

**NUTRIGENOMIC - NUTRITIONAL GENOMIC
SUATU HARAPAN BARU UNTUK PENCEGAHAN DAN
PENGOBATAN PENYAKIT YANG SUDAH LAMA ADA**

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ABSTRAK

Sudah lama diketahui bahwa penyakit yang diderita oleh manusia berkaitan dengan makanan yang dimakan, namun sampai sekarang belum semuanya jelas bagaimana makanan atau komponen yang ada di makanan menyebabkan terjadinya proses penyakit tersebut dan lebih lagi bagaimana mekanisme molekuler dan biokimia proses tersebut terjadi. Setelah human genom proyek diselesaikan 5 tahun yang lalu ilmuwan biologi dan ilmuwan kedokteran terpacu untuk mengaplikasikan informasi genome pada proses terjadinya penyakit dan bahkan mereka berupaya untuk menemukan cara baru dalam mencegah atau mengobati penyakit.

Informasi genome ini juga memacu nutrisisionis atau ilmuwan bidang pangan untuk sangat antusias untuk mengungkapkan bagaimana makanan atau komponen makanan dapat merubah genome manusia dan mereka sangat ingin tahu bagaimana mekanisme molekuler makanan dan komponen makanan dalam merubah proses fisiologis dan pathologis sel.

Melalui riset diharapkan hubungan antara makanan dengan gen akan lebih banyak terungkap sehingga mekanisme proses penyakit terkait dengan makanan akan semakin jelas. Menghindari suatu makanan nantinya merupakan salah satu upaya untuk mencegah suatu penyakit dan konsumsi makanan tertentu diharapkan dapat mencegah atau menyembuhkan suatu penyakit. Suatu harapan baru melalui pengaturan makanan akan memecahkan masalah penyakit terkait dengan makanan yang sudah merupakan problem lama kita.

NUTRIGENOMIC NUTRITIONAL GENOME A NEW HOPE FOR OLD PROBLEMS

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Let food be your medicine and medicine be your food
(Hippocrates the father of modern medicine 400 BC)



NUTRITIONAL GENOMIC IS THE STUDY OF INTERACTION BETWEEN NUTRIENTS AND GENES, THE EFFECTS OF THIS INTERACTION ON HEALTH INCLUDE RESEARCH ON THE EFFECTS OF NUTRIENT ON MOLECULAR LEVEL PROCESSES IN THE BODY

PHENOTYPE = GENOTYPE + ENVIRONMENT + GENOTYPE X ENVIRONMENT

GENOTYPE : IS THE SEQUENCE OF ALL GENES AND TYPICALLY CONSIDERED TO CONSTITUTE ALL OF THE POLYMORPHISM WITHIN INDIVIDUAL AS WELL

NUTRIGENETICS REFER TO THE SPECIFIC GENE SEQUENCE DIFFERENCES BETWEEN HUMAN AND HOW THESE AFFECT THE DIFFERENCE IN RESPONSE TO DIET AND PARTICULAR NEEDS FOR NUTRIENTS

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ENVIRONMENT IS THE SUM OF ALL EXTERNAL VARIABLES INCLUDING DIET, LIFE STYLE, COEXISTING ORGANISM IN THE SKIN AND INTESTINE. ALL OF THOSE ENVIRONMENT ARE SOURCES FOR FUEL, NUTRIENTS, METABOLITES, INDUCER AND STRESS ATTENUATOR.

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HEALTH OR DISEASE N
PHENOTYPE

NUTRIGENOMIC SEEKS TO PROVIDE A MOLECULAR GENETIC UNDERSTANDING FOR HOW A COMMON DIETARY CHEMICALS (ie NUTRITION) AFFECTS HEALTH BY ALTERING THE EXPRESSION AND OR STRUCTURE OF AN INDIVIDUAL GENETIC MAKE UP.

PROGRESSION FROM A HEALTHY PHENOTYPE TO A CHRONIC DISEASE PHENOTYPE MUST OCCUR BY CHANGES IN GENE EXPRESSION OR BY DIFFERENCE IN ACTIVITIES OF PROTEIN AND ENZYMES AND THAT DIETARY CHEMICALS DIRECTLY OR INDIRECTLY REGULATE THE EXPRESSION OF GENOMIC INFORMATION.

GENE IN THE GENOME AND OF THEMSELVES DO NOT CREATE A DISEASE. ONLY WHEN THEY ARE PLUGGED TO HARMFUL ENVIRONMENT UNIQUE TO THE INDIVIDUAL DO THEY (GENE) CREATE THE OUTCOME OF DISEASE.

SINGLE NUCLEOTIDE POLYMORPHISMS ARE THE KEY GENETIC OF EMERGING SCIENTIFIC DISCIPLINE CALLED NUTRIGENOMICS OR NUTRITIONAL GENOME

1. AN INDIVIDUAL IS EXPOSED TO MULTIPLE ENVIRONMENTAL TRIGGERS WHICH INTERACT WITH OUR GENE
2. SINGLE NUCLEOTIDE POLYMORPHISM CAUSE ALTERATION IN GENE EXPRESSION
3. THE ALTERED CELLULAR FUNCTION LEADS TO CHRONIC DISEASE STATE
4. EARLY ASSESSMENT CAN LEAD TO INDIVIDUALIZED FIRST LINE THERAPY INCLUDING DIET LIFE STYLE MODIFICATION AND SPECIFIC TREATMENT TO THE INDIVIDUAL

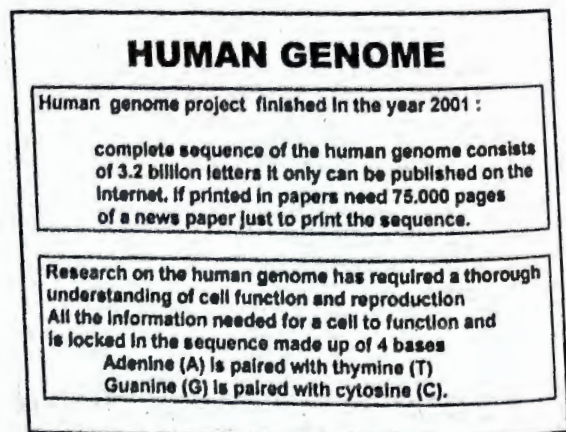
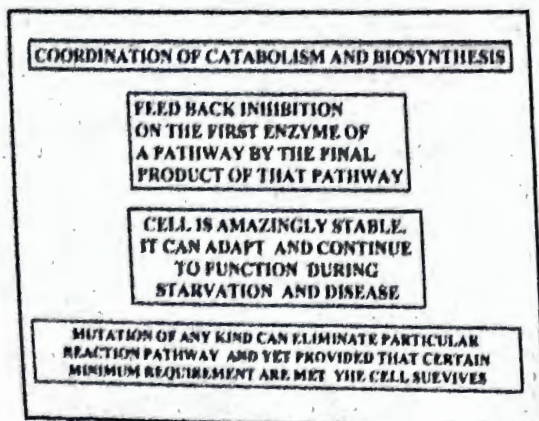
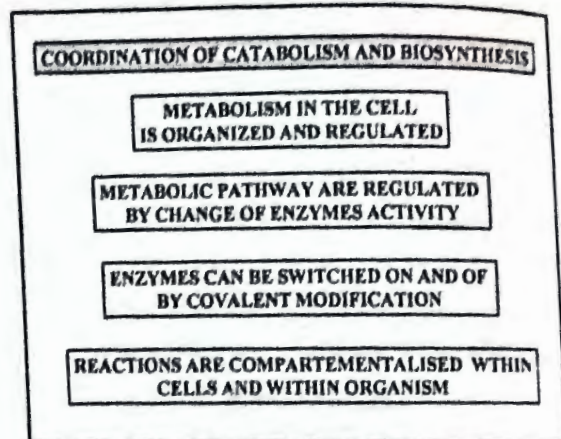
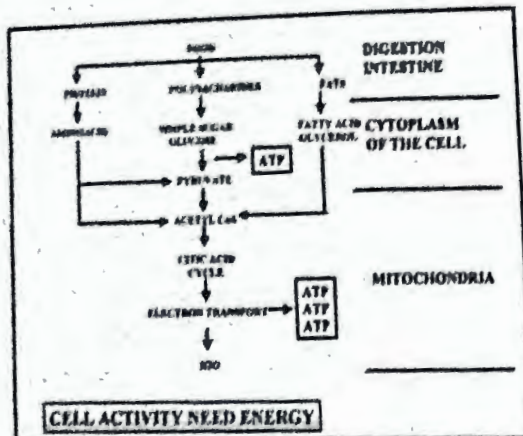
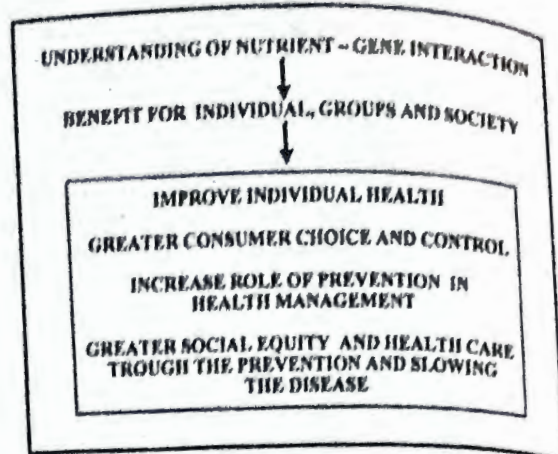
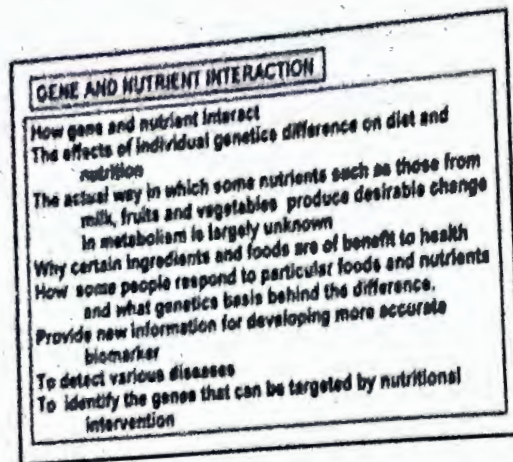
OUT OF CONTROL INFLAMMATION IS RESPONSIBLE FOR A VAST ARRAY OF KILLER DISEASE

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DISCOVERY OF SINGLE NUCLEOTIDE POLYMORPHISM IN INDIVIDUAL DNA'S MAY HANDLE ON HOW TO USE NUTRIGENOMIC TO DAMPEN THE EFFECTS OF INFLAMMATION POSSIBLY IS VERY IMPORTANT TO TEST THE SNP FOR CHRONIC INFLAMMATION BE IDENTIFIED FIRST

DIETARY PATTERN ARE KNOWN STRONGLY LINKED TO THE TOP TEN CAUSES OF SICKNESS AND DEATH IN NORTH AMERICA SUCH AS:

HYPERTENSION
HEART DISEASE
DIABETES
SEVERAL CANCERS
ALZHEIMER'S DISEASE
SCHIZOPRENIA
OSTEOPOROSIS
OBESITY
GLAUCOMA
IMMUNE SYSTEM RESPONDS



DNA

CELL ARE FUNDAMENTAL UNIT OF A LIVING ORGANISM

ALL INFORMATION AND INSTRUCTION NEEDED TO DIRECT CELL ACTIVITY, CAN BE FOUND IN A SUBSTANCE CALLED DEOXYRIBONUCLEIC ACID (DNA)

DNA IS FOUND IN THE NUCLEUS OF THE CELL. DNA MOLECULE CONSISTS OF TWO STRANDS DNA THAT WRAP AROUND ONE ANOTHER TO RESEMBLE A TWIST LADDER

SEQUENCE OF THE BASES MAKES HUMAN IS HUMAN IN OTHER WORD SEQUENCE OF THE BASE THAT UNDERLIES THE DIVERSITY OF ORGANISM OR PLANT

DNA SEQUENCER HOLD THE SECRET OF EVERY LIFE FORM FROM BACTERIA TO HUMAN AND SCIENCE NOW HAS THE POWER TO DECODE THESE BOOKS OF LIFE CALLED GENOME

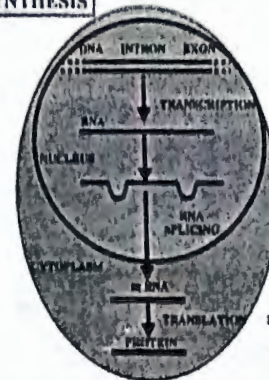
A GENOME CONSISTS OF ALL OF THE DNA MOLECULES IN AN ORGANISM
A GENE IS A SUBUNIT OF DNA THAT DETERMINES AN INDIVIDUAL'S INHERITED CHARACTERISTICS SUCH AS EYE/ HAIR COLOUR
SIZE OF GENOME VARY FROM THE SMALLEST 600,000 BASE PAIR (bp) IN BACTERIA, TO HUMAN GENOME AROUND 3 BILLION bp

Gene carry information to enable the cell to make a protein in the cell, the protein in turn determines a whole host of features such as what the organism look like, how well it function, and perhaps even how it behaves. Indeed protein in the cell that actually do all the work.

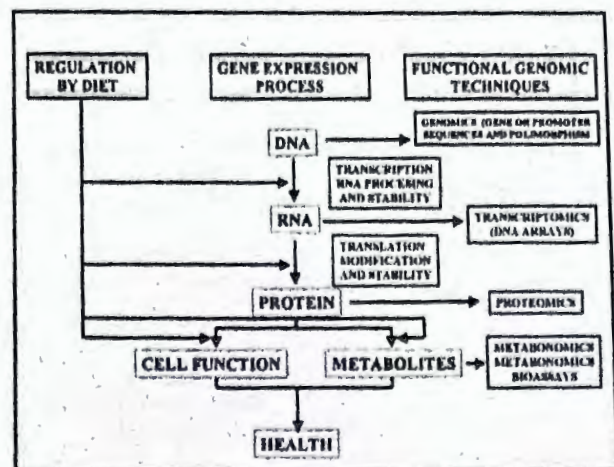


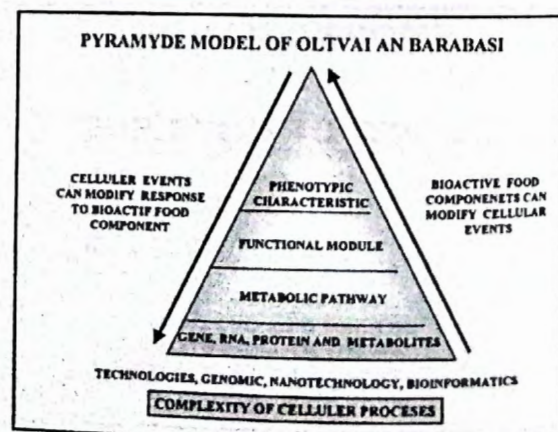
THE NUCLEOTIDE SEQUENCE OF A GENE DETERMINES THE AMINOACID SEQUENCE OF A PROTEIN

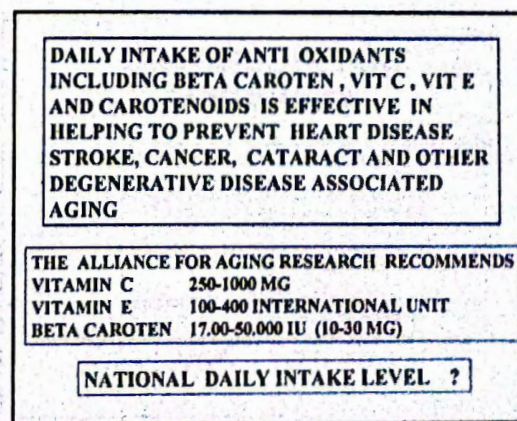
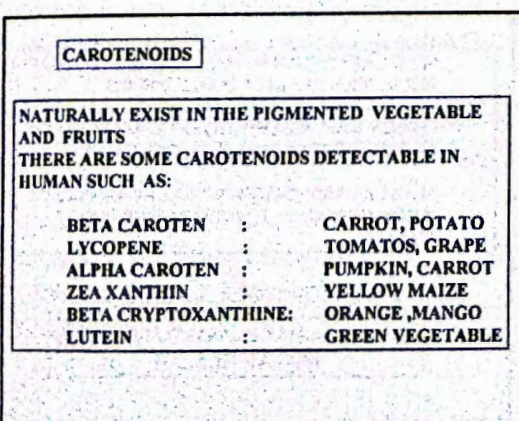
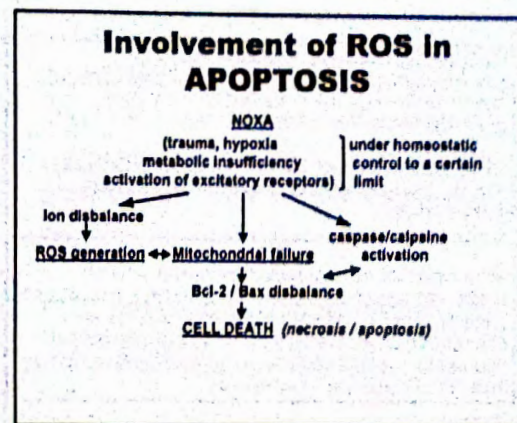
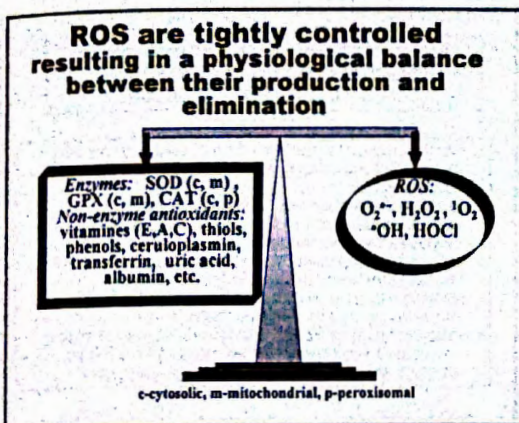
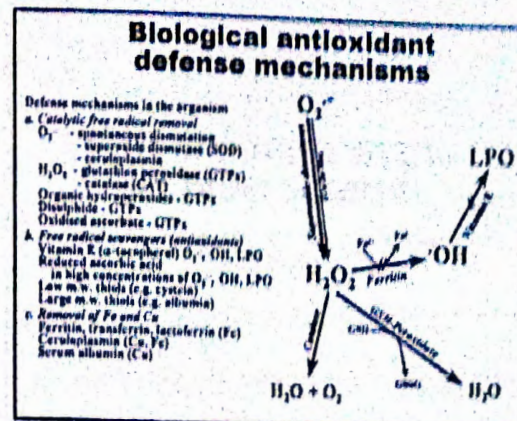
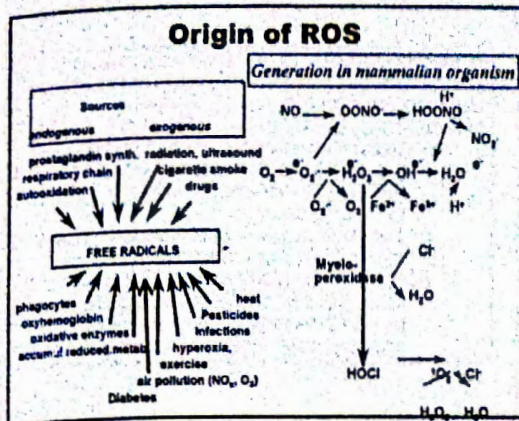
PROTEIN SYNTHESIS

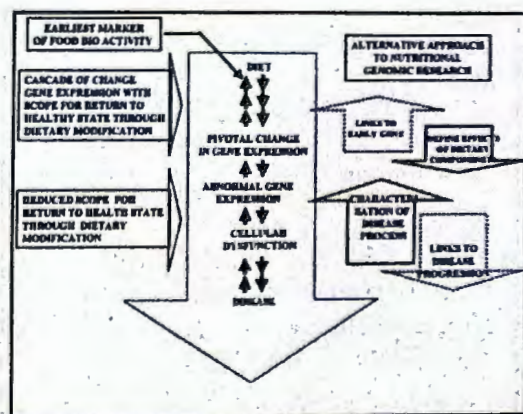
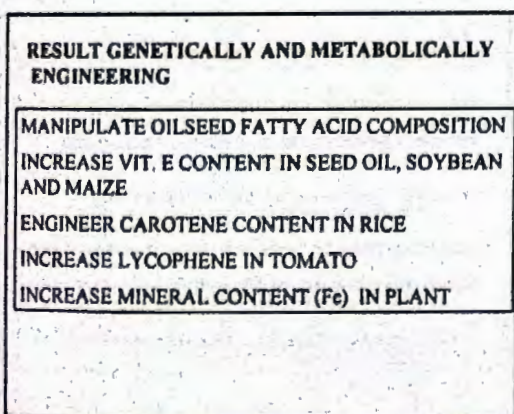
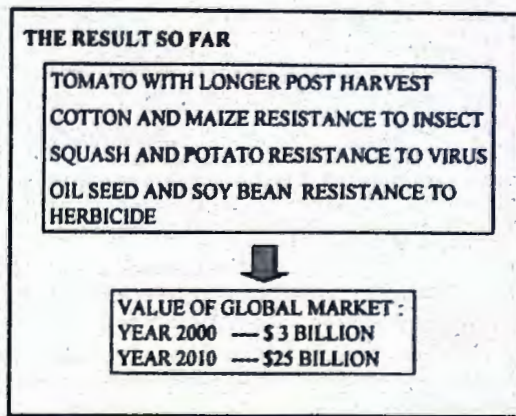
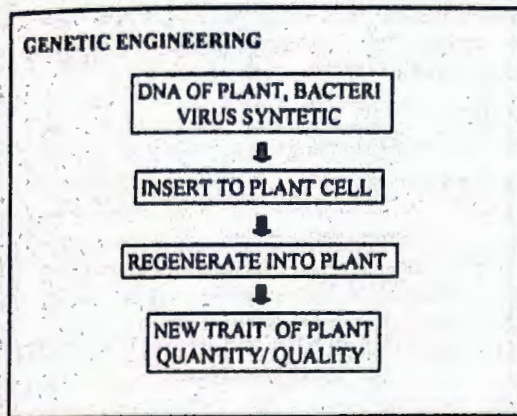
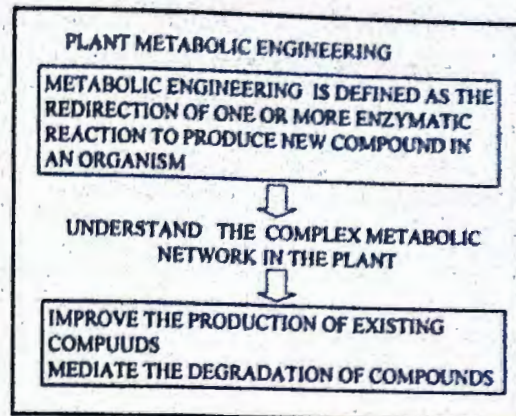
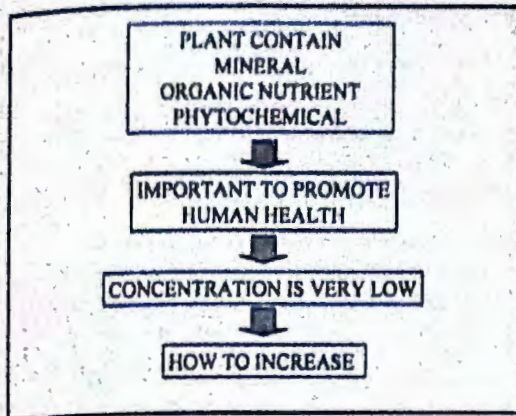


EFFECT OF NUTRIENT









SPECIFIC EXAMPLE FOR NUTRIGENOMIC RESEARCH

1. COMMON DIETARY CHEMICALS ACT ON THE HUMAN GENOME EITHER DIRECTLY OR INDIRECTLY TO ALTER GENE EXPRESSION OR STRUCTURE
2. UNDER CERTAIN CIRCUMSTANCES, AND IN SOME INDIVIDUALS DIET CAN BE A SERIOUS FACTOR FOR A NUMBER OF DISEASE
3. SOME DIETS REGULATE GENE (AND THEIR NORMAL, COMMON VARIANT) ARE LIKELY TO PLAY A ROLE IN THE ONSET, INCIDENCE, PROGRESSION AND SEVERITY OF CHRONIC DISEASE
4. THE DEGREE TO WHICH DIET INFLUENCE THE BALANCE BETWEEN HEALTHY AND DISEASE STATE MAY DEPEND ON INDIVIDUAL GENETIC MAKE UP
5. DIETARY INTERVENTION BASED ON KNOWLEDGE OF NUTRITIONAL REQUIREMENT, NUTRITIONAL STATUS AND GENOTYPE (i.e. INDIVIDUALIZED'S NUTRITION) CAN BE USED TO PREVENT, MITIGATE OR CURE CHRONIC DISEASE

The future

Research using the knowledge from the Human Genome Project will ultimately enable scientists

To understand the functions of human genes and the laws that regulate how they are switched on and off

Provide them with information on how genes and nutrients interact and the effect of individual genetic differences on diet and nutrition. For example, the actual way in which some nutrients such as those from milk, fruits and vegetables, produce desirable changes in metabolism is largely unknown.

The future

Research using the knowledge from the Human Genome Project will ultimately enable scientists

To identify these effects and help to understand why certain ingredients and foods are of benefit to health.

The genetic basis behind the differences in how some people respond to particular foods and nutrients can be identified and used to recommend foods and diets that are most beneficial for each individual

To provide new information for developing more accurate biomarkers (indicators) to detect various diseases much earlier and identify the genes that can be targeted by nutritional intervention to prevent them

Will look more closely at the implications this research has for future advances in health and nutrition

PEOPLE ARE CONSTANTLY EXPOSED TO DNA FROM THE FOOD, MICROORGANISM

DNA IS NOT TOXIC MATERIAL

INTRODUCED DNA TO HUMAN CELL IS DIFFICULT

HUMAN GASTRO INTESTINAL TRACT IS AN EFFICIENT DIGESTIVE SYSTEM, AND DNA IS RAPIDLY BROKEN DOWN INTO PIECES

TRANSFORMATION OF DNA FROM BROKEN PLANT TO MICRO ORGANISM IN THE SOIL NEED SPECIAL CONDITION SUCH AS TEMPERATURE

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DNA HAS TO BE RELATIVELY STABLE

THE BACTERIUM NEED TO BE ABLE TO TAKE UP THE DNA

POSSIBLE HEALTH OUTCOMES

COMMUNICABLE DISEASE
ORGANISM PRODUCING MORE SERIOUS DISEASE
THE ORGANISM MORE RESISTANT TO ANTIBIOTICS
THE EMERGING OF NEW ORGANISM

NON COMMUNICABLE DISEASE
DIABETES, CANCER, ARTERIOSCLEROSIS, ATHEROSCLEROSIS

NUTRITIONAL IMBALANCE
ALTERED STARCH COMPOSITION OF POTATO
ALTERED LEVEL OF ANTIOXIDANT VITAMIN
ALTERED LEVEL OF FATTY ACID

ALTERED IMMUNE RESPONSE
MORE RESPONSE TO ALLERGEN

THEORETICAL WAY IN WHICH GM PROCESS AFFECT HUMAN HEALTH

THE INSERT GENE MAY ITSELF HAVE ADVERSE EFFECTS

THE INSERT GENE MAY CODE NEW PROTEIN THAT IS TOXIC OR PRODUCED ALLERGIC REACTION

THE INSERT GENE MAY INCREASE THE PRODUCTION OF THE EXISTING TOXIN

THE INSERT GENE MAY ALTER BEHAVIOUR OF MICROORGANISM

THE INSERTED GENE MAY TRANSFER FROM A MICRO ORGANISM TO ANOTHER MICROORGANISM IN THE GUT

GM MICROORGANISMS MAY ALTER BALANCE IN THE NORMAL FLORA OF THE GUT