Financial Disclosure

No financial disclosures exist
Objectives

- Define common cancer therapy agent for Breast, Lung, Colon Cancers
- Describe the differences among cancer therapies
- Achieve a basic understanding of the mechanisms of actions of chemotherapy, hormone therapy, targeted therapies, and immunotherapy respective to Breast, Lung, and Colon Cancers
- Have a basic understanding of common toxicities for cancer agents and regimens
- Have an understanding of available resources for information regarding cancer therapies
Cancer treatment
Cancer Therapy Agents

Chemotherapy

Hormonal Therapy

Immunotherapy

Targeted Therapy
# Common Cancer Therapy Side Effects

<table>
<thead>
<tr>
<th>Fatigue</th>
<th>Myelosuppression</th>
<th>Nausea/Vomiting</th>
<th>Diarrhea/Constipation</th>
<th>Mucositis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peripheral Neuropathy</td>
<td>Alopecia</td>
<td>Immune-mediated pneumonitis, hepatitis, colitis, endocrinopathies and rash</td>
<td>Oncology Emergencies</td>
<td></td>
</tr>
</tbody>
</table>
Cancer Therapy Limitations

- Toxicity of agents
- Lifetime dose
- Hypersensitivity reactions
- Drug resistance
- Secondary malignancies
- Adherence
- Insurance Authorization
- Patient cost
Chemotherapy

• Treatment of cancer cells with chemicals
• Cytotoxic - poisonous to cells
<table>
<thead>
<tr>
<th>Chemotherapy</th>
<th>Phase cycle specific agents</th>
<th>Cell cycle specific agents</th>
<th>Cell cycle non-specific agents</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Only the cells in a specific cycle are affected dividing throughout cycle</td>
<td>Effects are mostly on the cells actively</td>
<td>Effects are on cells at any phase</td>
</tr>
</tbody>
</table>
Chemotherapy Classifications

- Alkylating Agents
- Antimetabolites
- Antimicrotubule Agents
- Topoisomerase I Inhibitors
- Topoisomerase II Inhibitors
Alkylating Agents

- Mechanisms of action: Interfere with DNA replication through cross linking of DNA strands, DNA strand breaking, and abnormal base pairing of proteins
- Most agents are **cell cycle non-specific**
- Activated by cytochrome p450
- **Toxicities:** Nausea/Vomiting, Hematopoietic, Reproductive
Antimetabolites

➢ Mechanism of action: Inhibit DNA synthesis by substituting metabolites or structural analogues during DNA synthesis

➢ Most agents are phase cycle specific

➢ Toxicities: Hematopoietic and GI

➢ Folate Analogs, Purine Analogs, Pyrimidine Analogs, Other
Antimicrotubule Agents

➢ Mechanism of action: Block cell division by preventing microtubule function
➢ Plant derived
➢ **Toxicities:** Peripheral Neuropathy
Topoisomerase I Inhibitors

- **Mechanism of action**: Interferes with the activity of topoisomerase in the process of DNA replication

- **Toxicities**: Nausea, vomiting, diarrhea, abdominal cramping.
Topoisomerase II Inhibitors

- Mechanism of action: Interferes with the activity of topoisomerase in the process of DNA replication
- Anthracyclines, Epipodophyllotoxins
- **Toxicities**: Nausea, vomiting, diarrhea, bone marrow suppression
Hormonal Therapy

Used in managing hormonally sensitive cancers (Breast, Prostate, Ovarian, and Endometrial cancer)

Mechanism of action: The hormone changes the hormonal environment that alters growth factors thus the stimulus for tumor growth is suppressed or removed
## Hormone Therapy

<table>
<thead>
<tr>
<th>Women</th>
<th>Men</th>
</tr>
</thead>
<tbody>
<tr>
<td>● Fatigue</td>
<td>● Decreased sexual desire</td>
</tr>
<tr>
<td>● Hot flashes</td>
<td>● Enlarged breasts</td>
</tr>
<tr>
<td>● Mood swings</td>
<td>● Hot flashes</td>
</tr>
<tr>
<td>● Nausea</td>
<td>● Impotence</td>
</tr>
<tr>
<td>● Osteoporosis</td>
<td>● Incontinence</td>
</tr>
<tr>
<td>● Weight gain</td>
<td>● Osteoporosis</td>
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</tbody>
</table>

- Fatigue
- Hot flashes
- Mood swings
- Nausea
- Osteoporosis
- Weight gain

- Decreased sexual desire
- Enlarged breasts
- Hot flashes
- Impotence
- Incontinence
- Osteoporosis
Examples of Hormonal Therapy

- Aromatase Inhibitors
- Estrogen receptor antagonist
- Selective estrogen receptor modulator (SERM)
Aromatase Inhibitors

- Mechanism of action: lowers the amount of estrogen which signals hormone receptors.
- Slows tumor growth by inhibiting this process.
- Used in *post-menopausal* women with hormone receptor positive breast cancer
- **Toxicities:** Arthralgia, vaginal dryness, accelerated bone loss (dexa scan)
Estrogen Receptor Antagonist

- **Mechanism of action:** Binds to estrogen receptors and down regulates estrogen receptor protein producing anti-estrogenic effects
- **Toxicities:** Injection site pain, hot flashes, arthralgia
Selective Estrogen Receptor Modulator (SERM)

- Mechanism of action: Selectively binds to estrogen receptors producing anti-estrogenic effects
- Toxicities: Hot flashes, vaginal dryness
- tamoxifen; need baseline GYN exam; Breast, premenopausal
- raloxifene; Post menopausal high risk for invasive breast cancer
IMMUNOTHERAPY: Using the Body To Fight Cancer
Immunotherapy

- Treatment that uses certain parts of the immune system to fight cancer. Modifies the relation between the tumor and the host.
- Stimulates or restores immune system to fight be more effective and efficient cancer cells.
- May give the immune system components, such as man-made proteins.
- Includes antibodies, cytokines, and other substances that stimulate immune function.
Immunotherapy Side Effects

- Pulmonary-pneumonitis
- GI/hepatic-diarrhea, increased AST/ALT-monitor levels
- Endocrine-thyroiditis-monitor thyroid
- Renal-monitor kidney function
- Neuro-physical exam
- Ocular
- Dermatological-rash
- Hypersensitivity reactions
Targeted Therapy

- Prevent/Block/Interrupt Cell Growth
- Cut off blood flow to tumor
- Target defects in the cancer cells
- Carry other drugs to a tumor
- Cause cell death (apoptosis)
- Make the cancer cells more receptive to the immune system
Checkpoint Inhibitors

• Immune checkpoints
  • molecules that prevent the immune response from damaging normal tissues in the body.
  • Involved in suppression of the immune system

• Checkpoint Inhibitors
  • A type of immunomodulator that manipulate the immune system.

• PD-1
  • Programed cell death protein
  • On T-cells

• PD-L1
  • programmed death ligand 1
  • Levels have been found to predict response
  • On some cancer cells
Retrieved from https://blog.dana-farber.org/insight/2015/09/what-is-a-checkpoint-inhibitor/
Therapeutic Antibodies

- Engineered antibodies produced by a single clone of cells that are specific for a given antigen
- Passive immunotherapy
- Enhance, restore, immune function
- Names end in “mab”
- Possible allergic reactions-hives/itching
- Flu-like symptoms, rash, GI changes, hypotension
Therapeutic Antibodies

- Murine-mouse
- Humanized-human
- Human Anti-Murine Antibody (HAMA)
- Chimeric-part mouse/human
- Conjugated-a chemotherapy drug, radioactive particle, or toxin is connected to monoclonal antibody
- Unconjugated-monoclonal antibody without any drug, radioactive particle, or toxin attached
Kinase Inhibitors

- Mechanism of action: Enzyme inhibitor that blocks the action of one or more protein kinase which alters biological processes including but no limited to modulate cell function
- Most names end in “nib”
- Toxicities: Vary based on target
ALK

- ALK (anaplastic lymphoma kinase)
  - ALK receptor tyrosine kinase is a protein that transmits signals from the cell surface into the cell through a process called signal transduction

- ALK inhibitors block
  - Blocks the ALK-dependent tumor cell proliferation
  - Multiple generations
    - each generation of ALK inhibitors is more potent, more selective, and more brain-penetrant compared with the prior generation

- Side effects
  - Nausea, vomiting, diarrhea, constipation, vision changes
BRAF

• BRAF
  • human gene that encodes a protein called B-Raf
  • gene is also referred to as proto-oncogene B-Raf and v-Raf murine sarcoma viral oncogene homolog B
  • BRAF protein is also known as serine/threonine-protein kinase B-Raf
  • BRAF protein is involved in sending signals in cells and in cell growth

• BRAF inhibitors
  • Inhibits BRAF V600E and V600K protein kinases leading to blocking tumor cell proliferation
  • Side effects
    • LFT’s, electrolytes, rash
EGFR

- EGFR (epidermal growth factor receptor)
  - transmembrane protein that is a receptor for members of the epidermal growth factor family (EGF family) of extracellular protein ligands
  - regulate cell growth, survival, and differentiation via multiple signal transduction pathways and participate in cellular proliferation and differentiation
  - over-expression is associated with the development of a wide variety of tumors
- EGF family
  - Four members: EGFR (ErbB1, HER1); ErbB2 (HER2, neu in rodents); ErbB3 (HER3); ErbB4 (HER4)
EGFR Antagonists

- EGFR Antagonists
  - Interrupts EGFR signaling
    - either by blocking EGFR binding sites on the extracellular domain of the receptor or by inhibiting intracellular tyrosine kinase activity
    - interference with the signaling pathways that modulate mitogenic and other cancer-promoting responses (cell motility, cell adhesion, invasion and angiogenesis)
  - Side effects
    - Rash, infusion reactions, hypomagnesemia
HER2

- HER2 (ERBB2/ne/HER2/neu)
  - HER 2 (Human epidermal growth factor receptor 2)
  - a growth-promoting protein on the outside of all breast cells
  - role is to facilitate excessive/uncontrolled cell growth and tumorigenesis
  - cancer cells with higher than normal levels of HER2 are called HER2-positive.

- HER2 Antagonist
  - Blocks HER2 activity to decrease tumor cell proliferation
KIT

- c-KIT (Mast/stem cell growth factor receptor, SCFR or CD117)
  - a protein that serves as an important cell surface marker used to identify certain types of hematopoietic (blood) progenitors in the bone marrow.
  - Involved in intracellular signaling
  - oncogene

- c-Kit inhibitors
  - Inhibit c-kit proteins to
• poly ADP ribose polymerase (PARP)
  • an enzyme that assists in DNA repair
• PARP inhibitors
  • Alters DNA repair pathways leading to cancer cell death
  • Side effects
    • Fatigue, nausea, GI upset, myelosuppression with high doses
VEGF

- Vascular endothelial growth factor (VEGF)
  - Protein produced by cells that stimulates the formation of blood vessels

- VEGF Antagonists
  - Binds and inhibits vascular endothelial growth factor, decreases microvascular growth and metastatic progression
  - Side effects
    - Hypertension, rash, epistaxis, proteinuria, GI bleed
Breast Cancer

➢ Stage/Treatment Intention
  ➢ Neoadjuvant
  ➢ Adjuvant
  ➢ Metastatic

➢ Types
  ➢ non-invasive, invasive
  ➢ ductal/lobular/mammary/inflammatory/papillary
  ➢ Paget’s disease

➢ Pre/peri/post menopausal

➢ Receptor status
  ➢ ER/PR/HER2
Breast Cancer Chemotherapy

- **Alkylating Agents**
  - **Platinum analog**
    - **Carboplatin**
      - Neoadjuvant/adjuvant/metastatic, given IV infusion
      - Hypersensitivity reactions (increases after #6 treatment): pre-medications
      - Myelosuppression monitor CBC with diff, thrombocytopenia
      - AUC (Area under the curve), monitor creatinine
      - Often given with a taxane
  - **Nitrogen Mustard**
    - **Cyclophosphamide**
      - Neoadjuvant, adjuvant, metastatic, given IV infusion
      - Myelosuppression, monitor CBC with diff; n/v/d

- **Antimetabolites**
  - **Pyrimidine antagonists**
    - **Fluorouracil, Gemcitabine**
      - Adjuvant, metastatic, IV push
      - Myelosuppression, n/v/d, mucositis, hand-foot syndrome, photosensitivity
  - **Folate analogs**
    - **Methotrexate**
      - Adjuvant, Yellow
      - GI toxicity
Breast Cancer Chemotherapy

- Antimicrotubules
  - Epothilones
    - Ixabepilone
      - Locally advanced/metastatic
      - May be combined with capecitabine
      - Hepatic toxicity-monitor LFT’s; myelosuppression
  - Halichonrin B analogue
    - Erubulin
      - Refractory metastatic
      - CBC/Creatinine baseline, monitor CBC, peripheral neuropathy
- Taxane
  - Paclitaxel
    - Neoadjuvant/adjuvant/metastatic-
    - Severe hypersensitivity reactions-pre-medications, myelosuppression-monitor CBC, hepatotoxicity-monitor LFT’s, peripheral neuropathy
  - Docetaxel
    - Severe hypersensitivity reaction, fluid retention, hepatic impairment, neutropenia, peripheral neuropathy
    - Due to ethanol in some formulations-avoid/minimize alcohol
  - Paclitaxel nanoparticle albumin-bound
    - Refractory metastatic
    - Myelosuppression-monitor CBC, peripheral neuropathy
Breast Cancer Chemotherapy

• Topoisomerase II inhibitors
  • Anthracyclines
    • Doxorubicin
      • neoadjuvant/adjuvant
      • RED color (alter urine color)
      • cardiotoxicity-baseline EF (Echo/MUGA)
      • Secondary AML or MDS
      • Myelosuppression-severe
      • Lifetime dose - 550 mg/m2 IV; 450 mg/m2 IV in patients who have received previous mediastinal radiation

• cardiotoxicity — baseline EF (Echo/MUGA)
• Myelosuppression — severe
• Secondary AML or MDS
• RED color (alter urine color)
• neoadjuvant/adjuvant
• Lifetime dose - 550 mg/m2 IV; 450 mg/m2 IV in patients who have received previous mediastinal radiation
Breast Cancer Hormonal Therapy
ER/PR Positive

- Selective Estrogen Receptor Modulator (SERM)
  - Tamoxifen
    - Given po
    - Reduce risk of recurrence, developing cancer in the other breast, and the risk of distant recurrence.
    - May be used pre/peri/post menopausal.
    - Possible side effects-vaginal dryness, discharge or bleeding, hot flashes
    - Increased risk of cancer of the lining of the uterus. Patients need a baseline gyn exam
    - Thromboembolism (DVT, PE)
Breast Cancer
Hormonal
Therapy
ER/PR Positive

- Estrogen Receptor Antagonist
  - Fulvestrant
    - Given IM
    - May be combined with ribociclib
    - Possible injection site pain
    - Hot flashes, vaginal dryness
Breast Cancer
Hormonal Therapy
ER/PR Positive

- Aromatase Inhibitors
  - Given PO
  - Post-menopausal
  - Baseline bone density and every 2 years, may need calcium supplementation and support with a bisphosphonate (risk for ONJ, assess dentition, monitor calcium and phosphate levels, monitor creatinine)
  - Arthralgias, hot flashes, vaginal dryness, discharge or bleeding
  - anastrozole, exemestane, letrozole
Breast Cancer HER2 Positive

• HER2
  • Overexpression occurs in approximately 15–30% of breast cancers
  • prognostic and predictive biomarker.

• Her2 antagonists
  • Trastuzumab
    • Used adjuvant, metastatic, often given with a taxane, carboplatin
    • Given IV, infusion reactions
    • Cardiomyopathy-monitor EF baseline, during treatment, after treatment
  • Pertuzumab
    • Neoadjuvant, adjuvant, metastatic, given IV
    • Cardiomyopathy-monitor EF (baseline and throughout care)
  • Lapatinib
    • advanced or metastatic, hepatotoxicity monitor LFT, baseline ECG, monitor magnesium level, may be combined with capecitabine, letrozole or trastuzumab
  • Neratinib
    • extended adjuvant, oral agent, monitor LFT’s at baseline and prior to each cycle, antidiarrheal prophylaxis during first 8 weeks of treatment
  • ado-trastuzumab emtansine or T-DM1
    • adjuvant, metastatic, given IV, hepatotoxicity, cardiotoxicity-monitor LVEF at baseline and every 3 months
Breast Cancer Therapy

- PARP Inhibitor
  - olaparib
    - oral drug
    - metastatic HER2-negative breast cancer and a BRCA1 or BRCA2 gene mutation who have previously received chemotherapy
    - Baseline CBC and then monthly
  - talazoparib
    - Oral
    - locally advanced or metastatic HER2-negative breast cancer and a BRCA1 or BRCA2 gene mutation
    - Baseline CBC and then monthly
Breast Cancer Therapy

- Target the CDK4/6 protein in breast cancer cells, which may stimulate cancer cell growth.
  - ER-positive, HER2-negative, advanced or metastatic breast cancer, may be combined with some types of hormonal therapy
    - Abemacicli
      - monotherapy, with hormonal therapy, baseline CBC and LFT’s and then every 2 weeks for 2 months, then every month for 2 months then as clinically indicated
    - Palbociclib
      - oral, post-menopausal, give with LHRH agonist if pre/perimenopausal
    - Ribociclib
      - advanced/metastatic/progressive disease, oral, give with aromatase inhibitor or fulvestrant,
      - give with LHRH agonist if pre/perimenopausal, baseline CBC with diff and LFT’s, repeating every 2 weeks for first 2 cycles then monthly, ECG at baseline, Cycle 1 Day 14 and Cycle 2 Day 1, monitor electrolytes including calcium, magnesium and phosphate
      - Ribociclib and letrozole co-pack (28 day supply, 21 days of ribociclib and 28 days letrozole)
  - NTRK
    - Larotrectinib
      - breast cancer with an NTRK fusion that is metastatic or cannot be removed with surgery and has worsened with other treatments
      - Baseline LFT’s and monitor
<table>
<thead>
<tr>
<th>Breast Cancer Regimens</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC-Adriamycin, cyclophosphamide</td>
</tr>
<tr>
<td>CMF-cyclophosphamide, methotrexate, 5-fluorouracil</td>
</tr>
<tr>
<td>FAC-5-fluorouracil, Adriamycin, cyclophosphamide</td>
</tr>
<tr>
<td>TAC-taxane, Adriamycin, cyclophosphamide</td>
</tr>
<tr>
<td>ACTH-Adriamycin, cyclophosphamide, taxane, trastuzumab</td>
</tr>
<tr>
<td>ACTHP-adriamycin, cyclophosphamide, taxane, trastuzumab, pertuzumab</td>
</tr>
</tbody>
</table>
Lung Cancer

- **Intention**
  - Neoadjuvant
  - Adjuvant
  - Metastatic

- **Stage**
  - Type-Small Cell/Non-Small Cell (adeno, squamous, large cell)

- **Receptor Status**
  - VEGF
  - ALK
    - About 5%
    - common in non-smokers
  - BRAF
  - EGFR inhibitors
    - T790M mutation
Lung Cancer Chemotherapy

- Alkylating Agents
  - Platinum analogs
    - Cisplatin
      - Nephrotoxicity-monitor creatinine
      - Peripheral neuropathy
      - Nausea/vomiting
      - Myelosuppression
    - Carboplatin
      - Hypersensitivity reactions (increases after #5 treatment)-pre-medications
      - Myelosuppression-monitor CBC with diff, platelets
      - AUC (Area under the curve), monitor creatinine
      - Often given with a taxane

- Antimetabolites
  - Folate antagonists
    - Pemetrexed-non-squamous NSC, locally advanced, maintenance, metastatic, folic acid/B12 supplementation, monitor CBC and LFT's
  - Pyrimidine analogs
    - Gemcitabine-NSC, locally advanced, metastatic, delayed thrombocytopenia, rash,
Lung Cancer Chemotherapy

- **Microtubule Agents**
  - Vinca alkaloids
    - vinorelbine-NSC, locally advanced, metastatic, vesicant, peripheral neuropathy, myelosuppression, injection site pain, alopecia, CBC and LFT’s
  - Taxane
    - paclitaxel-infusion reactions, pretreat with premedication’s, myelosuppression, peripheral neuropathy
    - albumin-bound paclitaxel-myelosuppression, peripheral neuropathy, monitor CBC
    - docetaxel-hepatic impairment, neutropenia, hypersensitivity reaction (pre-medications), peripheral neuropathy, fluid retention, minimize ethanol use, CBC and LFT’s

- **Topoisomerase II Inhibitors**
  - Epipodophyllotoxins
    - etoposide-hypotension, myelosuppression, monitor CBC, alopecia
Lung Cancer Targeted Therapy

- ALK Inhibitors
  - about 5% of lung cancers
  - ALK positive cancers are common in non-smokers,
  - NSC, metastatic, oral agents
  - Monitor Creatinine, LFT's, CBC with diff, electrolytes, mg, vision changes/light sensitivity
    - 1st generation
      - crizotinib-NSC, metastatic, oral,
    - 2nd generation
      - certitinib-NSC, metastatic, oral
      - alectinib-NSC, metastatic, oral
      - brigatinib
    - 3rd generation
      - lorlatinib-3rd generation
Lung cancer Immunotherapy

- **Checkpoint Inhibitors**
  - PD-1
    - **pembrolizumab**
      - first line, Stage III/metastatic with high PD-L1 expressing tumor with no EGFR or ALK aberrations
      - First line for squamous metastatic
      - First line non-squamous with no EGFR or ALK aberrations
      - Progressive disease with PD-L1 expressing tumor
      - creatinine, LFT’s, TFT’s, electrolytes
    - **nivolumab**
      - monitor creatinine, LFT’s, TFT’s, electrolytes
    - **durvalumab**
      - Stage II NSC, unresectable, given after concurrent platinum-based chemo and radiation
NSC Lung Cancer

• VEGF Antagonists
  • Stops the formation of new blood vessels
  • Monoclonal antibody
    • Bevacizumab
      • Non-squamous, NSC locally advanced or metastatic
      • Many be given with or without chemo
      • GI perforation
      • Delayed wound healing, hold prior to surgery
      • Hemorrhage
      • **Hypertension, proteinuria, TFT’s**
    • ramucirumab
      • Refractory, metastatic
      • Given IV

• GI perforation
• Delayed wound healing, hold prior to surgery
• Hemorrhage
• **Hypertension, proteinuria, TFT’s**
NSC Lung Cancer

- EGFR antagonist
  - Metastatic
  - Oral agents
  - Monitor creatinine and LFT’s
    - erlotinib
      - Exon 19 deletions or exon 21 (L858R) substitution mutations
      - Metastatic, titrate dose,
    - afatinib
      - non resistant to EGFR mutations, squamous type
    - gefitinib
      - Exon 19 deletions or exon 21 L858R
      - metastatic
NSC Lung Cancer

• EGFR Antagonist’s continued
  • osimertinib
    • First line EGFR exon 19 deletions or exon 21 L858R
    • Subsequent for EGFR T790M mutations
    • **Baseline LVEF**, monitor electrolytes
  • dacomitinib
    • Exon 19 deletions or exon 21 L858R mutations
  • necitumumab
    • Squamous, untreated metastatic
    • Given IV
Small Cell Lung Cancer

- **Limited Stage**
  - Chemotherapy/radiation
    - Cisplatin/carboplatin

- **Extensive Stage**
  - Cisplatin/carboplatin
  - Etoposide

- **Subsequent**
  - Irinotecan
  - Paclitaxel, vinorelbine
  - Nivolumab, Pembrolizumab
  - Gemcitabine
Colon Cancer

➢ Treatment intention
  ➢ Neoadjuvant, adjuvant, metastatic
➢ Stage
➢ Targets
  ➢ VEGF
  ➢ EGFR
➢ Biomarker status
  ➢ RAS-KRAS/NRAS
  ➢ BRAF
  ➢ microsatellite instability (MSI-H) or mismatch repair deficiency (dMMR).
Colon Cancer Chemotherapy

- **Alkylation Agents**
  - Platinum Analogs
    - Oxaliplatin-3rd generation, anaphylactic reactions, **cold phenomenon-mixed in dextrose, peripheral neuropathy**, monitor CBC with diff, LFT’s, CMP, Mg

- **Antimetabolites**
  - Pyrimidine antagonists
    - 5-fluorouracil IV bolus/IV continuous infusion, need central line, leucovorin often given for potentiation, n/v/d/mucositis, photosensitivity
    - Capecitabine-oral agent, warfarin interaction, hand-foot syndrome, mucositis, n/v/d
    - Trifluridine/tipiracil-oral agent, metastatic, refractory, trifluridine inhibits DNA synthesis and cellular proliferation; tipiracil blocks the metabolism of trifluridine, myelosuppression, monitor CBC with diff, GI-abdominal cramping, diarrhea

- **Topoisomerase I Inhibitors**
  - Calprotectin derivatives
    - Irinotecan-diarrhea (early, delayed), abdominal cramping, may give atropine, myelosuppression
Colon Cancer Targeted Therapy

- **VEGF Antagonists**
  - Bevacizumab-IV infusion, GI perforation, surgery/wound healing complications, hemorrhage, monitor BP (hypertension), UA-proteinuria
  - Regorafenib-oral agent, metastatic and failed other therapies, hepatotoxicity (monitor LFT’s, electrolytes, lipase)
  - Ziv-aflibercept-Injection, metastatic refractory, hemorrhage, GI perforation, monitor BP, UA
  - Ramucirumab-IV, refractory metastatic, monitor CBC, BP, proteinuria, rash
Colon Cancer Targeted Therapy

• EGFR Antagonists
  • Cetuximab-IV infusion, metastatic, patient’s without RAS mutations infusion reactions, hypomagnesemia, monitor Mg levels, rash (acneiform),
  • Panitumumab-IV, metastatic, patients without RAS mutations, dermatologic toxicities (severe), hypomagnesemia
Colon Cancer Immunotherapy

• Pembrolizumab
  • targets PD-1, a receptor on tumor cells, preventing the tumor cells from hiding from the immune
  • metastatic colorectal cancers that have a molecular feature called microsatellite instability (MSI-H) or mismatch repair deficiency (dMMR).

• Nivolumab
  • MSI-H or dMMR metastatic colorectal cancer that has grown or spread after treatment with chemotherapy with a fluoropyrimidine (such as capecitabine and fluorouracil), oxaliplatin, and irinotecan

• Nivolumab and ipilimumab combination
  • MSI-H or dMMR metastatic colorectal cancer that has grown or spread after treatment with chemotherapy with a fluoropyrimidine, oxaliplatin, and irinotecan
Colon Cancer Regimens

**Adjuvant/Metastatic**

- FOLFOX
  - 5-flourouracil, oxaliplatin, leucovorin
  - Multiple doses and ways given (FOLFOX-4, FOLFOX-6, modified FOLFOX-6 (mFOLFOX-6), and FOLFOX-7)
- FOLFOX +/- bevacizumab
- FOLFURI
  - 5-flourouracil, leucovorin, irinotecan
- FOLFURI +/- bevacizumab
- CAPEOX-
- XELIRI/CAPIRI: Capecitabine with irinotecan
- XELOX/CAPEOX: Capecitabine with oxaliplatin
- Cetuximab (metastatic)
Supportive Care Medications

- IV hydration
- Electrolyte replacement
- Antiemetic’s, Antidiarrheal, Stool softeners/laxatives
- Nutritional support
- Appetite stimulants
- Antidepressants/Antianxiety
- Pain management
Advanced Practice Considerations

- Maintain awareness of cancer agents and treatment options
- Utilize Package Insert for drug details including dosing and toxicity management
- Encourage supportive care to minimize toxicity
- Collaborate with respective disciplines
- Support patients physically (symptom management), psychosocially (referrals to social work/case management), emotionally (referrals to psychology/support groups) and spiritually (refer to chaplain/spiritual counselor)
- Spend time with other team members
Resources

- FLASCO
- chemocare.com
- uptodate.com
- ASCO
- American Cancer Society
  - 1-800-813-HOPE (4673)
  - http://www/cancer.org/
- National Cancer Institute
  - 1-800-4-CANCER (422-6237)
  - http://www.cancer.gov/
  - https://www.cancer.gov/about-cancer/treatment/drugs
- National Comprehensive Cancer Network
  - http://www.nccn.org/
- Vanderbilt My Cancer Genome
  - www.mycancergenome.org
Self-Care

Taking care of your mind & thoughts

Taking care of your physical health & body

Increasing your own well-being through self-care behaviors

Taking care of your spiritual health

Taking care of your emotions

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References

References