villi**

**Goblet cells were more resistant than enterocytes**



4h

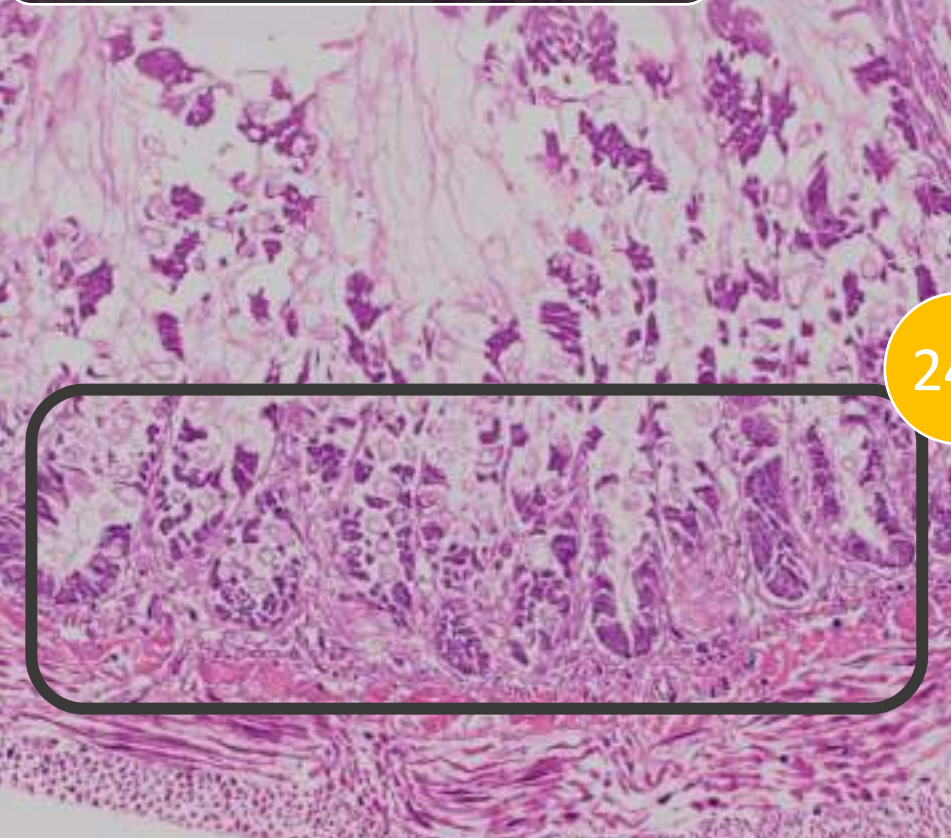


**SMALL INTESTINE**

**LARGE INTESTINE**



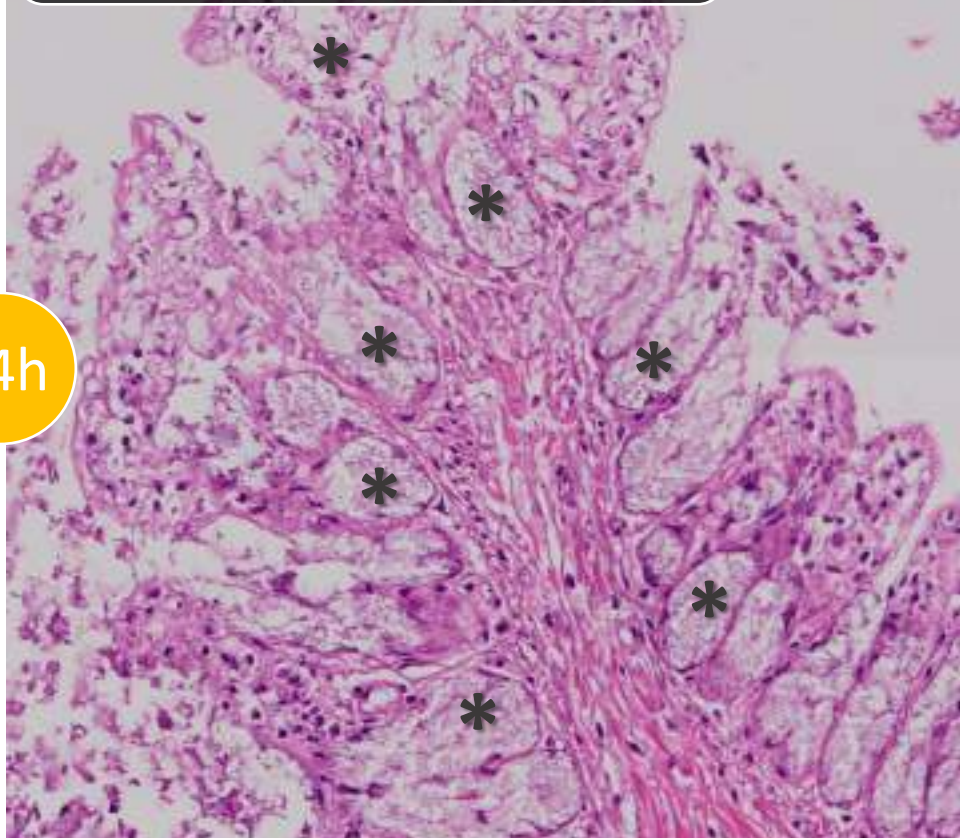
- +++ Separation of enterocytes from lamina propria
- ++ Sloughing of apical enterocytes
- ++ Crypts: Sloughing/ Lysis



24h

**SMALL INTESTINE**

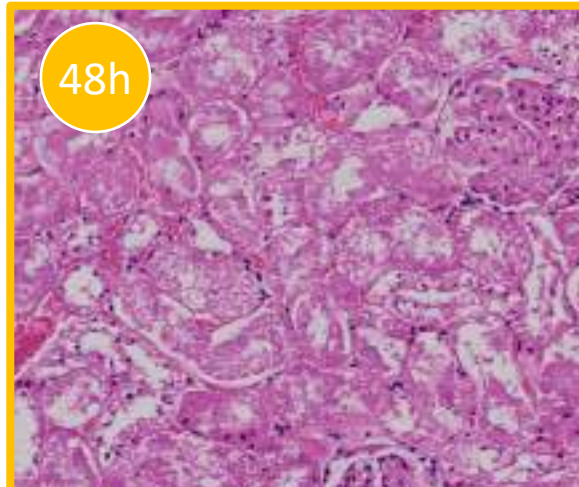
- + Separation of enterocytes from lamina propria
- ++ Sloughing of enterocytes
- ++ Goblet cells: Sloughing/ Lysis



**LARGE INTESTINE**

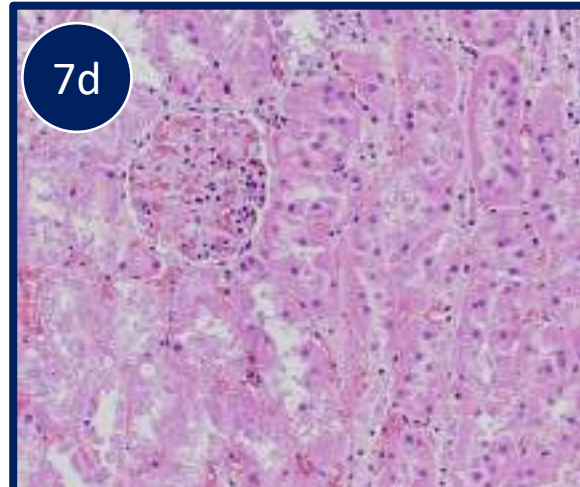
# COOLING OF ANIMALS AFTER DEATH

	<u>COOLING EFFECT</u>
<b>Kidneys</b>	Slow Down
<b>Liver</b>	Slow Down
<b>Intestines</b>	Slow Down



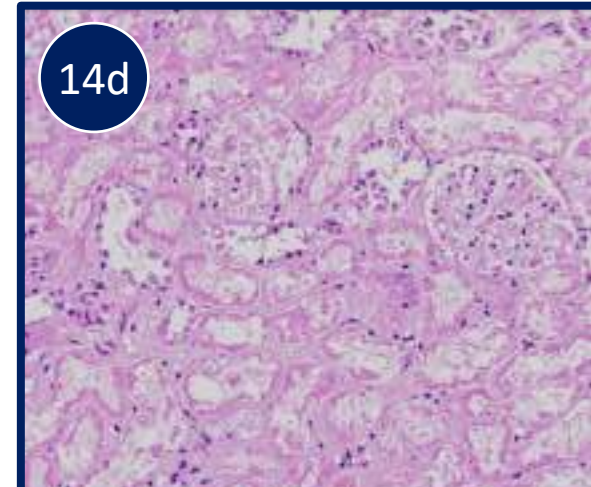
48h

**Room Temperature**  
**(18–22°C)**



7d

**Refrigerator**  
**(2–6°C)**



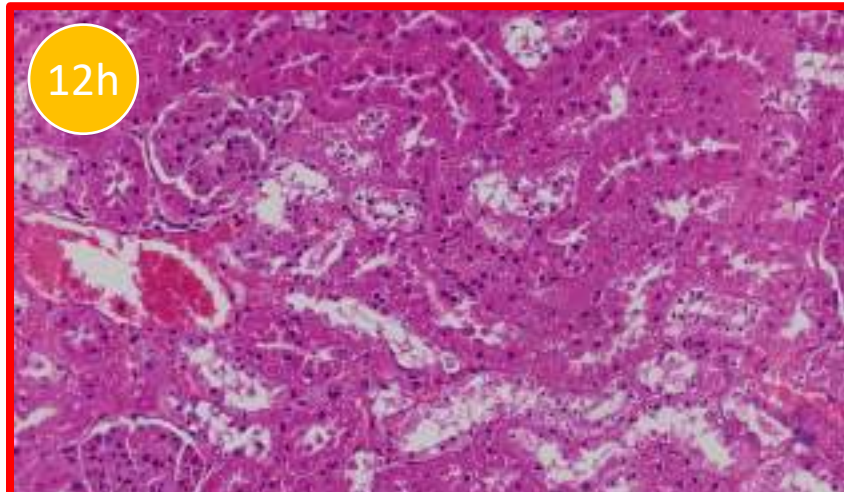
14d

**Refrigerator**  
**(2–6°C)**

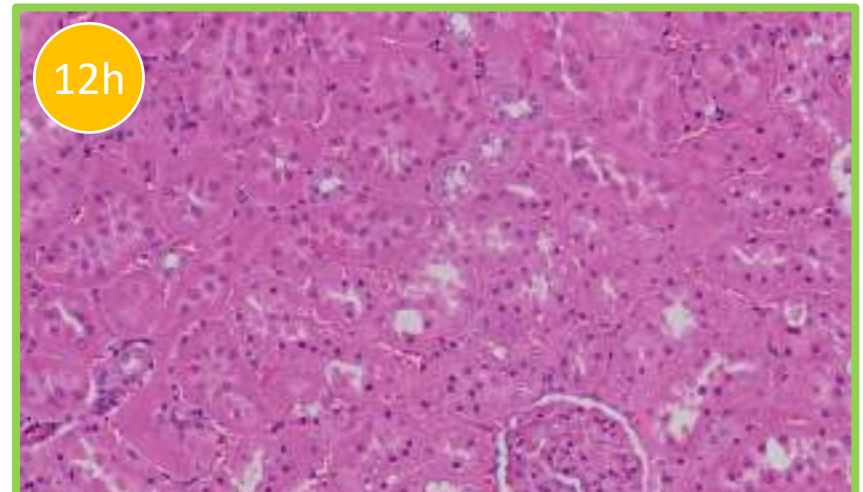


# EXSANGUINATION OF ANIMALS AFTER DEATH

	<u>COOLING EFFECT</u>	<u>EXHANGUINATION</u>
<b>Kidneys</b>	Slow Down	Slow Down
<b>Liver</b>	Slow Down	Slow Down
<b>Intestines</b>	Slow Down	No Effect



**Non-Exsanguinated**



**Exsanguinated**

# CONCLUSIONS

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1. Post-mortem microscopic changes in rat tissues are **specific, recognizable, progressive and evolve over time**
2. The onset and progression of post-mortem microscopic changes in rat tissues can **differ among organs and among areas of the same organ**
3. **Exsanguination and cooling may slow down the progression of** post-mortem microscopic changes in rat tissues
4. **A global interpretation** of all organ findings and its comparison with other organs is needed to **ease the differentiation between post-mortem changes and real lesions**



**THANK YOU!**

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