Dental Materials I

Unit V

Aqueous Elastomeric Dental Impression Materials
Aqueous Elastomeric Dental Impression Materials

Uses: Comes in various forms.

Each material has its own particular technique for use and purpose.

Dental impression materials are **exact/precise** - manufacturers directions must be followed completely. Unlike plaster and stone.

- Alginate is not accurate enough to use for a final impression for crown and bridge, but would it make sense to use hydrocolloid for the primary impression to make a study model. These materials set either by a chemical or cooling action.

- Elastomeric impression stretch elastically when removed over the tooth and then spring back to their original shape.

Aqueous Elastomeric Hydrocolloids

- A more common name for the water based impression materials.
- Colloid are suspensions of molecules in some type of dispersing medium such as, water, hence the term hydrocolloid.
- The molecules each possess a similar electrical charge and therefore repel each other.

Irreversible Hydrocolloids - Alginate

- The transformation from sol to gel (gelatin) of irreversible hydrocolloid (alginate) occurs by a chemical reaction. Once the gel has formed it cannot go back to sol.

- Alginate has various brand names, some in gel form and in a soft mass. There are a variety of colors, flavors, dust free and antimicrobial options.
Aqueous Elastomeric Dental Impression Materials

- Impression Categories/Types:
  - Aqueous elastomeric is water based
  - Non-aqueous elastomeric is a synthetic rubber based material
Aqueous Elastomeric Dental Impression Materials

Impression Techniques: used with impression materials

- **Indirect technique** - impression taken outside the mouth-on a model
- **Direct technique** - impression taken in the mouth
Aqueous Elastomeric Dental Impression Materials

- Characteristics:
  - Materials are non-elastic or elastomeric.
  - Alginate not accurate for final impression
  - Hydrocolloid for primary impression, too expensive/involved
  - These materials set by chemical or cooling action.
  - Elastomeric impression stretch when removed
  - Then spring back to original shape.
Aqueous Elastomeric Dental Impression Materials

- Acqueous Elastromeric Hydrocolloids

1. A common name for water based impression materials.
2. Colloid are suspensions of molecules in some type of dispersing medium such as, water, hence the term hydrocolloid
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Aqueous Elastomeric Materials

Irreversible Hydrocolloid

- Alginate - various brand names
- variety of colors/flavors
- dust free
- antimicrobial
Aqueous Elastomeric Materials

Irreversible Hydrocolloid

■ Uses

■ Impressions:
  - for appliances
  - study/orthodontic models
  - partial/denture repairs
  - preliminary edentulous impressions
Aqueous Elastomeric Materials

Irreversible Hydrocolloid

- Physical Characteristics
  - Gels by a chemical reaction
  - Not accurate as reversible colloid
  - More porous
Aqueous Elastomeric Materials

Irreversible Hydrocolloid

- **Types**
- **Normal Set** - Type II
  - gel 2 - 4.5 min
- **Fast Set** - Type I
  - gel 1 - 2 min
- **Extra Fast Set**
  - gel less than 1 min
- **Chromochon** - Type I or II
  - color change indicates mixing/setting
Aqueous Elastomeric Materials

Irreversible Hydrocolloid

- **Composition**
  - 15% Potassium Alginate - (sea kelp) a thickening agent
  - 16% Calcium Sulfate - reacts w/potassium to create a gel
  - 2% Trisodium Phosphate - a retarder determines working/setting
  - 4% Zinc Oxide - a filler
  - 3% Potassium Titanium Fluoride - added as an accelerator so the gypsum will set
  - 60% Diatomaceous Earth - a filler to increase strength/stiffness this silica has been identified as an occupational hazard
Aqueous Elastomeric Materials

Irreversible Hydrocolloid

- Packaging and Storing
  - Cans, tubs, pouches, bulk, premixed
  - Fluff cans before dispensing - let it settle!
  - Do not breathe dust
  - Shelf life no longer than 1 year
  - Deteriorates quickly with temp/moisture
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Irreversible Hydrocolloid

- Working and Setting Time

- Gelation time
- measured from the beginning of the mix
- until gelation occurs
- must be enough time to:
  - mix, load tray, pass, place in mouth
Aqueous Elastomeric Materials

Irreversible Hydrocolloid

- Working and Setting Time
  - Water temperature - only method of controlling set
    - cold prolongs set
    - warm accelerates set
Aqueous Elastomeric Materials

Irreversible Hydrocolloid

- **Mixing**
  - water/powder ratio is crucial
  - deviations weaken mix
  - insufficient spatulation can reduce gel strength by 50%
  - excessive spatulation breaks up gelatin stage, weakens final product
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Irreversible Hydrocolloid - Mixing

- **Bowl Technique**
  - water measured, placed in bowl
  - alginate measured & added to water
  - spatulate with swiping, mashing fashion against sides of flexible bowl
  - mix 1 minute - *smooooth* & creamy - not drippy
  - load tray
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Irreversible Hydrocolloid - Mixing

- **Baggie Technique**

- place alginate into baggie
- shake into one corner
- add water, express air
- fold, mash, knead, squeeze
- mix 20-30 seconds
- tear one corner, squeeze into tray
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Irreversible Hydrocolloid

- **Infection Control**
  - rinse immediately
  - spray with surface disinfection
  - follow manufacturer’s directions
  - rinse, wrap in a wet paper towel
  - place in baggie, label - call for pick up or pour
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Irreversible Hydrocolloid

- **Common Difficulties**
  - grainy material - water too warm
  - too much water - sloppy
  - prolonged spatulation - sets up
  - failure to pour immediately - dries out
  - improperly removed - tears & distorts
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Irreversible Hydrocolloid

- Common Difficulties

- distortion from delayed pouring
- imbibition
  - swells - takes up moisture from air or towel
- syneresis
  - shrinks - looses water - dry towel
Aqueous Elastomeric Materials

Reversible Hydrocolloid

- **History/Outdated?**
- The first elastomeric impression material introduced to dentistry
- agar agar extracted from kelp is used as the colloid base
Aqueous Elastomeric Materials

Reversible Hydrocolloid

- Use/Indications
  - final impression for lab made restorations
Aqueous Elastomeric Materials

Reversible Hydrocolloid

- **Physical Characteristics**

- **Colloid**
  - large molecules or groups of molecules suspended in a dispersing medium

- **Reversible**
  - go from liquid to gel - then gel to liquid repeatedly
Aqueous Elastomeric Materials

Reversible Hydrocolloid

- Physical Characteristics
- Stability

- prone to syneresis/imbibition
- impression immersed in 2% potassium accelerator
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Reversible Hydrocolloid

- Physical Phases

- Sol

  - groups of molecules dispersed within water
  - behave like a fluid of high viscosity
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Reversible Hydrocolloid

- **Gel**

- reduce temperature
- groups of molecules join together
- forms a network of chains or fibrils
- fibril network encloses dispersed medium
- water at 102°F forms semi solid = gel
Aqueous Elastomeric Materials

Reversible Hydrocolloid

- **Gel Strength**
- Weak & tears
- remove from mouth with snap
- no tugging

- **Gelatin Temperature**
- temperature when change from sol to gel
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Reversible Hydrocolloid

- Reversible

- ability to change from sol to gel to sol

- Known as “Jello theory”
Aqueous Elastomeric Materials

Reversible Hydrocolloid

- Dimensional Stability

- Syneresis
  - loss of water by evaporation creates shrinkage

- Imbibition
  - absorption of water creates swelling

- both cause distortion
Aqueous Elastomeric Materials

Reversible Hydrocolloid

- Preparation and Storage
  - Uses a special machine $$
  - hydrocolloid unit
  - special trays, syringe, tubs
  - three separate tanks
  - temperatures are controlled
Aqueous Elastomeric Materials

Reversible Hydrocolloid

- **Preparation and Storage**
  - 1) Liquefying Section (L)
    - 10 minutes in boiling bath
    - 212°F
  - 2) Storage Section (C)
    - left for hours
    - 150°F - must knead tubes thoroughly
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Reversible Hydrocolloid

- **Preparation and Storage**

- **3) Conditioning or Tempering Section (R)**
  - cooling material to 115°F
  - place in impression tray
  - conditioning bath for 10 minutes
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- **Process:**
  - Dr injects low-viscosity syringe material into mouth (from storage to mouth)
  - Assistant pats dry water-soaked outer layer of material off of tray
Aqueous Elastomeric Materials

- **Reversible Hydrocolloid**

- tray is inserted into mouth & held in place
- cool water (60-70 F) is ran through tray for no less than 5 minutes
Aqueous Elastomeric Materials

- Reversible Hydrocolloid
- Final Steps

- spray off impression as per mfg.
- put into biohazard labeled bag
- containing 2% potassium solution
Aqueous Elastomeric Materials

Reversible Hydrocolloid

- Common Difficulties
  - Inaccuracy
  - Stiff or grainy material
  - Syringe and tray material did not join
  - Rough/ chalky stone or die surface