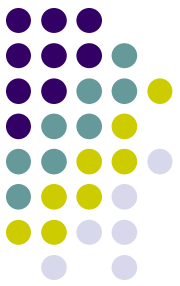


PRP and Its Complications

First, let's talk about laser-tissue interaction...



Q

PRP and Its Complications

What are the five modes of laser-tissue interaction?

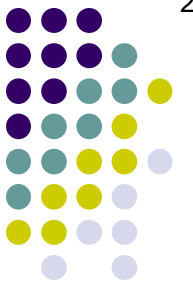
?

?

?

?

?



A

PRP and Its Complications

What are the five modes of laser-tissue interaction?

Photo-
chemical

aka photoactivation

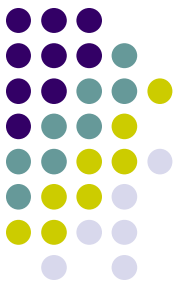
Thermal

Photo-
ablation

Plasma-induced
ablation

Photo-
disruption

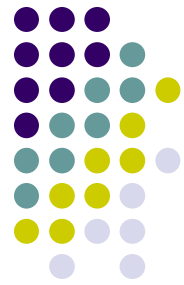
*aka plasma-
induced disruption*



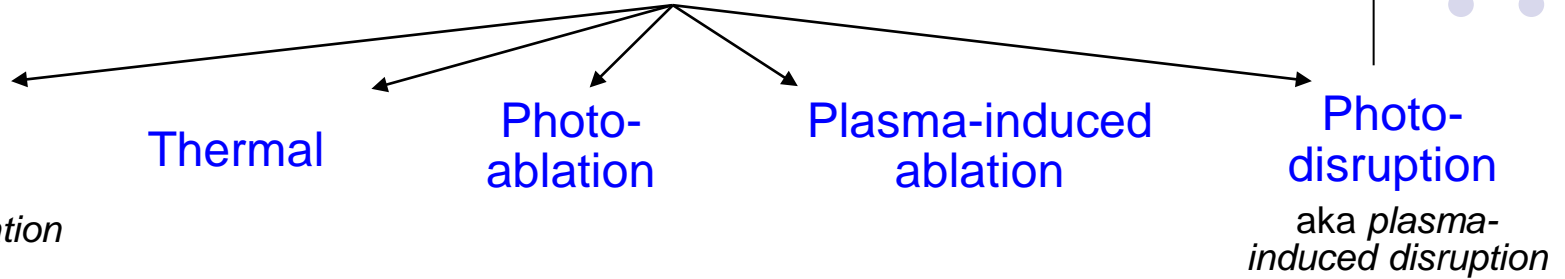
Q

PRP and Its Complications

4



The five modes of laser-tissue interaction



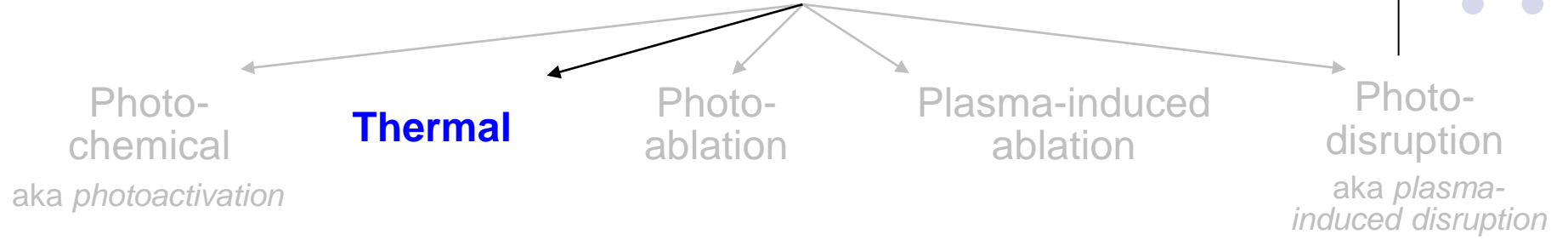
Which mode is PRP an exemplar of?

A

PRP and Its Complications



The five modes of laser-tissue interaction

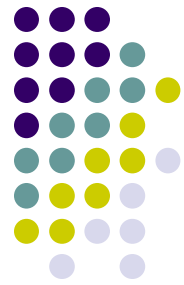


Which mode is PRP an exemplar of?

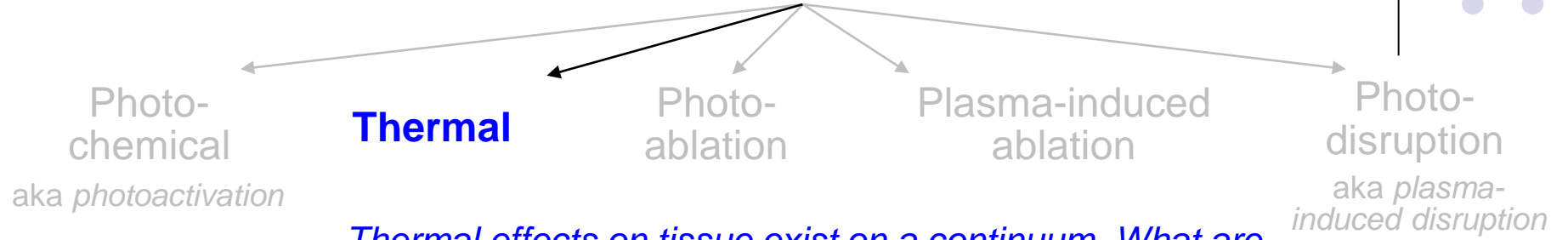
Thermal

Q

PRP and Its Complications



The five modes of laser-tissue interaction



Thermal effects on tissue exist on a continuum. What are the five degrees (see what I did there?) of tissue effects?

-
-
-
-
-

A

PRP and Its Complications



The five modes of laser-tissue interaction

Photo-chemical
aka photoactivation

Thermal

Thermal effects on tissue exist on a continuum. What are the five degrees (see what I did there?) of tissue effects?

- Hyperthermia
- Coagulation
- Vaporization
- Carbonization
- Melting

Photo-ablation

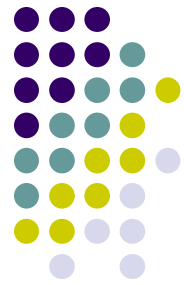
Plasma-induced ablation

Photo-disruption
aka plasma-induced disruption

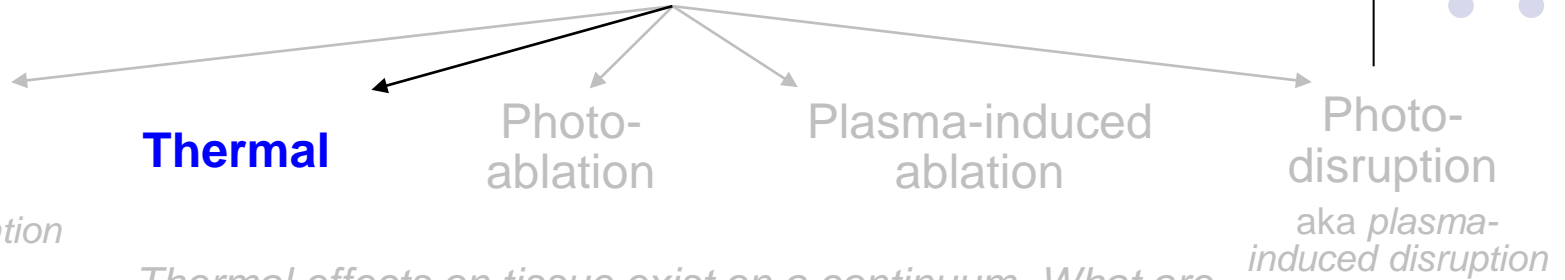
Q

PRP and Its Complications

8



The five modes of laser-tissue interaction



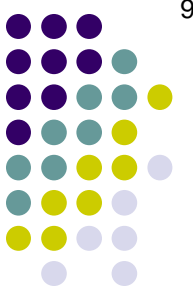
Thermal effects on tissue exist on a continuum. What are the five degrees (see what I did there?) of tissue effects?

- Hyperthermia?
- Coagulation?
- Vaporization?
- Carbonization?
- Melting?

Which thermal effect is employed most frequently?

A

PRP and Its Complications



The five modes of laser-tissue interaction

Photo-chemical
aka *photoactivation*

Thermal

Thermal effects on tissue exist on a continuum. What are the five degrees (see what I did there?) of tissue effects?

- Hyperthermia
- Coagulation**
- Vaporization
- Carbonization
- Melting

Which thermal effect is employed most frequently?
Coagulation

Photo-ablation

Plasma-induced ablation

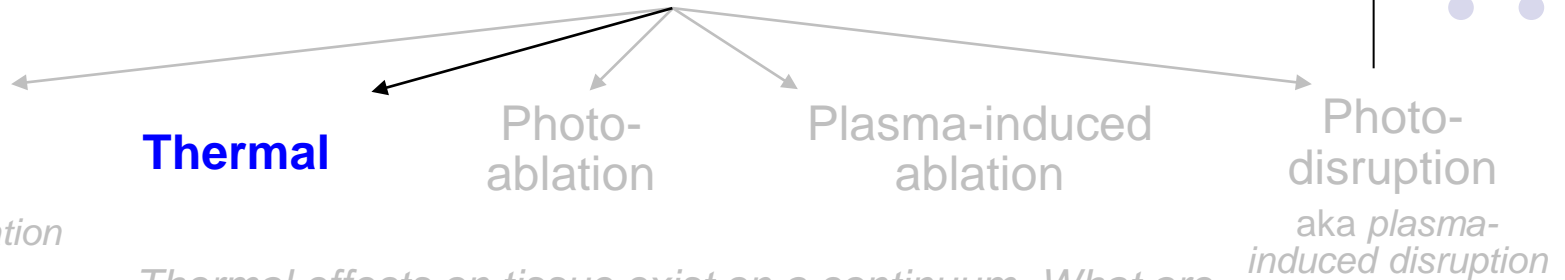
Photo-disruption
aka *plasma-induced disruption*

Q

PRP and Its Complications



The five modes of laser-tissue interaction



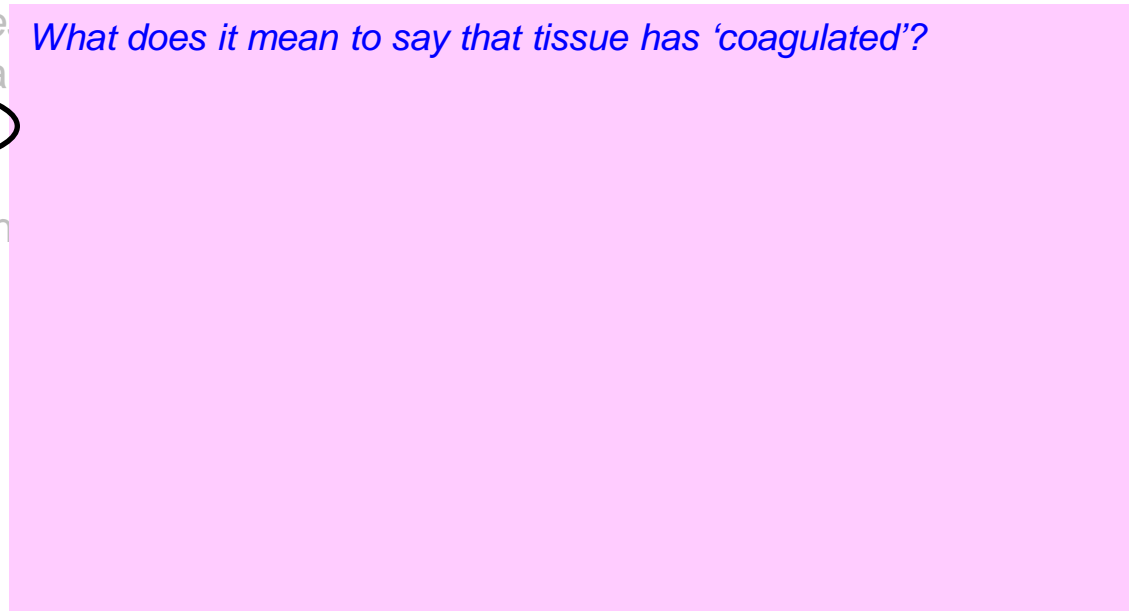
Thermal effects on tissue exist on a continuum. What are the five degrees of thermal effects?

- Hyperthermia
- Coagulation**
- Vaporization
- Carbonization
- Melting

Which thermal effect is most commonly associated with laser-tissue interaction?

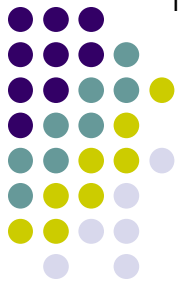
Coagulation

What does it mean to say that tissue has 'coagulated'?

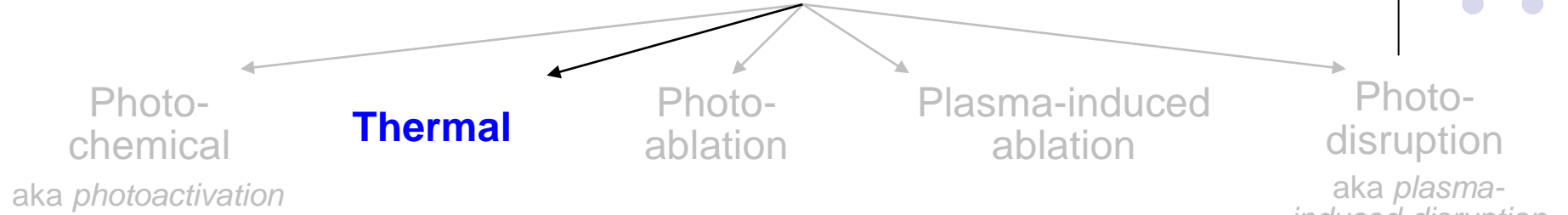


A

PRP and Its Complications



The five modes of laser-tissue interaction



Thermal effects on tissue exist on a continuum. What are the five degrees?

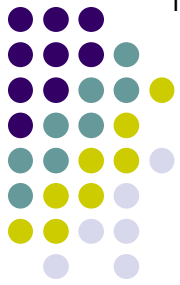
- Hyperthermia
- Coagulation**
- Vaporization
- Carbonization
- Melting

What does it mean to say that tissue has 'coagulated'?
It means the proteins have been denatured

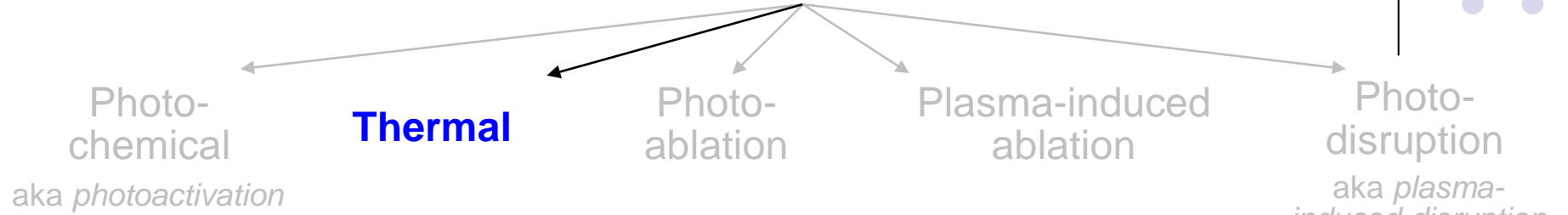
Which thermal
Coagulation

Q

PRP and Its Complications



The five modes of laser-tissue interaction



Thermal effects on tissue exist on a continuum. What are the five degrees?

- Hyperthermia
- Coagulation**
- Vaporization
- Carbonization
- Melting

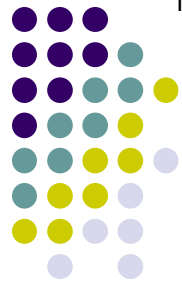
Which thermal Coagulation

What does it mean to say that tissue has 'coagulated'?
 It means the proteins have been denatured

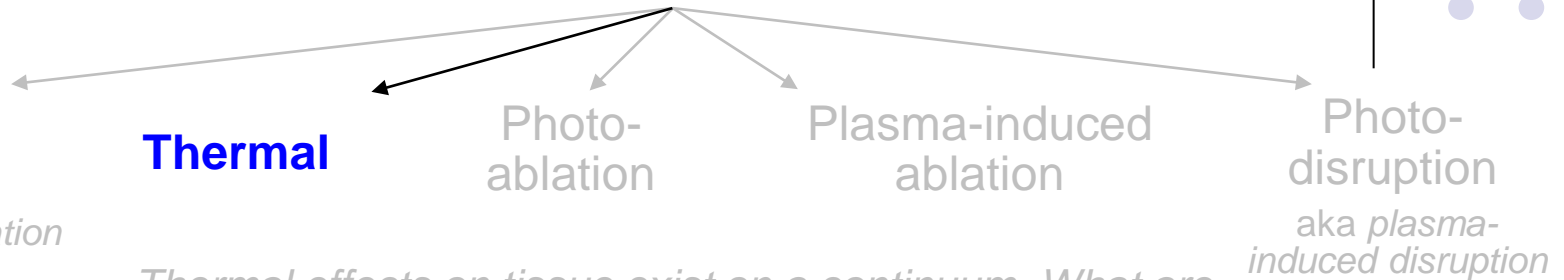
OK, what does it mean to say a protein has been 'denatured'?

A

PRP and Its Complications



The five modes of laser-tissue interaction



aka photoactivation

Thermal

Thermal effects on tissue exist on a continuum. What are the five degrees?

- Hyperthermia
- Coagulation**
- Vaporization
- Carbonization
- Melting

Which thermal
Coagulation

What does it mean to say that tissue has 'coagulated'?

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OK, what does it mean to say a protein has been 'denatured'?

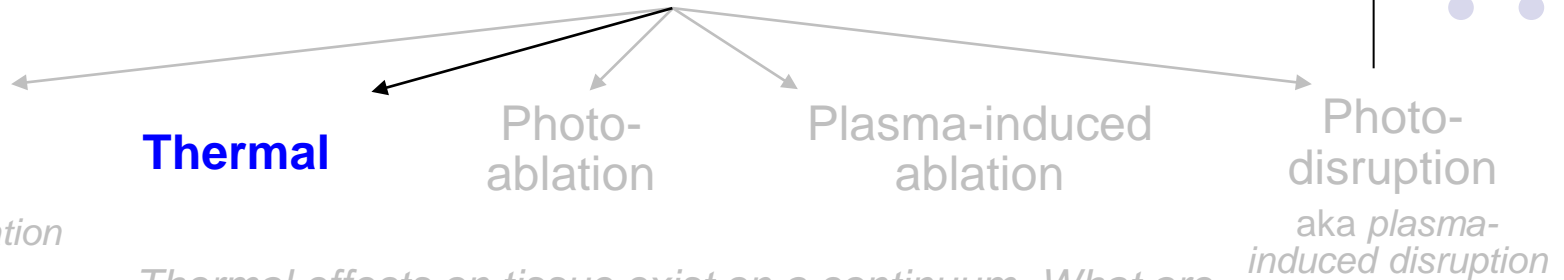
It means the protein has been forced out of its native conformation by some sort of applied stress (in this case, heat). Because a protein's function is inextricably tied to its shape, denatured proteins do not behave as they do in their native form.

Q

PRP and Its Complications



The five modes of laser-tissue interaction



Thermal effects on tissue exist on a continuum. What are the five degrees?

- Hyperthermia
- Coagulation**
- Vaporization
- Carbonization
- Melting

Which thermal effect is most common in PRP?
Coagulation

What does it mean to say that tissue has 'coagulated'?

It means the proteins have been denatured

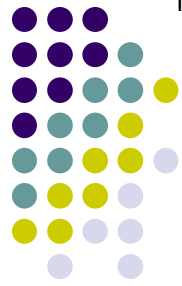
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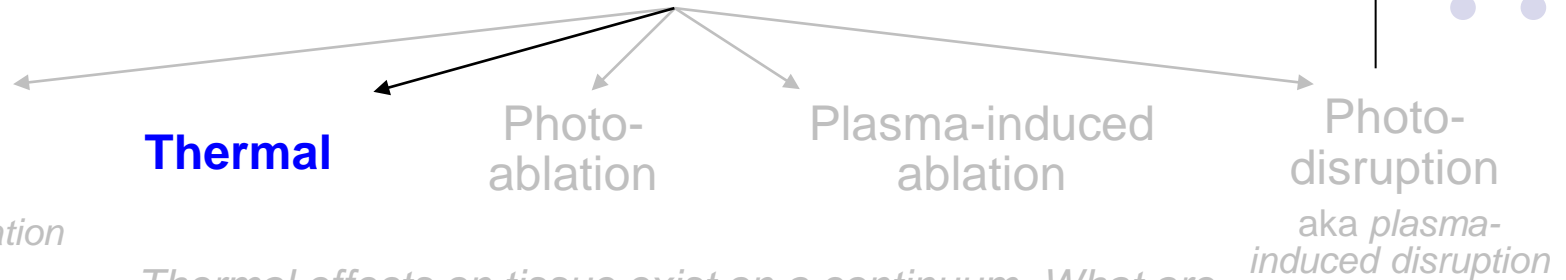
Can you give an example of protein denaturation?

A

PRP and Its Complications



The five modes of laser-tissue interaction



Thermal effects on tissue exist on a continuum. What are the five degrees?

- Hyperthermia
- Coagulation**
- Vaporization
- Carbonization
- Melting

Which thermal effect is Coagulation?

What does it mean to say that tissue has 'coagulated'?

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OK, what does it mean to say a protein has been 'denatured'?

It means the protein has been forced out of its native conformation by some sort of applied stress (in this case, heat). Because a protein's function is inextricably tied to its shape, denatured proteins do not behave as they do in their native form.

Can you give an example of protein denaturation?

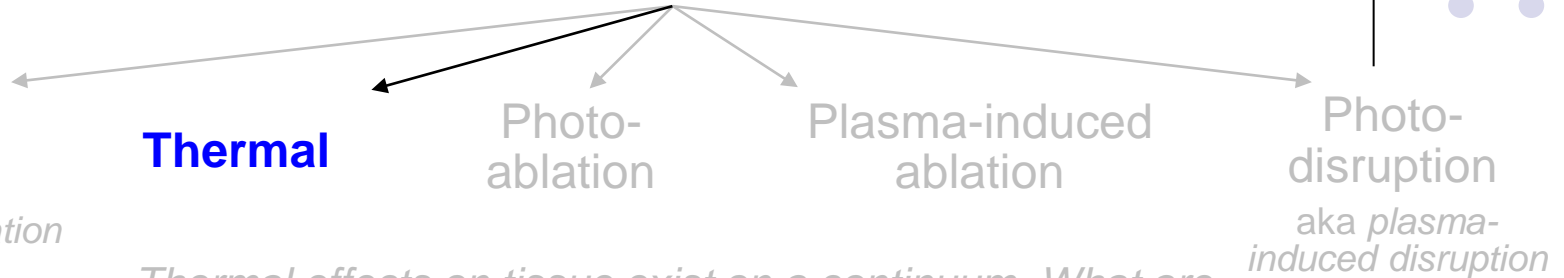
Consider egg albumin. In its native state, it's a clear liquid. But if sufficient heat is applied, it becomes a white solid. (And if sufficient salsa is applied to the white solid, it becomes delish.)

Q

PRP and Its Complications



The five modes of laser-tissue interaction



Thermal effects on tissue exist on a continuum. What are the five degrees?

--Hyperthermia

--**Coagulation**

--Vaporization

--Carbonization

--Melting

Which thermal effects are most relevant to PRP?
Coagulation

What does it mean to say that tissue has 'coagulated'?

It means the proteins have been denatured

OK, what does it mean to say that tissue has 'denatured'?

It means that the protein's native conformation (shape, function) is lost (e.g., due to heat, pH change, etc.). Because a protein's function is maximally tied to its shape, denatured proteins do not behave as they do in their native form.

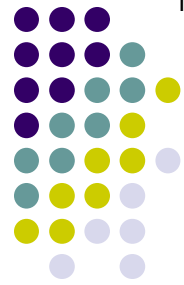
At what temperature does retinal tissue start to coagulate?

Can you give an example of protein denaturation?

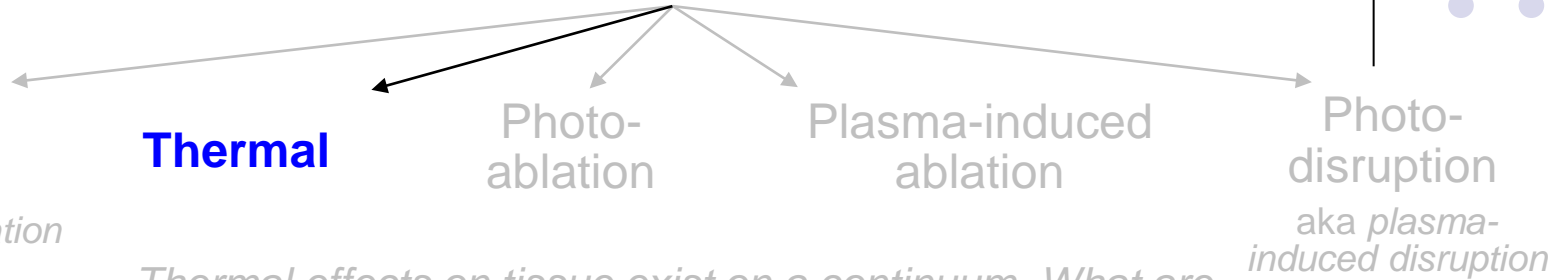
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A

PRP and Its Complications



The five modes of laser-tissue interaction



Thermal effects on tissue exist on a continuum. What are the five degrees?

- Hyperthermia
- Coagulation**
- Vaporization
- Carbonization
- Melting

Which thermal effect is Coagulation?

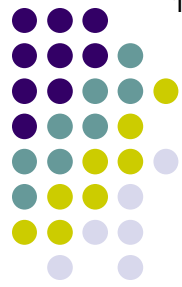
What does it mean to say that tissue has 'coagulated'?
It means the proteins have been denatured

At what temperature does retinal tissue start to coagulate?
65°C

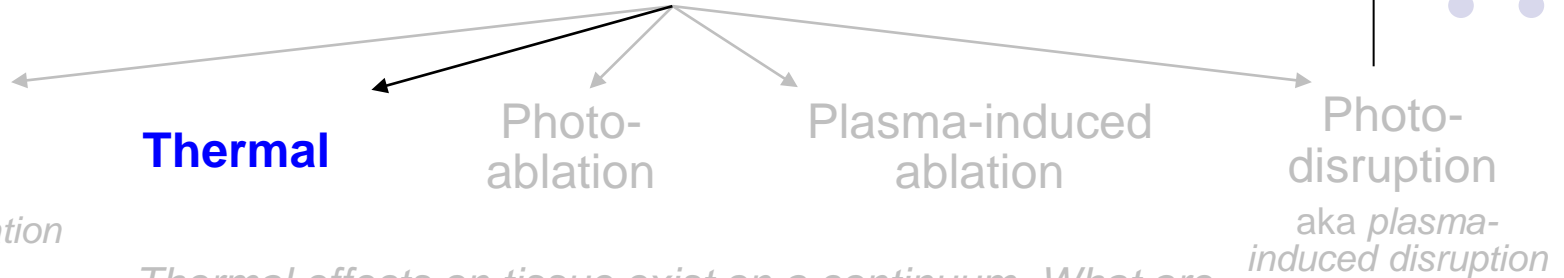
OK, what does it mean to say that tissue has 'denatured'?
It means that the proteins have lost their native conformation (shape, function).
Because a protein's function is maximally tied to its shape, denatured proteins do not behave as they do in their native form.

Can you give an example of protein denaturation?
Consider egg albumin. In its native state, it's a clear liquid. But if sufficient heat is applied, it becomes a white solid. (And if sufficient salsa is applied to the white solid, it becomes delish.)

PRP and Its Complications



The five modes of laser-tissue interaction



Thermal effects on tissue exist on a continuum. What are the five degrees?

- Hyperthermia
- Coagulation
- Vaporization
- Carbonization
- Melting

Which thermal effect is most common in PRP?
Coagulation

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OK, what does it mean to say that proteins have been 'denatured'?
At what temperature does retinal tissue start to coagulate?
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It means that the protein's native conformation (shape, heat). Because a protein's function is maximally tied to its shape, denatured proteins do not behave as they do in their native form.

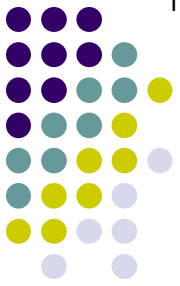
Can you give an example of protein denaturation?
Consider egg albumin. In its native state, it's a clear liquid. But if sufficient heat is applied, it becomes a white solid. (And if sufficient salsa is applied to the white solid, it becomes delish.)

For more info on lasers, see slide-set FELT26

Q

PRP and Its Complications

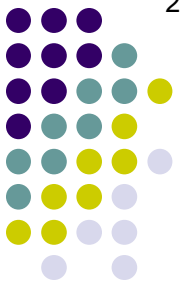
- Which laser is used to perform PRP?



A

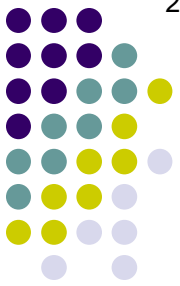
PRP and Its Complications

- Which laser is used to perform PRP?
Argon **green** or **blue-green**



Q

PRP and Its Complications

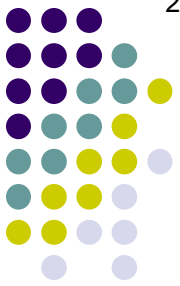


- Which laser is used to perform PRP?
Argon **green** or **blue-green**
- How many shots constitute a full compliment of PRP?

A

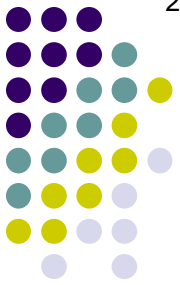
PRP and Its Complications

- Which laser is used to perform PRP?
Argon **green** or **blue-green**
- How many shots constitute a full compliment of PRP? **About 1200-1400**



Q

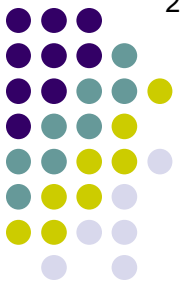
PRP and Its Complications



- Which laser is used to perform PRP?
Argon **green** or **blue-green**
- How many shots constitute a full compliment of PRP? **About 1200-1400**
- What spot size should be used?

A

PRP and Its Complications



- Which laser is used to perform PRP?
Argon **green** or **blue-green**
- How many shots constitute a full compliment of PRP? **About 1200-1400**
- What spot size should be used? **500 μm**



Q

PRP and Its Complications

- Which laser is used to perform PRP?
Argon **green** or **blue-green**
- How many shots constitute a full compliment of PRP? **About 1200-1400**
- What spot size should be used? **500 μm**
- How much power?

Q/A

PRP and Its Complications



- Which laser is used to perform PRP?
Argon **green** or **blue-green**
- How many shots constitute a full compliment of PRP? **About 1200-1400**
- What spot size should be used? **500 μ m**
- How much power? **Enough to produce a** color **or**
light color **-colored burn**



A

PRP and Its Complications

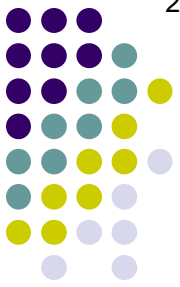
- Which laser is used to perform PRP?
Argon **green** or **blue-green**
- How many shots constitute a full compliment of PRP? **About 1200-1400**
- What spot size should be used? **500 μ m**
- How much power? **Enough to produce a **gray** or **light cream**-colored burn**



Q

PRP and Its Complications

- Which laser is used to perform PRP?
Argon **green** or **blue-green**
- How many shots constitute a full compliment of PRP? **About 1200-1400**
- What spot size should be used? **500 μ m**
- How much power? **Enough to produce a **gray** or **light cream**-colored burn**
- How much distance between burns?

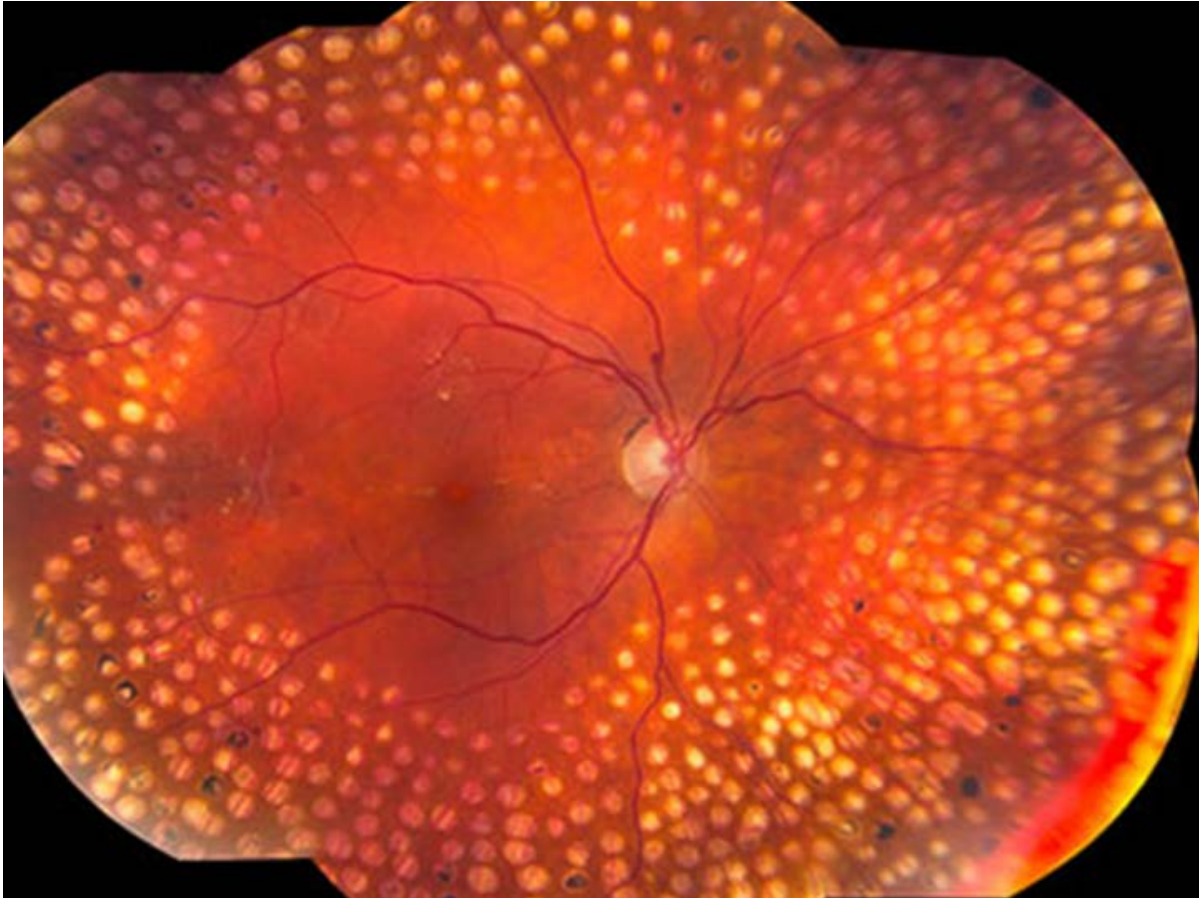


A

PRP and Its Complications

- Which laser is used to perform PRP?
Argon **green** or **blue-green**
- How many shots constitute a full compliment of PRP? **About 1200-1400**
- What spot size should be used? **500 μ m**
- How much power? **Enough to produce a **gray** or **light cream**-colored burn**
- How much distance between burns? **About half a burn's width**

PRP and Its Complications



PRP



Q

PRP and Its Complications

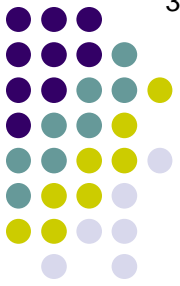
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Argon **green** or **blue-green**
- How many shots constitute a full compliment of PRP? **About 1200-1400**
- What spot size should be used? **500 μm**
- How much power? **Enough to produce a **gray** or **light cream**-colored burn**
- How much distance between burns? **About half a burn's width**
- Should it be done in one, or multiple sessions?



A

PRP and Its Complications

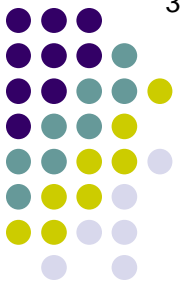
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Argon **green** or **blue-green**
- How many shots constitute a full compliment of PRP? **About 1200-1400**
- What spot size should be used? **500 μ m**
- How much power? **Enough to produce a **gray** or **light cream**-colored burn**
- How much distance between burns? **About half a burn's width**
- Should it be done in one, or multiple sessions?
It doesn't matter



Q

PRP and Its Complications

- What are known complications of PRP?
 - Reduced vision
 - Reduced vision
 - Reduced two words
 - Loss of # to # lines BCVA
 - Decreased two diff words
- Effects on vision*

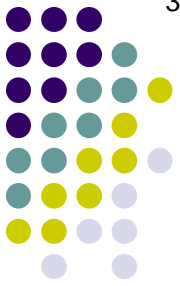


A

PRP and Its Complications

- What are known complications of PRP?
 - Reduced peripheral vision
 - Reduced color vision
 - Reduced contrast sensitivity
 - Loss of 1-2 lines BCVA
 - Decreased night vision

Effects on vision

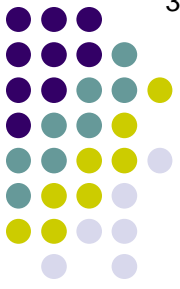


Q

PRP and Its Complications

- What are known complications of PRP?
 - Reduced peripheral vision
 - Reduced color vision
 - Reduced contrast sensitivity
 - Loss of 1-2 lines BCVA
 - Decreased night vision
 - Decreased parasympathetic function
 - Decreased two words

Effects on vision

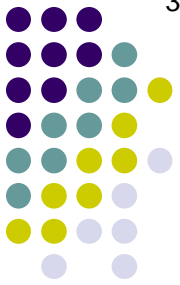


A

PRP and Its Complications

- What are known complications of PRP?
 - Reduced peripheral vision
 - Reduced color vision
 - Reduced contrast sensitivity
 - Loss of 1-2 lines BCVA
 - Decreased night vision
 - Decreased accommodation
 - Decreased corneal sensitivity

Effects on vision



Q

PRP and Its Complications

- What are known complications of PRP?

What do accommodation and corneal sensitivity have in common?

- Decreased **accommodation**
- Decreased **corneal sensitivity**

Q/A

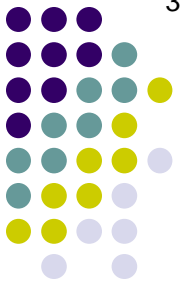
PRP and Its Complications

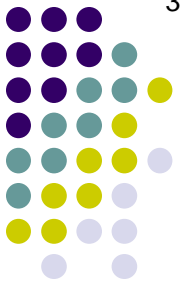
- What are known complications of PRP?

What do accommodation and corneal sensitivity have in common?

Both are mediated by the nerves

- Decreased **accommodation**
- Decreased **corneal sensitivity**





A

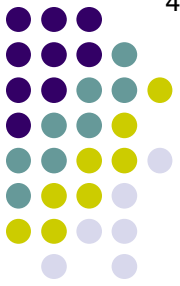
PRP and Its Complications

- What are known complications of PRP?

What do accommodation and corneal sensitivity have in common?

Both are mediated by the long ciliary nerves

- Decreased **accommodation**
- Decreased **corneal sensitivity**



Q

PRP and Its Complications

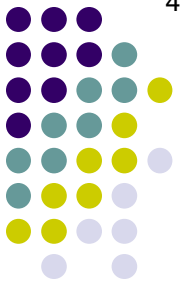
- What are known complications of PRP?

What do accommodation and corneal sensitivity have in common?

Both are mediated by the long ciliary nerves

OK, but what do the long ciliary nerves have to do with PRP?

- Decreased **accommodation**
- Decreased **corneal sensitivity**



Q/A

PRP and Its Complications

- What are known complications of PRP?

What do accommodation and corneal sensitivity have in common?

Both are mediated by the long ciliary nerves

OK, but what do the long ciliary nerves have to do with PRP?

The long ciliary nerves run pretty deep (ie, just under the choroid) in the

horiz vs vert meridian

- Decreased **accommodation**
- Decreased **corneal sensitivity**



A

PRP and Its Complications

- What are known complications of PRP?

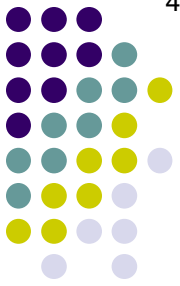
What do accommodation and corneal sensitivity have in common?

Both are mediated by the long ciliary nerves

OK, but what do the long ciliary nerves have to do with PRP?

The long ciliary nerves run pretty deep (ie, just under the choroid) in the horizontal meridian

- Decreased **accommodation**
- Decreased **corneal sensitivity**



A

PRP and Its Complications

- What are known complications of PRP?

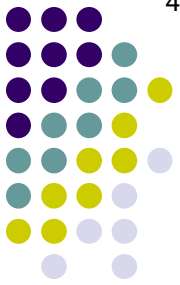
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Both are mediated by the long ciliary nerves

OK, but what do the long ciliary nerves have to do with PRP?

The long ciliary nerves run pretty deep (ie, just under the choroid) in the horizontal meridian. Because of their location, they are vulnerable to damage during PRP.

- Decreased **accommodation**
- Decreased **corneal sensitivity**



Q

PRP and Its Complications

● What are known complications of PRP?

What do accommodation and corneal sensitivity have in common?

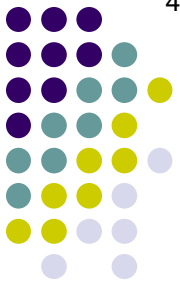
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How can one minimize the risk to the long ciliary nerves?

- Decreased **accommodation**
- Decreased **corneal sensitivity**



A

PRP and Its Complications

● What are known complications of PRP?

What do accommodation and corneal sensitivity have in common?

Both are mediated by the long ciliary nerves

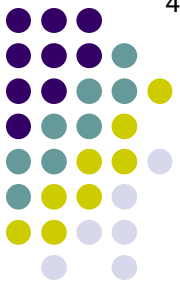
OK, but what do the long ciliary nerves have to do with PRP?

The long ciliary nerves run pretty deep (ie, just under the choroid) in the horizontal meridian. Because of their location, they are vulnerable to damage during PRP.

How can one minimize the risk to the long ciliary nerves?

By avoiding the horizontal meridian during PRP

- Decreased **accommodation**
- Decreased **corneal sensitivity**



Q

PRP and Its Complications

- What are known complications of PRP?
 - Reduced peripheral vision
 - Reduced color vision
 - Reduced contrast sensitivity
 - Loss of 1-2 lines BCVA
 - Decreased night vision
 - Decreased accommodation
 - Decreased corneal sensitivity
 - Macular
- Effects on vision*

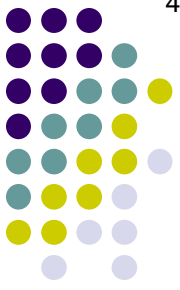


A

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Effects on vision

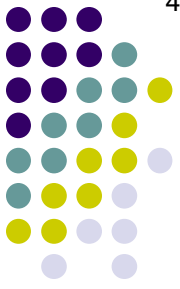


Q

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 - Decreased **corneal sensitivity**
 - Macular **edema**
 - Inadvertent **yikes** burn

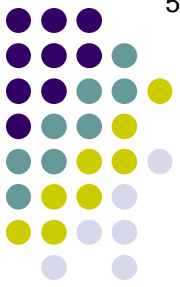
Effects on vision



A

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 - Inadvertent foveal burn
- Effects on vision*

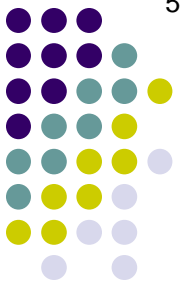


Q

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 - Inadvertent foveal burn
 - Choroidal

Effects on vision

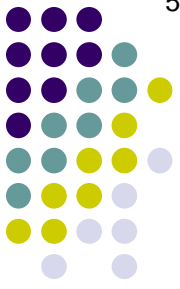


A

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 - Decreased corneal sensitivity
 - Macular edema
 - Inadvertent foveal burn
 - Choroidal detachment

Effects on vision

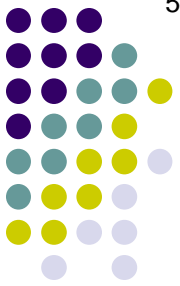


Q

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 - Decreased **corneal sensitivity**
 - Macular **edema**
 - Inadvertent **foveal** burn
 - Choroidal **detachment**
 - Iatrogenic break in Bruch's → yikes! (abb.)

Effects on vision



A

PRP and Its Complications

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 - Decreased **corneal sensitivity**
 - Macular **edema**
 - Inadvertent **foveal** burn
 - Choroidal **detachment**
 - Iatrogenic break in Bruch's → **CNVM**

Effects on vision

(CNVM = Choroidal neovascular membrane)