


Genetic Education for Native Americans (GENA®) Obj 8 and Breast Cancer Risks with emphasis on Hereditary Types of Breast Cancer

“Genetic Education for Native Americans” (GENA®) [HG01866] Obj. #08. Understand classical patterns of inheritance and cultural traditions related to these patterns.

Faculty:
 Linda Burhansstipanov, MSPH, DrPH, CHES
 (Cherokee Nation of Oklahoma)
 President and Grants Director
 Native American Cancer Research
 3022 South Nova Road
 Pine, CO 80470-7830
 1-800-537-8295
<http://www.NatAmCancer.org>



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OBJECTIVES
By the end of this segment, the learner will be able to:

1. Identify at least 2 factors that increase your risks for developing Breast cancer.
2. Identify at least 2 factors that help protect you from developing Breast cancer.

Examples of Inheritance in Everyday Native American Life

- ☞ New grandparents
- ☞ Indian corn(s)
- ☞ Sheep
- ☞ Indian paint horse
- ☞ Tribal “rules” or morals related to marriage and childbearing
- ☞ When hunting, saving the strongest looking male rather than killing him

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Figure 1. Excerpt from GENA® objective 26

What is a cell?

☞ All humans start out from 2 cells combining

- ☞ The one from the mother is the “egg”
- ☞ The one from the father is the “sperm”




Obj-26 “What is a cell?” - NACR 303-838-9359

Causes of Cancer


- ☞ Dietary/Lifestyle
- ☞ Environment
- ☞ **Genetics (hereditary cancers account for only 5-10% of all cancers)**

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QUESTION: What does “hereditary” mean?

- ☞ “Hereditary” means that the characteristic came from the sperm and egg (from you dad and mom) when you were conceived in the womb
- ☞ Less than 10% of all cancers are “hereditary”





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Terminology


 Phenotype = tongue rolling

 Genotype = TT Tt tt

 Dominant = T [Capital letters]

 Recessive = t [lower case letters]

 Homozygous = TT or tt

 Heterozygous = Tt


Perhaps the "phenotype" for tongue rolling is homozygous recessive, or "tt"


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Parents that are **heterozygous (Tt)** can have offspring that are homozygous or heterozygous at a ratio of

1 : 2 : 1
 TT : Tt tT : tt

 a 25% chance of the child being **"homozygous dominant"** (TT)

 a 50% chance of the child being **"heterozygous"** (Tt or tT)

 a 25% chance of the child being **"homozygous recessive"** (tt)



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Punnett Square #1 – tongue rolling

	T	t	mom	
T	T T	T t		
t	t T	t t		

dad



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Punnett Square #2 – tongue rolling

	t	t		
T	T t	T t		
t	t t	t t		



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Punnett Square #3 – tongue rolling

	T	T		
t	t T	t T		
t	t T	t T		



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Punnett Square #4 – tongue rolling

	T	T		
T	T T	T T		
T	T T	T T		



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Card toss	Genotype (record alleles)	Phenotype	Heterozygous / Homozygous
Ex	T t	Tongue rolling	heterozygote
#1	t t	Unable to roll tongue	homozygote
#2	T T	Tongue rolling	Homozygote
#3	T t	Tongue rolling	Heterozygote
#4	t t	Unable to roll tongue	Homozygote
#5	t T	Tongue rolling	Heterozygote
#6	T t	Tongue rolling	heterozygote

Card toss	Genotype (record alleles)	Phenotype	Heterozygous / Homozygous
Ex	T t	Tongue rolling	heterozygote
#1			
#2			
#3			
#4			
#5			
#6			

Reebops


Species with only 8 chromosomes (rather than 23 like humans)

Used with permission from Patti Soderberg, author of article in *The Science teacher*. Nov 1992, pages 28-31 (originally called "marshmallow meiosis") Website: www.wisc.edu/cbe/assets/docs/pdf/reebops/reebops.pdf



How Can I Help Myself?

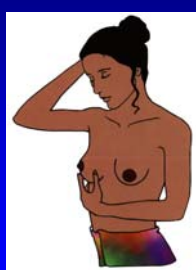
- ☞ Know if I am more likely to get breast cancer
- ☞ Understand my breasts
- ☞ Routinely follow good breast health practices



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Will I get Breast Cancer?




- ☞ Being female and getting older put you at some risk for breast cancer.
- ☞ Knowing the risk factors may help you lower your personal risk

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The shield in these slides represents your protection against things that may make you more susceptible to cancer (i.e., cancer risks)

The larger the holes and the more number of holes in the shield, the less likely it is to protect you from cancer or other health problems




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Cancer risks that “damage” her shield of protection

include:

1. Being a woman
2. Growing older
3. Personal history of breast cancer
4. Personal history of another type of cancer
5. Hereditary risk (e.g., BRCA1, BRCA2)
6. Family history
7. Sedentary life style
8. Over recommended body weight by 15-20 pounds (high fat / calorie diet)
9. Drinking equivalent to more than 7 alcoholic drinks in a week
10. No birth children
11. No breast feeding longer than 1 year



The woman’s “shield” of protection against breast cancer may include:

1. Daily physical activity
2. Healthy, low fat diet
3. Limited to no alcohol



Most women who get breast cancer have none of the risk factors other than age and gender.



Most women are the first in their family; you do NOT need to have a family member who has been diagnosed with breast cancer

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Family History and Breast Cancer among Natives



This section was revised with Laurie DeDecker working with the Intertribal Council of Michigan

So, if only up to 10% of all cancers are “hereditary”, then why do scientists say, “All cancer is genetic?”

- ☞ Ahem It is okay if you want to guess at an answer!!
- ☞ Almost all of us are born with no cancer causing genes from mom (egg) and dad (sperm)

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Why Do Scientists Say, “All cancer is Genetic?”

- ☞ But damage to body cells (“somatic”) during your life can start cancer to develop
- ☞ Some types of cancer begin when 2 types of damage happen to your body cells. Other types don’t begin to become cancer until 5 damages occur

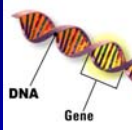
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QUESTION: What does "Genetic" Mean?



- Genes are the blueprint for our body
- Genes are contained in the 46 chromosomes (23 pairs, including the sex / germ cells)
- Our chromosomes are inherited from our parents
- But our bodies can be born with healthy genes that are damaged by our behaviors or sometimes by the environment

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Genetic Changes and Cancer

- All cancer is "genetic"
 - But few cancers are "hereditary"
- Changes in genes are called mutations
- Cancers start as a change/mutation in a single gene
- For most types of breast cancer, the same cell and its genes need to be damaged by at least two events

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"Sporadic" Breast Cancer

- Is the most common form of breast cancer
- Is the result of a multiple mutations in a single gene
- Is the result of factors such as
 - Diet
 - Lifestyle
 - Environmental exposure

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"Sporadic" (begins in body cells, not from sperm or egg from parents) Breast Cancer

- Tend to occur later in life
- Cannot be passed directly from a parent to a child = they are **not** inherited
- Account for most breast (and other) cancers

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QUESTION: What are "Hereditary" Damages (called "Mutations" [mew-TAY-shawns])?

- They are damage(s) within either the sperm or egg at conception
- The mutation is present in every cell of the body
- Does not guarantee a person will develop cancer = increased **risk** of cancer
- Are *very* rare
- Germline (egg and sperm from parents) = Inherited / hereditary**

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Inherited Breast Cancer

- Gene mutation \neq cancer
- Inherited forms of cancer are rare
- The most common inherited breast cancer syndromes are:
 - BRCA1
 - BRCA2 (in almost all breast cancer that is diagnosed in males)
- Little is known about inherited cancer in American Indians and Alaska Natives

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Breast Cancer Risk

- Increases if you have a 1st degree family member who has / had breast cancer:
 - “First degree relatives” means your parents, sibling or children
 - Does not include “Indian adopted” parents, siblings or children
 - If a first degree relative is diagnosed with breast cancer you have more risk than if it is an auntie or a cousin

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QUESTION: What does “1st degree relative” mean?

- Parents (i.e., you came from their egg and sperm)
- Brother(s) or Sister(s) who came from the same womb as you
- Children who came from your womb
- Does not include family members we “adopt” in the Indian way

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Breast Cancer Risk

- If a first degree relative is diagnosed with a type of cancer *other than breast* you may be at greater risk (hereditary form) if they have:
 - Colorectal
 - Ovarian
 - Prostate
 - Pancreas

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Breast Cancer Risk

- Because these each *may* have the same hereditary damages in BRCA1 or BRCA2
 - If different types of cancer, such as
 - If one first degree relative has skin cancer
 - and another has lymphoma,
 - and another has kidney
 - The genetic mutation is NOT likely to be related to BRCA1 or BRCA2,

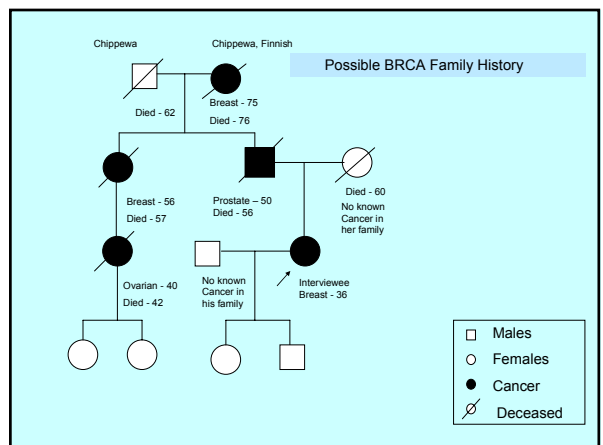
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Inherited Breast Cancer (BRCA1 and BRCA2)

- Many family blood relatives diagnosed with cancers
- Bilateral cancers
- May be all breast cancers or a mixture of breast, prostate, ovarian and other cancers
- Cancers may occur early in life
- Multiple diagnoses likely because you have the genetic marker BRCA1 or BRCA2

Zora Brown's Story

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Breast Cancer Risk Assessment

- ☞ Involves a review of all risk factors for breast cancer
- ☞ Includes review of family cancer history
- ☞ Is part of an informed decision making process
- ☞ May be provided by a number of different professionals
- ☞ Genetic testing is not the goal of the process

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Breast Risk Assessment

- ☞ Results in ranking your risk
 - ☞ Low
 - ☞ Moderate
 - ☞ High
- ☞ Every woman should be screened based on her own level of risk
- ☞ But at a minimum, 40 and older need an annual well woman breast check-up

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Hereditary Breast Cancer: Triple Negative Breast Cancer

- ☞ Breast tumor is negative for:
 - ☞ Estrogen
 - ☞ Progesterone
 - ☞ HER2/neu genetic marker
- ☞ 1st noticed among African-American women diagnosed at young age
- ☞ Aggressive cancers

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If No Info About Triple Negative in AIANs ...

- ☞ No information about how common this is among AIANs
- ☞ Why may triple negative have an impact in Indian Country?
 - ☞ HINT: Think about Civil War and slavery

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Three negative types of breast cancer genetics that are less likely to show on mammogram are patients who are negative for:

- ☞ Estrogen breast tumors
- ☞ Progesterone breast tumors
- ☞ her2/neu breast tumors

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Family History Evaluation

- ☞ Done by a professional with specific training in cancer genetics
 - ☞ Geneticist
 - ☞ Genetic counselor
 - ☞ Physician or nurse with specific training

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Genetic Testing

- Only for high risk families
- Used to determine if a mutation from a known inherited cancer syndrome can be identified in a family
- Requires genetic counseling and informed consent
- Requires a sample of blood or cells collected from the inside of the cheek.
- May not always identify the gene responsible for cancer risk in a family

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Genetic Testing

- Are very expensive (over \$1,000)
- Costs for adult types of cancer are not covered by IHS, Tribal or Urban Indian Health programs
- TV commercials from the maker of the BRCA1 and BRCA2 test (Myriad), are very misleading
 - Imply that you are not a good parent if you do not have genetic testing

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Genetic testing is not for everyone and the decision about testing may be a “family” decision

But if you take part, you do not need to share the results with your family (i.e., PRIVATE)

Screening and Cancer Risk

- High Risk Women
 - May need to start screening before age 40
 - May need different screening tests
 - Ultrasound or MRI
 - May need to screen for other cancers
 - Ovarian and colorectal

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Screening and Cancer Risk

- High Risk Men
 - May need to screen differently for cancers too
 - In BRCA families they may need to screen for breast cancer
 - May need to screen earlier & more often for prostate and colorectal cancers

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Key Points

- Most breast cancers are **not** related to an inherited breast cancer syndrome
- Having close family members with breast cancer raises breast cancer risk
- Cancer risk assessment may be helpful for those with many family members have had cancer
- Genetic testing is not the goal of cancer risk assessment

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