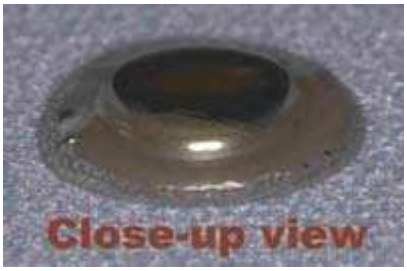
Amalgam

Proper Disposal of the Plastic Bladders Found Inside Some Amalgam Capsules (1/06)

Question: What is the proper method for disposing of the plastic mercury "bladders" that are in some amalgam capsules?

Answer: This is a very relevant question due to the change in Air Force policy on recycling amalgam waste. Some manufacturers enclose the mercury within the amalgam capsules using a "pillow pack" to prevent premature mixing of the mercury and alloy powder before trituration. The pillow pack is a small, clear, plastic envelope that resembles a bladder (see picture). The kinetic energy generated during trituration ruptures the pillow pack and allows the mercury to mix with the powder. The used pillow pack appears as a piece of plastic that usually comes out of the capsule with the mixed amalgam.



In 2003 the American Dental Association (ADA) published Best Management Practices for Amalgam Waste. The ADA has periodically updated these recommendations. The recommendations included guidelines for recycling disposable amalgam capsules. The Air Force followed the ADA's lead and issued a policy letter on amalgam waste recycling in 2004 (updated in FY06). The policy letter requires USAF Dental Services to recycle the disposable amalgam capsules. This includes the plastic pillow. After an amalgam capsule is opened and the triturated amalgam is removed the plastic pillow should be put back into the used capsule, the capsule recapped, and then stored in a sealed container. An alternative method for recycling the plastic pillow is to store it with amalgam scrap in a sealed container. The amount of used amalgam capsules and scrap amalgam stored in the dental treatment room before being placed in a central recycling area in the dental clinic is determined by local policy. Air Force policy requires that contact amalgam (contacted patient), non-contact amalgam, disposable traps with amalgam contamination, and extracted teeth with amalgam restorations also be recycled.

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[Return to Top]

Factors to use when Selecting a Brand of Amalgam (Originally published in May 1996)

Question: Recently, several new brands of amalgam have been introduced to the market and I am thinking about buying one of them. I usually base my purchase of a new amalgam on how it handles when I condense and carve it. Should I use other factors?

Answer: With new amalgam brands being introduced to the market each year, it is important to have some way of identifying the brands that will meet your needs and expectations. It is probably safe to say that most clinicians don't have an established set of criteria that they use when buying a new amalgam. Manufacturers, on the other hand, commonly use the purported clinical handling characteristics of their new amalgams as a way of marketing them. Are these characteristics useful when trying to decide if a new amalgam alloy is one you want to buy, or are there other factors that should be considered?
Before discussing whether or not handling characteristics is a factor one should use when selecting an amalgam, let's take a look at a few selection factors that, for many years, have been considered to be important. One of these factors is the amalgam's compressive strength. Frequently, clinicians compare a newly-marketed alloy's one-hour or 24-hour compressive strength with values for competing brands. Unfortunately, this factor is really not a very discriminating one. That isn't to say that strength is unimportant; in fact, the early and ultimate strength of an amalgam is quite important to its clinical performance and success. If an alloy is not sufficiently strong, the heavy loads that may be brought to bear on it will cause it to fracture and fail. The reason that strength is not a very useful selection factor is because essentially all amalgams introduced to the market exceed the minimum strength required by the ANSI/ADA specification and will be sufficiently strong to resist fracture when used appropriately.

Another factor that has been used as a selection criterion for many years has been creep (i.e., the degree to which the amalgam permanently deforms as a result of stress). In the early 1970s, a relationship was shown to exist between creep and marginal deterioration of amalgam. As a result, many clinicians evaluated and chose amalgam brands based on their creep rates. They felt that the lower the creep rate, the less chance the amalgam would exhibit chipped margins. While this is true, advances in amalgam composition have rendered creep rate comparisons essentially meaningless. This is because the creep rates for today's high-copper amalgams are so low that creep rate is no longer a useful predictor of the tendency for an amalgam to exhibit marginal deterioration. So while having a low creep rate is still important, basically all amalgams introduced to the market today have sufficiently low creep rates.
If strength and creep are not very useful selection criteria for the vast majority of new amalgam brands being introduced to today's market, what criteria should be used? Probably the most important factor that a clinician can use when choosing a new amalgam is the results of long-term clinical studies of the product. Unfortunately, few (if any) new amalgam alloys are tested in these types of studies before they are marketed. Even when they are used in these types of studies, it is not practical to wait for three to five years for the test results before you make a choice about purchasing a new amalgam. What other factor can be used then that is clinically important? Well, we have essentially gone full circle because we return to your initial question and comment about clinical handling characteristics. Probably the most useful characteristic to consider when selecting a new alloy is the way it handles during condensation and carving. Knowing what type of amalgam the product is compositionally can be very helpful in giving you information about how you can expect it to handle. For example, if the alloy is a single-composition lathe cut amalgam (of which few exist), you can expect that it will provide definite resistance to condensation.

This will make it a good choice when attempting to establish good, firm interproximal contacts. Unfortunately, its resistance to condensation makes it difficult to condense in areas with limited access. In addition, it will harden more slowly than other types of amalgam and will not be as smooth during carving and burnishing. On the other hand, single-composition-spherical alloys (e.g., Tytin, Megalloy, Valiant) have basically the opposite characteristics. They are much easier to condense into areas with limited access, they are smoother, and they harden faster. Unfortunately, it can be a challenge to produce solid interproximal contacts with this type of amalgam in certain situations. Finally, the admixed alloys (e.g., dispersalloy, Contour, Valiant Ph.D., Original D) combine the characteristics of the other two types of amalgam. They have been described as having the advantages of the single-composition-spherical alloys but not having their disadvantage.

Although I have mentioned that strength and creep rate are not particularly useful as selection factors, you should be aware of them and ensure that the brand of amalgam you are considering has acceptable values. Dealing with manufacturers who have an established reputation can also improve the chances that you will buy a product that will meet your needs and expectations.

Return to Top

Determining Mixing Times for Amalgam (Originally published in May 1997)

Question: I just received a new triturator that has a set mixing speed. Unfortunately, because the triturator is new, neither the manufacturer of the triturator nor the manufacturer of the amalgam I like to use provides a recommended mixing time for this triturator. Is there a way of determining how long I should mix the amalgam without simply guessing?

Answer: Your problem is not an uncommon one. Quite a few new triturators have been introduced to the market in the last five years. Not uncommonly, the manufacturer will neglect to include, or choose not to include, recommended mixing times for amalgam alloys. Usually, the clinician and assistant are left to their own devices to determine the appropriate mixing times. It is important to mix amalgam for the appropriate amount of time because it can affect the alloy's working time (i.e., the amount of time available for condensing and carving the amalgam), especially if the amalgam is an admixed type such as Dispersalloy® (Dentsply/Caulk), Valiant Ph.D.® (Vivadent), or Original D® (Wykle Research). It is therefore important to have a method you can use to quickly and accurately determine the appropriate mixing time for your amalgam.

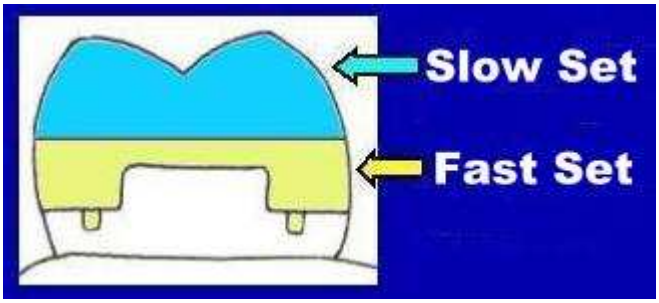
One way of doing this is to follow the steps listed below:

- Set the triturator's mixing time for 6 seconds shorter than you normally use, then:
- Make a mix and examine the amalgam for plasticity.
- If the amalgam is too dry and does not hold together, increase the mixing time by one-second increments, each time making a test mix and examining its plasticity.
- When the first acceptable plastic mix is produced, increase the setting by two seconds and use that as the appropriate mixing time for that particular amalgam.
- Further adjustments of the mixing time may be necessary, however this gives you one way of determining a mixing time using an organized approach.

Return to Top

Using Two Types of Amalgam for One Restoration (Originally published in Jan 2002)

Question: What is your opinion about mixing different types of amalgams like an admix and a spherical? My specific question is whether or not it's okay to use a faster-setting spherical like Tytin for the bottom part of a chamber-retained buildup and a slower-setting admixed amalgam like Valiant Phd for the top portion to give more time for carving?



Answer: One of the most important differences between the various types of amalgam is their handling characteristics. For example, single-composition-spherical (SCS) amalgams like Tytin (SDS/Kerr), Megalloy (Dentsply/Caulk), and Logic + (Southern Dental Industries) are characterized by being harder, stronger in compression, and faster setting than admixed ones like Dispersalloy (Dentsply/Caulk), Valiant PhD (Ivoclar Vivadent), and Original D (Wykle Research). An alloy that becomes harder faster can more effectively be used in retentive features such as amalgapin preparations, peripheral shelves, grooves, and slots. Placing a slower-setting admixed amalgam over the

SCS can provide you with additional carving time for incorporating proper anatomy and contours. You can maximize these advantages by selecting the faster-setting version of a SCS amalgam (usually called fast-set) and the slower-setting version of an admixed amalgam (usually called regular-set or possibly slow-set). This will provide maximum early retention of the restoration coupled with extended carving time. Laboratory studies appears to support this type of technique because they indicate that the strength of a combination of two types of amalgam is not statistically different from that of a single type.1,2 Also, research has shown that the resistance to early dislodgment of an amalgapin-retained complex amalgam is greater when using the SCS Tytin or a combination of Tytin and the admixed DECSpersalloy than when using dispersalloy alone.3 Importantly, the same study found no evidence of delamination during testing. This appears to be a viable and useful procedure when placing complex amalgams, especially when using amalgapin features for retention/resistance.

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Return to Top

Selecting a New Brand of Amalgam (Originally published in Jan 2002)

Question: A number of the dentists in our clinic are complaining about the amalgam we are using so we want to buy a new brand. What are the important properties we should look at before we make up our minds?

Answer: Your question is a good one because some of the factors that were considered important years ago are no longer good ones on which to base a decision. Before we discuss those, however, I should mention what the single most important information is that you can have. That's how well the product has performed in long-term clinical studies. Unfortunately, unless the amalgam brand has been on the market for at least 3 to 5 years, few if any clinical studies will be available for review. So we have to turn to factors such as physical properties. This is where it is important to note that things have changed over the years. For example, the strength of an amalgam after it sets isn't as good a selection criterion as it once was because all brands marketed today are strong enough to resist the normal forces encountered in the oral cavity. Likewise creep rate, which can be a predictor of the degree to which an amalgam will undergo marginal "ditching" or breakdown, used to be helpful in selecting a brand of amalgam. Since the advent of the high-copper amalgams, however, creep rates are so low that they are no longer a good discriminator when comparing brands.

So, if strength and creep rate are no longer useful factors, what are some characteristics or properties that should be examined before buying a new type of amalgam? Well, one of the most important is the specific type of amalgam the brand is. The four types of amalgam, based on the shape(s) of the alloy particles they contain, are: single-composition lathe cut (SCL), single-composition spherical (SCS), admixture of lathe-cut with spherical silver-copper eutectic particles, and admixture of lathe-cut with single-composition-spherical particles. Why is this important? It's important because the shape of the particles in an amalgam greatly affect its handling characteristics. For example, SCS amalgams (e.g., Tytin, Megalloy, Valiant, Logic+) are easy to condense, get harder faster, and are smoother to carve, burnish and polish than the other three types. Unfortunately, though, they are more difficult to establish solid proximal contacts with. SCL amalgams, on the other hand, have the opposite advantages and disadvantages. Lastly, admixed amalgams (e.g., dispersalloy, Original D, Permite C, GS 80, Indisperse, Valiant Ph.D.) have the advantages of the SCS amalgams and can be used pretty effectively to establish acceptable proximal contacts. Another good selection factor is cost. Conserving our limited budgets is

wise and a significant amount of money can be saved if you can find an acceptable amalgam at an attractive price.

DIS can be a useful source of information about amalgam, particularly some of the more recently introduced products. Over the years we have evaluated such products as Valiant Snap-Set (Ivoclar Vivadent), Megalloy (Dentsply/Caulk), Original D (Wykle Research), Logic+ (Southern Dental Industries), Tytin FC (SDS/Kerr), Permite C (Southern Dental Industries), GS 80 (Southern Dental Industries), and Indisperse (Indisperse Distributing). In previous issues of Dental Items of Significance we have also discussed a number of amalgam-related topics including a way of determining the correct mixing time for amalgam, possible mercury contamination of amalgamators, and the amalgam bonding procedure. If you have questions about amalgam or need more help in selecting a specific brand, please contact DECS.

Return to Top

Proper Handling of Amalgambond (Originally published in Jan 2001)

Question: Yesterday, I had a very unexpected thing happen while I was treating a patient using Amalgambond. My assistant had mixed the base and catalyst and was using a cotton roll to clean up some leftover liquid. He placed the cotton roll on a patient napkin where it began to smolder and then flame. I had never heard of something like that. The flame wasn't large and it went out pretty quickly, but I'd like to know if this is specific to Amalgambond or can other bonding products cause this?

Answer: Amalgambond is the only bonding product that exhibits this behavior. It has been known for some time that the catalyst of Amalgambond (and Amalgambond Plus), tri-n-butyl borane, can cause paper to smolder if it is applied to it. On Parkell's web site (http://www.parkell.com/), the Material Safety Data Sheet (MSDS) for the catalyst notes that it is a relatively unstable, volatile liquid that can "(g)enerate heat when exposed in the air and may cause spontaneous combustion of cotton, gauze or other flammable materials." For that reason, Parkell provides guidance for properly handling the catalyst. If you spill some of the catalyst or have mixed base and catalyst to clean up, use a slightly damp cloth towel. Do not use a dry piece of gauze, paper, or cotton and never discard the cloth towel or towelette in a trash receptacle. Immediately after wiping up the liquid, you should run the cloth under running water, wring it out, and then let it dry in the open. Other measures for avoiding this problem include mixing the base and catalyst immediately before use, cleaning up any excess catalyst and base as soon as possible, and never leaving the catalyst syringe uncovered.

Return to Top

To Bond or not to Bond? (Originally published in Jan 2003)

Question: I have been told to bond all of my amalgam restorations at my base. Should I be placing a resin adhesive so routinely?

Answer: Many laboratory and several clinical studies over the last decade have evaluated the potential advantages and disadvantages of bonding amalgam to tooth structure.

Multiple laboratory studies have found definite advantages with bonded amalgam restorations with increased retention,[1] fracture resistance,[2,3] and marginal seal.[4] Staninec found that the use of adhesives provided greater retention than grooves or dovetails.[1] Oliveira and others found improved fracture resistance in large MOD preparations when bonding amalgam over the use of copalite alone.[2] A study by Burgess and others found no difference in the strength of complex amalgam restorations using four TMS pins or bonding, but the combination of the two significantly increased the forces necessary for fracture.[3] Studies have also shown increased retention of amalgam when bonding with resins containing filler particles.[5] The more viscous bonding agent may improve penetration into the amalgam during condensation.[6] Also, research has shown a reinforcement of remaining tooth structure with bonded amalgam restorations.[7] However, the ability to maintain this reinforcement over time remains equivocal

with some studies showing no increase in fracture resistance after aging and thermocycling.[8,9] The use of an adhesive agent under amalgam has been shown in laboratory studies to decrease microleakage.[4] Again, the long-term significance of this decrease is unknown.

Most of the clinical studies have found no decrease in post-operative sensitivity[10,11] and no difference in the performance of bonded amalgam restorations compared with traditional mechanically-retained restorations.[6,12] Contrary to popular belief, the preponderance of clinical investigations has demonstrated no difference in sensitivity reported by patients receiving amalgam restorations with or without resin adhesives.[10,11] Summitt and others published a clinical study comparing the performance of bonded versus pin-retained complex amalgam restorations and found no difference after five years between the two techniques. They concluded that bonding with a filled bonding resin (Amalgabond Plus, Parkell Inc., Farmingdale, NY) was a satisfactory method of retaining large amalgam restorations replacing entire cusps.[6] So, should you place an adhesive agent under all of your amalgam restorations? Given the added cost, time and technique sensitivity of using adhesive liners, there appears to be no clinically-demonstrated benefit in bonding conventional preparations which contain customary retentive features.[13] However, given the advantages of increased retention, strength and marginal seal found in laboratory studies, the bonding of amalgam may be justified adjunctively with traditional mechanical retention in large restorations replacing a cusp, when tooth structure may need some reinforcement, and for crown foundations. [13]

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Return to Top