In today’s research driven society, it has become commonplace for institutions to rely upon DNA and RNA extraction techniques to help obtain genomic data from old specimens. Generally, specimens were commonly preserved for future gross examination and/or teaching. Using histological examination of specimens from museum jars from the Pathology Department at the Indiana University School of Medicine, the sequential and chronological degradation of DNA and RNA has been studied. We examined gross specimens from nine decades from 1920 until 2000. We evaluated histologic preservation of kidney, liver, heart, lung, spleen, uterus, and brain for nuclear structure in these samples. Nuclear preservation was based on amount of nuclei per 20X microscopic field and the crispiness of the nuclear membrane and internal features. The nucleus in high lipid tissues such as the brain were found to degrade at a quicker rate than dense tissues such as the heart and uterus. Our study has shown specimens preserved beyond fifty years were likely to have little to no nuclei left, thus indicating that there was little to no DNA and RNA remaining. This technique of histologic evaluation first is an important finding and a general guideline which may save research institutions from the expensive process of DNA and RNA extraction.

The tissues are fixed overnight in neutral buffered formalin and then transferred to 70% ethanol prior to processing to a paraffin block. All the specimens were embedded in paraffin and cut into 5-9 micrometers sections. The sections were air dried and stained with hematoxylin and eosin (H&E). The H&E stained sections were reviewed using a light microscope and the degree of nuclear hypoxia, and chemical composition of fixative (refer to graph 1). The fixation preservation in which the tissues were preserved was also considered when analyzing the molecular structural integrity of the nucleic acids. The highest percentage of DNA yield and concentration was found in lipid based tissues such as the brain versus dense tissues such as the heart and uterus. Preserved organs such as the liver and heart had higher rates of DNA/RNA degradation rate in lipid based tissues and lower rates in dense tissues.

**RESULTS**

The tissues (kidney, liver, heart, lung, spleen, uterus, and brain) were in a state of good histologic preservation with retention of nuclei, cytoplasm and cell membrane in most tissues after 1900. In general, tissues collected before 1950 showed more severe cell degeneration associated with complete dissolution of some nuclei, washed out cell cytoplasm, and some cell membrane dissolution. These degenerative features were observed to be more severe in the kidney, liver, lung, spleen, and brain than the heart and uterus. The heart and uterus had moderate nuclear loss at the 1920 time frame (see figure 1-8). The fixation preservation in which the tissues were preserved was also considered when analyzing the molecular structural integrity of the nucleic acids. The highest percentage of DNA yield and concentration was found in lipid based tissues and lower rates in dense tissues. The specimen preservation in which the tissues were preserved was also considered when analyzing the molecular structural integrity of the nucleic acids.

**CONCLUSIONS**

Through chronological analysis our study has shown H&E can reliably predict DNA and RNA status – if nuclei are gone, both DNA and RNA are degraded. Estimating from this finding, our study may consequently be used to help predict whether or not it is worth a research institution’s money to attempt extraction. Lysed DNA and RNA were found to degrade more rapidly in lipid based tissues such as the brain versus dense tissues such as the heart and uterus.

**REFERENCES**


**MATERIALS & METHODS**

All of the data was collected after a detailed IRB approved protocol. Upon breaking the seal on the museum jars, sections of tissue were taken for preservation, fixation, and analysis. The specimens from each decade consisting of various organs such as brain, kidney, liver, heart, lung, spleen, and uterus were included in the study. Newly all organs looked intact and lesions (hemorrhages, necrosis, inflammation and tumors) could still be seen in the tissue.

**Tissue Processing:** The tissues are fixed overnight in neutral buffered formalin and then transferred to 70% ethanol prior to processing to a paraffin block. All the specimens were embedded in paraffin and cut into 5-9 micrometers sections. The sections were air dried and stained with hematoxylin and eosin (H&E).

**Slide Evaluation:** Three investigators QCd the various slides by light microscopy to evaluate the following information. Our histology specifications for both the H&E stained slides and the following are: the presence of nuclear preservation and/or the loss of cellular structural preservation compared to those of organs such as the brain.

**DNA Concentration Yield for Various Fixatives**

**RESULTS**

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