out at 0.67% away from an A.

The part she fell down on was the ISA, the practical chemistry exam marked by the school, the results of which vary enormously between schools and unfortunately, are not the best at her school. These are very subjective, with some students reporting that the ISA raised everyone's grades at their schools and others with opposite experiences.

She took a gap year and therefore did not apply with predicted grades. Before sending the UCAS forms she rang around to see if any of them would consider her, but was disappointed to find that this was not to be. She is manually dexterous, making intricate cakes for all family birthdays, among other arty creations. She has excellent communication skills, has been a youth leader for years and does regular volunteer work. There must be so many other able students to create such competition!

I am struggling to make sense of this and wondering if there are others around with similar situations?! Would ringing around on clearing day help?

Any advice would be appreciated!

Rant over...

I. Pine, by email

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DENTAL ARCHAEOPARASITOLOGY

Rigorous analysis

Sir, the identification of structures recovered from dental calculus deposits (DCD) is complex. Such structures result from either mastication during life or taphonomic agents arriving after death. The complexity of identifying structures from DCD supplicates for convincing differential diagnoses. Most often, masticated structures recovered from DCD are vegetal or mineral in origin.[1-3] A convincing report of parasite eggs recovered from DCD begins with eliminating the possibility that the eggs in question are not actually fragments of plant tissues, phytoliths, starches, or sand grains.[1-3] These structures might look like parasite eggs to the untrained eye.[4]

Once a solid case has been made to the contrary regarding vegetal or mineral origins, then it is appropriate to consider animal origins for the structure(s) in question. Next, length-width measurements and morphological features of structures should be used to form a differential diagnosis. When a structure is suspected of being a parasite, it is critical for researchers to examine the structure in light of the natural history of the suspected organism. It is also important for researchers to question whether the structure(s) arose from in-life mastication or from decomposer organisms comprising the necrobiome.[5] Such strategies avoid misdiagnoses leading to inaccurate conclusions regarding the recovery of parasite evidence from DCD.

In a previous letter to this Journal, a case for the recovery of a *Schistosoma mansoni* egg from the DCD of a ninth century AD individual buried in France was reported.[6] Justification of the diagnosis is necessary because the discovery of an egg in the mouth is counterintuitive, considering that the eggs are disseminated through superior mesenteric to large intestine and into faeces. This report gave no indications as to how the authors determined that the structure reported as an egg was not of plant or mineral origin. The authors provided only a single (length) measurement and pointed out only a single morphological feature (lateral spine) regarding the structure in question. There was no differential diagnosis and no discussion of whether the structure originated via in-life mastication or via taphonomic processes. There were no photomicrographs to support the claim that this egg was that of *S. mansoni*. Only a single egg was reported from this individual's DCD. Single-egg reports are not sufficient for the establishment of a parasite's existence as a disease agent among a historic population.[4,5] The authors' claim that this case constitutes 'the oldest evidence of the parasite in Europe' is implausible at best.

As new microscopy techniques are applied to archaeoparasitological studies, it is imperative that researchers employ adequate protocols for the differential diagnosis of microstructures recovered from DCD. It is similarly imperative that reports of parasite structures recovered from DCD are held up to scrutiny and are not haphazardly interpreted. The authors of the above-mentioned letter should include a full differential diagnosis, at least one photomicrograph, discussion of potential presence of organisms constituting the necrobiome, and a more conservative interpretation of their results, to address the scepticism of archaeoparasitologists with regard to the information presented in the letter.

J. J. Morrow, K. J. Reinhard,
Lincoln, Nebraska

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2. Power R C, Salazar-García D C, Wittig R M, Freiberg M, Henry A G. Dental calculus evidence of Taï Forest Chimpanzee plant consumption and life history transitions. *Sci Rep* 2015; **5:** 15161.
3. Wesolowski V, Mendonça de Souza S M F, Reinhard K, Ceccantini G. Evaluating microfossil content of dental calculus from Brazilian sambaquis. *J Archaeol Sci* 2010; **37:** 1326–1338.
4. Reinhard K J. Reestablishing rigor in archaeological parasitology. *Int J Paleopathol* 2016; in press.
5. Morrow J J, Newby J, Piombino-Mascali D, Reinhard K J. Taphonomic considerations for the analysis of parasites in archaeological materials. *Int J Paleopathol* 2016; **13:** 56–64.
6. Charlier P, Abadie I, Cavard S, Brun L. Ancient calculus egg. *Br Dent J* 2013; **215:** 489–490.

Dr Philippe Charlier responds on behalf of his co-authors: We have read with high interest the response by J. J. Morrow and K. J. Reinhard discussing our examination of an egg of Schistosoma mansoni *in the dental calculus deposit (DCD) of a ninth century AD male individual from France. The decision not to publish the photomicrograph of the parasite was originally made by the Editor-in-Chief for space reasons.*

From all aspect (length-width measurements and morphological features), and considering slight deformation due to the acid-treatment of dental calculus,[1] the presented egg (Fig. 1) corresponds to one of Schistosomia mansoni.[2] *It is therefore possible to eliminate all differential diagnoses (fragments of plant elements, phytoliths, starches, sand grains, pollens, etc). No parasite has been found in the control samples from the periphery of the cadaver.*

Fig. 1 General view of the Schistosomia mansoni egg (HES, ×200 magnification)

We have discussed the possibility of dissemination of this egg out of the superior mesenteric to large intestine tract: vomiting is a relatively common cause of such superior dissemination of the parasite (whatever the presence of any neurological complication of the disease), that may led to ectopic localisations, including oral ones.[3,4]

Archaeology has given the opportunity of enhancing tools and methods for retrospective diagnoses process in the context of forensic anthropology. The same rigour is systematically given for any samples and procedures, whatever its date and origin.

1. *Charlier P, Huynh-Charlier I, Munoz O, Billard M, Brun L, de la Grandmaison G L. The microscopic (optical and SEM) examination of dental calculus deposits (DCD). Potential interest in forensic anthropology of a bio-archaeological method.* Leg Med (Tokyo) 2010; **12:** *163–171.*
2. *Lapierre J. Maladies exotiques et parasitoses autochtones.* Paris: Fournier, *1975.*
3. *Ripert C. Schistosomiase intestinale à S. mansoni.* Presse Med *2000;* **29:** *1577–1579.*
4. *Carod-Artal F J. Neurological complications of Schistosoma infection.* Trans R Soc Trop Med Hyg 2008; **102:** *107–116.*

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