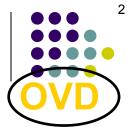


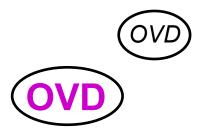


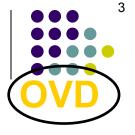
Before we start: In this context, what does OVD stand for?





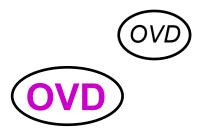
*Before we start: In this context, what does* OVD *stand for?* Ophthalmic viscosurgical device





Before we start: In this context, what does OVD stand for? Ophthalmic viscosurgica device

Note this word—*device*. The point being: Contrary to popular opinion, OVDs are **not** drugs, **not** pharmaceuticals.



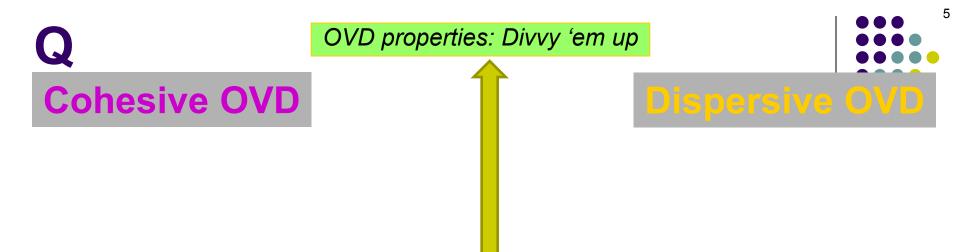


Before we start: In this context, what does OVD stand for? Ophthalmic viscosurgica device

Note this word—*device*. The point being: Contrary to popular opinion, OVDs are **not** drugs, **not** pharmaceuticals. Rather, they are a **surgical device**—more closely related to the bladder retractor you held for hours on Ob/Gyn than they are to the Shugarcaine that precedes them in the AC.



Joel Shugar MD 1958-2008 RIP



In this next part, physical properties of OVDs will be presented in pairs, and you must decide which property goes with which sort of OVD.





OK, start divvying (do these two simultaneously)

Molecular weight: High Molecular weight: Low Molecule length: Long Molecule length: Short Self-adheres well Self-adheres *poorly* Surface tension: High Surface tension: Low *Easy* to aspirate *Difficult* to aspirate Maintains space well Maintains space *poorly* Coats structures *poorly* Coats structures well Viscosity: *High* Viscosity: Low





Molecular weight: High

Now these -

Molecule length: Long Molecule length: Short

Self-adheres well Self-adheres *poorly* Surface tension: *High* Surface tension: Low Easy to aspirate *Difficult* to aspirate Maintains space well Maintains space *poorly* Coats structures *poorly* Coats structures well Viscosity: *High* Viscosity: Low

#### Molecular weight: Low



# **Cohesive OVD**

Molecular weight: High

#### Molecule length: Long

#### Self-adheres *well* Self-adheres *poorly*

Surface tension: *High* Surface tension: *Low Easy* to aspirate *Difficult* to aspirate Maintains space *well* Maintains space *poorly* Coats structures *poorly* Coats structures *well* Viscosity: *High* Viscosity: *Low* 

### Molecular weight: Low



# **Cohesive OVD**

Molecular weight: High

Molecule length: Long

Self-adheres well

## **Dispersive OVD**

Molecular weight: Low

Molecule length: Short

Self-adheres poorly

# Surface tension: *High* Surface tension: *Low*

*Easy* to aspirate *Difficult* to aspirate Maintains space *well* Maintains space *poorly* Coats structures *poorly* Coats structures *well* Viscosity: *High* Viscosity: *Low* 





Molecular weight: High

Molecule length: Long

Self-adheres well

Surface tension: High

*Easy* to aspirate *Difficult* to aspirate Maintains space *well* Maintains space *poorly* Coats structures *poorly* Coats structures *well* Viscosity: *High* Viscosity: *Low* 

## **Dispersive OVD**

Molecular weight: Low

Molecule length: Short

Self-adheres poorly

Surface tension: Low





Molecular weight: High

Molecule length: Long

Self-adheres well



The BCSC offers a synonym for surface tension—what is it? (Hint: It's something-ability)

> Coats structures *well* Viscosity: *High* Viscosity: *Low*

#### Molecular weight: Low

Molecule length: Short

Self-adheres poorly





Molecular weight: High

Molecule length: Long

Self-adheres well



The BCSC offers a synonym for surface tension—what is it? (Hint: It's something-ability) 'Coatability'—the tendency for the surface of a liquid to stick to another surface

> Coats structures *well* Viscosity: *High* Viscosity: *Low*

Molecular weight: Low

Molecule length: Short

Self-adheres poorly





Molecular weight: High

Molecule length: Long

Self-adheres well



The BCSC offers a synonym for surface tension—what is it? (Hint: It's something-ability) 'Coatability'—the tendency for the surface of a liquid to stick to another surface. Coatability is directly vs proportional to surface tension, which means that substances with low surface tension are worse vs coat-ers' than are those with high surface tension.

> Coats structures *well* Viscosity: *High* Viscosity: *Low*

## Dispersive UVD

Molecular weight: Low

Molecule length: Short

Self-adheres poorly





Molecular weight: Low

Molecule length: Short

Self-adheres poorly



Molecular weight: *High* 

Molecule length: Long

Self-adheres well



The BCSC offers a synonym for surface tension—what is it? (Hint: It's something-ability) 'Coatability'—the tendency for the surface of a liquid to stick to another surface. Coatability is inversely proportional to surface tension, which means that substances with low surface tension are better 'coat-ers' than are those with high surface tension.

> Coats structures *well* Viscosity: *High* Viscosity: *Low*





Molecular weight: High

Molecule length: Long

Self-adheres well

Surface tension: High

**Dispersive OVD** 

Molecular weight: Low

Molecule length: Short

Self-adheres poorly

Surface tension: Low

# *Easy* to aspirate *Difficult* to aspirate

Maintains space *well* Maintains space *poorly* Coats structures *poorly* Coats structures *well* Viscosity: *High* Viscosity: *Low* 



# **Cohesive OVD**

Molecular weight: High

Molecule length: Long

Self-adheres well

Surface tension: High

Easy to aspirate

## **Dispersive OVD**

Molecular weight: Low

Molecule length: Short

Self-adheres poorly

Surface tension: Low

Difficult to aspirate

#### Maintains space *well* Maintains space *poorly*

Coats structures *poorly* Coats structures *well* Viscosity: *High* Viscosity: *Low* 



# **Cohesive OVD**

Molecular weight: High

Molecule length: Long

Self-adheres well

Surface tension: High

Easy to aspirate

Maintains space well

## **Dispersive OVD**

Molecular weight: Low

Molecule length: Short

Self-adheres poorly

Surface tension: Low

Difficult to aspirate

Maintains space poorly

Coats structures *poorly* Coats structures *well* 

> Viscosity: *High* Viscosity: *Low*



# **Cohesive OVD**

Molecular weight: High

Molecule length: Long

Self-adheres well

Surface tension: High

Easy to aspirate

Maintains space well

Coats structures poorly

#### Viscosity: *High* Viscosity: *Low*

## **Dispersive OVD**

Molecular weight: Low

Molecule length: Short

Self-adheres poorly

Surface tension: Low

Difficult to aspirate

Maintains space poorly

Coats structures well



Molecular weight: High

Molecule length: Long

Self-adheres well

Surface tension: High

Easy to aspirate

Maintains space well

Coats structures poorly

Viscosity: *High* 

# **Dispersive OVD**

Molecular weight: Low

Molecule length: Short

Self-adheres poorly

Surface tension: Low

Difficult to aspirate

Maintains space poorly

Coats structures well

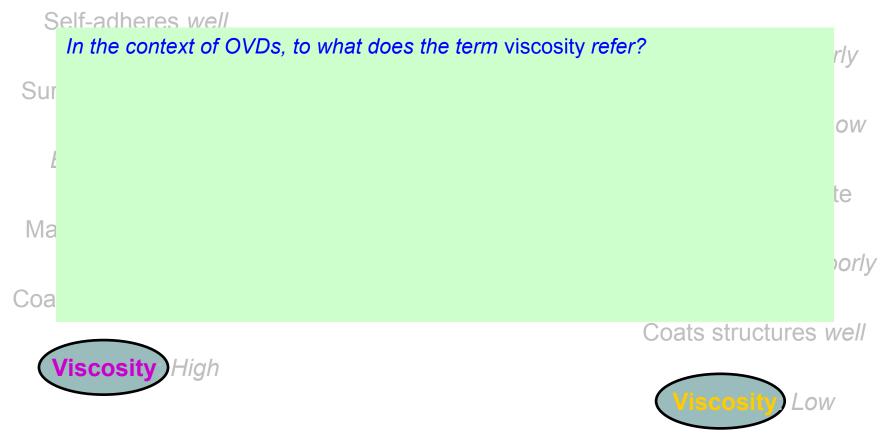




Molecular weight: High

Molecule length: Long

Molecular weight: Low





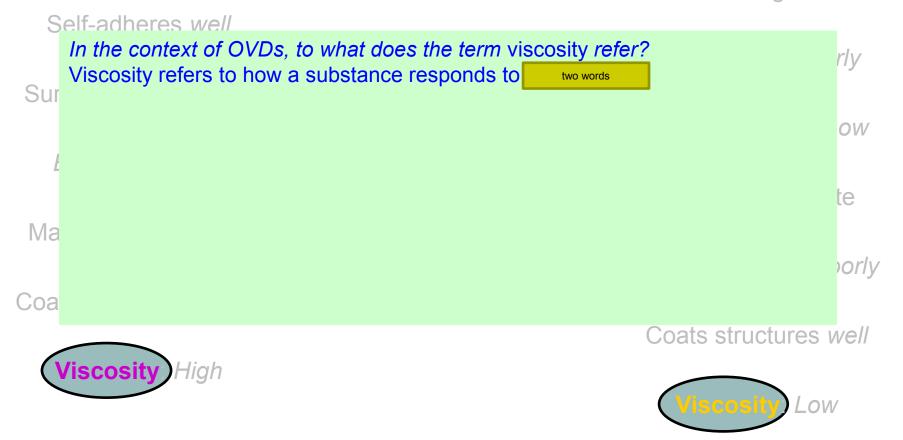


21

Molecular weight: High

Molecule length: Long

Molecular weight: Low



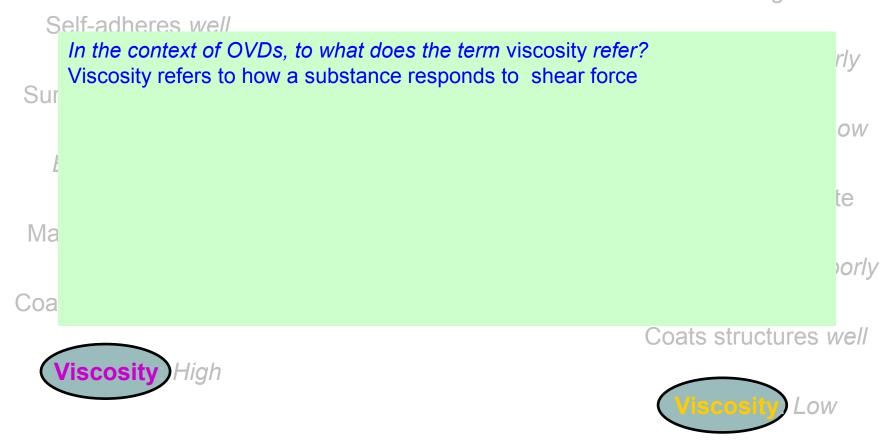




Molecular weight: High

Molecule length: Long

Molecular weight: Low



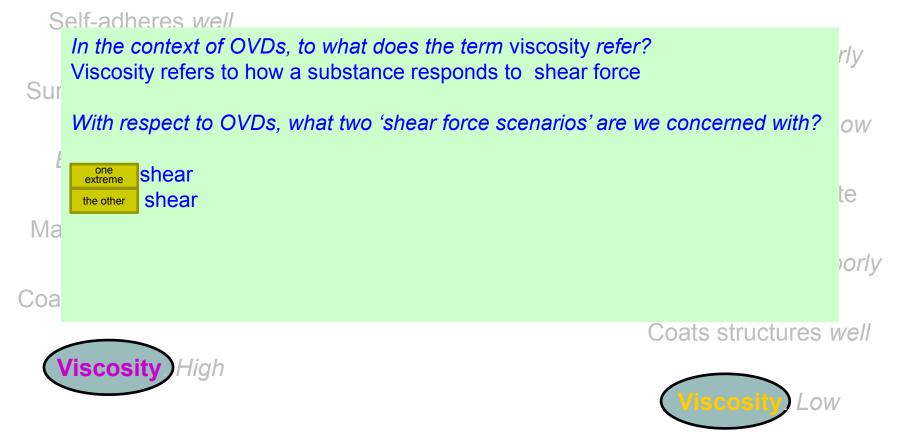




Cohesive OVD Molecular weight: *High* 

Molecular weight: Low

Molecule length: Long



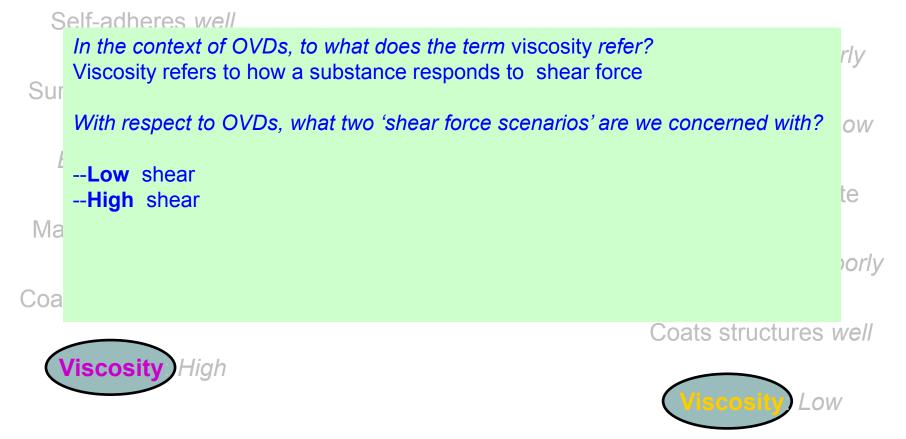




Molecular weight: High

Molecular weight: Low

Molecule length: Long







Molecular weight: High

Molecular weight: Low

Molecule length: Long

```
Self-adheres well
     In the context of OVDs, to what does the term viscosity refer?
                                                                                    rly
     Viscosity refers to how a substance responds to shear force
Sur
     With respect to OVDs, what two 'shear force scenarios' are we concerned with?
                                                                                    OW
     Which intraoperative steps provide a ready example of each?
     --Low shear: ?
                                                                                    te
     --High shear
 Ma
                                                                                    borly
Coa
                                                                Coats structures well
    Viscosity
                 ligh
                                                                                 OW
```

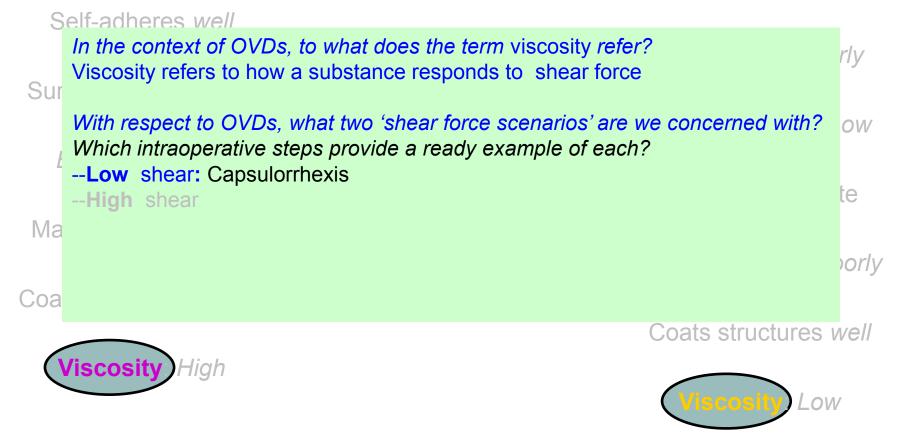




Molecular weight: *High* 

Molecular weight: Low

Molecule length: Long



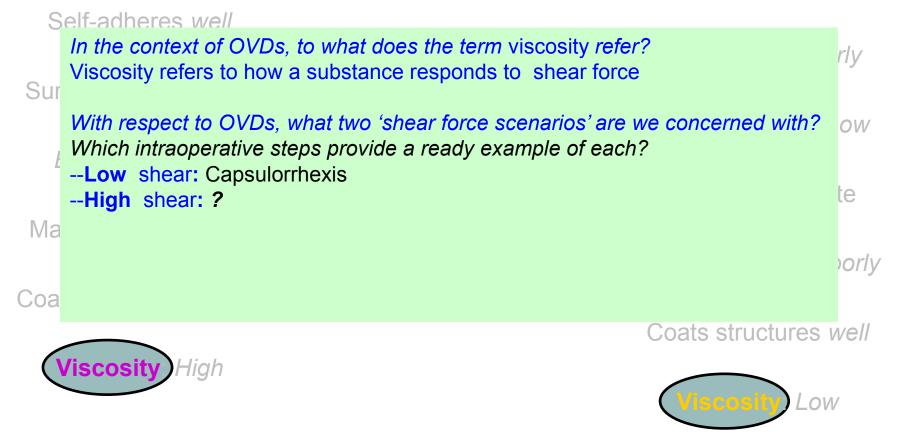




Cohesive OVD Molecular weight: *High* 

Molecular weight: Low

Molecule length: Long



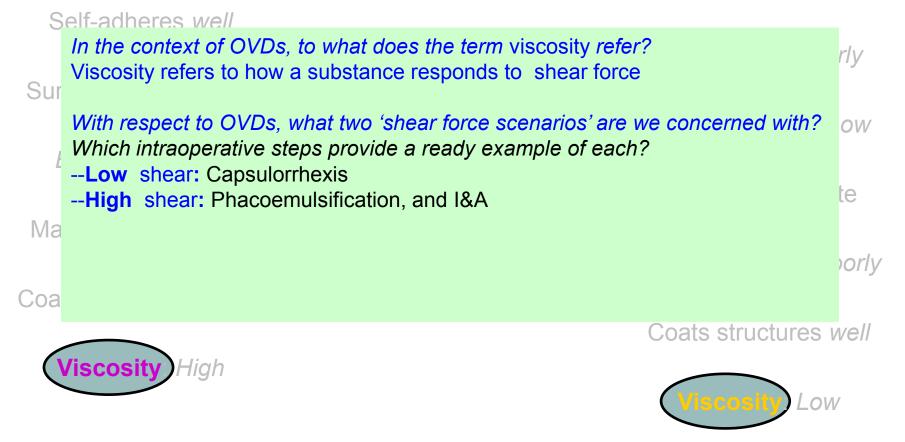




### Cohesive OVD Molecular weight: *High*

Molecular weight: Low

Molecule length: Long







Molecular weight: High

Molecular weight: Low

Molecule length: Long

Self-adheres well		
Sur	In the context of OVDs, to what does the term viscosity refer? Viscosity refers to how a substance responds to shear force	rly
Sui	With respect to OVDs, what two 'shear force scenarios' are we concerned with? Which intraoperative steps provide a ready example of each?	OW
	Low shear: Capsulorrhexis High shear: Phacoemulsification, and I&A	te
Ma	What simplified way does the BCSC suggest to think about viscosity?	orly
Соа		
	Coats structures well	
	Viscosity High	





Molecular weight: High

Molecular weight: Low

Molecule length: Long

```
Self-adheres well
     In the context of OVDs, to what does the term viscosity refer?
                                                                                     rly
     Viscosity refers to how a substance responds to shear force
Sur
     With respect to OVDs, what two 'shear force scenarios' are we concerned with?
                                                                                      OW
     Which intraoperative steps provide a ready example of each?
     --Low shear: Capsulorrhexis
                                                                                     te
     --High shear: Phacoemulsification, and I&A
 Ma
     What simplified way does the BCSC suggest to think about viscosity?
                                                                                      borlv
     Think of it as how 'thick' or 'thin' a liquid is
Coa
                                                                  Coats structures well
    Viscositv
```







Molecular weight: High

Molecular weight: Low

Molecule length: Long

```
Self-adheres well
     In the context of OVDs, to what does the term viscosity refer?
                                                                                      rlv
     Viscosity refers to how a substance responds to shear force
Sur
     With respect to OVDs, what two 'shear force scenarios' are we concerned with?
                                                                                       OW
     Which intraoperative steps provide a ready example of each?
     --Low shear: Capsulorrhexis
                                                                                      te
     --High shear: Phacoemulsification, and I&A
 Ma
     What simplified way does the BCSC suggest to think about viscosity?
                                                                                      orly
     Think of it as how 'thick' or 'thin' a liquid is: High-viscosity liquids are
                                                                           one
Coa whereas low-viscosity liquids are other one
                                                                  Coats structures well
    Viscosit
```





Molecular weight: High

Molecular weight: Low

Molecule length: Long

```
Self-adheres well
     In the context of OVDs, to what does the term viscosity refer?
                                                                                      rlv
     Viscosity refers to how a substance responds to shear force
Sur
     With respect to OVDs, what two 'shear force scenarios' are we concerned with?
                                                                                      OW
     Which intraoperative steps provide a ready example of each?
     --Low shear: Capsulorrhexis
                                                                                      te
     --High shear: Phacoemulsification, and I&A
 Ma
     What simplified way does the BCSC suggest to think about viscosity?
                                                                                      borlv
     Think of it as how 'thick' or 'thin' a liquid is: High-viscosity liquids are thick ,
Coa whereas low-viscosity liquids are thin.
                                                                  Coats structures well
```





Think of the OVD molecules as pasta.

### **Cohesive OVD**

Molecular weight: High

Molecule length: Long

Self-adheres well

Surface tension: High

Easy to aspirate

Maintains space well

Coats structures poorly

Viscosity: High

### **Dispersive OVD**

Molecular weight: Low

Molecule length: Short

Self-adheres poorly

Surface tension: Low

Difficult to aspirate

Maintains space poorly

Coats structures well

Molecular weight: *High* 

#### Molecule length: Long

Self-adheres well

Surface tension: *High* 

Easy to aspirate

Maintains space well

Coats structures poorly

Viscosity: High

Think of the OVD molecules as **pasta**. **Cohesive** OVD molecules are like spaghetti—very long.



Molecular weight: Low

Molecule length: Short

Self-adheres poorly

Surface tension: Low

Difficult to aspirate

Maintains space poorly

Coats structures well

Molecular weight: *High* 

#### Molecule length: Long

Self-adheres well

Surface tension: High

Easy to aspirate

Maintains space well

Coats structures poorly

Viscosity: High

Think of the OVD molecules as **pasta**. **Cohesive** OVD molecules are like spaghetti—very long. **Dispersive** OVD molecules are like macaroni—very short.



Molecular weight: Low

#### Molecule length: Short

Self-adheres *poorly* 

Surface tension: Low

Difficult to aspirate

Maintains space poorly

Coats structures well

Molecular weight: High

Molecule length: Long

#### Self-adheres well

Surface tension: High

Easy to aspirate

Maintains space well

Coats structures poorly

Viscosity: High

Think of the OVD molecules as **pasta**. **Cohesive** OVD molecules are like spaghetti—very long. **Dispersive** OVD molecules are like macaroni—very short.

Now consider serving spaghetti vs macaroni. Because spaghetti strands are long, they entangle with and adhere to one another.



Molecular weight: Low

#### Molecule length: Short

Self-adheres *poorly* 

Surface tension: Low

Difficult to aspirate

Maintains space poorly

Coats structures well

Molecular weight: High

#### Molecule length: Long

#### Self-adheres well

Surface tension: High

Easy to aspirate

Maintains space well

Coats structures poorly

Viscosity: High

Think of the OVD molecules as **pasta**. **Cohesive** OVD molecules are like spaghetti—very long. **Dispersive** OVD molecules are like macaroni—very short.

Now consider serving spaghetti vs macaroni. Because spaghetti strands are long, they entangle with and adhere to one another. So spooning *any* tends to result in the removal of *most* of the spaghetti.

# persive OVD

37

Molecular weight: Low

#### Molecule length: Short

Self-adheres *poorly* 

Surface tension: Low

Difficult to aspirate

Maintains space poorly

Coats structures well

Molecular weight: High

Molecule length: Long

#### Self-adheres well

Surface tension: *High* 

Easy to aspirate

Maintains space well

Coats structures poorly

Viscosity: *High* 

Think of the OVD molecules as **pasta**. **Cohesive** OVD molecules are like spaghetti—very long. **Dispersive** OVD molecules are like macaroni—very short.

Now consider serving spaghetti vs macaroni. Because spaghetti strands are long, they entangle with and adhere to one another. So spooning *any* tends to result in the removal of *most* of the spaghetti.

In contrast, because macaroni are so short, they **don't** entangle and **don't** adhere to one another.



Dispersive Ovu

Molecular weight: Low

Molecule length: Short

#### Self-adheres poorly

Surface tension: Low

Difficult to aspirate

Maintains space poorly

Coats structures well

Molecular weight: High

Molecule length: Long

#### Self-adheres well

Surface tension: High

Easy to aspirate

Maintains space well

Coats structures poorly

Viscosity: *High* 

Think of the OVD molecules as **pasta**. **Cohesive** OVD molecules are like spaghetti—very long. **Dispersive** OVD molecules are like macaroni—very short.

Now consider serving spaghetti vs macaroni. Because spaghetti strands are long, they entangle with and adhere to one another. So spooning *any* tends to result in the removal of *most* of the spaghetti.

In contrast, because macaroni are so short, they **don't** entangle and **don't** adhere to one another. Thus, repeated spoonings are needed to remove macaroni from a bowl.



### **Dispersive OVD**

Molecular weight: Low

#### Molecule length: Short

#### Self-adheres poorly

Surface tension: Low

Difficult to aspirate

Maintains space poorly

Coats structures well

Molecular weight: High

Molecule length: Long

#### Self-adheres well

Surface tension: *High* 

#### Easy to aspirate

Maintains space well

Coats structures poorly

Viscosity: *High* 

Think of the OVD molecules as **pasta**. **Cohesive** OVD molecules are like spaghetti—very long. **Dispersive** OVD molecules are like macaroni—very short.

Now consider serving spaghetti vs macaroni. Because spaghetti strands are long, they entangle with and adhere to one another. So spooning *any* tends to result in the removal of *most* of the spaghetti.

In contrast, because macaroni are so short, they **don't** entangle and **don't** adhere to one another. Thus, repeated spoonings are needed to remove macaroni from a bowl.

So it is with OVDs. Cohesives, with their long entangled molecules, tend to come out of the eye as a single glob



Molecular weight: Low

#### Molecule length: Short

#### Self-adheres poorly

Surface tension: Low

*Difficult* to aspirate

Maintains space poorly

Coats structures well

Molecular weight: High

Molecule length: Long

#### Self-adheres well

Surface tension: *High* 

#### *Easy* to aspirate

Maintains space well

Coats structures *poorly* 

Viscosity: *High* 

Think of the OVD molecules as **pasta**. **Cohesive** OVD molecules are like spaghetti—very long. **Dispersive** OVD molecules are like macaroni—very short.

Now consider serving spaghetti vs macaroni. Because spaghetti strands are long, they entangle with and adhere to one another. So spooning *any* tends to result in the removal of *most* of the spaghetti.

In contrast, because macaroni are so short, they **don't** entangle and **don't** adhere to one another. Thus, repeated spoonings are needed to remove macaroni from a bowl.

So it is with OVDs. Cohesives, with their long entangled molecules, tend to come out of the eye as a single glob, whereas the short-chained dispersives have to be removed piecemeal.



Molecular weight: Low

Molecule length: Short

#### Self-adheres poorly

Surface tension: Low

#### Difficult to aspirate

Maintains space poorly

Coats structures well

Molecular weight: High

Molecule length: Long

#### Self-adheres well

Surface tension: *High* 

#### *Easy* to aspirate

Maintains space well

Coats structures *poorly* 

Viscosity: *High* 

Think of the OVD molecules as **pasta**. **Cohesive** OVD molecules are like spaghetti—very long. **Dispersive** OVD molecules are like macaroni—very short.

Now consider serving spaghetti vs macaroni. Because spaghetti strands are long, they entangle with and adhere to one another. So spooning *any* tends to result in the removal of *most* of the spaghetti.

In contrast, because macaroni are so short, they **don't** entangle and **don't** adhere to one another. Thus, repeated spoonings are needed to remove macaroni from a bowl.

So it is with OVDs. Cohesives, with their long entangled molecules, tend to come out of the eye as a single glob, whereas the short-chained dispersives have to be removed piecemeal.

In like fashion, the non-self-adhering dispersives do an excellent job coating intraocular structures



**Dispersive OVD** 

Molecular weight: Low

Molecule length: Short

#### Self-adheres poorly

Surface tension: Low

#### Difficult to aspirate

Maintains space poorly

Coats structures well

Molecular weight: High

Molecule length: Long

#### Self-adheres well

Surface tension: *High* 

#### Easy to aspirate

Maintains space well

#### Coats structures poorly

Viscosity: *High* 

Think of the OVD molecules as **pasta**. **Cohesive** OVD molecules are like spaghetti—very long. **Dispersive** OVD molecules are like macaroni—very short.

Now consider serving spaghetti vs macaroni. Because spaghetti strands are long, they entangle with and adhere to one another. So spooning *any* tends to result in the removal of *most* of the spaghetti.

In contrast, because macaroni are so short, they **don't** entangle and **don't** adhere to one another. Thus, repeated spoonings are needed to remove macaroni from a bowl.

So it is with OVDs. Cohesives, with their long entangled molecules, tend to come out of the eye as a single glob, whereas the short-chained dispersives have to be removed piecemeal.

In like fashion, the non-self-adhering dispersives do an excellent job coating intraocular structures, whereas their self-adherence renders cohesives unsuitable for this.



Molecular weight: Low

#### Molecule length: Short

#### Self-adheres poorly

Surface tension: Low

#### **Difficult** to aspirate

Maintains space poorly

#### Coats structures well