Oral Chemotherapy: A Mouthful

Presented by Glenn Myers BScPharm, ACPR, RPh
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Objectives

- Identify the major classes of oral chemotherapy agents
- Discuss mechanism of action (MOA), place in therapy, adverse effects, drug interactions (DIs) & treatment pearls of oral chemotherapy classes
- Demonstrate an understanding for the treatment of characteristic adverse effects of selected oral chemotherapy agents

Oral Chemotherapy

- Chemotherapy taken orally to treat cancer
- Antineoplastic
  - Suppress the abnormal & rapid growth of malignant cells
- Specificity varies with selected agent
  - Non-specific MOA
  - Targeted therapy
    - Binds specific targets on cells that effect cell cycle mechanisms
  - Immunotherapy

Pro's & Con's

PROs	CONs
• Patient can manage own therapy	• ↑ risk of medication non-compliance
• **Usually** requires less supportive care for ADRs due to specificity	• ↑ risk of mal-absorption OR supra-absorption
• Less dose dense chemotherapy	• Not available for all malignancies
• Less visits to hospitals & oncology clinics	• ↑ risk of drug/food interactions • Excessive cost of medications (ie. Economic toxicity)

Oral Chemotherapy

- **Multi tyrosine kinase inhibitors (TKIs)**
  - Imatinib (Gleevec®), Sunitinib (Sutent®), Sorafenib (Nexavar®), Dasatinib (Sprycel®), Nilotinib (Tasigna®)
- **Epidermal Growth Factor Receptor Inhibitors (EGFR-I)**
  - Erlotinib (Tarceva®), Lapatinib (Tykerb®), Gefitinib (Iressa®)
- **Anti-metabolites**
  - Capecitabine (Xeloda®)
- **Anti-hormonal Agents**
  - Tamoxifen, Anastrazole (Arimidex®), Exemestane (Aromasin®), Letrozole (Femara®), Abiraterone (Zytiga®)
- **Alkylating Agents**
  - Temozolomide (Temodol®), Cyclophosphamide (Procytox®)
- **Miscellaneous**
  - Everolimus (Afinitor®), Lenalidomide (Revlimid®), Prednisone

Oral Chemotherapy

- **Multi Tyrosine Kinase Inhibitors (TKIs)**
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Tyrosine Kinase Inhibitors

- Targeted therapy
- Broad spectrum of activity
  - Hematologic malignancies
  - Solid tumors
- First approved in 2001
- Represent a big step forward for patient specific therapy
  - Targeted = less toxicities

Mechanism of Action

- Tyrosine kinases (TKs)
  - Catalyses phosphorylation of tyrosine residues
  - Governs cellular processes including:
    - Cellular growth & survival
    - Proliferation
    - Differentiation
    - Apoptosis
- Two different types of TKs
  - Receptor TKs
  - Cellular TKs

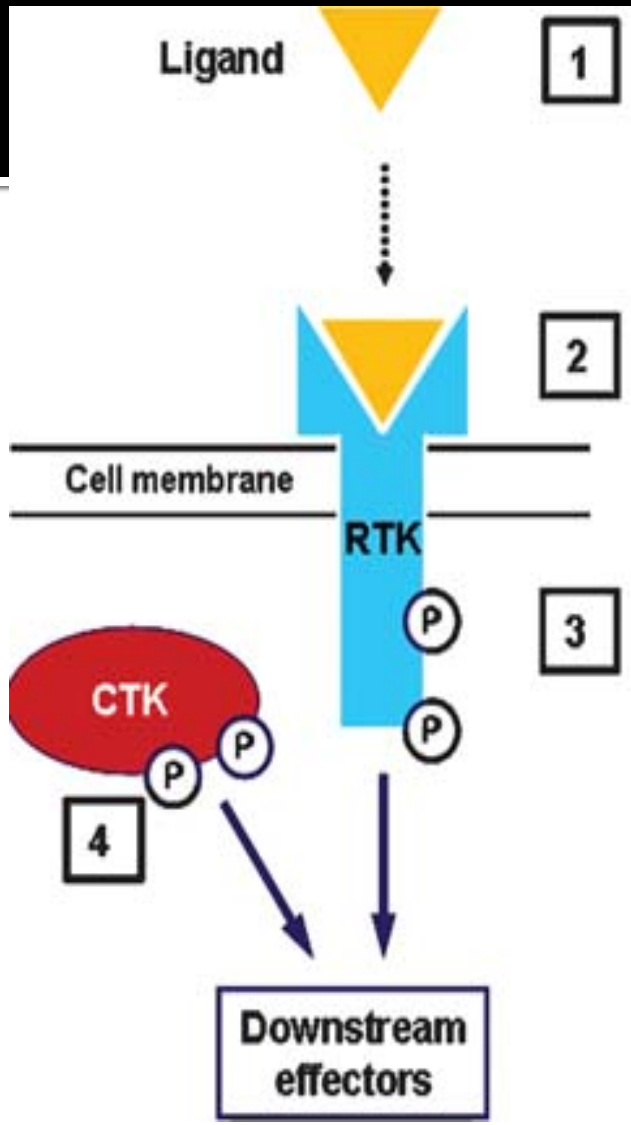
Mechanism of Action

Extracellular Activity

- Inhibits ligand **OR** binds to extracellular TK domain
- Monoclonal antibodies (aka *large molecule*)
- IV administration
- Trastuzumab (Herceptin®), Bevacizumab (Avastin®), Cetuximab (Erbitux®)

Intracellular Activity

- Binds TKs on intracellular TK domain **OR** cellular TKs
- Bind ATP binding site of TKs
- Aka "small molecule TKI"
- **PO administration**



	Target	Drug
1. Ligand sequestration/inactivation	VEGF-A	Bevacizumab
2. Receptor binding/inactivation	EGFR	Cetuximab
3. Inhibition of RTK phosphorylation	EGFR	Erlotinib
4. Inhibition of CTK phosphorylation	Bcr-Abl	Imatinib

RTK = Receptor tyrosine kinase
CTK = Cytosolic tyrosine kinase
(P) = Phosphorylation

Devita et al. Cancer: Principle's and Practice of Oncology. 9th edition. 2011

Multi-TKIs

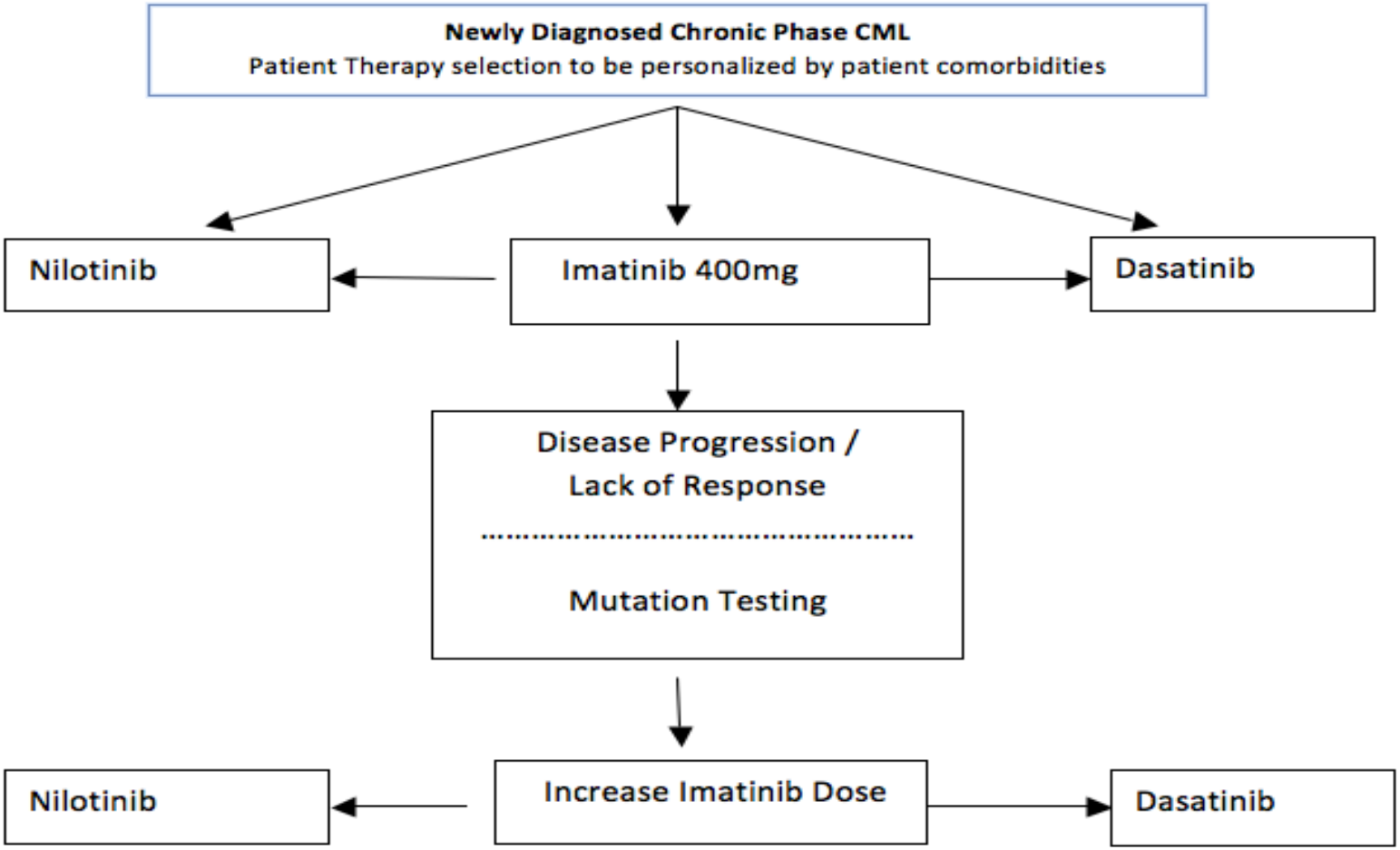
- Act on cellular TKs in the cytoplasm
  - Amplify signal from trans-membrane TKs

- Each drug acts on unique cellular TKs

TKI	Enzymes effected
Imatinib (Gleevec®)	Bcr-Abl (*major*), c-kit, PDGFR
Dasatinib (Sprycel®)	Bcr-Abl (*major*), Src family, c-kit, PDGFR, EPHA2
Nilotinib (Tasigna®)	Bcr-Abl (*major*), c-kit, PDGFR
Sunitinib (Sutent®)	VEGFR, c-kit, PDGFR, CSF1-R, Flt-3, RET
Sorafenib (Nexavar®)	VEGFR, c-kit, PDGFR, Raf, Flt-3, RET, FGFR-1

Place in therapy

	Cancer Site	TKI
Hematologic	Chronic Myeloid Leukemia (CML)	**Imatinib**
		Dasatinib
		Nilotinib
	Acute Lymphocytic Leukiemia (ALL)	**Dasatinib**
Solid Tumor	*GIST	**Imatinib**
		Sunitinib
	Renal Cell Carcinoma	**Sorafenib**
		Sunitinib
	Hepatic Carcinoma	**Sorafenib**
	Pancreatic Carcinoma	**Sunitinib**
*GIST = Gastrointestinal Stromal Tumor		


Newly Diagnosed Chronic Phase CML
Patient Therapy selection to be personalized by patient comorbidities
Nilotinib
Imatinib 400mg
Dasatinib
Disease Progression /
Lack of Response
Mutation Testing
Nilotinib
Increase Imatinib Dose
Dasatinib

Adverse Events

- Chemo related toxicities must be graded before treatment
- Toxicities graded by the Common Terminology Criteria for Adverse Events (CTCAE)
  - Grades toxicities from 1-5
  - 1= Mild toxicity ; 5= Death
- Toxicity grade coordinates with elected supportive care
- Refer to drug manuals for comprehensive list of ADRs
  - www.bccancer.bc.ca
  - www.cancercare.on.ca

Adverse Events

- **Myelosuppression**
  - **Neutropenia** & **thrombocytopenia**
  - Related to underlying malignancy
  - Dose related (ie. *Higher doses in accelerated phase of disease*)
  - Dasatinib > Imatinib > Nilotinib > Sorafenib/Sunitinib
- Hepatotoxicity
  - ↑Tbili *(>3x ULN)* & ↑AST/ALT *(>5x ULN)*
  - Dose reduction or interruption
- Edema
  - Dose related
  - Pleural effusion (*Dasatinib)*
  - Caution in CHF, ascites, etc.
  - Responsive to loop diuretics (ie. *Furosemide*)

Adverse Events

- Diarrhea
  - Dasatinib > Nilotinib > Imatinib
  - Supportive therapy (ie. Loperamide)

- Pancreatitis
  - ↑ in amylase/lipase (>2x ULN)
  - Unique to **Nilotinib**

- QT Prolongation
  - **Nilotinib >> Dasatinib > Sunitinib**
  - **May require interruption**
  - Monitor new/current meds that could also ↑QT_c

- Electrolyte abnormalities
  - Hypo-/hyperkalemia, hyponatremia, hypocalcemia, hypophosphatemia
  - Nilotinib

Adverse Events

- **Hypertension (14-28%)**
  - Sunitinib & Sorafenib (…Due to inhibition of VEGF & PDGF TK..?)
  - Avoid non-DHP CCBs due to drug interactions
- **Left Ventricular Dysfunction** (↓ in LVEF)
  - Sunitinib & Sorafenib
  - Caution patients with previous cardiac history (*ie. CHF, MI, etc.)*
  - Monitor LVEF with MUGA scan at baseline & as clinically indicated
- Hypothyroidism (36%)
  - Sunitinib
  - Monitor TSH monthly during therapy
- Hand-Foot syndrome (12-14%)
  - Sorafenib > Sunitinib
  - Different than Xeloda type HFS
- **Bleeding/Hemorrhaging** (15-26%)
  - Sorafenib & Sunitinib
  - Occurs from any site

Drug Interactions (DIs) – TKIs

- All TKIs extensively metabolized by **CYP3A4**
  - Cornucopia of drug interactions
  - May inhibit 3A4 metabolism of other substrates

Other Substrates	Inhibitors	Inducers
Warfarin, non-DHP CCBs, statins, digoxin, **midazolam**	Grapefruit juice, Azole antifungals, erythromycin, clarithromycin etc.	**Dexamethasone,** Rifampin, anticonvulsants, SJW etc.

- PPI's, H_2RA's and Antacids
  - ↑pH of gastric secretions = ↓absorption = ↓pharmacological effect
  - Separate administration by ~2-4 hours

- Synergistic QT_c prolongation
  - Antimicrobials, 5-HT_3 antagonists (ie. Ondansetron), antiarrythmics, etc.

Administration

- Food can vary the bioavailability of some TKIs
  - Food = ↓gastric pH = unpredictable absorption = ↑ ADRs
- Strict guidelines on administration

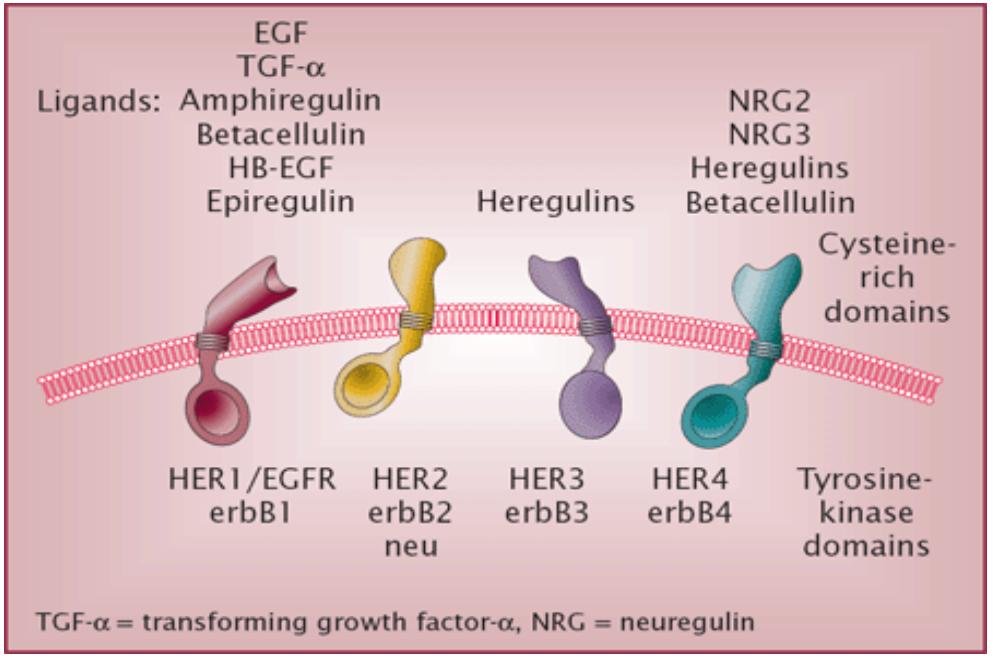
TKI	Dose	Administration	Renal Adjustment
Imatinib	400-800mg daily	With Food	☺
Nilotinib	300-400mg BID	**WITHOUT Food***	☺
Dasatinib	100-140mg daily	N/A	☺
Sunitinib	37.5-50mg daily	N/A	☺
Sorafenib	400mg BID	**WITHOUT Food***	☹
*=1hr before OR 2hrs after a meal; N/A= not applicable			

Monitoring

Baseline	Regular	As clinically indicated
• CBC, Plt • Lytes, SCr/BUN, LFTs, uric acid •Amylase/lipase (*nilotinib*) • TSH (*sunitinib*) • QT interval (ECG) • Drug interactions	• CBC, Plt • Lytes, SCr/BUN, LFTs, uric acid •Blood pressure (*sunitinib/sorafenib*) • Electrolytes (*nilotinib)* • TSH (*sunitinib*) • QT interval (ECG) • Compliance	• CBC, Plt • TSH (*sunitinib)* • MUGA scan (*sunitinib/sorafenib)* • Blood Pressure (*sunitinib/sorafenib)* • Fluid retention (*ie. Pleural effusion, pedal edema, etc)* • Drug interactions

EGFR specific TKIs

- Reversibly inhibit receptor TK on HER family of receptors
- EGFR = "HER-1"
- Over-expressed and/or mutated in many cancers



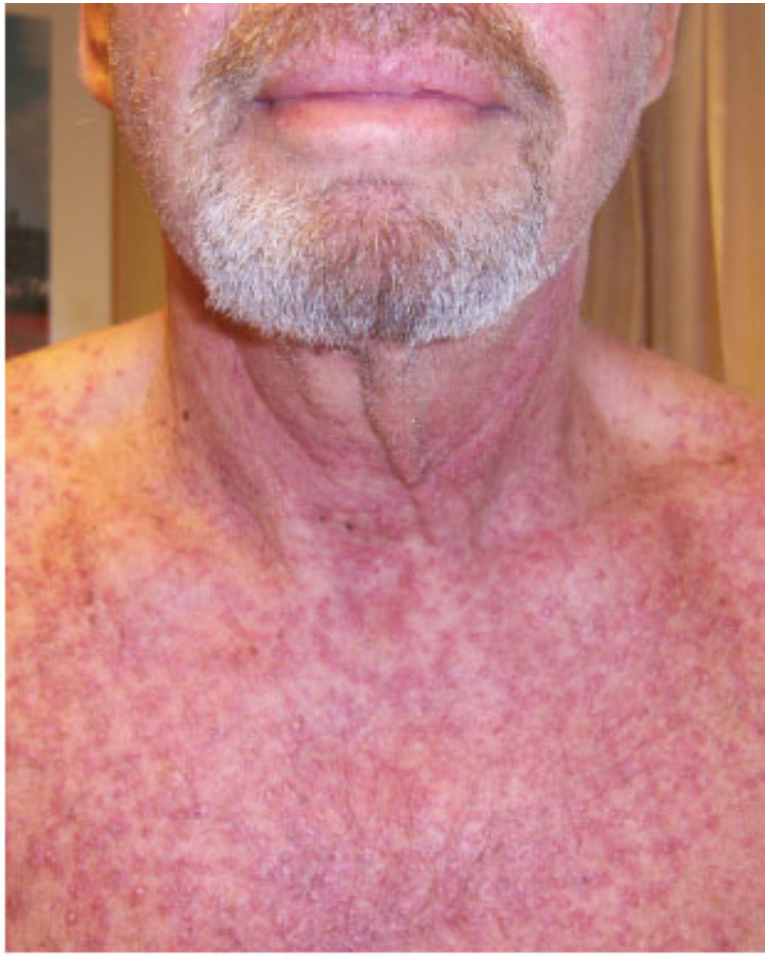
Drug	TK Target
Lapatinib (Tykerb®)	EGFR (HER-1) + HER-2
Erlotinib (Tarceva®)	EGFR (HER-1)
Gefitinib (Iressa®)	EGFR (HER-1)

Place in therapy

- HER-2 (+) Breast cancer
  - Lapatinib combined with Xeloda®
  - **Adjuvant**: Relapsed on or within 12months of Herceptin®
  - **Advanced**: Progress despite prior Herceptin® based therapy
- Advanced non-small cell lung cancer (NSCLC)
  - Erlotinib, Gefinitinb
  - 2nd or 3rd line

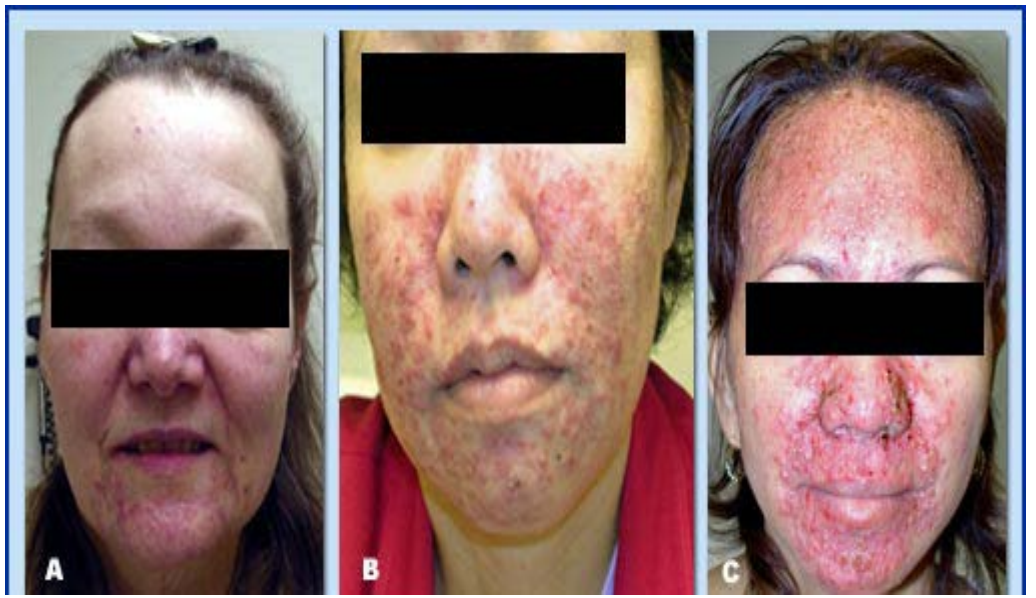
Adverse Events

- Rash (45-100%)
  - Class specific toxicity
    - Acneiform **like** rash on face & upper trunk
  - Correlates with clinical activity of drug → surrogate marker?
- Other skin toxicities
  - Nail changes (10-20%), xerosis, pruritis, hirsutism, trichomegaly
- Diarrhea (36-59%)
  - Dose related
  - Symptomatic treatment (ie. Loperamide)
- QT_c Prolongation
- Interstitial Lung Disease (ILD) (0.3-2%)
  - Gefitinib & erlotinib
  - Requires discontinuation of drug



BETH EABY-SANDY, CRNP, OCN

FIGURE 1. Grade 3 rash on the chest of a patient taking erlotinib



http://www.managecrc.com/articles/ArticleReader.aspx?article=157&page=1http://www.oncologynurseadvisor.com/managing-egfr-inhibitor-side-effects-in-lung-cancer-patients/article/177850/

EGFR Induced rash

Mild Symptoms (Grade 1)

- No Treatment **OR**
- Topical HC 1-2.5% Clindamycin 1% gel
- **Duration**: 2-4 weeks
- No dose reduction required

Moderate Symptoms (Grade 2)

- HC 1-2.5% Clindamycin 1% **PLUS**
- Doxycycline 100mg BID **OR** Minocycline 100mg BID
- **Duration**: 2-4 weeks
- No dose reduction required

Severe Symptoms (Grade 3-4)

- HC 1-2.5% Clindamycin 1% **PLUS**
- Doxycycline 100mg BID **OR** Minocycline 100mg BID
- **PLUS** Short course of PO steroids
- Dose reduction or interruption in therapy

Li et al. Targ Oncol. 2009; 4: 107-119

EGFR Induced rash

- Counselling Points
  1. Bath in warm or lukewarm water (not hot)
  2. Use mild soaps without alcohols, perfume or dyes
  3. Continuous use of non-alcoholic, emollient cream (ie. Eucerin®)
  4. Avoid prolonged sun exposure
     - Wear hat, long sleeved shirt & pants
     - Use zinc OR titanium oxide based sun block on exposed areas

Li et al. Targ Oncol. 2009; 4: 107-119

Drug Interactions

- Extensively metabolized by CYP3A4
  - May inhibit metabolism of other CYP3A4 substrates

Other Substrates	Inhibitors	Inducers
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- PPI's, H2RA's & Antacids
  - ↑pH = ↓absorption = ↓pharmacological effect
  - Separate administration by ~2-4hrs
- QT_c prolongation drugs
- Metoprolol…?
  - Gefitinib inhibition of CYP2D6

Administration

EGFR Inhibitor	Dose	Administration	Renal Adj.	†Hepatic Adj.
Lapatinib	1250mg daily	***WITHOUT Food**	☺	☹
Erlotinib	150mg daily	***WITHOUT Food**	☺	☹
Gefinitib	250mg daily	N/A	☺	☺

*= 1 hour before OR 2 hours after meals
† = Tbili >3X ULN **OR** AST/ALT >5X ULN requires interruption or discontinuation
N/A = Not applicable

Monitoring

Baseline	Regular (Each cycle)	As clinically indicated
• CBC, Plt • Lytes, SCr/BUN, LFTs, bilirubin • Chest X-ray for ILD (*Erlotinib, Gefitinib)* • MUGA scan (*Lapatinib)* • Skin & nail abnormalities • QT interval (ECG) • Drug interactions	• CBC, Plt • Lytes, SCr/BUN, LFTs, bilirubin • Skin & nail abnormalities • Compliance	• CBC, Plt • Chest X-ray for ILD (*Erlotinib, Gefitinib*) •MUGA scan (*Lapatinib)* • QT interval (ECG) • Drug interactions

Oral Chemotherapy

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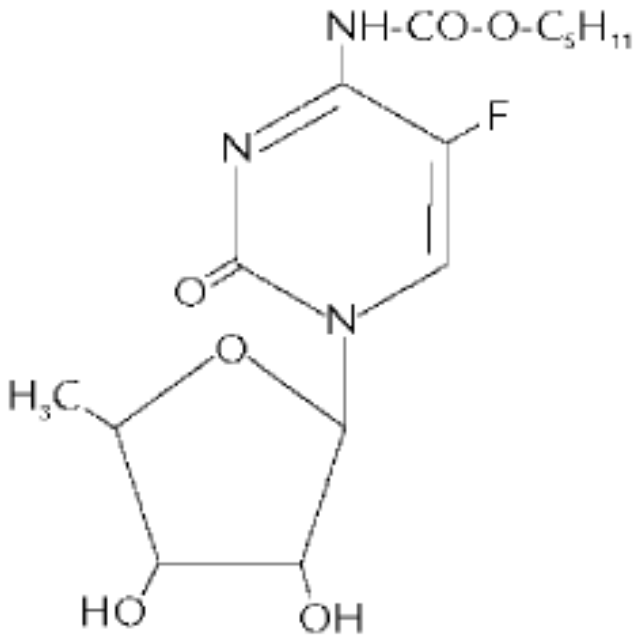
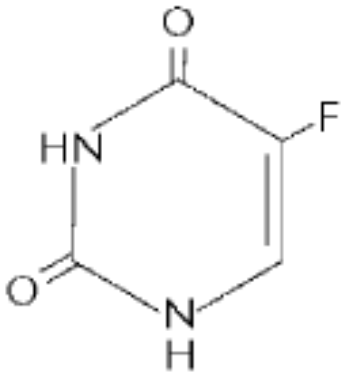
Capecitabine (Xeloda®)



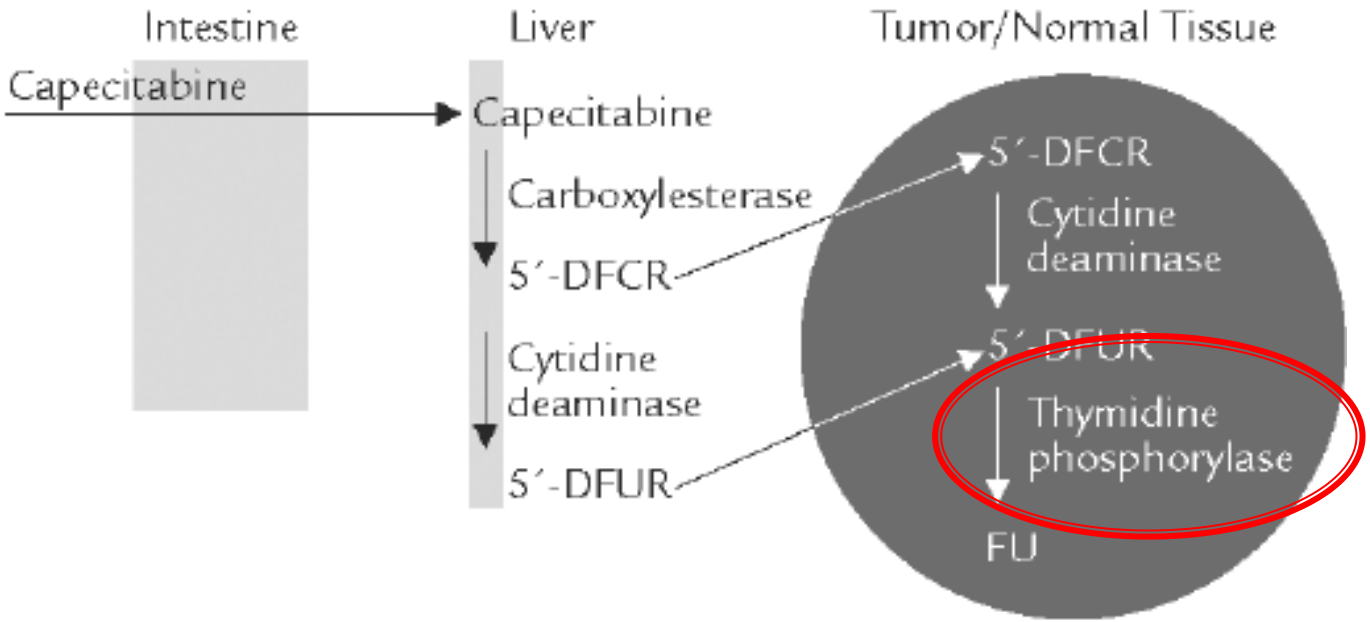
Capecitabine



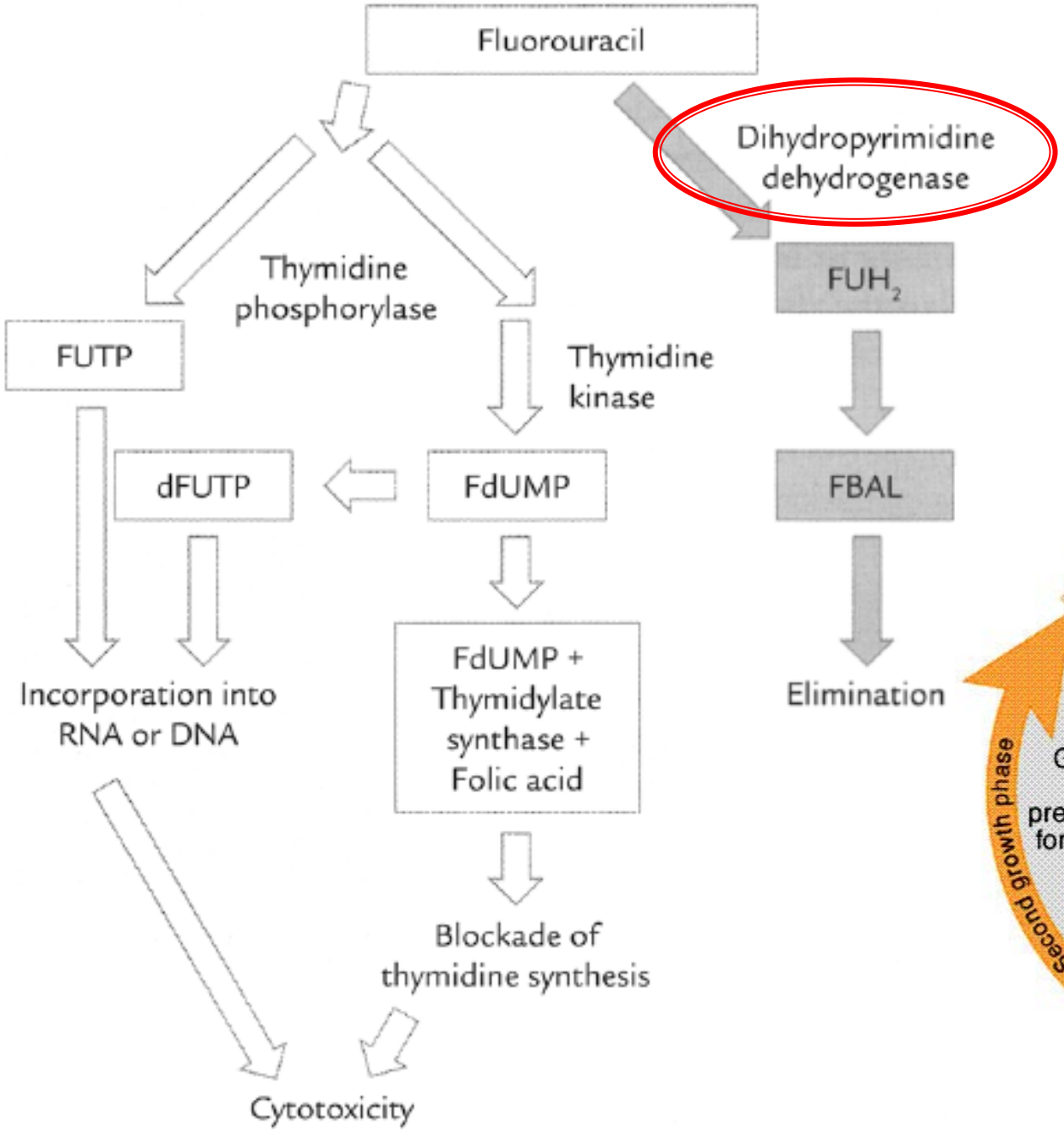
Fluorouracil

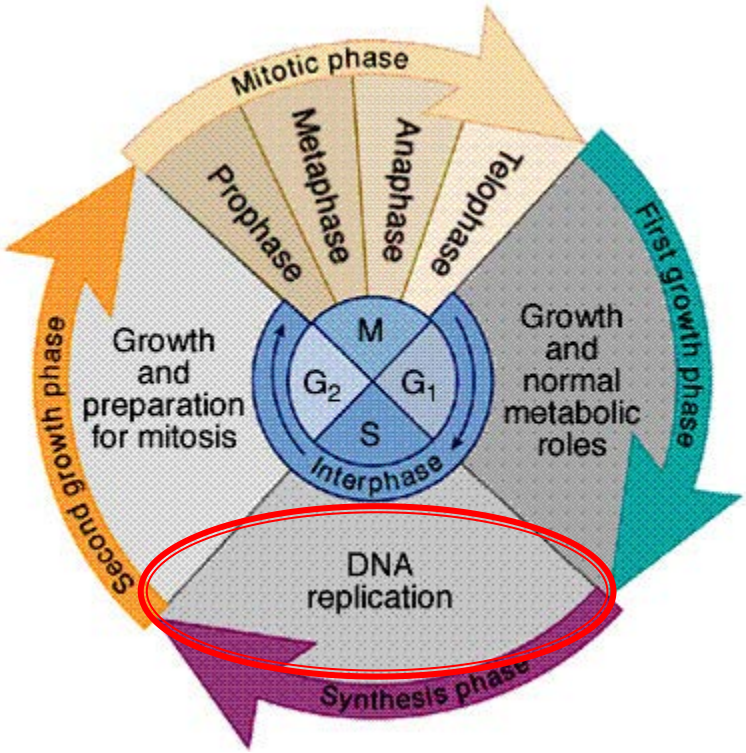
Pharmacology

- Pro-drug metabolized to 5-Fluorouracil (5-FU)
  - 3 step metabolism
  - Concentrates 5-FU within tumor tissue



Walko et al. Clincial Therapeutics. 2005; 27(1): 23-44





Walko et al. Clincial Therapeutics. 2005; 27(1): 23-44

Place in therapy

- Metastatic breast cancer
  - Mono-therapy
  - Combination with Docetaxel (Taxotere®)
  - Combination with Lapatinib **OR** Herceptin®
- Gastrointestinal malignancies
  - Colorectal cancer
    - Adjuvant & Metastatic settings
    - Acts as a radio-sensitizer in combination with radiation
  - Esophageal & gastric cancers
  - Neuro-endocrine cancer of the pancreas

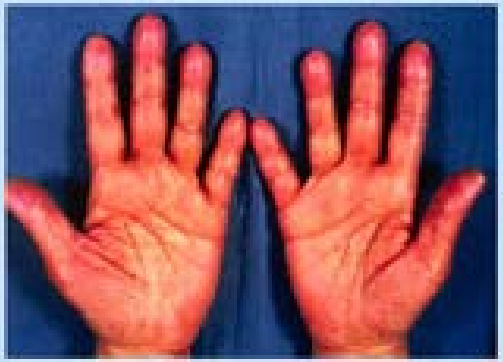
Adverse Effects

- Palmar-Plantar Erythrodysesthesia (53-57%)
  - Aka Hand-Foot syndrome (HFS)
- Nausea (38-53%) , Vomiting (23-37%) & Anorexia (20-23%)
  - **Moderate** emetogenic potential
- Diarrhea (**49-57%)**
  - Supportive care is **KEY**
- Stomatitis (25%)
  - Tender & painful oral ulceration
- Severe hyperbilirubinemia (~19%)
  - Bilirubin >1.5X ULN requires interruption until normalization

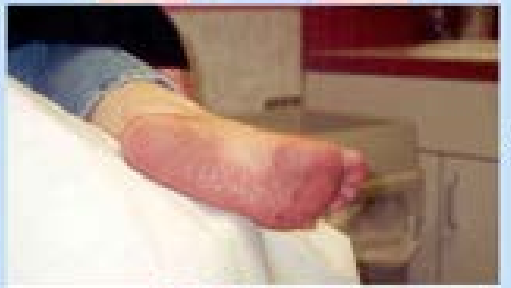
HFS

- PEG-Doxorubicin, Xeloda®, 5-FU, sorafenib, sunitinib
- Symptoms are painful & debilitating
  - Dysesthesia → erythema → swelling → blistering → ulceration
- Multiple pathologic mechanisms
  - Concentration in sweat glands
  - Mechanical trauma to micro-capillaries in hands/feet
  - Build up of 5-FU metabolites in skin
- Time dependant
  - Occurs after >3-4 weeks of therapy

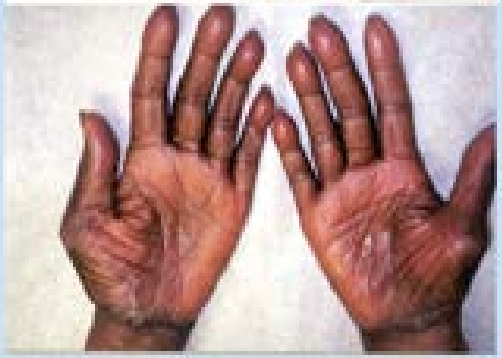
Degen et al. JDDG. 2010; 8: 652-661



Grade 1
Numbness, dysesthesia or paresthesia, tingling, painless swelling or erythema, and/or discomfort of hands or feet not disrupting normal activities



Grade 2
Painful erythema and swelling of hands or feet and/or discomfort affecting ADLs



Grade 3
Moist desquamation, ulceration, blistering or severe pain of hands or feet, or severe discomfort preventing work or performance of ADLs

HFS

- Dose reduction & therapy interruption mainstay of therapy
  - Grade 1: Focus on prevention
  - Grade 2-3: Delay therapy until grade 0-1; possible dose ↓
  - Grade 4: Usually requires D/C of therapy
  - Typically improves within 1-2 weeks after interruption

- Prevention & supportive care is critical
  - **Goals of therapy**: ↓ pain, discomfort & prevent infections
  - Petrolatum and/or lanolin based emollients
  - Cold compresses & cold water baths
  - Analgesics (ie. Tylenol, opioids, Celecoxib…?)
  - Vitamin B_6 (pyridoxine)

Gressett et al. J Oncol Pharm Practice. 2006; 12: 131-141
Degen et al. JDDG. 2010; 8: 652-661

HFS

- Counselling points
  1. Avoid tight fitting shoes, gloves and socks
  2. Limit strenuous activity requiring hands & feet
     - Heavy lifting, long walks, running, standing for long periods
  3. Avoid sweating and excessive heat on the hands & feet
     - Sweat or perspiration should be washed off immediately
  4. Promote regular use of moisturizers on hands & feet

Drug Interactions

- Warfarin
  - **CYP2C9 inhibition**
  - May ↑ INR on initiation or dose changes
  - Monitor INR more frequently initially
- Phenytoin
  - May ↑ phenytoin levels
  - Monitor levels & for signs of toxicity
- Antacids (Mg^{2+}, Al)
  - Space 2hrs from therapy
  - Theoretical interaction, **not clinically meaningful**

Administration

- Dosed twice daily (BID) after meals
- 1250 mg/m^2 BID (total 2500 mg/m^2 daily)
  - Cycles **usually** 2 weeks on, 1 week off
- Requires **renal adjustment**
  - ~96% renal elimination
  - Ensure patient isn't in acute renal failure (ie. diarrhea….)

>50 mL/min	30-50 mL/min	<30 mL/min
Full dose	25% dose reduction	**Contraindicated**

Monitoring

Baseline	Regular (Each cycle)	As clinically indicated
• CBC, Plt • Lytes, SCr/BUN, LFTs, **bilirubin** • Drug interactions	• CBC, Plt • Lytes, SCr/BUN, LFTs, **bilirubin** • Exam of hands & feet to assess for HFS • Compliance	• CBC, Plt • Bilirubin, LFTs • Drug interactions

- Regular monitoring for HFS can allow for early detection
  - Preventative therapies can be initiated to prevent progression

Oral Chemotherapy

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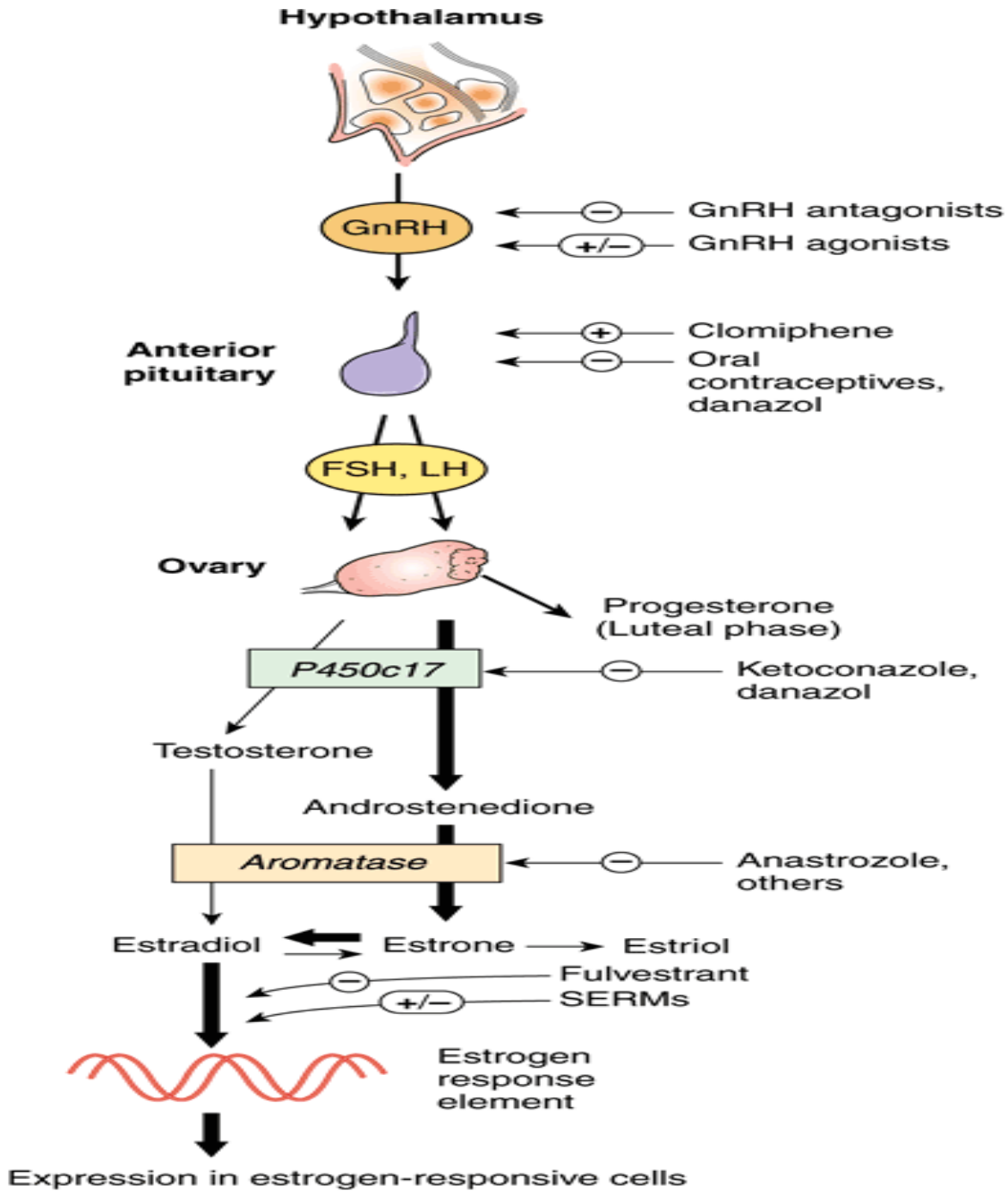
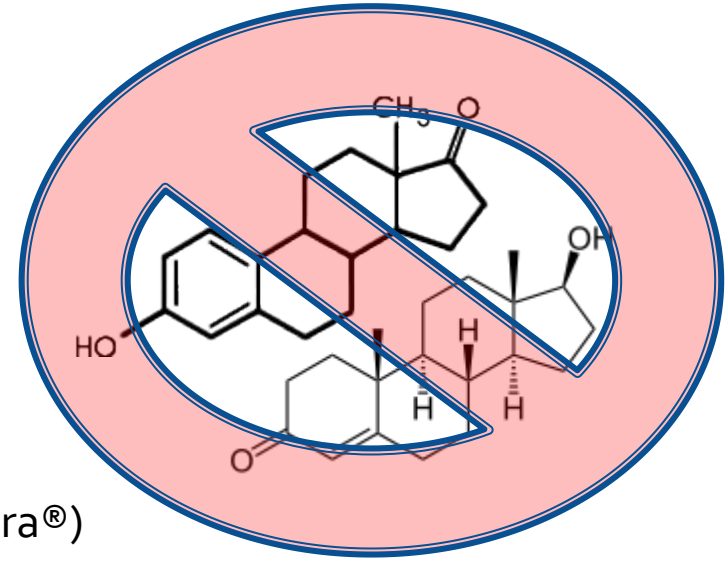


Moy et al. Goodman and Gillman's The Pharmacological Basis of Therapeutics. 12th edition.

Anti-hormonal Agents

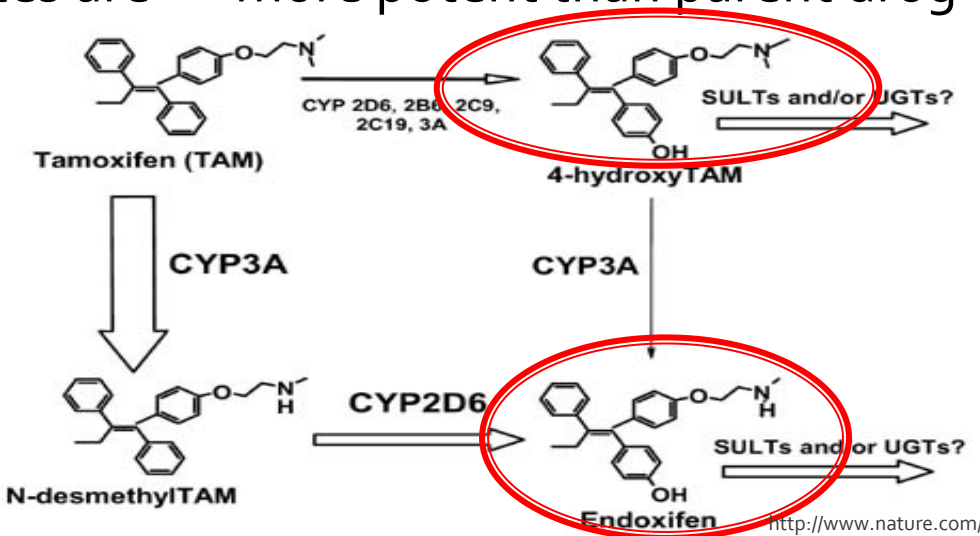
- Selective Estrogen Receptor Modulator (SERM)
  - Tamoxifen
- Aromatase Inhibitors (AIs)
  - Steroidal analogues
    - Exemestane (Aromasin®)
  - Non-Steroidal analogues
    - Anastrazole (Arimidex®), Letrozole (Femara®)
- Anti-androgen
  - Abiraterone (Zytiga®)



Tamoxifen

- Mixed effects at estrogen receptors
  - **Antagonistic**: Breast tissue
  - **Agonistic**: Bone (↑ *BMD*), endometrial tissue (hypertrophy/cancer), liver (↓ lipids), coagulation (↑ Thrombosis)

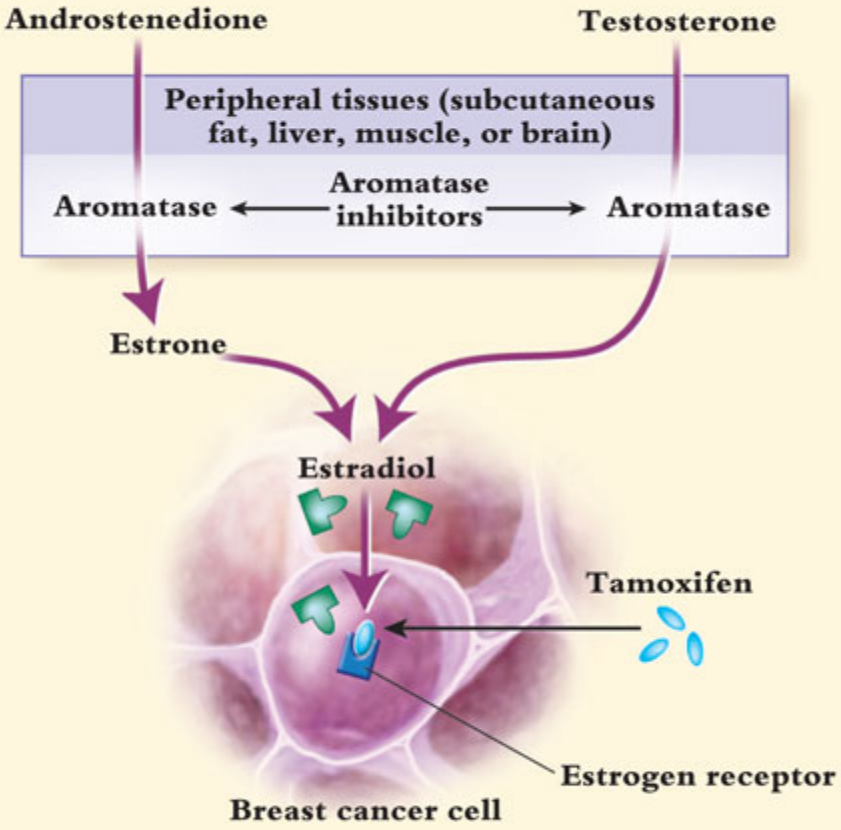
- Requires activation by CYP2D6 (major) & 3A4/5
  - Metabolites are ++ more potent than parent drug



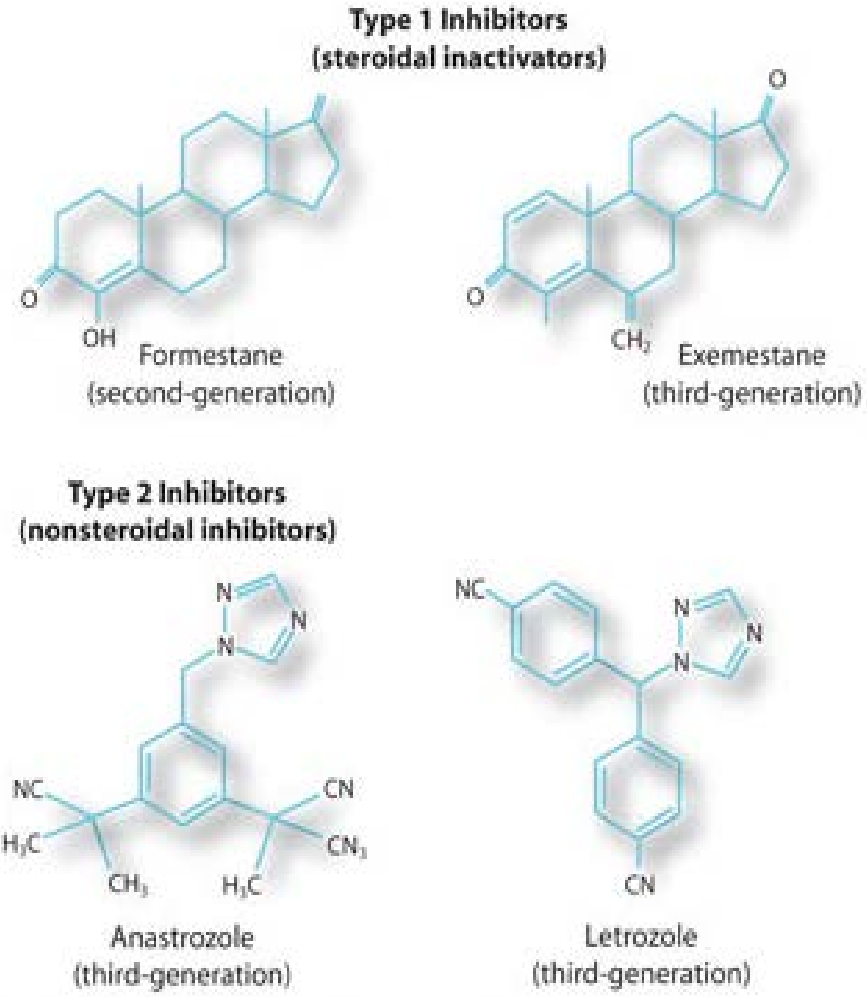
http://www.nature.com/clpt/journal/v80/n1/fig_tab/clpt2006384f1.html

Aromatase Inhibitors

Figure 2. Mechanism of action of the aromatase inhibitors.



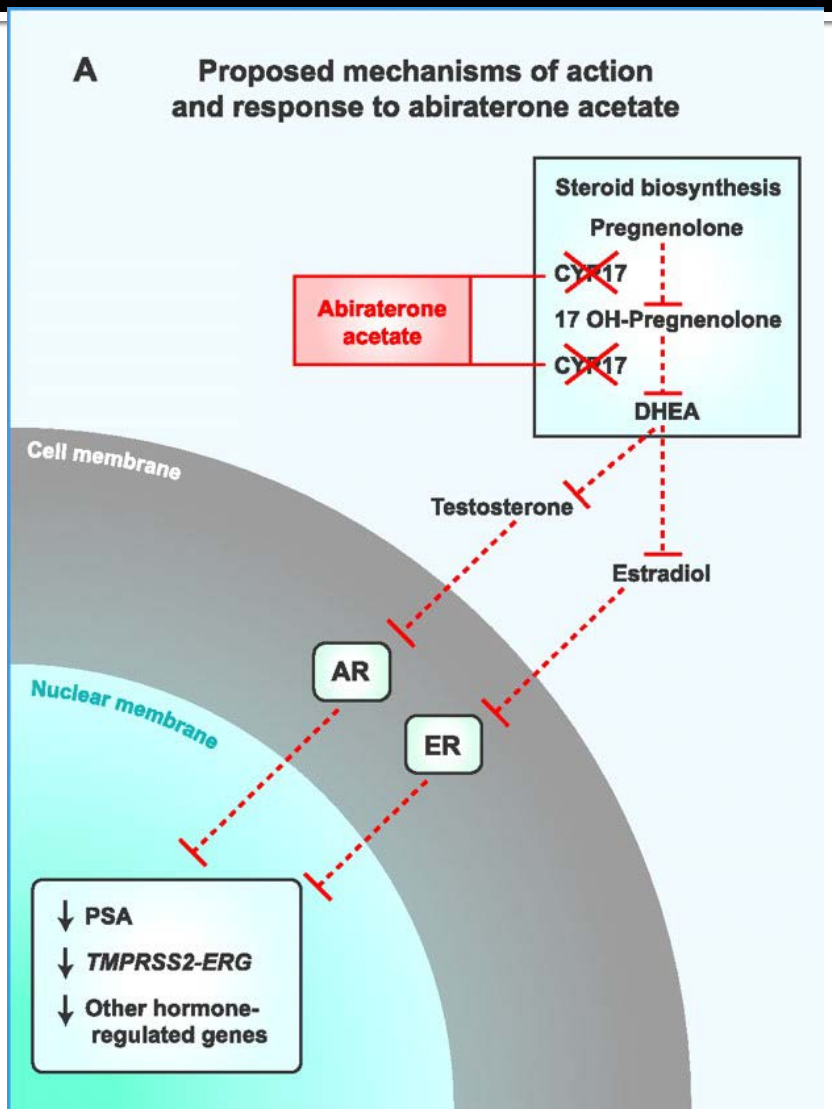
Source: Smith IE, Dowsett M. Aromatase inhibitors in breast cancer. N Engl J Med. *2003;348:2431-2442. Copyright © 2003 Massachusetts Medical Society. All rights reserved.*



e inhibitors in breast cancer. N Engl J Med. *2003;348:2431-2442.*
al Society. All rights reserved.

Abiraterone

- Testosterone stimulates growth of prostate tumors
- Inhibits metabolism of pre-cursors to testosterone
  - Via CYP17 enzyme
  - Testis, adrenals, prostate tumor
- Adrenal glands compensate by ↑ mineralo-corticoid production
  - ADRs



http://cancerres.aacrjournals.org/content/69/12/4937/F1.expansion

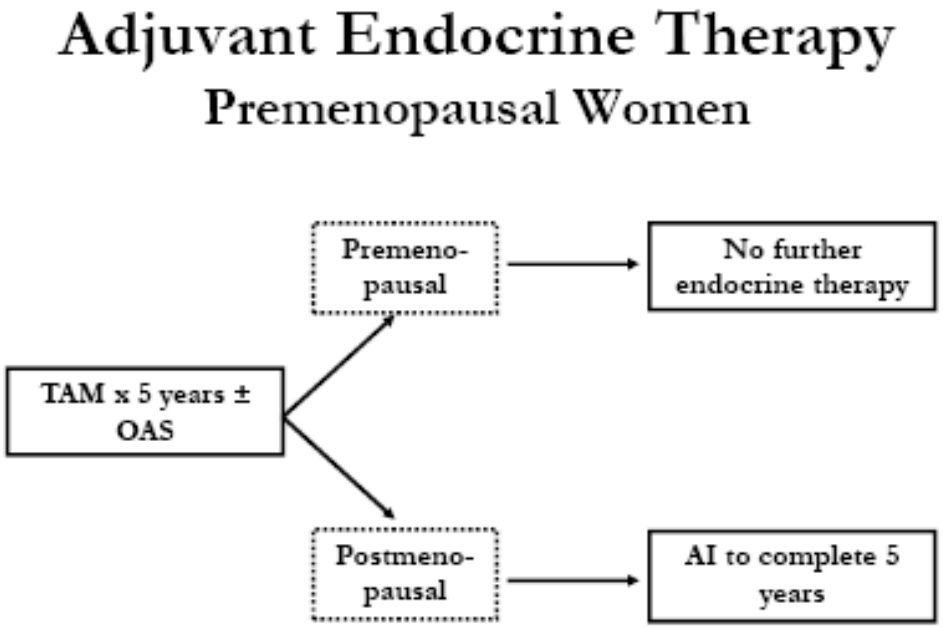
Place in therapy

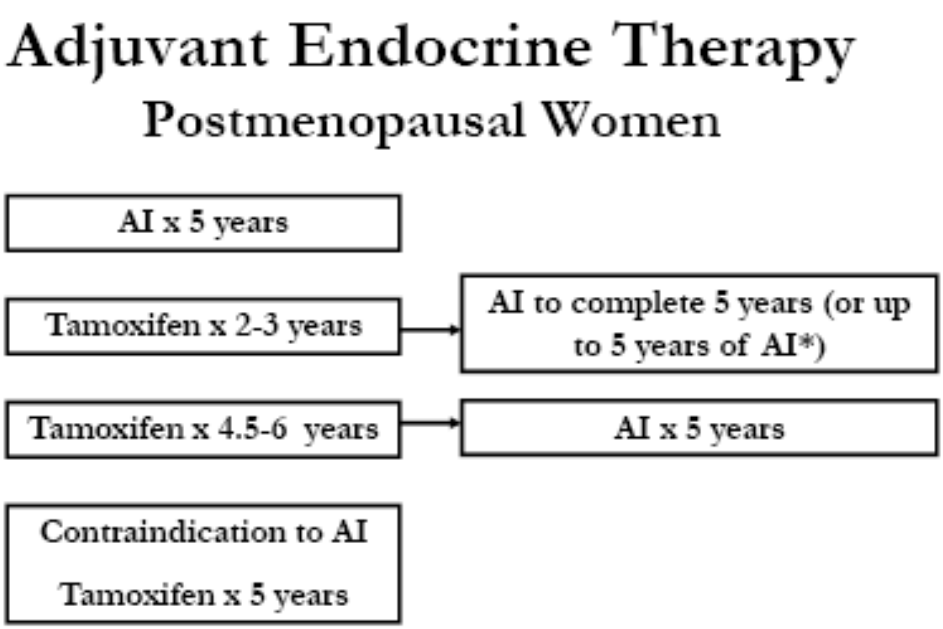
- Adjuvant breast cancer
  - All tumors that are ER/PR +

Drug Class	Place in Therapy
Tamoxifen	• **Premenopausal women**: 5 yrs of treatment • **Postmenopausal women:** 2-3yrs of tamoxifen followed by AI (to complete 5yrs OR additional 5yrs) • **Postmenopausal women**: 4.5-6yrs of tamoxifen followed by 5 yrs of AI
AIs	• **Postmenopausal women only** • 5 yrs of therapy (*with no tamoxifen*) • 5 yrs of therapy after 2-3 yrs OR 4.5-6yrs of tamoxifen

- Metastatic castrate resistant prostate cancer (mCRPC)
  - Combined with prednisone 10mg daily
  - 2nd line after treatment with docetaxel (Taxotere®)
  - Castration could be surgical or pharmacological

Place in therapy





Barnett C. Breast Cancer Review. ACCP/ASHP Oncology Pharmacy Prepratory Course. 2012

Adverse Effects

- Menopausal type ADRs
  - Hot flashes, sweating, depression
- Arthralgia & myalgia (4-29%)
- Endometrial hypertrophy
  - Bleeding/spotting, endometriosis, ↑risk of endometrial cancer
- Venous thromboembolism (2-5%)
  - Monitor those patients at ↑ risk
- Vision abnormalities (<1-7%)
  - Cataracts, retinopathy, visual acuity

- Menopausal type ADRs
  - Hot flashes, vaginal dryness, depression
- Arthralgia & Myalgia (2-36%)
- Headache (8-19%)
- Osteoporosis
  - ↑ risk of fractures
  - Calcium + Vitamin D supplementation
- Edema (2-17%)
- Androgenic ADRs
  - Buildup of testosterone
  - Hoarseness, acne, hypertrichosis

Adverse Effects (Abiraterone)

- Hyper-aldosterone ADRs
  - Fluid retention, **hypertension** & **hypo-**kalemia
  - Avoid use of spironolactone (**may ↑ androgen production)**
- Hepatotoxicity (2%)
  - Reversible if dose ↓ or therapy is withheld
  - Typical in 1st 3 months
  - Hold if AST/ALT >5x ULN or Tbili > 3X ULN, then ↓ dose
- Arthralgia & myalgia (27-36%)

Drug Interactions

- Tamoxifen requires activation by **CYP2D6** & 3A4/5
  - Inhibitors of CYP2D6
    - Switch to other anti-depressant with less enzyme inhibition (ie. Celexa)
    - Reference **Yellow Card**
  - Clinical implications unknown

CYP 2D6 Inhibitors	CYP 3A4 Inhibitors
SSRIs (ie. **Paroxetine, fluoxetine),** Bupropion, quinine	GFJ, erythromycin, clarithromycin, azole antifungals etc.

- Estrogens (…obviously…)
- Abiraterone metabolized by CYP3A4
  - Also inhibitor of CYP2D6, 2C9/19, 3A4/5 & p-glycoprotein
  - Drug interactions of unknown clinical significance

Administration

Drug	Dose	Administration	Renal Adj.	Hepatic Adj.
Tamoxifen	20mg daily	N/A	☺	☹
Anastrazole	1mg daily	N/A	☺	☹
Exemestane	25mg daily	N/A	☺	☺
Letrozole	2.5mg daily	N/A	†☺	☺
Abiraterone	1000mg daily	***WITHOUT Food**	☺	☹

*= 1 hour before OR 2 hours after meals
†= Not recommended in CrCL < 10mL/min
N/A = Administration with food not applicable

Monitoring

Baseline	Regular (Each cycle)	As clinically indicated
• CBC, Plt , lytes, SCr/BUN • LFTs, bilirubin • Lipid Profile • Drug interactions	• CBC, Plt , **Lytes**, SCr/BUN (*Abiraterone)* • LFTs, bilirubin • Blood Pressure (*Abiraterone*) •Calcium (*tamoxifen*) • Lipid profile (q 3 months) •Compliance	• CBC, Plt, SCr/BUN • Lytes (*Abiraterone)* • LFTs, bilirubin • Bone Mineral Density (BMD) • Eye exam (*Tamoxifen*) • Drug interactions

- Prostate specific antigen (PSA) monthly to assess efficacy

Notable Exclusions… ☹

- Lenalidomide (Revlimid®)
  - Advanced multiple myeloma (MM)
  - Myelodysplastic syndromes (MDS)
- Everolimus (Afinitor®)
  - 2nd line advanced renal cell carcinoma
  - Breast cancer..?
- Corticosteroids
  - Prednisone, dexamethasone
  - Multiple Leukemias, lymphomas & MM
- Cyclophosphamide (Procytox®)
- Temozolomide (Temadol®)
  - Head & Neck

Take home points

- Always verify:
  - Administration of medication (**Food/No food**)
  - DIs when therapy initiated **OR** new medications started
- Grade toxicities before proceeding with care
  - Level of supportive care coordinates with toxicity grade
  - Algorithms usually present in drug monographs
- Medication adherence is critical
  - May increase resistance & cause unfavorable clinical response
  - Continually monitor tolerability
- Always be proactive with ADRs
  - Monitor, Monitor, MONITOR!
  - Many grade 3-4 ADRs can be prevented with timely supportive care
  - ADRs can lead to ↑morbidity, ↓ compliance & ↓ patient outcomes

Useful Oncology Resources

- BC Cancer Agency
  - www.bccancer.bc.ca
- Cancer Care Ontario (CCO)
  - www.cancercare.on.ca
- Cancer Care Nova Scotia
  - www.cancercare.ns.ca
- American Society of Clinical Oncology (ASCO)
  - www.asco.org
- Multinational Association of Supportive Care in Cancer (MASCC)
  - www.mascc.org
- National Comprehensive Cancer Network (NCCN)
  - www.nccn.org
- European Society for Medical Oncology (ESMO)
  - www.esmo.org
- Canadian Society of Pharmacists in Oncology (CaPhO)
  - www.capho.org
- Cancer Network
  - www.cancernetwork.com
- Care Beyond Cure (Publication from CSHP)

Questions?

Happy Halloween ☺

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