

$\delta^{13}\text{C}$ in Hair (dog and human) and Fingernail Keratin by LA IRMS



Measurements of $\delta^{13}\text{C}$ in hair and fingernail keratin can contribute significantly to the reconstruction of the life history of an individual, be it human or animal, modern or ancient. The $^{13}\text{C}/^{12}\text{C}$ ratio measured in hair keratin is indicative of the individual's diet (*i.e.*, C3 vs. C4 plants). This analysis is of interest mainly in archaeological and anthropological research, as well as forensic investigation.

Hair samples (one human, one dog; Fig. 1) were placed in the ablation chamber without any pre-treatment and International Atomic Energy Agency IAEA-C-3 cellulose ($\delta^{13}\text{C}_{\text{PDB}}$ of 24.91 ‰) was used as standard. Ablation parameters are presented in Table 1. Helium was used as carrier gas (35 mL min^{-1} flow rate) and furnace combustion temperature was set to 850° C, while the GC column was heated at 30° C.

Scan Type	Spot Size (μm)	Repetition Rate (Hz)	Fluence (Jcm^{-2})	Scanning Speed ($\mu\text{m/s}$)	Ablation Time (s)
Line scan	50	20	1	10	10

Table 1. Ablation parameters used for the analyses.

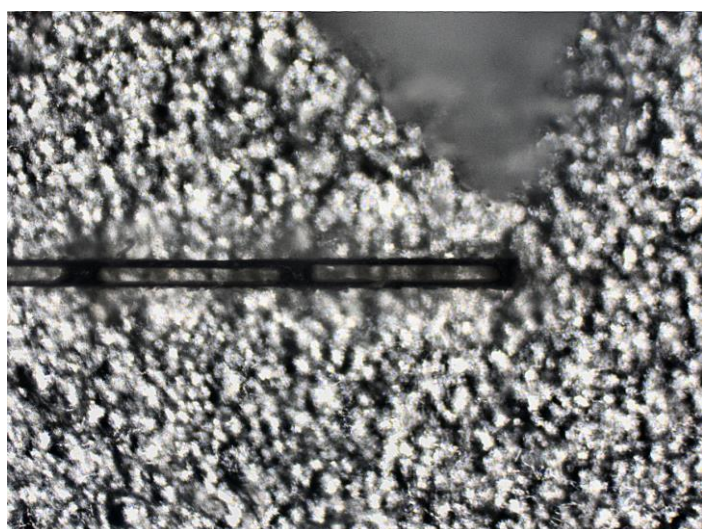


Figure 1. Microscope photograph of the ablation tracks left on dog hair.

The instrumental setup consists of a Sercon HS2022 interfaced with CryoFlex coupled to a Teledyne Photon Machines LSX 213G2+ laser ablation system equipped with an isoScell sample chamber (Terra Analytic, available through Sercon). Analyses were carried out at Terra Analytic.

The advantage of LA IRMS in this application is that it gives the user the possibility of sampling sequentially, at intervals as small as 100 μm , which allows for very fine spatial resolution; this can be then translated to temporal resolution.

Samples were ablated sequentially, from the base (1) to the tip (5), following the growth direction. The human hair and fingernail samples come from the same individual who is also the dog's owner. Corrected results are shown in Table 2.



Measurement	Dog hair	Human hair	Human fingernail
1	-22.07	-24.03	-20.23
2	-21.78	-24.33	-20.61
3	-21.67	-23.35	-20.61
4	-21.15	-25.42	-20.55
5	-22.88	-23.39	

Table 2. $\delta^{13}\text{C}$ results for each ablated spot on the three analysed matrices.

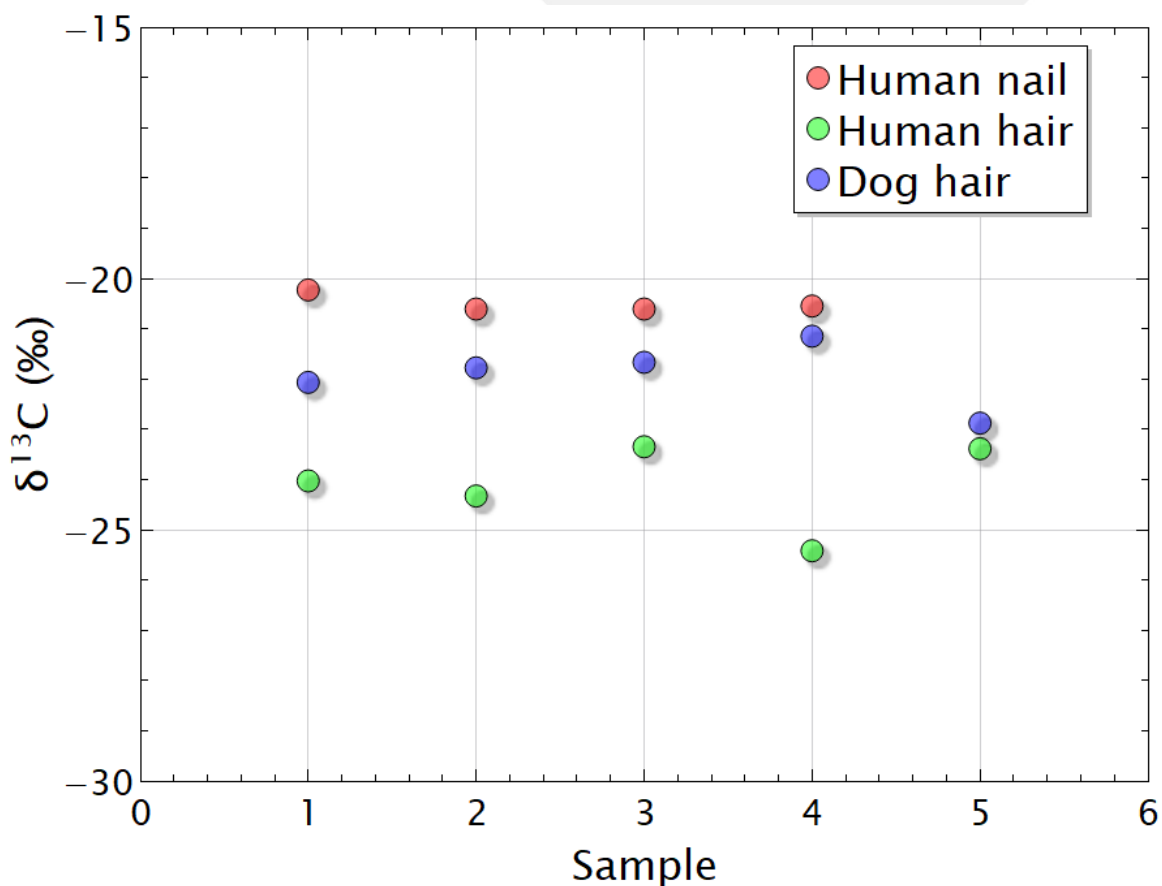


Figure 2. Graphic representation of the results.