The Multiethnic Cohort Study

Genetic Variation and Cancer

GENETIC VARIATION

SOMATIC DNA MUTATIONS
- Occur in nongermline tissues
- Cannot be inherited

GERMLINE DNA MUTATIONS and VARIANTS (SNPs)
- Rare mutations
  - Present in egg or sperm
  - Can be inherited
  - Cause cancer family syndrome
- Common polymorphisms - SNPs
  - Present in egg or sperm
  - Are inherited
  - Can lessen or increase the effect of exposures in cancer risk

DNA GENOTYPING

De-identified Biospecimen
DNA extraction
DNA Plate for genotyping

A MEC-participant’s blood sample was extracted for DNA at the genomics laboratory and genotyped for a SNP in the FTO gene together with other participants’ samples. For this particular person, heterozygosity (AC genotype) for the SNP was observed, meaning that this person has inherited both the more common allele C and the risk-associated variant allele A from his/her parents. This means that this MEC member is at greater risk for Early Onset Obesity and Type 2 Diabetes, as compared to the participants with two common alleles, but is at lower risk than those with two risk-associated variant alleles.

GENOME-WIDE ASSOCIATION STUDIES (GWAS)
HOW DOES DNA VARIATION (SNPs) RELATE TO RISK FOR DISEASE

GWAS studies associations between SNP variants and phenotypes. The goal is to identify gene variants related to human disease.

Phenotype is a set of observable characteristics resulting from the interaction between genotype and environment, such as:
- Chronic diseases, such as diabetes and cancer
- Traits, such as body size and shape
- How your body responds to diet, exercise, smoking, etc.

DE-identified Biospecimen
Sample preparation and preservation
DNA binding
Nascent population

SNPs are studied in GWAS

GENES AND ENVIRONMENT + LIFESTYLE
Gene-environment interaction (GxE) is when different genotypes respond to an exposure in different ways.

“Genetics loads the gun, lifestyle pulls the trigger”
- Caldwell Esselstyn

The majority; 90–95% of all cancer cases have their roots in the lifestyle (up to 65%) and environment (up to 30%).

GxE: the effects of the lifestyle and environment can be affected by the individual’s genetic background (SNPs etc).

Only 5–10% of cancer cases can be attributed solely to inherited “bad genes” = germline mutations.

NUTRIGENETICS - YOUR GENES AND YOUR DIET
Nutrigenetics is the study of individual differences at the genetic level (SNPs) influencing the body’s response to diet.

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