BIO- 301

CURRENT MID TERM FILE

LION GROUP OF ZOOLOGIST

MADE BY NOOR (BIO301 LECTURER)

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1 Non disjunction

– one gamete receives two copies of homologous chromosomes and other will have no copy.

2Cluster rule

Stated that pyrimidines often occur in clusters, and hence on the complementary strand purines do likewise

3Genetic mapping

Genetic mapping - also called linkage mapping provides clues about which chromosome contains the gene and precisely where it lies on that chromosome.

4. Chromosome structure:

chromosomes are made of DNA And associated proteins. Chromosome carries part or all of a cell's genetic information. Chromosomes have sister chromatids. Centromere is constricted region, where chromatids are attached. A

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chromosome constitutes DNA molecule, a protein Histones and supercoiled DNA.

5.Polyploidy:

Multiples of haploid number

- *Triploidy or tetraploidy etc*
- *Fetus does not survive*

Two major types

Autopolyploidy
Allopolyploidy

6.Acquired Variation

Acquired variation result from an individual's activities or nutrition or from environment conditions during a lifetime.Acquired characteristics can not be inherited. Language, obesity, athletic skills etc Example: Apples - different position on same tree.

Variation by genetic and environment
Many variations - both genetic and environmental. Height depend on what genes you inherit and the amount of food you get.

There are six common types of epistasis gene interactions: dominant, dominant inhibitory, duplicate dominant, duplicate recessive, polymeric gene interaction, and recessive.

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7.What is Inherited Variations?

Inherited variations result from the activity of genes.

Genetically controlled and cannot be altered.

Blood groups, finger prints and sex etc.

8.Genetic mapping

Genetic mapping - also called linkage mapping provides clues about which chromosome contains the gene and precisely where it lies on that chromosome.

9.Size at stages of mitosis:

There is variation in the sizes of chromosomes during different stages of mitosis such as

Interphase: Chromosomes are longest & thinnest.

Prophase: there is a progressive decrease in their length accompanied with an increase in thickness.

Anaphase: chromosomes are smallest.

Metaphase: chromosomes can be easily observed.

Chromosomes are studied during metaphase

Measurement of chromosomes: Chromosomes are generally measured during mitotic metaphase.

10. Structural Abnormalities

Chromosome breakage & subsequent reunion in a different

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configuration

Types based on genetic material

Balanced – chromosome complement is complete.

Unbalanced – when there is incorrect amount of genetic material.

Types

Translocations

Deletions

Insertions Inversions

Ring chromosome

Isochromosomes

11.Epigenetics and fragile X chromosome Fragile X syndrome

is most commonly caused by a CGG trinucleotide repeat expansion in the 5' region of the FMR1 gene. Unaffected individuals have 6-50 CGG repeats.

Epigenetics and fragile X chromosome

200 CGG repeats is seen in individuals with fragile X.

>200 CGG repeats is correlated with hyper methylation at CpG dinucleotides and sile.

12. Telophase

consists of four events: Chromosomes start to uncoil. Nuclear envelope forms around the chromosomes at each pole of the

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cell. Telophase Spindle fibers break down and dissolve, Daughter nucleus is formed in each of the daughter cell. Telophase Nuclear membranes are formed around each set of chromatids. Nucleoli also reappear. Chromosomes unwind back into chromatin material. Telophase – effects of prophase are reversed During telophase, the effects of prophase and prometaphase are reversed. Telophase Summary Spindle fibers break down and nuclear members develops around each daughter nucleus.

13.Causes of Variation

Genetic causes of variation

Environmental causes of variation

Genetic causes of variation

Meiosis

Sexual reproduction

Mutations

Environmental causes of variation

Nutrients

Drugs

Temperature

Physical training

14.Trisomy

Trisomy is a type of polysomy in which there are three copies of a particular chromosome, instead

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of the normal two. Trisomy is a type of aneuploidy (an abnormal number of chromosomes).

Trisomy -Autosomes and sex chromosome

Autosomal trisomy

Sex-chromosome trisomy

Trisomy of chromosome 21, which is found in Down syndrome, is called trisomy 21.

Trisomy Types

Primary trisomy - an entire extra chromosome has been copied.

Partial trisomy - an extra copy of part of a chromosome.

Secondary trisomy - the extra chromosome has duplicated arms.

Tertiary trisomy - extra chromosome is made up of copies of arms from two other chromosomes.

Common trisomy in humans

Trisomy 21

Trisomy 18

Trisomy 13

Klinefelter's syndrome (47 XXY)

15Modern Genetics Concepts

Chromosomes and Gene (s)

Mendelian Genetics and Non-Mendelian Genetics

Genotypes and Phenotypes

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Mutations and Polymorphism

16Mendel s' law of Segregations

During the formation of gametes, the two alleles responsible for a trait separate from each other.

Alleles are then "recombined" during the process of fertilization.

Example 1

During a cross, gametes of each parent first segregate. Then, gametes combine to give new genotype. Resulting phenotype will be according to genotype.

17Conclusions of Mendelian inheritance

Mendelian inheritance

Mendel s' conclusions were based on three laws:

Law of Dominance

Law of Segregation

Law of Independent Assortment

18Conclusion- law of dominance

Cross of true-breeding strains resemble only one of the parents.

Smooth seeds (S) are completely dominant to wrinkled seeds (s)

19Conclusion - Law of segregation

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Two members of a gene pair segregate (separate) from each other during the formation of gametes.

20Conclusion-Law of independent assortment

Alleles for different traits assort independently of one another.

Genes on different chromosomes independently behave.

21 Telophase

consists of four events: Chromosomes start to uncoil. Nuclear envelope forms around the chromosomes at each pole of the cell. Telophase Spindle fibers break down and dissolve, Daughter nucleus is formed in each of the daughter cell. Telophase Nuclear membranes are formed around each set of chromatids. Nucleoli also reappear. Chromosomes unwind back into chromatin material. Telophase – effects of prophase are reversed During telophase, the effects of prophase and prometaphase are reversed. Telophase Summary Spindle fibers break down and nuclear members develops around each daughter nucleus.

22 Color Blindness

- *Normal Female XX, Normal male XY*
- *Color Blind XcXc, Carrier XcX, Color Blind Male XcY*

Color blindness occurs when you are unable to see colors in a normal way. It is also known as color deficiency. Color

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blindness often happens when someone cannot distinguish between certain colors. This usually happens between greens and reds, and occasionally blues.

23Meiosis:

Meiosis - diploid cells are reduced to haploid cells. This is aprocess by which gametes
(sex cells) are produced. Chromosome numbers would be doubled without meiosis. If meiosis did not occur, the chromosomes number in each new generation would be doubled. The offspring would die. Meiosis is a two cell divisions process. There is only one duplication of chromosomes during
meiosis I.
Meiosis I
Meiosis II
Spermatogenesis and oogenesis
Meiosis in males is called spermatogenesis and produces sperms.
Meiosis in females is called oogenesis and produces ova.

24.Mendelian and Non-Mendelian inheritance

Mendelian inheritance

Gregor Mendel's model of inheritance describes Each trait is controlled by a single gene.

Each gene has two alleles.

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A clear dominant-recessive relationship between alleles.

Mendelian inheritance involve the genes that obey Mendel's laws: Law of dominance Law of segregation Law of independent assortment.

Mendelian inheritance

Phenotypes will obey patterns;

Autosomal dominant

Autosomal recessive

X-linked etc.

Non-Mendelian inheritance

Pattern of inheritance that deviate from Mendelian pattern of inheritance is called as Non

Mendelian inheritance.

Those genes that do not follow principles of heredity formulated by Gregor Mendel.

Examples of Non-Mendelian inheritance

Mitochondrial inheritance

Genomic (parental) imprinting

Incomplete dominance

Co-dominance

Multiple alleles

Epigenetic

25.Monosomy:

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Loss of a single chromosome

Monosomy of autosomes is lethal

Turner syndrome XO i.e. loss of sex chromosome.

Causes of monosomy: followings are the causes of monosomy

26 Non disjunction – one gamete receives two copies of homologous chromosomes and other will have no copy.

Loss of chromosome. As it move towards pole of cell during anaphase.

27Pyruvate carboxylase

encoded by the gene PC is an enzyme of the ligase class that catalyzes the physiologically irreversible carboxylation of pyruvate to form oxaloacetate

28 maltase,

enzyme that catalyzes the hydrolysis of the disaccharide maltose to the simple sugar glucose. The enzyme is found in plants, bacteria, and yeast; in humans and other vertebrates it is thought to be synthesized by cells of the mucous membrane lining the intestinal wall.

29.Amylase

is an enzyme, or special protein, that helps you digest food. Most of your amylase is made in the pancreas and salivary glands. A small amount of amylase in your blood and urine is normal.

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30Protein folding

is a process by which a polypeptide chain folds to become a biologically active protein in its native 3D structure. ... The amino acids in the chain eventually interact with each other to form a well-defined, folded protein. The amino acid sequence of a protein determines its 3D structure.

31Allostery

in haemoglobin. Haemoglobin is an allosteric protein. This means that the binding of oxygen to one of the subunits is affected by its interactions with the other subunits.

32. Chromosome and chromatin

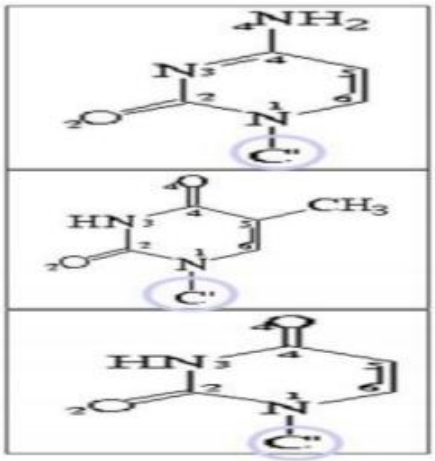
Chromosomes	Chromatin
• Tightly packaged DNA	• Unwound DNA
• Found only during cell division	• Found throughout Interphase
• DNA is not being used for macromolecule synthesis	• DNA *is* being used for macromolecule synthesis

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Summary - Mitosis and meiosis

SUMMARY		
Property	Mitosis	Meiosis
DNA replication	Occurs during interphase before mitosis begins	Occurs during interphase before meiosis I begins
Number of divisions	One, including prophase, metaphase, anaphase, and telophase	Two, each including prophase, metaphase, anaphase, and telophase
Synapsis of homologous chromosomes	Does not occur	Occurs during prophase I along with crossing over between nonsister chromatids; resulting chiasmata hold pairs together due to sister chromatid cohesion
Number of daughter cells and genetic composition	Two, each diploid ($2n$) and genetically identical to the parent cell	Four, each haploid (n), containing half as many chromosomes as the parent cell; genetically different from the parent cell and from each other
Role in the animal body	Enables multicellular adult to arise from zygote; produces cells for growth, repair, and, in some species, asexual reproduction	Produces gametes; reduces number of chromosomes by half and introduces genetic variability among the gametes

33.Purine and pyramidines

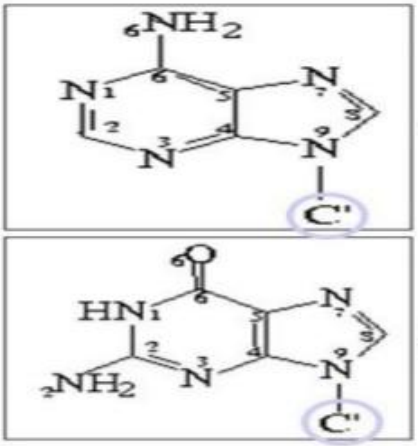


cytosine

thymine

uracil

Nitrogenous bases purines



adenine

guanine

Polynucleotide linkage

