

Capturing the moment: chewing today and 10 000 years ago

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The prehistoric and early historical archaeological records abound in infant skeletons, while living children are remarkably rare. We have captured a few moments in the lives of some children: a modern child who failed to blow a chewing-gum bubble, and some Early Mesolithic children taking part in the daily work tasks of their group by chewing resin to be used for attaching and sealing, among other things. The data base is teeth marks in the chewing gum and resin lumps, respectively. The experience of chewing was in all probability quite different for these children from these two different times. We analyse this, as it concerns work tasks, pleasure and feelings.

Keywords: chewing gum, resin, children, jetty, Early Mesolithic, senses

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Living children

Living children – crawling, laughing, playing, working, looking after younger sisters and brothers, and whatever else they did – are notoriously hard to glimpse in archaeological data from prehistoric and early historical times. Archaeological children are usually associated with contexts related to death, and are excavated from burial grounds and churchyards, or were sacrificed and later excavated from various ritual sites (cf. Swedish examples: Johnsen & Welinder 1995, Welinder 1998).

We have previously discussed living children from the time when they lost their milk teeth (Kjellström *et al.* 2009). The starting point was the extraordinary find of seventeen milk teeth from at least three or four children between the ages of 5 and 10 years. After they fell out, the teeth had been stuck between the logs of an early modern log house. In this article, we will again use teeth, but now to discuss another aspect of the lives of children both before and after they lost their milk teeth; namely, the use of chewing gum. This

provides us with another remarkable way to discuss living children in archaeology.

Archaeology of the senses

An aim of modern museum scenography is to engage all the senses of the visitors (Geijerstam 1995, Sundin 2002, Anttehaag 2007). For archaeologists, however, it is a more difficult task to excavate and reconstruct the uses of the senses of people long since dead, and even more difficult to imagine what sensory impressions meant to them.

The visual faculty obviously has pride of place in archaeology, although the sparkling colours of the past are seldom discussed (Jones & MacGregor 2002, Cleland & Stears 2004). The sound waves that entered the auditory tubes of humans in the ancient past have irrevocably faded away. This is an area of guesswork and experimental archaeology (Burnett *et al.* 1991). However, the smell of the past is known to everybody who has excavated a latrine in a medieval town (Westholm



Fig. 1. The reconstructed jetty on the River Tidan in Tidaholm, a town in western Sweden, downstream from the jetty where the chewing gum was found. Photo: Mikael Snäll 2007.

1995, Hartvigsen 1997). In the latest decade, the sub-discipline of archaeology of the senses (Jones & Hayden 1998, Houston & Taube 2000, Hamilakis 2002, Woolgar 2006, Heller-Roazen 2007) has tried to encompass the full world of sensations of prehistoric and early historical people: how these people experienced their daily lives and surroundings with their five senses. This is a pathway into the phenomenology of the past.

Chewing a piece of gum engages all of the five human senses: seeing, hearing, smelling, tasting and feeling. It may also affect another sense: the sense of balance. Fish have yet another sense: the lateral line with the ability to detect movements in the water. In the following, we will try to approach some children and their efforts to chew chewing gum, one modern child from Tidaholm in Sweden and several Early Mesolithic children from the Huseby klev site, also in Sweden, ten thousand years apart.

Methods for analysing teeth

Humans have two sets of teeth, deciduous or milk teeth and permanent teeth. The timing and variation of the mineralisation and eruption of each tooth are well known and documented (Hillson 1998).

In the present study, the FDI numbering system (*Fédération Dentaire Internationale*) is used. This is an internationally used two-digit system for identifying and coding teeth. The first digit (1, 2, 3 and 4 for permanent teeth, 5, 6, 7 and 8 for deciduous teeth) denotes the upper right, upper left, lower left and lower right quadrant of the mouth. The second digit (1–8) denotes the specific tooth.

Several methods may be applied to identify teeth from dental impressions (e.g. Fisher 2004:242, Thali *et al.* 2005). Different types of casts can be made, resulting in two- or three-dimensional impressions. This makes it possible, at least in the latter case, to investigate each tooth in detail. In a forensic setting, individual features of bite marks such as wear patterns, signs of restorations or spacing between teeth make it possible to help identify a victim or potential perpetrator (Dolinak *et al.* 2005).

In the analysis of the chewing gum from Tidaholm, the tooth marks in the chewing gum were photographed to scale, measured, and compared with sets of reference teeth. In addition, Mikrosile, a casting material designed for forensic tool-mark analysis, was used. In the Huseby klev study, a silicon dental impression

material (President, Coltene) and silicon casts of the dental impressions made in lumps of resin were used.

The age estimations in this study are based on the knowledge of tooth-wear patterns during the Late Mesolithic in Denmark and Sweden (Alexandersen 2005). A suggestion of the sex of the owner of one tooth is based on size (Alexandersen 2005). The discussion of the life quality of the owners of the teeth is based on the presence of caries and enamel hypoplasia, i.e. growth disturbances due to stress (Hillson 1998).

A jetty in Tidaholm

Like a blue ribbon, the northbound River Tidan gives beauty and life to the town of Tidaholm in western Sweden. The river has always served people with food, ice, energy, and bathing possibilities, as well as carrying away waste from various types of production. Generations of children have met to play in the afternoon along the banks of the river (Johansson *et al.* 2000).

Until recently, there were three public jetties by the river for washing clothes in the central parts of the town. These jetties were somewhat luxurious: they were spacious and had roofs protecting washerwomen from rain and hot sun. Women from the neighbourhood came here to wash clothes. Many children had household tasks to perform: one of them was helping their mothers with the heavy laundry, transporting it to and from the river to be scrubbed and rinsed. Generally, the girls helped with the actual washing, while the boys assisted in transporting and were then left to play nearby (Snäll 2005, 2006).

The jetties fell into decay when modern plumbing made them outdated. Soon, children left the playing area by the river for other activities elsewhere. By the 1980s, the riverbanks of the Tidan formed scarcely any part of the everyday life of the townspeople.

When the borough council of Tidaholm started an historical reconstruction project of one of the jetties, archaeological interest was aroused. What would it be like to excavate the site of a jetty? Would it be possible, with archaeological methods, to learn about the everyday activities at this type of workplace, activities so common that they have almost disappeared from people's memories? For four days in 2005 and 2006, a minor excavation took place at the site of the southernmost of the three public jetties, i.e. not the one that was reconstructed and can be seen and entered at its original location (Fig. 1), but another one of the three.

The excavation was visited by many interested people who told the excavators about their childhood

experiences by the river and the work done by their mothers and grandmothers on that very jetty. Many happy memories were shared among these visitors, mostly men in their seventies and eighties.

The date of the Tidaholm chewing gum

The chewing gum lay among the litter on the shore of the stream at the abutment of the jetty. In addition to the used piece of chewing gum, there was one piece of foil from a stick of chewing gum and one piece of unused chewing gum in two joinable parts.

No finds indicated specifically that clothes had been washed just there. The litter consisted of all kinds of rubbish left by the inhabitants of the town during their daily life along the stream: angling, catching crayfish, swimming, strolling, and drinking and playing poker. On the stream bed, there were mainly bottles and broken glass.

Datable artefacts were coins and bottle caps and tops (cf. Rathje & Schiffer 1982, figs. 8–1). The four coins found range in time between 1960 and 1986. The caps and tops came from various kinds of bottles and cans for liquor, wine, beer, lemonade and soft drinks. These are characteristic for the time span, about 1950–1985. The chewing gum had probably been lost during this period.

The osteology of the chewing gum

The bit of used chewing gum (15x18x8 mm) from the Tidaholm jetty displays dental impressions of three teeth on the more convex surface (Fig. 2). The bite marks, each tooth approximately 4–5 mm in length, are narrow and straight, indicating incisors, that is, teeth in the front of the mouth adapted to cutting. The depths of the marks are 2–3 mm, and the silicon casts do not reflect any distinct dental wear. The appearance and size of the marks, together with comparisons with reference materials, identify the marks as those made by deciduous teeth numbered 81, 71 and 72 in the FDI system (Fig. 3).

Two additional bite marks are visible on the opposite side of the chewing gum. These are 6–7 mm long and similar in appearance and depth but not as distinct in shape as the others. The teeth are identified as numbers 51 and 61, the upper front teeth.

The fact that the bite marks indicate a child whose deciduous front teeth had completely erupted narrows the estimated age interval. Although there are considerable individual variations, the identified teeth are generally fully erupted at the end of the first year, thus setting the lower age. However, it is unlikely that such



Fig. 2. The chewing gum from the jetty in Tidaholm, western Sweden. The dental impressions are caused by a child's milk teeth. Photo: Anna Kjellström 2008.

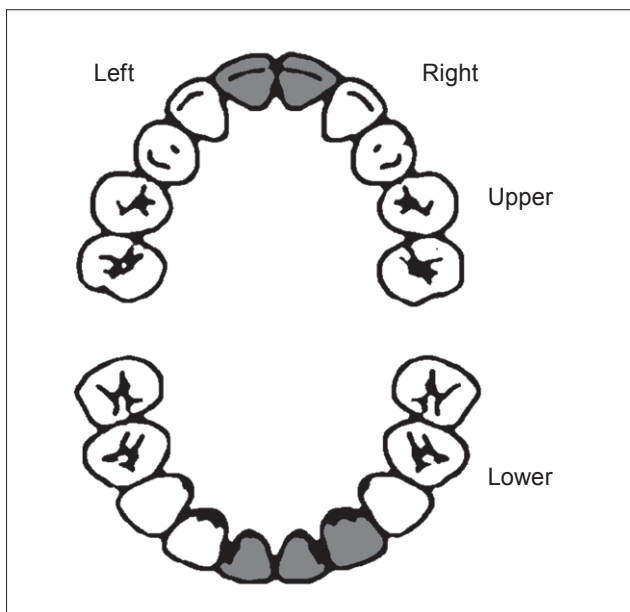


Fig. 3. Dental chart showing the identified teeth in the chewing gum from the jetty in Tidaholm, western Sweden.

a young child would be allowed to chew gum. Without any scientific investigations, common sense suggests that most parents would not hand out gum to children younger than at least three years. The upper age should be set to about seven, since the deciduous front teeth most often are lost by that age (Hillson 1998). This suggests that a child in the age interval 3–7 years chewed the Tidaholm chewing gum.

A sad moment in the life of a child

Before spitting it out, the child gave the chewing gum a last forceful chew, leaving marks from the upper and lower front teeth. Based on the empirical experience of one of the authors, the dental impression is interpreted

as an attempt to blow a bubble. This operation consists of the chewer biting and holding on to the gum with her or his upper front teeth while stretching the gum out with the lower teeth. This act forms an elongated mass with the tip of the tongue in the middle. Then air is blown into the gum. The lips are a bit parted, allowing the gum to protrude and swell. Voilà, a bubble (Fig. 4)!

However, in the present case, the child lost control of the gum just before blowing the bubble and dropped it to the ground. The well-brought-up Tidaholm child did not pick up the chewing gum and pop it back into his or her mouth.

The Mesolithic Huseby klev site

The Mesolithic site of Huseby klev is situated on Orust, an island in the central part of the Bohuslän province, western Sweden. During the Mesolithic, the settlement area was at the edge of a hilly district alongside a bay in the outer archipelago.

The chewing gum from Huseby klev was found on a beach area that had been used as a habitation site for a hunter-gatherer group (Nordqvist 2005) before being transgressed by a relative rise in sea level and situated below sea level for thousands of years. The spot where the chewing gum at Huseby klev was found was covered by various kinds of sediment, clay, sand and gravel, and lay more than two metres below the modern surface.

The settlement site was excavated in 1993 and 1994 as part of a rescue excavation (Hernek & Nordqvist 1995). The covering sediments were removed by a mechanical excavator, and the actual layer where the find was made was then water sieved. The preservation conditions were extremely good. Many different kinds of organic material were found, including numerous shellfish shells, bark, hazelnuts and twigs. Bones of land mammals such as wild boar and red deer were preserved in this shell-rich layer, but those of seals and porpoises, especially the white-beaked dolphin, dominated. Fish bones were less common. In addition, there were worked bone and antler artefacts such as axes, mattocks, punches and fish hooks.

In a limited section of this deeply embedded cultural layer, a concentration of bark and hazelnut shells was found, as well as wild apples, rose hips and sloe berries. Chewing gum was recovered from the same section, along with other resin fragments. All the finds in this layer were C14-dated to about 8000 BC (calibrated age), that is, about 10 000 years ago.



Fig. 4. Capturing the moment in the life of this child – just before the bang of the bubble. Photo: Mikael Snäll 2009.



Fig. 5. The oldest chewing gum in the world from Huseby klev, Bohuslän province, Sweden, used by a 12–14-year-old child, probably a boy, around 8000 BC. Photo: Bengt Nordqvist 1994.

The oldest chewing gum in the world

Huseby klev is still the site with the richest finds of chewing gum, as well as resin, and the earliest one (Hernek & Nordqvist 1995). About 90 different finds of resin stem from the site. All have some kind of impressions, but in only one case is a piece of resin joined to a tool. This is a bone point with resin used as an adhesive between the point and the wooden shaft. The wooden shaft no longer exists, but an impression of it is left in the resin. The most spectacular of the

resin finds are the eleven pieces of small lumps which display impressions of teeth marks (Fig. 5), which we call here chewing gum.

The teeth marks are so well preserved that it is possible to determine the age of each individual chewer (Alexandersen 2005). It is a rare case in archaeology to be able to actually observe Stone Age individuals, and the possibility to identify traces of children who lived 10 000 years ago is even more seldom. In this case, we identified not just one child, but were able to differentiate several individuals. Some lumps had been chewed repeatedly – over and over again – which actually may indicate that the children used the resin as chewing gum.

The osteology of the lumps of resin

All the chewing gum had been chewed by children and teenagers (Table 1). The youngest individual was 5–6 years old and the oldest was about 16–18 years old, but there are also marks from individuals who were, for example, 10 years old. Other individuals have been determined as children, but no specific age could be given. Thus, there are pieces of chewing gum with marks originating from individuals who still had their milk teeth. One tooth mark indicates the sex:

Sample no.	Age estimate (yrs.)	Teeth according to the FDI system
8224	5–6	64–65, 26 and 74–75, 36
8083	6–11	54–55, 16
8085	ca. 10	53–55 or 63–65, and 73–75 or 83–85
2037	12–14	23–27 and 33–37
2575	ca. 16–18	13–17 and 43–47
8078	<20	Molar impressions
2418, 2527, 2581, 8061, 8250	No estimate	

Table 1. The age distribution among the teeth marks in the lumps of resin at the Huseby klev site, Bohuslän province, Sweden (Alexandersen 2005).

it seems that this gum was chewed by a young boy (Table 1, no. 2037).

We have not been able to trace changes in the chewing of resin or the use of the teeth along the lifespan of the individuals from birth to 16–18 years: that is, the span present in the teeth marks. Accordingly, we cannot discuss maturation into adulthood among the Early Mesolithic children. We will just look upon them as children and adolescents, although the oldest ones may very well have passed into adulthood according to the contemporary view of their own society.

The teeth marks on the pieces of resin are so well preserved that we can actually travel back in time and study single teeth with respect to the abrasion on each one. Together the teeth in the collection show the status of the health of these young persons. The archaeological evidence indicates the quality of life the individuals experienced during childhood and adolescence.

Resin for pleasure and use

Why chew resin lumps during the Early Mesolithic? One suggestion is that resin was used for cleansing the teeth. Another suggestion is that the chewing was a step in processing the resin before it was used for various purposes. The latter idea leads to new questions: Why did only children and teenagers chew lumps of resin? The answer could be very simple. The youngsters liked the special texture of the lumps. It was fun to chew the resin. This idea bets the question, however – why did adults not think the same way? Presumably nothing else in Stone Age life was

like the texture of soft resin. But then we have the other side of the problem. The botanical substance of the resin has been identified as birch (Aveling 2005), which has an especially strong taste. It could be that the lumps were chewed for a very short while, and when the strong taste appeared the children just spat them out.

The detailed examination of the lumps of resin gives a clue as to the use of resin at the site (Malmros 2005). All the lumps contain small pieces of plant fibres. The conclusion is that before they were put to any use, the lumps were chewed at length. In the process, the resin became homogenised, warm and smooth. Then it was ready for use. Obviously most of the resin found at the site was used in one way or another, not just for the sole purpose of chewing it. Most likely the resin was multifunctional.

The chewing gum as well as the teeth marks shows that the children used their teeth as tools. Especially one tooth with a special wear pattern indicates that this individual had been working with skins, leather or plants (Alexandersen 2005), and had used her or his teeth as part of the work process. Another tooth, a milk tooth, has tartar, and thus perhaps gingivitis, i.e. an infection in the gums. The owner of this tooth seems not to have been so keen on cleaning his or her teeth. However, other teeth in the collection indicate that these particular individuals had a good standard of living as they were growing up, since the preserved teeth show no evidence of enamel hypoplasia, indicating periods of malnutrition or illness.

All the pieces of chewing gum had been chewed only by children and teenagers. As it is very rare in archaeology to actually be able to identify young individuals in this explicit way, it gives us a new starting point for looking at this particular artefact material. Let us therefore have a look at the social aspect of the lumps of resin.

At the Huseby klev site, large numbers of fragments of resin were found with marks other than those of teeth. These pieces indicate activities related to other aspects of Stone Age life. Some of these lumps demonstrate that someone was in the process of making something, but the person was interrupted or she or he stopped for some reason. For example, there are lumps which have blurred traces of teeth marks from chewing and impressions from being rolled around in the hand. Another lump has a hole in it, similar to one somebody would make when pushing a stick through soft resin. Then the next stage to be expected in the process ought to have been the heating of the

piece. But the person was not satisfied, so before heating it up, the now soft lump was once more placed on one of the person's legs and a hand was put on top of it, probably to keep the lump steady, and then the stick was once more pushed into the resin. Today, 10 000 years later, the lump of resin contains all these different marks of the person's skin on its surface.

There are also some pieces of resin that have retained the marks of twigs about one centimetre thick. These pieces have a curved shape. The twigs are parallel and close to one another. The suggestion is that these pieces are fragments of some kind of containers. The marks of the twigs indicate that the containers were woven. It seems that the resin was used to make the containers watertight in order to hold liquids like water or blood.

Some lumps of resin had fragments of birch bark directly attached to the surface. These are the largest pieces found on the site. The suggestion is that these lumps are the remains of the initial process of making the resin. According to this theory, the birch bark was utilised as a collector. When the resin was gathered, it flowed down onto the bark, thus preventing the resin from picking up unwanted materials such as sand, for example.

There are also pieces of resin with different kinds of impressions of twisted cord made from plant fibres. Four of these pieces have been connected with pieces of wood. There is one specimen with the cord associated with twigs which have a smooth surface, and which belong to the group described above as containers. Then there are three fragments with impressions of cord and a hand-made hole. They belong to the groups of lumps described next.

Eighteen pieces in this group are characterised by having a thin, flat appearance. Their upper surface is smooth and impressions of plant fibres are found on the opposite side. All these fragments are considered to be discards from boat repairs. On the smooth upper surface of one piece are two fingerprints left by the person who did the repair. It has not been possible to determine the age or sex of this person. There are also some pieces of resin which show the traces of someone working on a wooden object. Some of these pieces have hand-made holes. Other marks indicate that the resin comes from wooden objects that have been worked with an axe. All these fragments of resin were intended to fill small and large cracks and fissures of some kind on a large wooden object. The conclusion is that all of the flat pieces of resin originate from caulking wooden boats.

The historical ethnology of chewing resin

Black lumps of resin with impressions of teeth are common archaeological finds (Aveling & Heron 1997, Brzezinski & Piotrowski 1997, Aveling 1998). The southernmost site in Sweden is Segebro, Scania, from about 5000 BC, and the northernmost one is Sävar, Västerbotten, from about 1500 BC (Alexandersen 1986, Sandén 1994). Laboratory analyses suggest that the black lumps are pitch, resin or tar from birch and evergreens (Aveling 2005). The Huseby klev lumps have not been analysed.

Traditionally resin was used for chewing. Historically spruce resin was used as chewing gum in Scandinavia. Still, today, many rural people remember chewing resin as children. An alternative was to chew pieces of bacon rind, which is salty and lasts longer.

Experience is needed to collect and carefully select the resin from the trees. Good quality spruce resin tastes refreshing and sweet. It may be hard work for the jaw muscles to chew it, and bubbles cannot be blown. Carl von Linné, the 18th-century scientist who created the current plant taxonomy, wrote a note on the chewing of resin and its commercial value in his diary while travelling in the province of Dalarna, central Sweden, in the summer of 1734 (Linné [1889] 1984; translated by Carole Gillis):

[...] the womenfolk, seldom the menfolk, chew in church and other places a kind of resin prepared in a special way, the thing they chew, so that the saliva flows strong and is expectorated. It is said that it makes one alert and protects against scurvy. At least it gives one clean gums and teeth. This chewing resin is prepared like this: one takes the clearest resin that can be gotten from spruce trees. It is chewed by shepherdesses, boys or old women, until the resin is white, so that it can be pulled between one's teeth – the longer it can be pulled, the better prepared it is. The resin that hasn't been chewed tastes more bitter and sticks more to the teeth. It is used and sold at Falun [the main town in Dalarna] in various shapes. When it is chewed it excites the ptyalismum [saliva] and is said to rot the teeth eventually. It is chewed until it gets red, hard and difficult to chew.

This perhaps comes closest to the chewing of resin during the Early Mesolithic, except of course trying it oneself or imagining doing it. Obviously, most of the senses are involved in chewing resin, like they are in chewing 21st century bubble gum.

To be a child tasting, chewing and blowing gum

Modern children like the taste of chewing gum; they enjoy blowing bubbles and experiencing a tiny bit of adulthood. As part of their childhood memories, the old people visiting the excavation at the jetty in Tidaholm emphasised the fun of competing with the other children in blowing the biggest and best bubble. The bubbles were the main point of chewing gum. Of course one liked the initial taste of a new stick of gum, and as the taste faded away, one just added a fresh piece to the old ones. The larger the wad of gum, the greater the chance of blowing an even larger bubble – the possibilities were unlimited.

The adults surrounding the chewing children may have had different experiences. One mother among the authors of this article, having several children herself, exclaimed in regard to chewing resin...

Ah, mothers of the past who didn't have to listen to the chomping and slurping of bubble gum!

...which was not agreed on by the other mother among the authors for gender-political reasons and as an idiosyncratic opinion. Grown-ups think they know best.

The Mesolithic children possibly also had fun chewing resin, although the birch resin used at the Huseby klev site does not taste as good as spruce resin, and it is impossible to blow bubbles from resin. On the other hand, while modern children may feel like grown-ups when they chew gum, for Mesolithic children, chewing resin was part of working together with adults – thus in a way being adults themselves.

Modern children find pleasure in blowing and popping bubbles when chewing tasty gum. The Mesolithic children gave their jaw muscles a good work-out when they prepared resins for various tasks. Hopefully they liked the taste of the resin at least.

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