

# New weaning food for prehistoric babies and origin of caries

## Abstract

Why caries increased in Neolithic? Was it caused by a new diet based more on carbohydrates, as usually explained? On the contrary, we suggest that intensification of caries is more connected to the new way of food preparation than with new foodstuffs. In Neolithic, special risk for deciduous teeth was new weaning food for prehistoric babies, probably kind of porridge based on grinded cereals and milk. New baby food, which might have formed a sticky paste around the teeth, most likely caused dental caries already during childhood.

## Research background

Increase in caries prevalence in Neolithic was confirmed by numerous research and explained as a consequence of diet based on cereals rich in sugars (Larsen 1995). But, many clinical studies show no evidence of a sugar-caries relation (Woodward and Walker 1994). Indeed, more important determinants of cariogenicity are not amount of sugars consumed, but the way they were eaten—frequency of consumption and the consistency of the food (Duggal and Van Loveren 2001; Touger-Decker and Van Loveren 2003). We propose here that one of the important causes for cariogenicity in Neolithic was the consistency of new diet for prehistoric babies. In order to indicate appearance of new type of weaning food, we combine two lines of indirect evidence from the territory of the Central Balkans. **First**, we present proofs that Early Neolithic bone spoons were used for feeding the babies (given that we found deciduous teeth bite-marks on them), which indicate appearance of new type of weaning food. **Second**, we present isotopic evidence for new diet of Neolithic children and also, evidence that caries does not appear on Mesolithic, but only on Neolithic children who were breastfed shorter, probably consuming new type of porridge.

## Bone spoons with teeth bite-marks

Although few bone tools from Paleolithic and Mesolithic were interpreted as spoons, their appearance was completely Neolithic phenomena, with thousands of spoons described in Anatolia and Europe (Nandris 1972). In archaeological literature, spoons are often interpreted as ritual objects, or tools of unknown function. But, our microscopic study on 23 spoons from Early Neolithic site Starčevo (South Banat, Serbia) provides new interpretation. Namely, on each spoon we detected numerous traces of deciduous teeth, and in cases of five spoons punctures of teeth in a row were found. Those bite marks present important evidence that Neolithic spoons were used for feeding babies. But, more importantly, spoons present indirect evidence that new type of “baby food” appeared in Neolithic. Quantity of spoons through Neolithic world is an important indicator of high frequency of porridge consumption, which was probably the second important cause of cariogenicity in Neolithic.



Figure 1: Bone spoon from Early Neolithic site Starčevo in Serbia

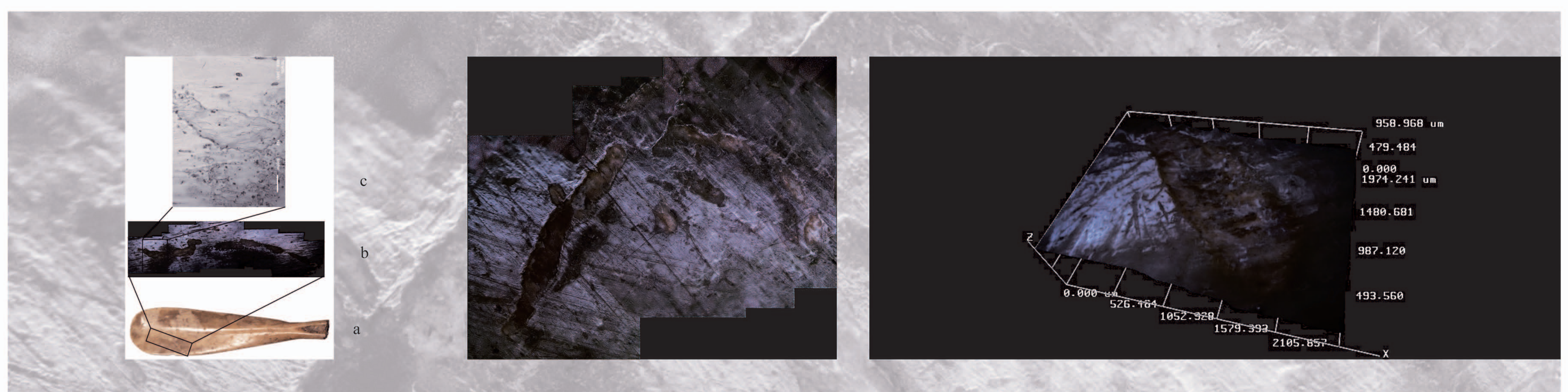


Figure 2: Bone spoon from Early Neolithic site Stračevo with trace of bite mark on posterior side (a); 3D Microscopic picture of deciduous teeth in row (b); SEM microscope picture of single tooth, presenting deepness caused by tooth puncture (c)



Figure 3: 3D microscopic representation of bite mark on bone spoon from Early Neolithic site Stračevo

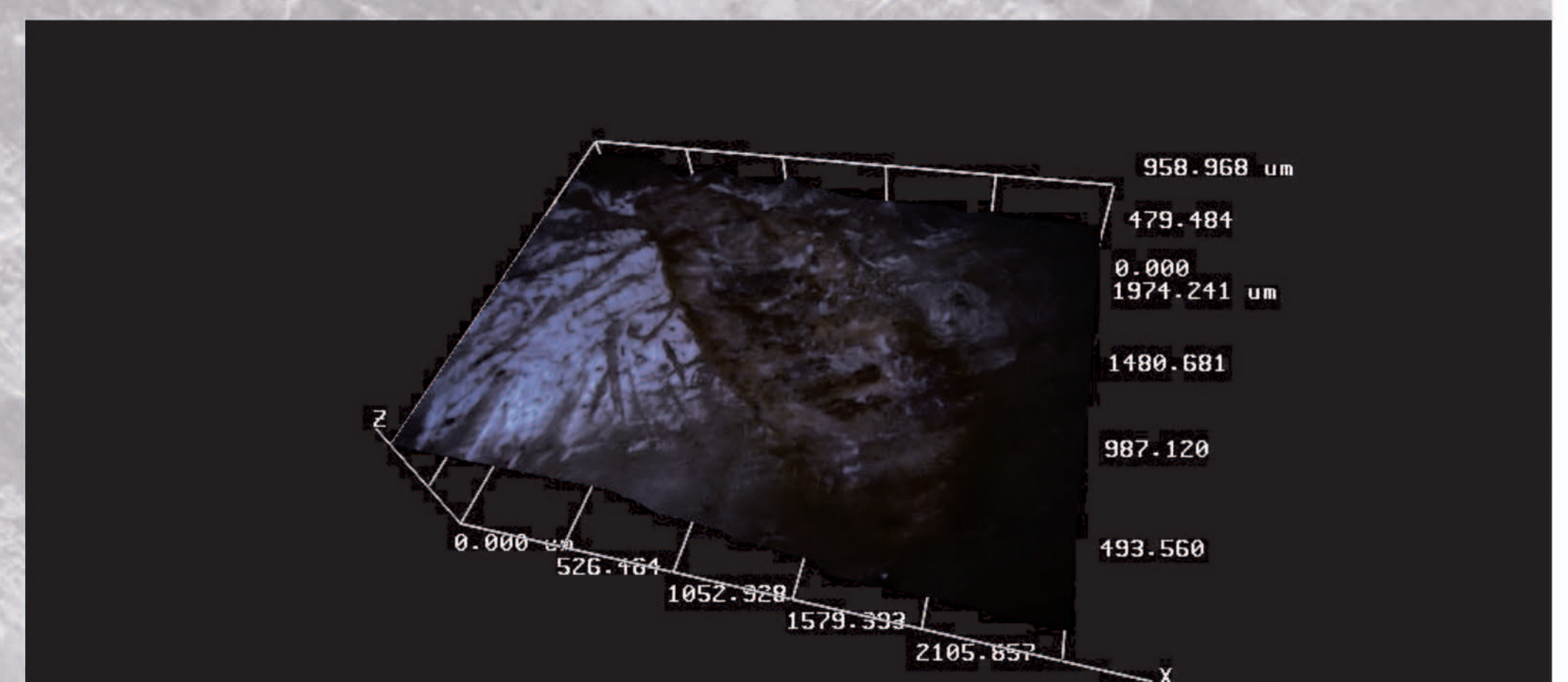


Figure 3: 3D microscopic representation of bite mark on bone spoon from Early Neolithic site Stračevo

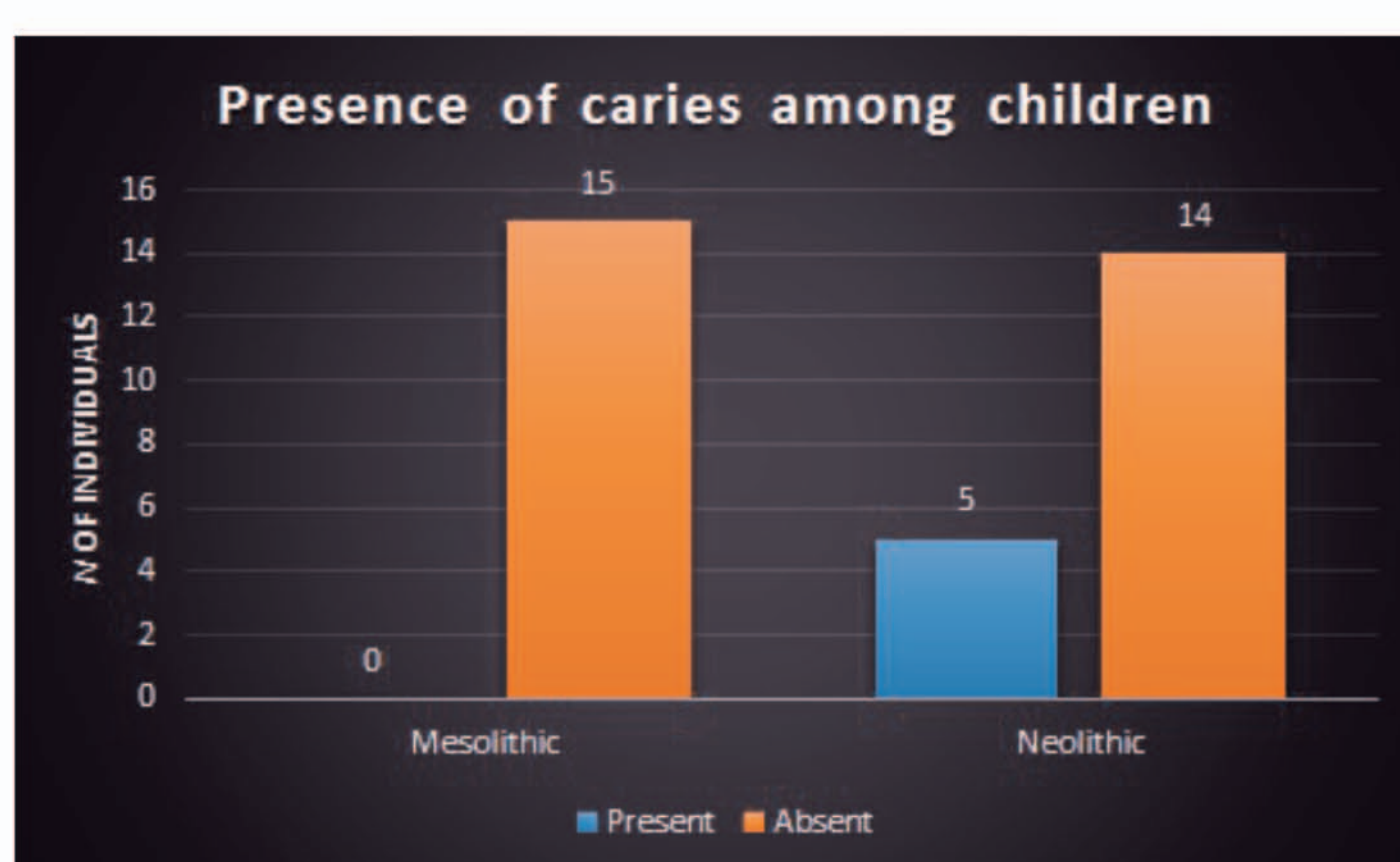


Figure 5: Prevalence of caries in Mesolithic and Neolithic children from the sites in Serbia: in Mesolithic, none of 15 children had caries, while in Neolithic, out of 18 children – 5 of them (27,7%) had caries.

## Caries and new weaning food

Second indirect evidence for appearance of new weaning food for prehistoric babies comes from our previous studies of stable isotopes (carbon, nitrogen and sulphur) in children bone from the Mesolithic and Neolithic sites in Serbia (de Beedellievre et al. 2015, Jovanović et al. 2015). First, while in Mesolithic diet was mostly fish-based, in Early Neolithic diet had more terrestrial pattern. Low  $\delta^{15}\text{N}$  values documented for children suggest a different type of weaning gruel than in Mesolithic. Second, Mesolithic children were longer breastfed than Neolithic children, and shorter breastfeeding in Neolithic was not possible without new weaning food for babies. At the same time, changes in diet of Neolithic babies had direct consequence on caries appearance—our sample contains 15 Mesolithic and 18 Neolithic children, and caries is detected only on Neolithic children, suggesting a possible input of new weaning gruels in their diet.



Figure 6: Caries on deciduous teeth—child from Early Neolithic site Ajmana

## Further understanding of caries origin

Increase of caries in Neolithic was important aspect of general health decline in that period, but still not adequately explained. Sugars in new Neolithic food cannot be the only explanation, because other causes, such as consistency of food, are much more important for cariogenicity than sugars itself. As we suggested, one important prerequisite for increase of caries was new weaning food for prehistoric babies, and cariogenic deciduous teeth probably also caused damage to the developing permanent teeth. Of course, new type of food preparation could not only trigger caries in children, but also in adults whose teeth could have also experienced contact with sticky food, like porridge or some kind of Neolithic cereal “bread”.

Our results indicate that in further understanding of origin of caries more attention should be paid on the new way of food preparation and consistency, than on foodstuff itself.



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