Do Sex Chromosomes Undergo Recombination

Advanced Topics in Forensic DNA Typing: Interpretation - John M. Butler 2014-07-28
Advanced Topics in Forensic DNA Typing: Interpretation builds upon the previous two editions of John Butler's internationally acclaimed Forensic DNA Typing textbook with forensic DNA analysts as its primary audience. Intended as a third-edition companion to the Fundamentals of Forensic DNA Typing volume published in 2010 and Advanced Topics in Forensic DNA Typing: Methodology published in 2012, this book contains 16 chapters with 4 appendices providing up-to-date coverage of essential topics in this important field. Over 80 % of the content of this book is new compared to previous editions. Provides forensic DNA analysts coverage of the crucial topic of DNA mixture interpretation and statistical analysis of DNA evidence Worked mixture examples illustrate the impact of different statistical approaches for reporting results Includes allele frequencies for 24 commonly used autosomal STR loci, the revised Quality Assurance Standards which went into effect September 2011
Sex Chromosome Evolution of Papaya - Jennifer Han (Ph. D.) 2014
Sex chromosomes are found throughout many diverse lineages across the animal and plant kingdom. Most of the sex chromosomes that have been studied are well established and have already experienced many evolutionary forces, making it difficult to reconstruct the dynamic changes involved in the evolution of sex chromosomes. Sex chromosomes are evolved from a pair of autosomes with closely linked sex determining genes that have stopped recombining. Papaya has many qualities that make it attractive for studying sex chromosome genetics. It is trioecious (male, female, and hermaphrodite) with sex determined by a pair of nascent sex chromosomes approximately 7 million years old. The genome is relatively small (442.5 Mb) and the sex determining region of the sex chromosomes is small and well characterized; the hermaphrodite and male specific region of the Yh and Y chromosome respectively is 8.1 Mb and the corresponding X is 3.5 Mb. These sex specific regions of the X and Y chromosomes not only contain the genes that control sex type, but they also have genes associated with the different sexes. While the vegetative forms of the three sexes are phenotypically identical, the reproductive structures are unique. In stark contrast to female and hermaphrodite flowers on male plants are borne on long pendulous peduncles (60-90 cm) at the leaf axis. Female and hermaphrodite flowers are borne on short peduncles (0-4 cm). Gynodioecious varieties SunUp, SunUp Diminutive mutant and dioecious AU9 were used to test the response of papaya to gibberellic acid (GA3). Gibberellic acid is a hormone known to cause elongation of stems throughout the plant kingdom. It is also known as a masculinizing hormone. Exogenous applications of GA3 on female and hermaphrodite papaya did not yield any sex reversals but there was a significant increase in peduncle length and inflorescence branch number in all treated plants. There was an increase in plant height for all treated plants except SunUp Diminutive mutant, suggesting that the mechanism causing the dwarf phenotype is independent of gibberellins. Gibberellin metabolism genes were identified in the papaya genome, none of which mapped to the sex-determining region of either the male- or hermaphrodite-specific region of papaya Y or Yh chromosome. We hypothesize that a trans-acting regulatory element that enhances gibberellin biosynthesis plays a role in the extreme length of the male papaya peduncle Sex chromosomes experience several evolutionary forces. To further study the structure of the sex chromosomes, a mapping population was created to generate a high density genetic map. A female AU9 was crossed with a hermaphrodite SunUp, the resulting offspring was backcrossed to the hermaphrodite SunUp. Fifty-one individuals derived from this cross were used to create restriction-site associated DNA sequencing (RAD-seq) libraries. A total of 228 RAD-seq markers were mapped to 9 major and 2 minor linkage groups. Previous studies have shown that the Y chromosome experiences severe recombination suppression along the sex determining region. The resulting map from this study showed that the X chromosome is not experiencing recombination suppression. Additionally, possible centromere locations were identified for the other chromosomes. Sex chromosomes also undergo degeneration of genetic material. The effective population size of the sex chromosomes is reduced compared to the autosome. The lack of recombination, especially for the Y chromosome also increases the rate of degeneration. RNA seq data was generated using flower and leaf tissue from females, males, and hermaphrodite individuals to determine the rate at which the Y chromosome is experiencing degeneration. Expression levels were compared between the X and Y linked alleles in males and hermaphrodites. If there is no Y degeneration, then the expression levels between the sex linked alleles should be equal. Expression of male leaf tissue had significantly less expression of the Y allele compared to the X allele. This was not found in hermaphrodites and in all flower tissue. Dosage compensation is a phenomenon utilized by many organisms with sex chromosomes to account for the heterogametic sex having only one allele for many of the genes on the sex chromosome. While many organisms compensate expression levels in the heterogametic sex, this is not true of all animals. Very few studies have been conducted to determine if plants undergo the same evolutionary forces as animals and also evolve dosage compensation. There was no detectable dosage compensation in the primitive papaya sex chromosome.
The Evolution of Sex Determination - Leo W. Beukeboom 2014
temperature) or social variables (e.g.
Evolution of Sex Determining Mechanisms - James J. Bull 1983

Genes in Conflict - Austin BURT 2009-06-30
Covering all species from yeast to humans, this is the first book to tell the story of selfish genetic elements that act narrowly to advance their own replication at the expense of the larger organism.
The Genetic Basis of Male Infertility - Ken McElreavey 2012-11-03
Every year there are new and exciting developments in assisted human reproduction, but how much do we really know about the underlying causes of infertility? This volume explores recent progress in the understanding of the genetics of spermatogenesis and male infertility. Topics include fundamental advances and current problems in the development and function of the testis, an outline of clinical findings in male infertility and an overview of the role of the Y chromosome in male fertility. Comprehensive critiques of posttranscriptional control during spermatogenesis, mammalian meiotic sterility, and comparative genetics of human spermatogenesis from the perspective of yeast, Drosophila and mice provide a global overview of the field.
Diverse Outcomes of Homologous Recombination in the Human Y Chromosome - Julian Hendrik Lange 2008
Mammalian sex chromosomes began diverging from an ordinary pair of autosomes roughly 300 million years ago. Inversions in the evolving Y chromosome sequentially suppressed recombination with the X chromosome. While pseudoautosomal regions in the human Y chromosome still participate regularly in allelic homologous recombination, the male-specific region of the Y (MSY) - the only haploid portion of the nuclear genome - does not. It does, however, engage in non-allelic homologous recombination. In this thesis, I examine modes and outcomes of non-allelic homologous recombination in the MSY. The predictions presented here are based on the double-strand break repair model of recombination between homologous chromosomes, in which a double-strand break (DSB) is the common precursor to crossing over and gene conversion. First, I show that massive MSY-specific palindromes, which maintain arm-to-arm sequence identity via gene conversion, are also the targets of crossing over. Crossover events in palindromes can lead to isochromosome formation and diverse reproductive disorders including sex reversal, male infertility, and Turner syndrome. Second, I demonstrate that a region of the MSY - thought to be recombinationally suppressed with the X chromosome - does undergo extensive X-Y gene conversion. This region encompasses hotspots of ectopic crossover events that lead to X-Y translocations associated with sex reversal syndromes. Although sequences in the MSY engage in productive recombination via gene conversion, alternative

resolution of DSBs by crossing over can produce evolutionary "dead ends."

Exploring the Mechanism of Meiosis in Drosophila Melanogaster - 2007

Sister chromatid cohesion is essential for proper chromosome segregation during meiosis. However, the mechanism of meiotic cohesion in Drosophila is unclear. We describe a novel protein, SOLO (Sisters On the LOose) that is essential for meiotic cohesion in Drosophila melanogaster. solo mutations cause high nondisjunction of sister and homologous chromatids of sex chromosomes and autosomes in both sexes. In solo males, sister chromatids separate prematurely and segregate randomly during meiosis II. Although bivalents appear intact throughout meiosis I, sister centromeres lose cohesion prior to prometaphase I and orient nearly randomly on the meiosis I spindle. Centromeric foci of SMC1 are absent in solo males at all meiotic stages. SOLO and the cohesin protein SMC1 co-localize to meiotic centromeres from early prophase I until anaphase II in wild-type males but both proteins are removed prematurely from centromeres at anaphase I in mei-S332 mutants, coincident with premature loss of cohesion in those mutants. solo mutations in females cause reduced frequency of homologous recombination between X chromosomes and autosomes, partially due to the loss of inhibition of sister chromatid exchange. Synaptonemal complex assembly is severely disrupted in early meiotic stage in solo females. SOLO colocalizes with SMC1 and C(3)G in meiosis. Additionally, SOLO is required for stabilizing chiasmata generated from residual recombination events. The data about the phenotypes of solo males and females and colocalization patterns of SOLO strongly suggest SOLO is a component of potential cohesin in Drosophila meiosis. Drosophila males undergo meiosis without recombination. However, the underlying mechanism is not known. Mutations of vasa cause high frequency of X-Y exchange in meiosis. Chromatin bridges at anaphase I and II, due to dicentric recombination events, were observed in vasa males. vas and solo double mutant showed precocious segregation of homologs at metaphase I besides chromatin bridge at anaphase I and II. Our data thus for the first time demonstrate that inhibition of meiotic recombination during male meiosis requires vas function and interactions between vas and solo regulate chromosome dynamics in male meiosis.

Elucidating Roles for AGO Proteins in Male Mouse Meiosis - Elizabeth A. Crate 2016

Meiosis is a specialized cell division during which genomic material of a diploid cell is halved to produce haploid gametes. During meiotic prophase I, autosomes become fully synapsed and undergo homologous recombination. In mammals, males are the heterogametic sex as their cells contain an X-Y chromosome pair. Despite the paring of these two chromosomes at their pseudoautosomal region, the rest of these chromosomes are asynapsed and transcriptionally silenced via Meiotic Sex Chromosome Inactivation (MSCI). Proper MSCI is essential for meiotic progression and gamete production in male mammals. However the mechanism underlying MSCI has not been fully elucidated. Recent work has implicated small non-coding RNA (sncRNA) binding partners, AGO3 and AGO4, in this process. My thesis work: 1. analyzes Dgcr8 and Dicer conditional knockout mice, 2. optimizes a FACS method for prophase I staged spermatocyte isolation, 3. Defines a strategy for the development of Ago3 and Ago4 epitope tagged mouse lines.

Sex Chromosomes and Sex-Linked Genes - Susumu Ohno 2013-06-29

Natural selection operates among individual organisms which differ in their genetic constitution. The degree of hereditary variability within a species is greatly enhanced by cross-fertilization. Indeed, the mechanism of sexual reproduction occurred very early in evolution, for it is seen today even in bacteria. In Escherichia coli, fertilization occurs by passage of the single chromosome from the male into the female bacterium (LEDERBERG, 1959). In multicellular organisms, the separation of germ from soma, and the production of haploid gametes became mandatory. The gametes were of two types. One, extremely mobile, was designed to seek out and penetrate the other, which loaded with nutrients, received the mobile gamete and intiated the development of a new individual. The foundation for true bisexuality was thus laid. In the primitive state of bisexuality, whether an individual is to be a sperm-producing male or an egg-producing female appears to be decided rather haphazardly. In the worm, Banelia viridis, the minute males are parasites in the female. Larvae that become attached to the proboscis of an adult female become males, while unattached larvae sink to the bottom and become females (BALTZER, 1935). The more sophisticated state of bisexuality was initiated by setting aside a particular pair of chromosomes for specialization and making either the male or the female a heterogametic sex. Sex chromosomes as we know them were thus born.

The Evolution of Sex - Richard E. Michod 1988

Essays on the genetic aspects of sex, genetic recombination, and genetics and the evolutionary process by molecular biologists, population geneticists, and ecologists.

Sex Determination in Vertebrates - 2019-04-16

Sex Determination, Volume 134, the latest release in the Current Topics in Developmental Biology series, contains current reviews in the field of vertebrate sex determination. It covers molecular pathways of sex determination in genetic and environmental species and encompasses both sex determination of somatic lineages and commitment of germ cells to male or female fate. Chapters in this new release cover, amongst other topics, Mapping the Sox9 Enhancer Elements, Epigenetic Regulation of Sex Determination, Evolution and Management of Sex Chromosomes, Regulation of Germ Cell Sex Identity in Medaka, Control of Sex Determination in Zebrafish, Sexually Dimorphic Germ Cell Identity in Mammals, and more. Contains reviews written by leading experts in each field Includes informative figures that illustrate principle points that are useful for teaching Written in a style that is clear and simple

The Biology of Reproduction - Giuseppe Fusco 2019-10-10

A look into the phenomena of sex and reproduction in all organisms, taking an innovative, unified and comprehensive approach.

MRCOG Part One - Alison Fiander 2016-10-13

A fully updated and illustrated handbook providing comprehensive coverage of all curriculum areas covered by the MRCOG Part 1 examination.

Stem Cells in Reproductive Medicine - Carlos Simón 2013-07-04

Stem Cells in Reproductive Medicine is essential reading for those keeping abreast of practical developments in this rapidly moving field.

Principles of Developmental Genetics - Sally A. Moody 2014-09-02

Providing expert coverage of all major events in early embryogenesis and the organogenesis of specific systems, and supplemented with representative clinical syndromes, Principles of Developmental Genetics, Second Edition discusses the processes of normal development in embryonic and prenatal animals, including humans. The new edition of this classic work supports clinical researchers developing future therapies with its all-new coverage of systems biology, stem cell biology, new technologies, and clinical disorders. A crystal-clear layout, exceptional full-color design, and bulleted summaries of major takeaways and clinical pathways assist comprehension and readability of the highly complex content. All-new coverage of systems biology and stem cell biology in context of evolving technologies places the work squarely on the modern sciences Chapters are complemented with a bulleted summary for easy digestion of the major points, with a clinical summary for therapeutic application Clinical highlights provides a bridge between basic developmental biology and clinical sciences in embryonic and prenatal syndromes

DNA Replication, Recombination, and Repair - Fumio Hanaoka 2016-01-22

This book is a comprehensive review of the detailed molecular mechanisms of and functional crosstalk among the replication, recombination, and repair of DNA (collectively called the "3Rs") and the related processes, with special consciousness of their biological and clinical consequences. The 3Rs are fundamental molecular mechanisms for organisms to maintain and sometimes intentionally alter genetic information. DNA replication, recombination, and repair, individually, have been important subjects of molecular biology since its emergence, but we have recently become aware that the 3Rs are actually much more intimately related to one another than we used to realize. Furthermore, the 3R research fields have been growing even more interdisciplinary, with better understanding of molecular mechanisms underlying other important processes, such as chromosome structures and functions, cell cycle and checkpoints, transcriptional and epigenetic regulation, and so on. This book comprises 7 parts and 21 chapters: Part 1 (Chapters 1–3), DNA Replication; Part 2 (Chapters 4–6), DNA Recombination; Part 3 (Chapters 7–9), DNA Repair; Part 4 (Chapters 10–13), Genome Instability and Mutagenesis; Part 5 (Chapters 14–15), Chromosome Dynamics and Functions; Part 6 (Chapters 16–18), Cell Cycle and Checkpoints; Part 7 (Chapters 19–21), Interplay with Transcription and Epigenetic Regulation. This volume should attract the great interest of graduate students, postdoctoral fellows, and senior scientists in broad research fields of

basic molecular biology, not only the core 3Rs, but also the various related fields (chromosome, cell cycle, transcription, epigenetics, and similar areas). Additionally, researchers in neurological sciences, developmental biology, immunology, evolutionary biology, and many other fields will find this book valuable.

Exploring the Biological Contributions to Human Health - Institute of Medicine 2001-07-02

It's obvious why only men develop prostate cancer and why only women get ovarian cancer. But it is not obvious why women are more likely to recover language ability after a stroke than men or why women are more apt to develop autoimmune diseases such as lupus. Sex differences in health throughout the lifespan have been documented. Exploring the Biological Contributions to Human Health begins to snap the pieces of the puzzle into place so that this knowledge can be used to improve health for both sexes. From behavior and cognition to metabolism and response to chemicals and infectious organisms, this book explores the health impact of sex (being male or female, according to reproductive organs and chromosomes) and gender (one's sense of self as male or female in society). Exploring the Biological Contributions to Human Health discusses basic biochemical differences in the cells of males and females and health variability between the sexes from conception throughout life. The book identifies key research needs and opportunities and addresses barriers to research. Exploring the Biological Contributions to Human Health will be important to health policy makers, basic, applied, and clinical researchers, educators, providers, and journalists-while being very accessible to interested lay readers.

Textbook of Human Reproductive Genetics - Karen Sermon 2014-04-10

What happens with our genome and epigenome in the first fundamental days of our development? How can this be analysed? What do we need to know when faced with patients' questions about their own infertility, or how to prevent the birth of affected children? For the first time, this book brings together both scientists' and clinicians' viewpoints on human reproductive genetics, making for a more comprehensive discussion of interest to ART professionals and developmental biologists. With worldwide leaders in this burgeoning field guiding the reader through from the basics to the most exciting recent discoveries, this book presents the wider picture of how reproductive medicine and biology links with genetics. The editors also address the new challenges raised in how to treat and counsel patients at fertility and genetic clinics, as well as eliciting vivid bioethical debates. This book brings together genetics, reproductive biology and medicine for practitioners and geneticists.

Molecular Biology of the Cell - Bruce Alberts 2004

Do Sex Chromosomes Undergo Recombination:

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