DNA DAMAGE IN PRESERVED SPECIMENS AND TISSUE SAMPLES: A MOLECULAR ASSESSMENT

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An a priori estimate concerning the integrity of DNA in tissue samples of a certain age can be of great relevance in a variety of areas of investigation, including forensic analyses, biological barcoding initiatives, or disease related research using formaldehyde-fixed paraffin embedded tissue. Information on the state of preservation and fragmentation of the DNA in such samples can guide the design of investigations and experiments.

Here we focus on the characterization of lesions in DNA samples extracted from preserved specimens, in particular dried insect specimens from museums and formaldehyde fixed frog specimens. The extracted DNA is digested with a combination of DNase I, Snake Venom Phosphodiesterase and Antarctic Phosphatase to single nucleosides and then analyzed by HPLC-ESI-TOF-MS.

We present data for moth specimens that were preserved dried and pinned with no additional preservative and for frog tissue samples that were preserved either in ethanol, formaldehyde, or fixed in formaldehyde and then preserved in ethanol. These preservation methods represent the most common methods of preserving animal specimens in museum collections. We observe changes in the nucleoside content of the moth samples over time, strikingly a loss of deoxyguanosine. We characterize the fragmentation state of the DNA and aim to identify abundant nucleoside lesions. Finally, simple models are introduced to describe the DNA fragmentation based on nicks and double strand breaks. These models allow us to rationalize the correlation between fragmentation and storage time we observe in extracted moth DNA samples.