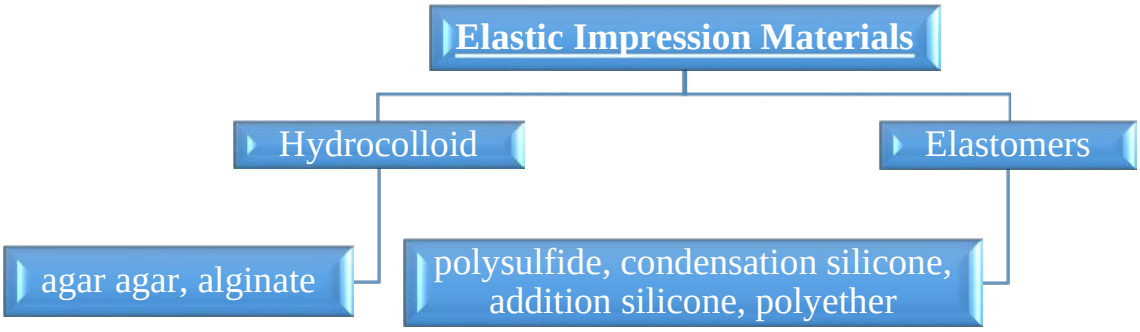
Lec.6 **Dr. Sahar**

Dental Materials

Elastic Impression Materials

It is the ideal impression materials for reproduction of tooth form and relationship, which can be with-drawn from the undercut area & return to its original form without distortion.



1. Hydrocolloid Impression Materials

The colloid can exist in the form of a liquid known as a sol, or a solid described as a gel. If the particles are suspended in water, the suspension is called hydrocolloid.

Types of hydrocolloid impression materials:

Based on the mode of ***gelation*** (conversion of sol to gel & development of elastic properties through alignment of polysaccharide chains), they are classified as:

1. Reversible hydrocolloids: set by lowering the temperature (they are reusable) e.g. Agar.

2. Irreversible hydrocolloids: set by chemical reaction (not reusable) e.g. Alginate.

Reversible hydrocolloids (Agar):

It was the first successful elastic impression material to be used in dentistry. It has been largely replaced by alginate hydrocolloid and rubber impression materials.

Agar impression is hydrophilic mucostatic, when heated they go into sol (liquefy) and returned to gel on cooling.

♦ **Uses:**

1. Cast duplication (during fabrication of cast metal removable partial denture).
2. Full mouth impression without deep undercuts.
3. Crown & bridge impression before elastomers came to the market.
4. As tissue conditioner.

♦**Supplied as:**

1. Gel in collapsible tube for impression, used with water cooled impression tray.
2. A number of cylinders in a glass jar (syringe material).
3. In bulk containers.







♦ **Composition:**

material	purpose
Agar 12% (seaweed extract)	Colloid as the base of the gel
Borax 0.2%	improve the strength of the gel
Potassium sulphate 1-2%	accelerator
Alkyl benzoate 0.1%	Antifungal agent (preservatives)
Water85%	dispersion medium for the colloidal suspension
Dyes and flavoring agent	

♦ **Equipment for agar impression:**

1. Water cooled rim lock tray.
2. Hydrocolloid conditioner (temperature controlled water bath).




♦ **Properties:**

- It is non-rigid hydrophilic, mucostatic impression.
- It is important to remove the tray by rapid snap action that enhances elastic recovery and decrease permanent deformation.
- Working time 7-15 min and setting time about 5 min that can be controlled by regulating the flow of water through the cooling tube.

Advantages	Disadvantages
It provides very accurate reproduction of surface detail.	Poor mechanical properties and low tear resistance.(Tear resistance better than alginate)
Agar impression is highly accurate at the time of removal from the mouth.	The cast should be poured immediately due to its low dimensional stability.
Hydrophilic (give the best result in the presence of saliva).	Need special equipment such as water cooled tray and temperature controlled bath.
Cheap material cause it can be used up to four times.	Cost equipment.
No mixing required and well tolerated by the patient.	Difficult to disinfect.

Irreversible hydrocolloids (Alginate)

It is hydrocolloid, non-rigid, hydrophilic and irreversible impression. Alginate is one of the most widely used dental impression material.

♦ **Supplied** as powder mixed with water and set by a chemical reaction.



♦**Used** widely for taking impression of partial dentures and not recommended for crown and bridge work.

♦ **Types:**

- Regular set.
- Fast set.

♦ **Composition:**

Material	Purpose
Sodium alginate	Hydrogel former (dissolve in water & reacts with calcium ions).
Calcium sulphate	Provides calcium ions of the cross reaction that converts sol to gel.
Sodium phosphate	Control working time, serve as retarder react with calcium sulphate.
Potassium sulphate	Counteract the inhibition effect of alginate on the setting of gypsum model material, giving high quality surface of cast.
Filler	Control consistency of the mix.
Quaternary ammonium	Provide self-disinfection.
Pigments	Provide color.
Reactive indicator	Give color change when setting is complete.

♦ **Chemical reaction:**

When powder and water are mixed, a chemical reaction occurs that cross links the polymer chain forming a three dimensional network structure.

sol (powder+water) ⟶ gel

Sodium alginate + water +calcium sulphate ⟶ sodium sulphate + calcium alginate

♦ **Mixing:**

When mixed powder with water a vigorous figure eight motion is the best with the mix being swiped against the side of the rubber bowel with intermitted rotation of spatula to press out air bubbles. The mix should be smooth, creamy with minimum of voids and does not drip off the spatula when it is raised from the rubber bowel.



♦ **Properties:**

- Mixing time 45- 60 sec. Over mixing result in reduction of setting time and final strength. While under mixing cause inadequate mixing and low strength.
- The alginate impression has a well-controlled working time but does vary from product to product. There are regular setting (setting time 2-4.5 minutes) and fast setting (setting time 1-2 minutes). Lengthening of setting time is better accomplished by reducing the temperature of the water used with mix (18-24C^{o}).
- The clinical setting time can be detected by the loss of tackiness of the surface, the material should be left inside the patient mouth for 2-3 min after loss of tackiness.
- Like agar, a snap removal is used to enhance elastic recovery and decrease permanent deformation.

Advantages	Disadvantages
The material is mucostatic and also hydrophilic.	The production of surface details is not as good as agar or elastomers, they are not recommended for crown & bridge work (popular for partial denture work).
Easy of manipulation with minimum equipment needed.	Poor dimensional stability, therefore the cast should be poured immediately.
Low cost.	It has poor mechanical properties and low tear strength (lower than agar).
Has suitable setting time.	Difficult to disinfect.
Flexibility of the set impression.	The permanent deformation is higher than agar.
Pleasant taste and smell.	

♦ **Recommendation:**

* Thin layers of alginate are weak. The thickness of alginate impression between the tray and tissue should be at least 3mm.

* Retention means to hold the material to the tray is needed, therefore perforated tray or rim lock tray is needed.

* The material should be left in patient mouth for 2-3 minutes after tackiness has gone from the surface, since the tear strength and resistance to permanent deformation increase significantly during this period.

* Set gypsum model should not remain in contact with the alginate impression for a period of hours because contact of slightly soluble calcium sulphate dihydrate with alginate gel containing a great deal of water is detrimental to the surface quality of model.