

# Chemotherapy for Brain Tumors

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# Review of Brain Tumors 101

## § Primary Brain Tumors

### – Gliomas

- **Grade 1:** *pilocytic astrocytoma*

§ Surgery

- **Grade 2:** *low grade astrocytoma*

§ Surgery => radiation or chemotherapy or both

- **Grade 3:** *anaplastic astrocytoma or anaplastic oligodendroglioma*

§ Surgery => chemotherapy plus radiation

- **Grade 4:** *Glioblastoma Multiforme*

§ Surgery => chemotherapy plus radiation

### – Meningiomas

### – Acoustic Neuromas

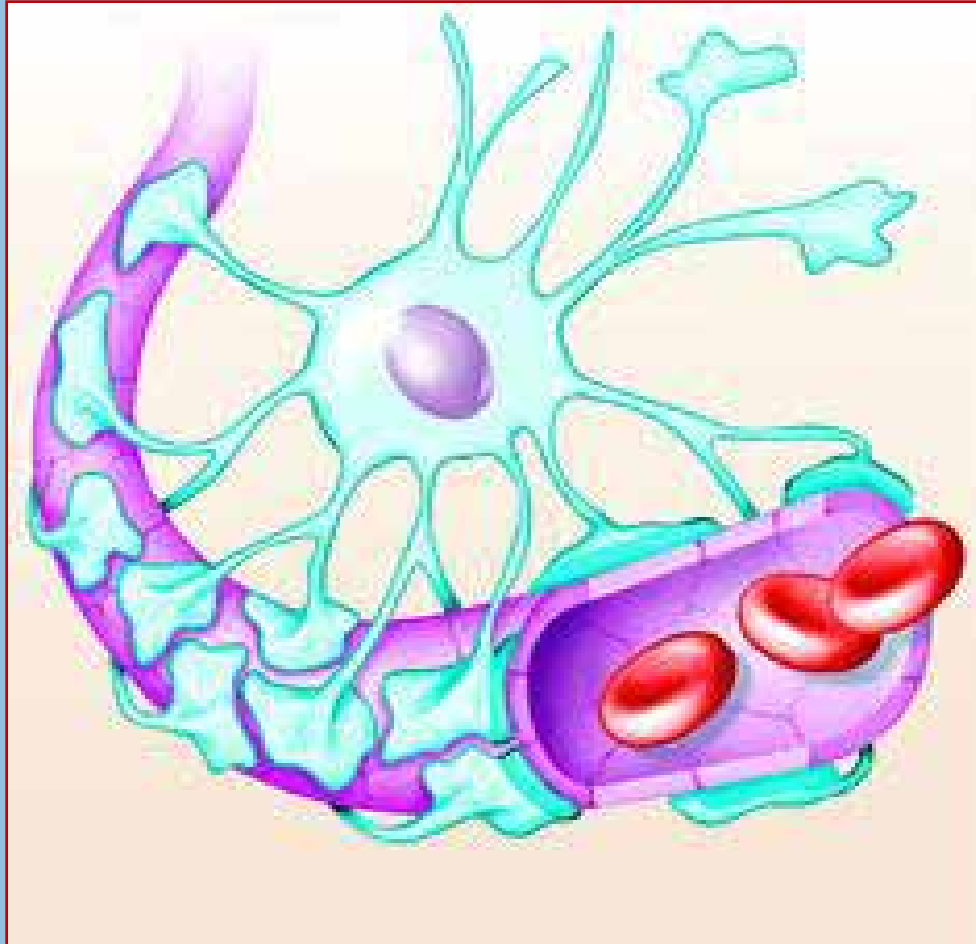
### – Pituitary adenomas

# Review of Brain Tumors 101

§ *Secondary* Brain Tumors are brain tumors that have metastasized from another primary tumor

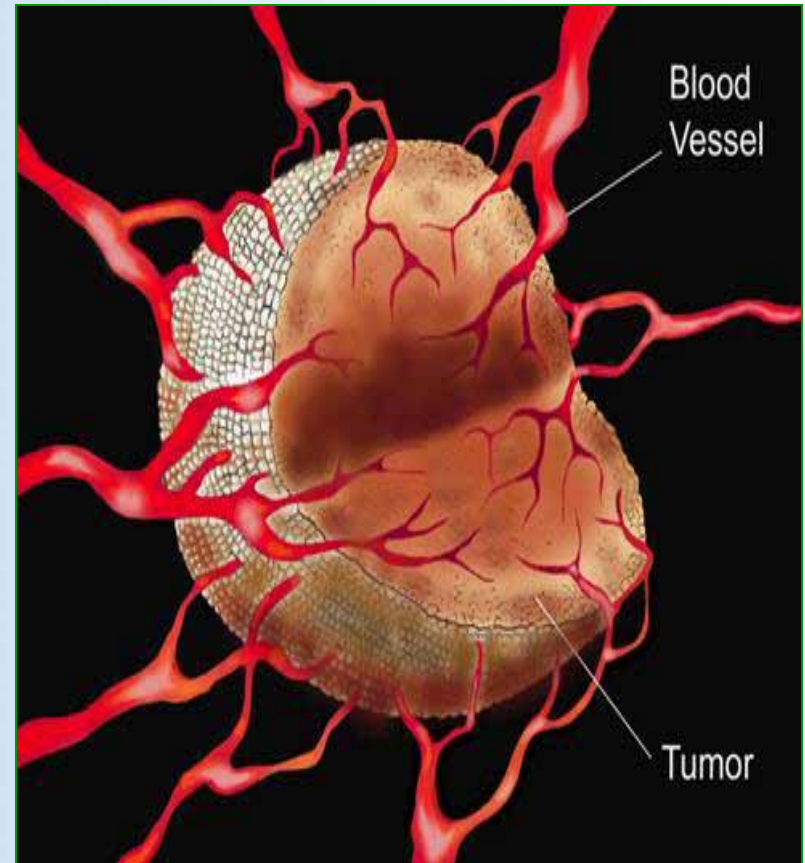
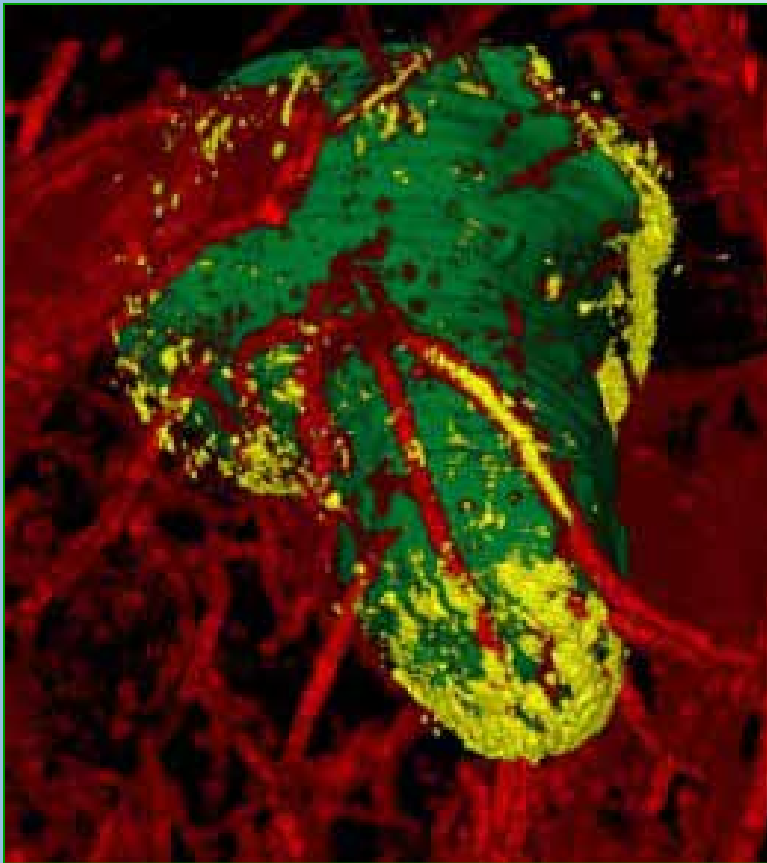
- Lung Cancer
- Melanoma
- Renal Cell Cancer
- Breast Cancer
- Lymphoma
- Colon Cancer

# Difficulties in Treating Brain Tumors?



*Blood  
Brain  
Barrier ?*

# Difficulties in Treating Brain Tumors?



# What do patients think when they hear the word Chemotherapy?



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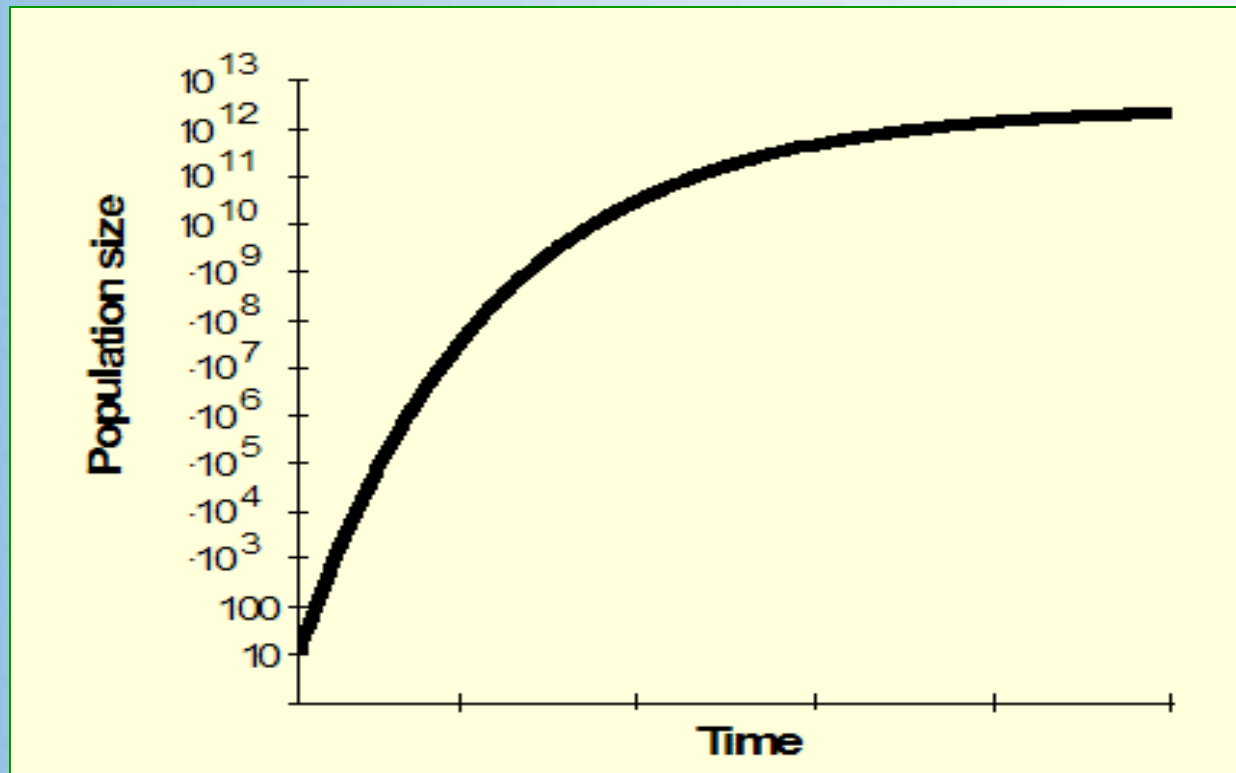
- § "I will need an IV in my arm."
- § "I am going to lose all my hair."
- § "I will have nausea and throw up."
- § "I will have to wear a pump to the chemotherapy."
- § "I will have to wear a mask at all times and cannot go in public places because I may get sick."

deliver

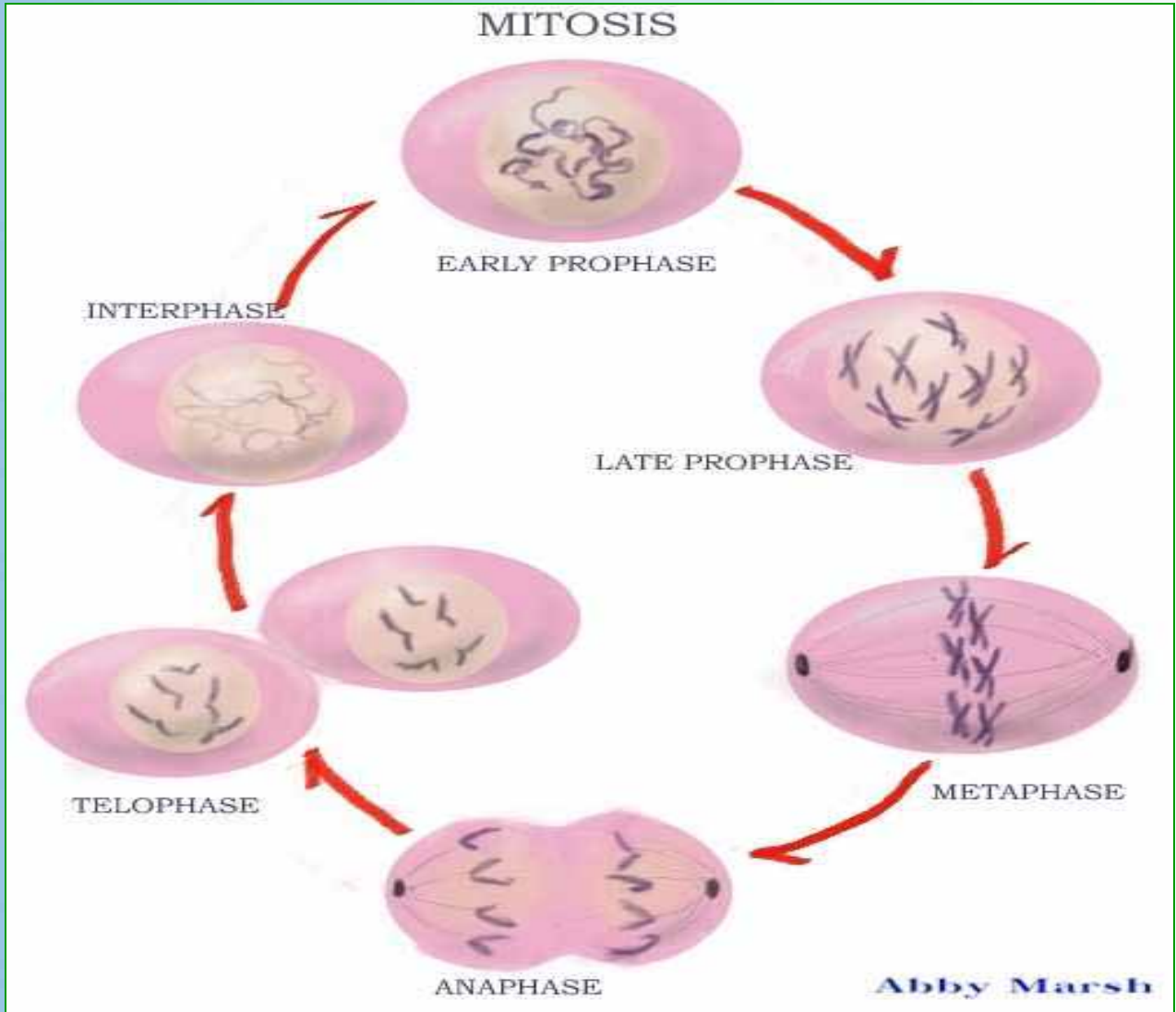


# Principles of Chemotherapy

## § Gompertzian Growth Curve



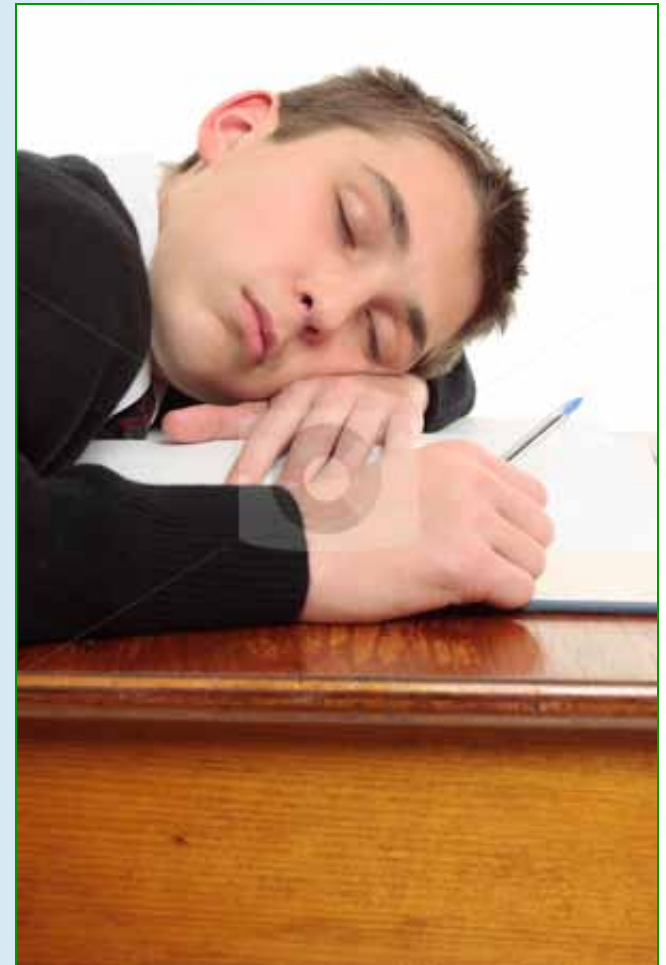
# MITOSIS



# What does this mean to me clinically?

**Smaller tumors are easier to treat than bigger tumors**

**The way tumors divide determines the type of chemotherapy to give.**



# Chemotherapy

## § “Chemical” therapy derived from *alchemy*

### – Cytotoxic Drugs

- Traditional chemotherapy agents
- Temozolomide

### – Targeted Agents

- Work against a specific receptor on the tumor
- Bevacizumab or Avastin works against the vascular endothelial growth factor

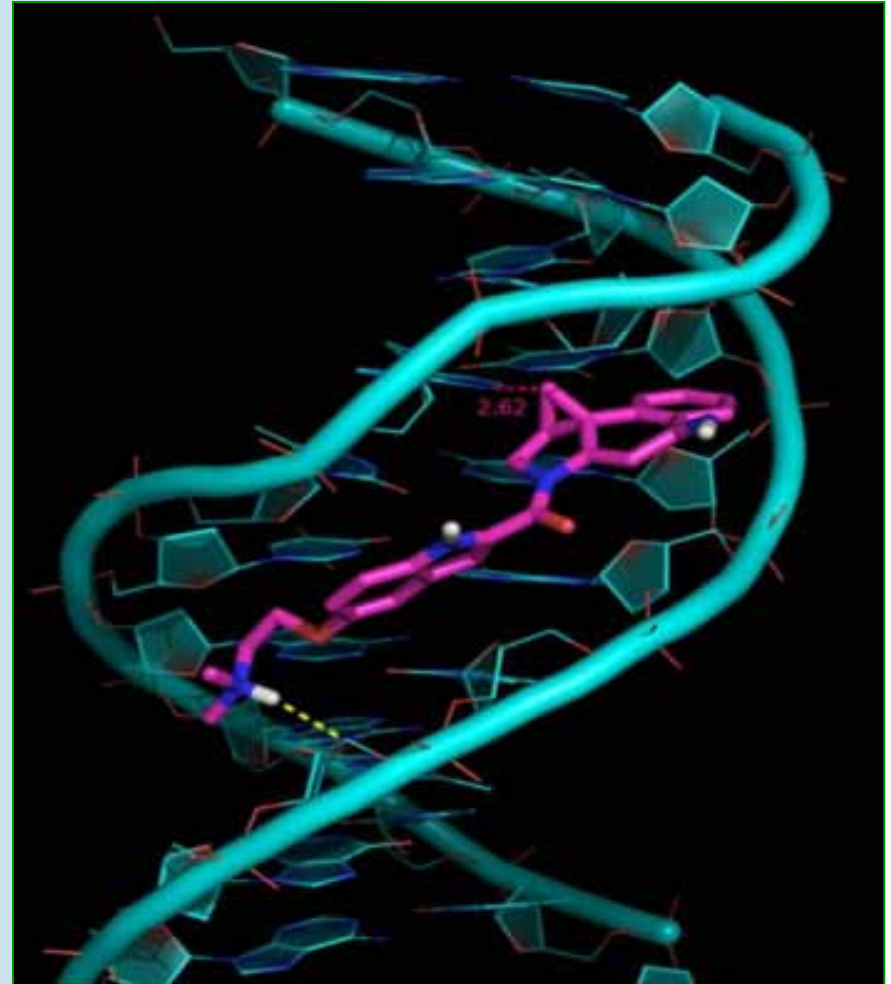
### – Anti-Angiogenesis Agents

- Works against new blood vessel growth
- Bevacizumab

# Cytotoxic Chemotherapy

## § Temozolomide

- Affects the DNA of dividing and non-dividing cells
- Crosses blood brain barrier
- Taken orally



# Schedule

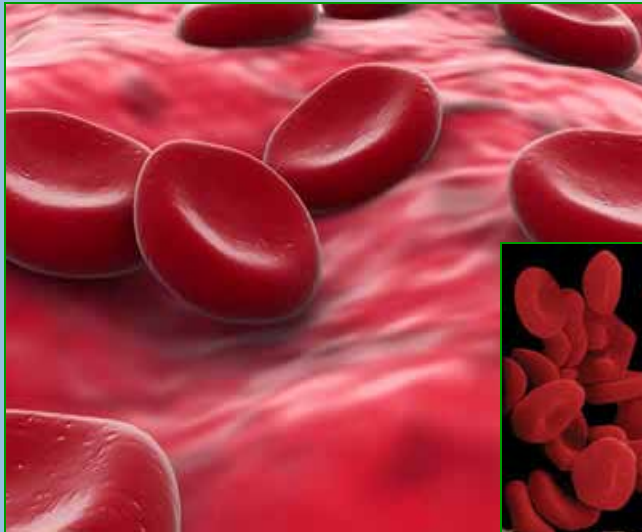
Temozolomide  
**DAILY**  
concurrent  
with Radiation  
therapy for 6  
weeks



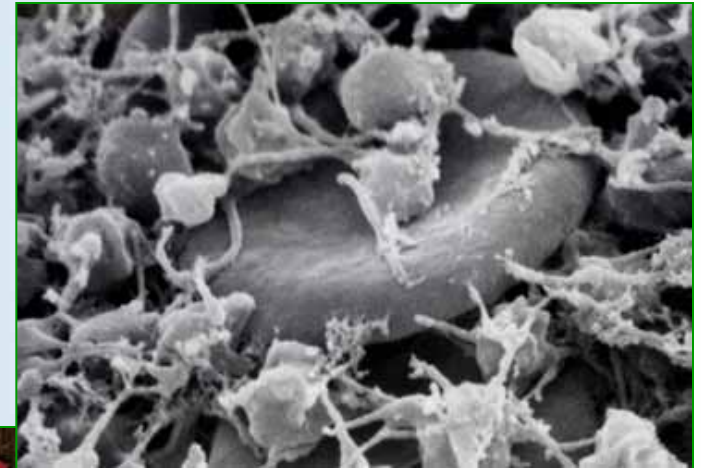
Monthly  
Temozolomide  
(5 days of  
month) x 1year

# Side effects of Temozolomide

- § Low blood counts
  - 16% of patients



Red Blood  
Cells/Hemoglobin



Platelets



White Blood Cells

# White Blood Cells

## § Neutrophils

- Fight bacterial infection
- Neutrophils  $>1500$  to start chemotherapy
- When Neutrophils  $<500$  and fever  $>101$ , must seek emergency attention and get antibiotics
- Can go up with steroids and infection

## § Lymphocytes

- Decrease with temozolomide
- Can cause opportunistic infections
- PCP pneumonia, shingles, cold sores
- Prophylaxis with Bactrim (3 days a week) or Dapsone



# Other Side effects of Temozolomide

## § Nausea

- Usually well controlled with an anti-emetic pill
- anzemet

## § Moderate to Severe Fatigue

- 33%

## § Opportunistic infections

## § Headache

## § Constipation

# Chemotherapy

## § “Chemical” therapy derived from *alchemy*

### – Cytotoxic Drugs

- Traditional chemotherapy agents
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### – Targeted Agents

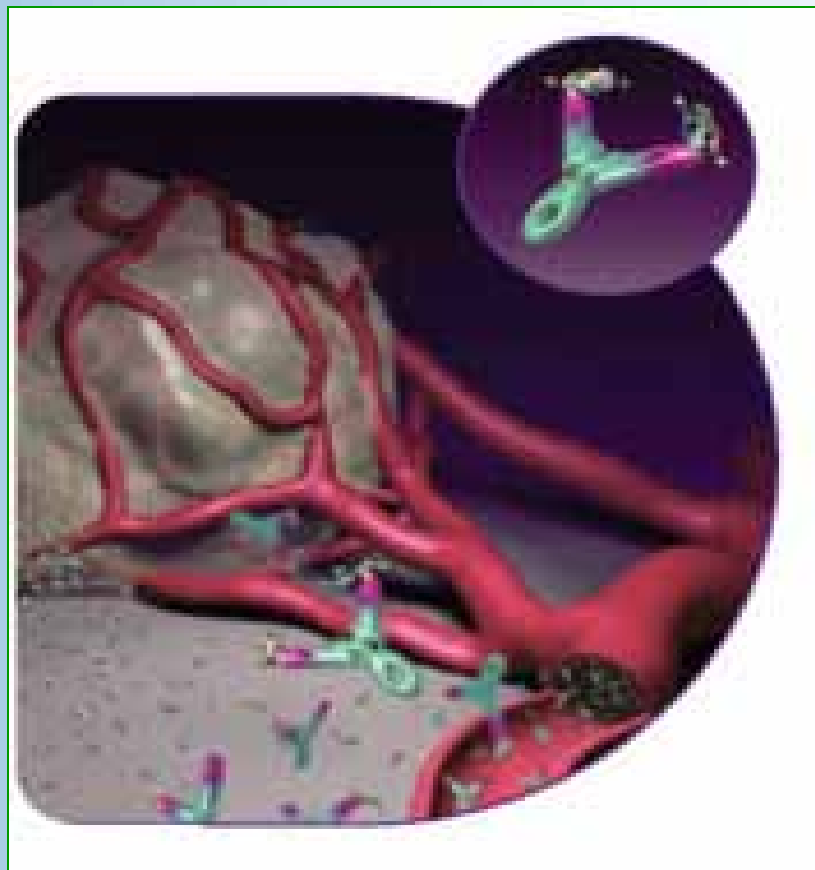
- Work against a specific receptor on the tumor
- Bevacizumab or Avastin works against the vascular endothelial receptor

### – Anti-angiogenesis Agents

- Works against new blood vessel growth
- Bevacizumab

# Bevacizumab

§ Vascular Endothelial Growth Factor (VEGF)



# Bevacizumab



# Bevacizumab Side Effects

§ Hypertension

§ Proteinuria

§ Bleeding

- GI perforation most common
- Wound Dehiscence

§ Clotting

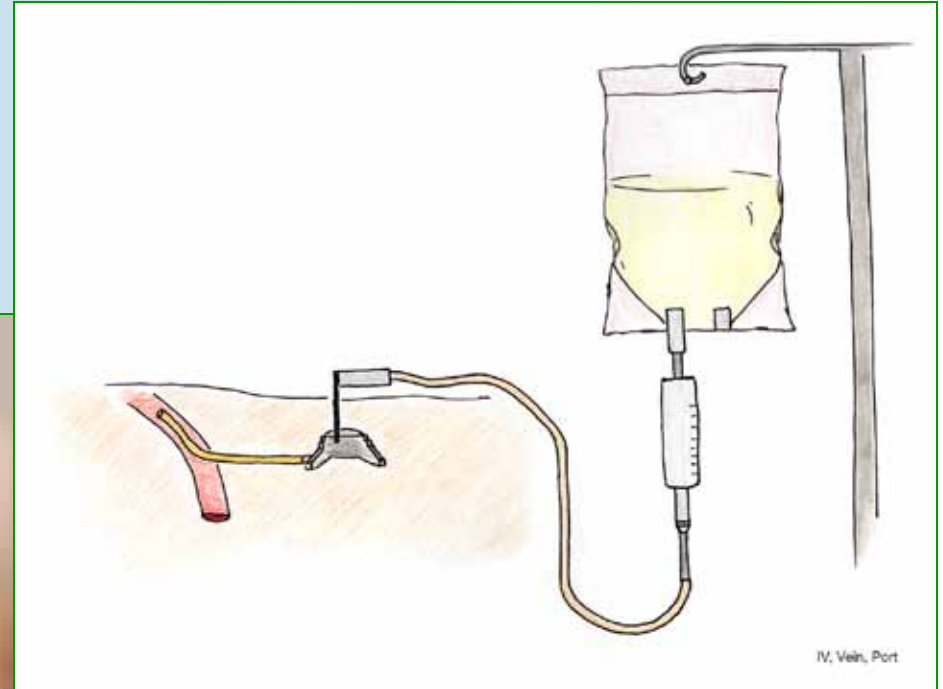
- Myocardial Infection
- Stroke
- Deep Venous Thrombosis
- Pulmonary Embolus

§ *Rare events especially if you are younger than 70 and don't have a personal history of clotting or bleeding.*

# Bevacizumab

§ Every 2 weeks

§ IV therapy

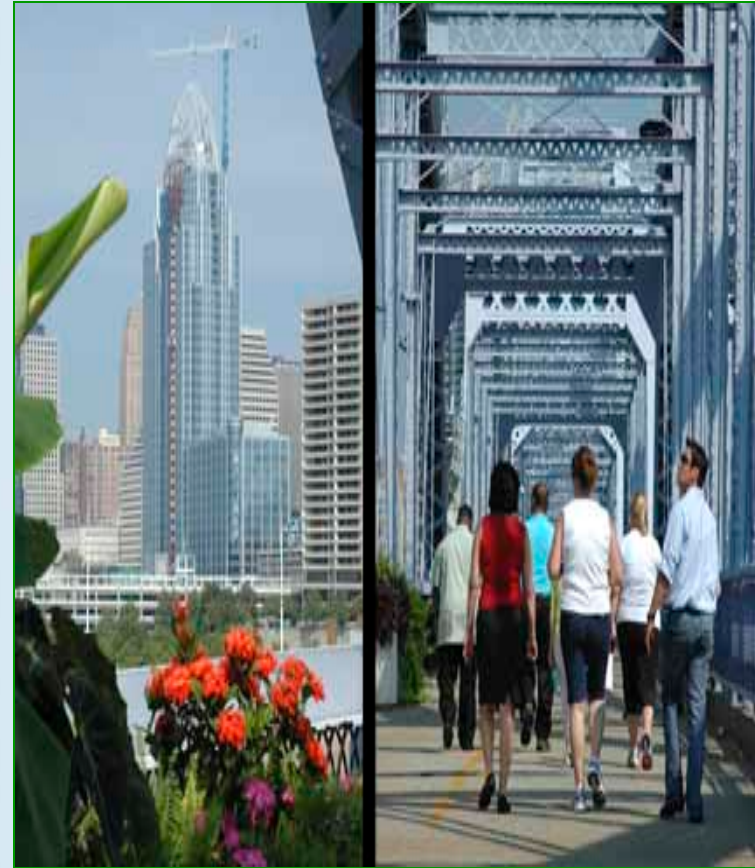


# Summary

**Chemotherapy is a general term for all drugs and there are many different drugs and side effects from those drugs.**

**You can have a life on chemotherapy.**

**MUCH, MUCH, MUCH more needs to be done!!**



**THIS IS YOUR LIFE.**  
DO WHAT YOU LOVE,  
AND DO IT OFTEN.

IF YOU DON'T LIKE SOMETHING, CHANGE IT.  
IF YOU DON'T LIKE YOUR JOB, QUIT.  
IF YOU DON'T HAVE ENOUGH TIME, STOP WATCHING TV.  
IF YOU ARE LOOKING FOR THE LOVE OF YOUR LIFE, STOP;  
THEY WILL BE WAITING FOR YOU WHEN YOU  
START DOING THINGS YOU LOVE.

STOP OVER ANALYZING, ALL EMOTIONS ARE BEAUTIFUL.  
WHEN YOU EAT, APPRECIATE  
**LIFE IS SIMPLE. EVERY LAST BITE.**

OPEN YOUR MIND, ARMS, AND HEART TO NEW THINGS  
AND PEOPLE, WE ARE UNITED IN OUR DIFFERENCES.  
ASK THE NEXT PERSON YOU SEE WHAT THEIR PASSION IS,  
AND SHARE YOUR INSPIRING DREAM WITH THEM.

**TRAVEL OFTEN;** GETTING LOST WILL  
HELP YOU FIND YOURSELF.  
SOME OPPORTUNITIES ONLY COME ONCE, SEIZE THEM.  
LIFE IS ABOUT THE PEOPLE YOU MEET, AND  
THE THINGS YOU CREATE WITH THEM  
SO GO OUT AND START CREATING.

**LIFE IS** LIVE YOUR DREAM,  
**AND WEAR**  
**SHORT.** YOUR PASSION.