

Survey of Bio.

wk. 8

Thripp
Survey
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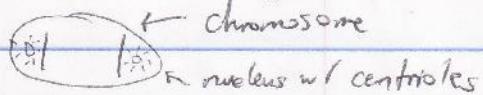
WED,

2009-10-21, 8-9:20 AM; sci. seminar today, 5 pts bonus

MITOSIS:

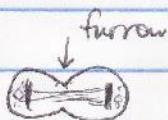
2-3 pm rm. 131

Anaphase: sister chromatids split becoming full-fledged daughter chromosomes

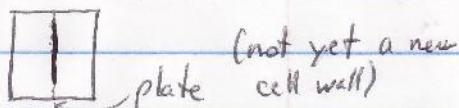


Cytokinesis = cell separation

Animals = furrow (pinching)



Plants = cell plate



Telophase: last phase of mitosis;

chromosomes begin to relax but are not yet fully relaxed

plants have a rigid cell wall so a furrow would be

Cytokinesis: cell splits

impossible

Nucleus begins to reassemble in each nucleus

Interphase: chromosomes are fully relaxed and are called chromatin now.

Prophase: chromatin condenses into chromosomes & moves toward equator

Anaphase: chromosomes are lined up at the equator

Metaphase:

Anaphase: chromatids separate, now called chromosomes

Telophase: cytokinesis, chromosomes relaxing

Cytokinesis or cell separation: during telophase

Plants form a cell plate

Animals form a furrow by the pinching of microfilaments

WED

Matt, 2009-10-21, 8-9:20 AM:

Cancer is abnormal cellular mitosis

(-) Skin cancer = 1.3M new cases yearly, 9.6K deaths

(-) Lung cancer = 169.4K new cases yearly, 154.9 deaths (!)

Cancer metastasizes: cancerous cells can enter the

bloodstream & go somewhere else & then call in
new blood vessels (metastases — a malignant tumor)

Cancer creates its own network of blood vessels, but
tumors produce nothing.

Tumors make blood vessel inhibitors AND stimulators.

Why? — inhibitor from primary tumor is gone when
primary tumor is removed — then dormant secondary
tumors come alive. Inhibitor — found in urine =

Benign tumor: cells divide \ominus trophoblast cells like in
unregulated, but don't pregnancy?

invade neighboring cells unregulated AND invade

Malignant tumor: cells divide neighboring cells

Metastasis: cells migrate through either lymph system
&/or circulatory system.

Cancer cells may skip G₁ or do S (synthesis) sloppily — small
and unuseful. They have no identification & go elsewhere.

Breast cancer may leave the breast & travel through the lymph
system to another organ

Cancer cells grow out of control: they divide at the wrong time or
Normal cells have a controlled cell cycle place

A tumor grows from a single cancer cell

Cancer cells invade neighboring tissue

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Nov 2009 WED, 2009-10-21, 8-9:20AM

~~cancer invades~~ radiation & chemotherapy
~~lymph system~~ kills rapidly dividing cells:
- cancer \hookrightarrow poison to cancer AND body

Somatic (body) cells: - hair cells, normal cells that divide quickly
does not produce sperm or eggs, diploid in animals ($2N$)

Germ cells: cells that will divide to make gametes,
haploid in animals ($1N$)

Autosome = non-sex chromosome (~~sex chro~~ = 44
Sex chromosomes = 2

A human karyotype has 22 pairs of autosomal chromosomes
(44 individually) and 1 pair of sex chromosomes
(2 individually). Chromosomes are sorted by type
(autosomal) & then by size from largest to smallest
(first) $XX = \text{♀}$ (female)

$XY = \text{♂}$ (male) Men have a different-size
chromosome

46 chromosomes in total 44 non-sex (autosomal), 2 sex

Sister chromatids are genetically identical (same alleles).

Homologous chromosomes have the same genes but possibly
different alleles (variations) — i.e. hair or eye color.

more chromosomes = more "surfaces" not necessarily more genes

Sexual reproduction depends on meiosis and fertilization

Mitosis: 1 cell \rightarrow 2 cells identical chromosomes + DNA [$2N$]

Meiosis: 1 cell \rightarrow 4 cells $\frac{1}{2}$ DNA or chromosomes [$1N$]

~~$2N$ haploid~~ = $2N$ = diploid $1N$ = haploid

$$46 \rightarrow 46$$
$$100 \rightarrow 100$$

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WED, 2009-10-21, 8-9:20 AM

~~Meiosis~~ Meiosis produces genetic variety!

~~Mitosis~~: One cell divides yielding TWO cells GENETICALLY IDENTICAL.

~~Meiosis~~: One cell divides twice, yielding ~~2²(4)~~ FOUR cells w/ half DNA (23 chromosomes) & GENETICALLY

~~(46)~~ $46 \rightarrow 23$ $100 \rightarrow 50$ $23 \rightarrow 23$ DIFFERENT.
(46 chromosomes) $100 \rightarrow 50$ $10 \rightarrow 10$

Mitosis vs. Meiosis: Mitosis: haploid \rightarrow haploid or } SAME
diploid \rightarrow diploid } DNA

Meiosis produces haploid cells (23) $20 \rightarrow 20$

Gametes (egg + sperm) are haploid (1N, 23 chromosomes in humans).

Humans are diploid (2N = 46 chromosomes) = man provides 23 chromosomes

sperm \leftarrow woman provides 23 chromosomes
fertilized egg = 46 chromosomes \rightarrow egg

\rightarrow a.k.a. zygote

Fertilization = fusion of sperm $\xrightarrow{(1N)}$ + egg $\xrightarrow{(1N)}$ = Zygote $\xrightarrow{(2N)}$

Plants alternate between haploid & diploid in their offspring (i.e. pine tree \rightarrow pine cone \rightarrow pine tree \rightarrow pine cone).

Animals are always diploid

THU, 2009-10-22, 9:30-10:50 AM 12:30-1:50 PM

Use the CD w/ your book for practice questions.

Angiostatins inhibit angiogenesis by cancerous tumors.

Dance of chromosomes video: when all chromosomes clump at middle, prophase becomes metaphase. The cell checks the

chromosomes & then we enter anaphase when the chromatids split & move to the poles (away from the equator), becoming full-fledged chromosomes again.

Thu, 2009-10-22 Survey of Bio. SI

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T/F: all cells in your body are genetically identical.
Plants form a cell plate to create a cell wall for the new cell in mitosis.

What is abnormal cell division? cancer

What is G₀? non-dividing stage

What 2 things disassemble in prophase? nucleus & nucleolus

When the chromosomes move to the equator, prophase becomes metaphase. Think middle. line up
line up at equator.

Duplicated chromosomes attached together are called sister chromatids.

In anaphase chromatids separate becoming chromosomes.
They then move toward the poles a.k.a.
away from the equator.

In telophase, the nucleus & nucleolus reassemble.

In animals, cytokinesis occurs by a cleavage furrow.

In plants, cytokinesis occurs by a cell plate.

PMAT → C₁ → S → C₂ → PMAT → C₁ → S → C₂

Somatic cells are diploid. Germ cells are haploid.

Mitosis: a 46-chromosome cell yields a 46-chromosome cell.

Meiosis: a 23-chromosome cell yields a 23-chromosome cell.

While sister chromatids are genetically identical, homologous chromosomes have same genes but may code for different alleles i.e. blue or brown eyes.

A karyotype is a numbered display of an organism's chromosomes, first sorted by autosome / sex, second sorted by size from largest to smallest.

Thu, 2009-10-22

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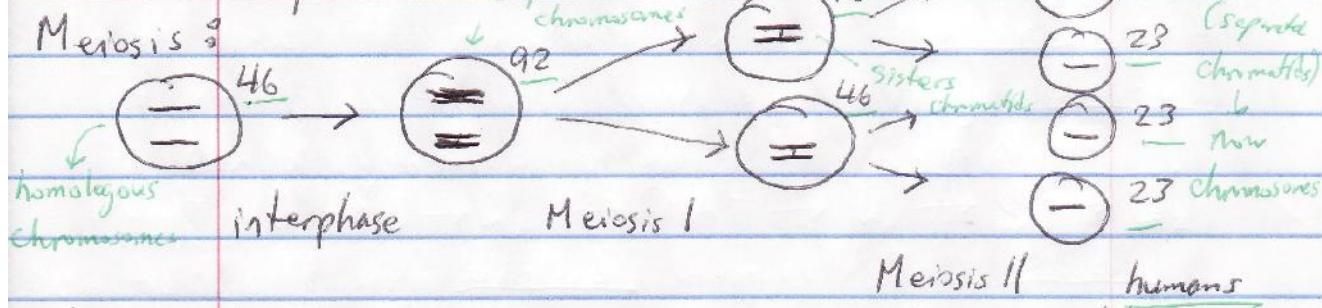
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- All humans start out female, & then develop a penis if the master switch gene is turned on → in the womb
- 2 sex chromosomes: male = XY, female = XX
- You have 23 chromosomes from Dad and 23 chromosomes from Mom unless you have Down syndrome which results from an extra chromosome (47 total) → trisomy 21 or another disease
- The number of chromosomes has nothing to do w/ an organism's complexity.

The fusion of a sperm cell and egg in sex is called fertilization. The process creates a zygote.

Mitotic sexual reproduction produces variety.

In meiosis, one cell divides twice (meiosis I and II) yielding 4 haploid cells with half the chromosomes of the parent



Humans don't make spores. Our sperm & eggs do not have a life of their own

Meiosis I

- homologs pair up
- homologs separate ($\# \rightarrow \frac{1}{2}$)
- recombination \rightarrow ①
- ① independent assortment
- ② crossing over

Meiosis II

- chromatids separate \rightarrow 2^a now called "chromosomes"
- also: random recombination orientation

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Crossing over occurs about 2 or 3 times in each chromosomes. 8 million combinations from each parent
 $\Rightarrow 2^{46}$ combinations w/out crossing over
 $= 72^{92}$ w/ crossing over?

Crossing over: blue & red chromosomes randomly combine:
man woman

huge combination of randomization — more than 64 trillion possibilities

chemotherapy = chemicals for blood kills all rapidly dividing cells
radiation = kills everything in 1 area

00 23 chromosomes from mom &
XY = male XX = female 23 chromosomes from dad

Since chromosomes themselves are germ cells, they have homologous chromosomes & half DNA (23 chromosomes in humans)

2^{23} combinations in men & women = $2^{23} \cdot 2^{23} = 2^{46}$
(64+ trillion combinations)

mitosis of a cell w/ 50 chromosomes yields 2 cells w/ 50 chromosomes each

Down syndrome = ~~21~~ trisomy 21 3 chromosome
in 21 pair

Zygote = $2N$ = fertilized egg

$\hookrightarrow N$ = set of chromosomes (23 in humans)

Meiosis I = prophase I, metaphase I, anaphase I, telophase I

Meiosis II = prophase II, metaphase II, anaphase II, telophase II