Explaining Personalized Medicine in Cancer and Some Tips for a Healthier Life

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Personalized Medicine in General

A type of medical care in which treatment is customized for an INDIVIDUAL patient

May use information about a person’s genes and environment to prevent, diagnose and treat a disease

Personalized Medicine/ Precision Medicine in Cancer

1. Screening for risk of hereditary cancer

or

2. Using specific information about a person's TUMOR to help diagnose, plan treatment, find out how well it is working, or make a prognosis

Personalized Medicine in Cancer

Looking at

- a person’s genetic makeup and family history and their risk for having cancer

AND

- How a person’s tumor might grow and respond to treatment

Personalized Cancer Screening for Hereditary Familial Cancers

*** Only 5-10% of cancers are hereditary

Other causes of cancer: toxins/ chemicals, bad diet/ un-nutritious food, no exercise, radiation exposure, hormone imbalances

Hereditary Cancers - “Bad Genes”

- Only the abnormal gene (mutation) is inherited, not the cancer itself
- Having the gene does not always result in cancer, it is only an increased risk of cancer

Examples of Hereditary Family Cancer Syndromes

1. Hereditary Breast and Ovarian Cancer (HBOC) Syndrome
   - Younger women
   - Sometimes more than one cancer
   - Inherited mutation: BRCA1 or BRCA2
   - Also higher risk for cancers of the fallopian tube, peritoneum, male breast, pancreas and prostate
   - If BRCA + → close relative (parent, sibling, child) has 50% chance of having it

Hereditary Cancers

2. Lynch Syndrome (hereditary non-polyposis colorectal cancer)

- Usually before age 50
- Mutation of MMR (mismatch repair) genes
- Results in abnormal DNA repair
- Need screening for colon cancer at age 20
- Also can cause endometrial cancer

Hereditary Cancers

3. Li-Fraumeni Syndrome

- Sarcomas, leukemia, cancers of the brain, adrenals, breast
- Mutation in TP53 gene
- TP53 is a tumor suppressor gene

Hereditary Cancers -
Screening for Hereditary/ Family Cancers

When might cancers be more likely caused by hereditary syndromes in families:

- Many cases of the same type of cancers
- Cancer occurring at a younger age than usual for that cancer
- More than one type of cancer in a single person
- Cancer occurring in many generations (mainly close relatives)

How Personalized Medicine is different

Before: patients with a specific type and stage of cancer (like stage 4 colon cancer) all received the same treatment

Now: choices can include the previous treatments plus some personalized cancer treatment

In Cancer, Personalized Treatments are often Drugs

Cancer Treatment BEFORE:

→ based on origin (like colon) and appearance under the microscope (histology)

Cancer treatment NOW:

→ genetic/ molecular profiles or tests to pick the appropriate therapy

Personalized Medicine for Specific Cancers

- Can customize treatments to be more effective and cause fewer side effects
- Predict the response of a particular therapy better
- Predicting the risk of recurrence

Standard Chemotherapy vs Targeted Therapy

1. Standard chemo: acts on all rapidly dividing normal and cancerous cells vs Targeted therapy: acts on specific molecules/ genes that are associated with the cancer
2. Standard chemo: was developed as medicine because it (indiscriminately) killed cells vs Targeted therapy: deliberately chosen or designed to interact with their target gene
3. Standard chemo: are cytotoxic agents (kill tumor cells) vs Targeted therapy; cytostatic (blocks tumor growth)

Genetic Model of Cancer

→ In cancer, genes which regulate cell growth and division are altered

→ targeting those genes specific to a person's tumor, and to stop the abnormal gene's activity

= Targeted Therapy

Targeted Therapies

*** Drugs which stop cancer growth by blocking genes which cause the cancer to grow

Targeted Therapies are the cornerstone of personalized/ precision medicine

Identifying Targets/ Genes

Find the target (protein, gene) which behaves differently in a cancer cells compared to a normal cell

Example of a Target: HER-2

HER-2 is seen more on the surface of some cancer cells (f ex breast cancer) than on normal cells

Also called higher HER-2 expression

→ the drug Herceptin (trastuzumab) is directed against HER-2 on the cell

Testing for Targeted Therapies

Genomic testing

Example Foundation One test

→ can identify proteins/targets and pair that information with available treatments

Most common Cancers, Targets and Medications

Lung cancer

- target EGFR in 10-35% of lung cancers

- drugs Tarceva (erlotinib), Iressa (gefitinib)

- 70% response rate

Lung cancer

- Target ALK
- In 3-7% of lung cancers
- Drug: Xalkori (crizotinib)

Other Targets

KRAS

BRAF

PIK3CA

mTOR

VEGF

PTEN

HER2

And Some Tips for a Healthier Life

“Tell me what you eat, and I will tell you what you are”

Dr Brillat-Savarin 1826

“Ninety percent of the diseases known to man are caused by cheap foodstuffs. You are what you eat.”

Victor Lindlahr, nutritionist, 1923

Diet and Cancer

- 30% of cancer deaths in US are linked to poor diet and obesity
- Excess body weight produces more estrogen and insulin which can stimulate cancer growth

Water

- One of the most essential elements to health
- To function properly, human body needs 1-7 liters of water a day
- Recommendation: 2 liters or 6-7 8oz glasses a day minimum

Water

Even a 2% drop in body water can cause sign of dehydration:

- Fuzzy short-term memory
- Trouble with basic math
- Difficulty focusing on small print
- FATIGUE

Water/ Dehydration

75% of Americans have mild, chronic dehydration

Even mild dehydration slows metabolism by 30%

In ⅓ of Americans, thirst mechanism is so weak it is often mistaken for hunger

Thirst mechanism is decreased as you age

Water intake reduces constipation

Decreases the risk of colon, bladder and even breast cancer

Diet is NOT Nutrition

Diet = What is consumed

Nutrition = what is obtained from food

Factors that affect nutrients:

- Metabolism
- Nerve and hormone function
- Nutrients available in your food
- Intestinal absorption, in cell use of nutrients
- Other vitamins/ minerals which work with or against other vitamins/ minerals
- Environmental pollutants, heavy metal exposure
- STRESS/ emotional status

Trace elements/ Mineral Deficiencies or Imbalances

Affect all body systems and metabolism (breakdown and usage) of proteins, fats, vitamins

Macronutrients/ Minerals

Found in higher concentrations in the body:

- Calcium
- Phosphorous
- Sodium
- Potassium
- Sulfur

Micronutrients/ Minerals

Also called trace minerals, needed in smaller amounts:

- Chromium
- Vanadium
- Selenium
- Lithium
- Manganese

Minerals are the basic spark plugs in the chemistry of life

Dr Henry Schroeder

Trace Elements/ Mineral Functions

Structural support - bones, teeth

Acid-base balance

Water balance

Nerve conduction/ function

Muscle contraction

Enzyme function

TMA - Looking at Mineral Status

TMA = tissue mineral analysis, often done by hair analysis

Why hair and not…

- Urine: measures only what is actually absorbed and then excreted
- Blood: measures what is absorbed and temporarily in the blood and then excreted or stored

→ neither one of those give a good reading of the mineral content of the body

***not FDA-approved but used extensively in natural and integrative medicine

Minerals and Vitamins

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- Status of minerals can give a strong indication of vitamin need
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- Hair analysis/ TMA reveals imbalances between nutrients and deficiencies
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- Vitamins are closely associated with the metabolic function of minerals

Examples of why Vitamin and Mineral Balance is Important

1. If Vitamin C is low or deficient → Copper can build up

→ that leads to deficiency of iron, selenium, potassium

2. If Vitamin C is too high → Copper is down → iron is retained

Vitamins working with Minerals

3. If Calcium is low → usually Vitamin D is required as well

4. Too much Vitamin C (to prevent a cold) can drop Zinc levels (needed to combat bacteria and viruses)

5. Too much Calcium can drop Phosphorous and Magnesium and cause bone loss ***

6. Hypertension/ elevated blood pressure → sodium is retained and Calcium and Magnesium drops. High blood pressure can be decreased with Calcium and Magnesium supplements.

Vitamins/ Minerals and Hormones

- Increased thyroid function → decreased estrogen
- Increased estrogen → decreased thyroid (ex with hormone replacement)
- PMS (pre-menstrual syndrome, lethargy, weight gain, depression) may be caused by too much estrogen. Increased estrogen → decreased thyroid → symptoms are worse. Progesterone decreases effects of estrogen on thyroid

STRESS

Stress can affect

- Hormone levels
- Vitamin levels
- Mineral levels
- Causes chronic inflammation
- Causes chronic degenerative diseases and cancer

“Exercise”

Just walking 30 minutes a day

- Increases your cancer survival by 33%
- Decreases the risk of getting cancer, diabetes and heart disease
- Decreases stress