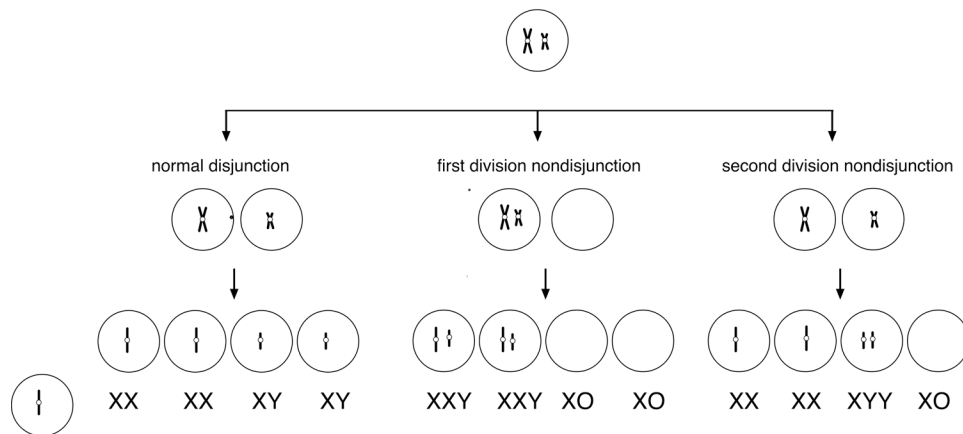


## Sex Chromosome Aneuploidies

Karyotype	Drosophila		Humans
XX	Normal Female	XX/AA = 1	Normal Female
XY	Normal Male	X/AA = 0.5	Normal Male
XO	Sterile Male	X/AA = 0.5	Turner Syndrome Female <ul style="list-style-type: none"> <li>• short stature (no adolescent growth spurt)</li> <li>• delayed/absent menarche</li> <li>• broad back of neck – webbing</li> <li>• change in angle of elbows</li> <li>• vascular anomalies</li> <li>• &gt;99% of XO fetuses spontaneously abort</li> </ul>
XXY	Normal female	XX/AA = 1.0	Klinefelter's Male <ul style="list-style-type: none"> <li>• phenotypically normal in early development</li> <li>• hypogonadal</li> <li>• prominent growth spurt in adolescence &gt; tall w/ long arms</li> <li>• minimal testicular development</li> <li>• gynecomastia</li> <li>• 1/100-1000 males</li> <li>• may benefit from androgen treatment</li> </ul>
XXX	meta- or superfemale sterile die early	XXX/AA = 1.5	normal female
XYY	normal male	X/AA = 0.5	normal male

## Sex Chromosome Aneuploidies



## Sex Chromosome Aneuploidy Frequencies

	per 15,000 spont abortion	per 85,000 live births
XYY	4	46
XXY	4	44
XO	1350	8
XXX	21	44

## Sex Development

Day	
28	few weeks after conception – pair of urogenital folds with protrubence in middle first signs of sex differentiation <ul style="list-style-type: none"> <li>• genital tubercle surrounded by 2 sets of folds, one in other</li> <li>• inner fold elongates with the tubercle to form a groove on the underside.</li> </ul>
50	male starts making testosterone (peaks at day 150)
59	first time possible to determine sex, but very confusing
63	male: tubercle elongates and groove formes tube urethra) larger folds form scrotum female: tubercle remains small >> clitoris groove >> labia minor external folds swell >> labia minor
150	males: testosterone peaks

## Sex Determination Anomalies

### Sex Reversal: Normal Secondary Sex Characteristics, Reversed Karyotype

	<u>Phenotype</u>	<u>Gonads</u>	<u>Karyotype</u>	<u>Cause</u>
Sex-reversed male:	normal female	ovaries	XY	SRY mutation RSP01 mutation
Sex-reversed female:	normal male	testes	XX	SRY translocated to X

### Pseudohermaphroditism (Intersex Syndromes)

	<u>Phenotype</u>	<u>Gonads</u>	<u>Karyotype</u>	<u>Cause</u>
Male:	normal female	testes	XY	androgen insensitivity
	female at birth male at puberty	testes	XY	5- $\alpha$ -reductase deficiency
Female:	masculinized genitalia	ovaries	XX	<i>in utero</i> exposure to androgens

### True Hermaphroditism

mosaics of XX and XY cells  
produce both ovarian and testicular tissue, but not dual genitalia  
genitally may be male, female, or intersex  
may be result of embryo fusions: least understood form of hermaphroditism

## Pseudohermaphroditism - Intersex Syndromes

<p><b>female</b></p>	<p><b>XX and have ovaries</b>  approximately half of all cases of ambiguous external genitalia  genitalia appear masculinized</p> <ul style="list-style-type: none"> <li>• sometimes clitoris looks/acts more like penis</li> <li>• sometimes labia join to look like scrotum</li> </ul> <p>internal organs typically feminine – development anomaly doesn't seriously affect internal development</p> <p>Caused by in utero exposure to high levels of androgens</p> <ol style="list-style-type: none"> <li>1. tumor on mother's suprarenal gland produces excessive amounts of androgen; rarest cause of female pseudohermaphroditism</li> <li>2. administration of androgenic hormones to pregnant woman to prevent miscarriage (also some environmental toxins)</li> <li>3. congenital adrenal hyperplasia; fetal adrenal glands produce large amounts of androgen most common form</li> </ol> <p>range from dramatic cases where the person looks very much like male, to cases where the clitoris is a bit enlarged, but the person clearly is a female</p>
<p><b>male</b></p>	<p><b>XY and have testes</b></p> <ol style="list-style-type: none"> <li>1 testicular feminization = androgen insensitivity syndrome  testes produce normal levels of androgens  body lacks androgen receptor  therefore develops along female body plan  genitals appear feminine  labia  clitoris  relatively short vagina  at puberty body develops still more along feminine lines  large breasts  round hips  tall, long limbs  little body hair  tend to fit dominant feminine ideal in US better than most true females  persistent rumor that many female high fashion models are AIS males.  typically don't know about condition until they go to gynecologist when they fail to menstruate</li> <li>2 5-a-reductase deficiency  5-a-reductase converts testosterone to dihydroxytestosterone  dihydroxytestosterone required for initial burst of male development in fetus  in absence of dht fetus develops female genitalia  short vagina  labia  clitoris  at puberty normal burst of testosterone causes male development  body masculinizes  taller, stronger, more muscular  significant body &amp; facial hair  no breast development  voice deepens  testes may descend into presumed labia  clitoris grows to look and act more like penis</li> </ol>