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Mendizabal Sasieta, Ana; Rodríguez-Trelles, Francisco, dir. Mechanisms of sexual selection in humans : MHC-based mate choice. 2021. 1 pag. (833 Grau en Genètica)

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Mechanisms of Sexual Selection in Humans: MHC-based Mate Choice

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Project typology: Bibliographic Review | Bachelor's Degree in Genetics (2020-2021)

1. ABSTRACT

Natural selection and sexual selection are processes that cause **evolutionary change**. While **natural selection** is the differential reproduction based on the adaptation and survival, **sexual selection** is based on sexual competition in order to secure a mate.

"Survival of the fittest doesn't matter, unless the fittest also have offspring" [1]

Some **advantages of sexual selection**:

- ✓ Evolution of secondary sexual features involved in species recognition and formation.
- ✓ Maintenance of deleterious mutations at lower equilibrium frequencies.

Objective 1: To describe the main **mechanisms of sexual selection in humans**.

Objective 2: To explore **MHC-based mate choice**.

2. METHODS

NCBI PubMed, Google Scholar and UAB Library Service literature database search using keywords such as "sexual selection", "mechanisms", "mate choice", "MHC" and "human", and Boolean combinations thereof. Critical reading, information integration and writing.

5. DISCUSSION

MHC-based disassortative mating is an evolutionarily conserved mechanism. However, some products of current societies could alter it:

- 🧴 **Perfumes:** there is a positive correlation between them and the personal scent, so they enhance the biological behavior of **MHC-based disassortative mating**.
- 🚫 **Oral contraceptives:** a tendency towards **MHC-based assortative mating** is observed. This could increase the number of spontaneous abortions in the population.

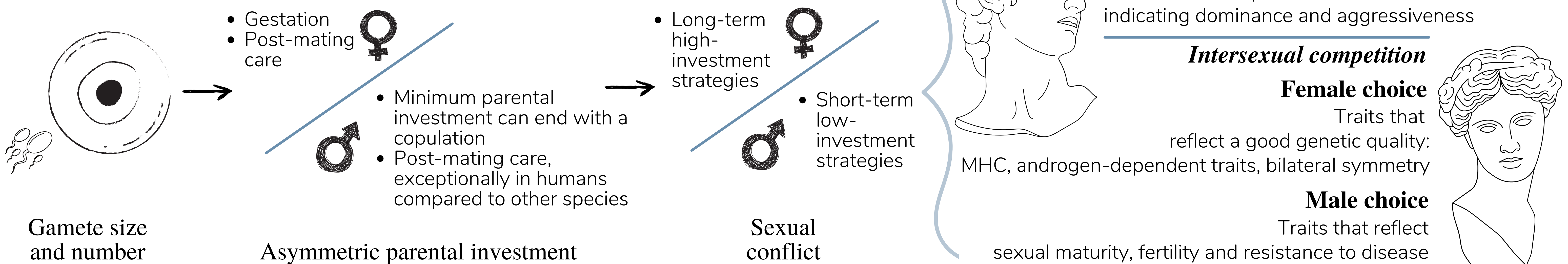
6. CONCLUSIONS

Secondary sexual characters have been shaped by **male contest and female choice in men**, and by **male choice in women**.

MHC-based disassortative mating would favour optimal diversity of the offspring's immune system. If confirmed, its presence in humans would have a great influence on today's societies.

3. MECHANISMS OF SEXUAL SELECTION

Differences in reproductive biology between sexes



4. MHC-BASED MATE CHOICE

The **Major Histocompatibility Complex (MHC)** is a group of genes encoding for proteins that attach to the surface of T-cells, and are involved in the **distinction of self molecules from foreign molecules** by the immune system. They are the **most polymorphic loci** in the vertebrates genome. This polymorphism is maintained via **pathogen-mediated natural selection** and **MHC-based disassortative mating**.

Experimental studies (Fig. 1a-b) and **comparative genomic analysis (Fig. 2)** indicate a general trend towards **MHC-dissimilar mates**, although a preference for **MHC-similar mates** is observed in women taking oral contraceptives (Fig. 1b) and in cultural traditions with consanguineous pairing schemes.

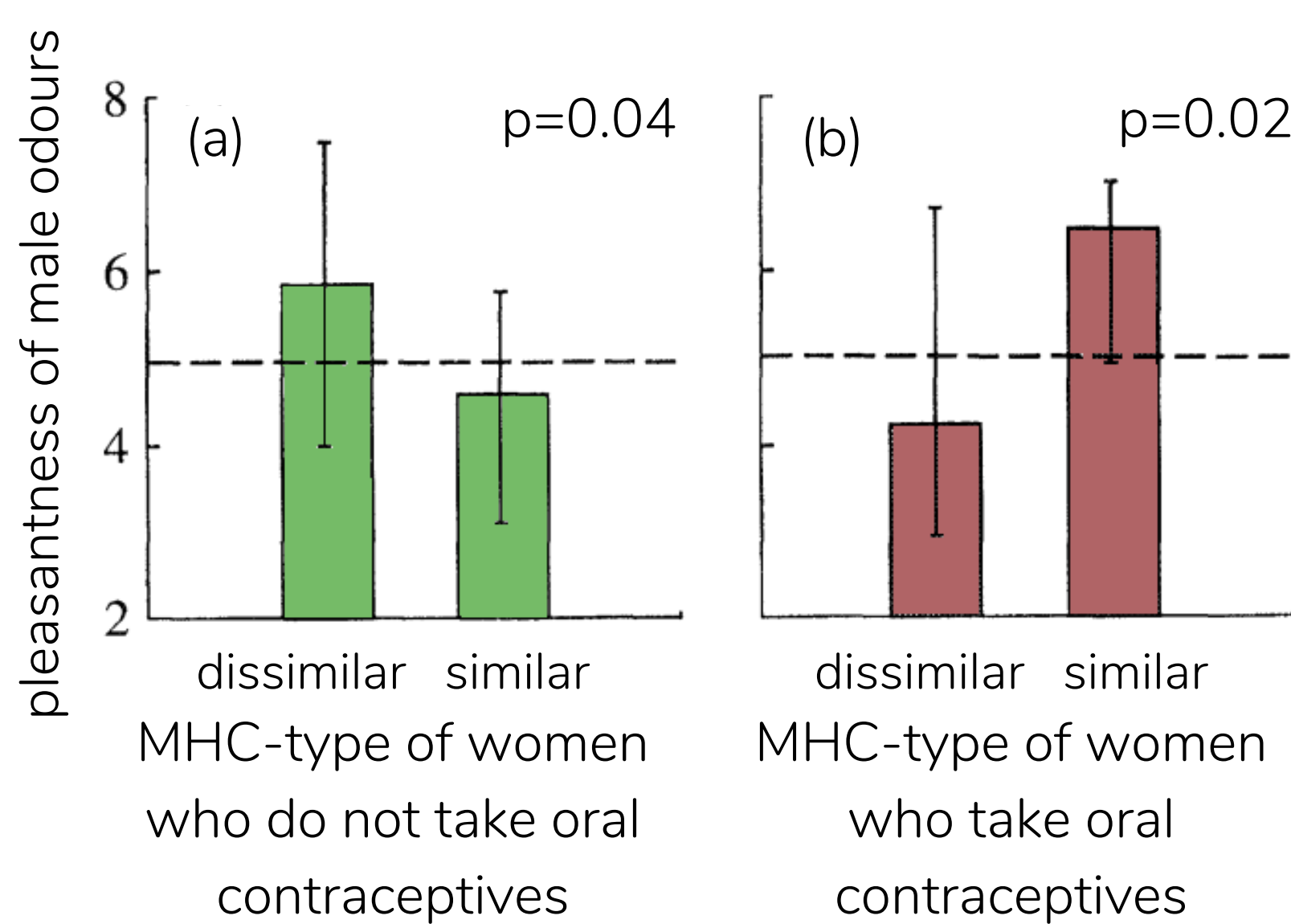
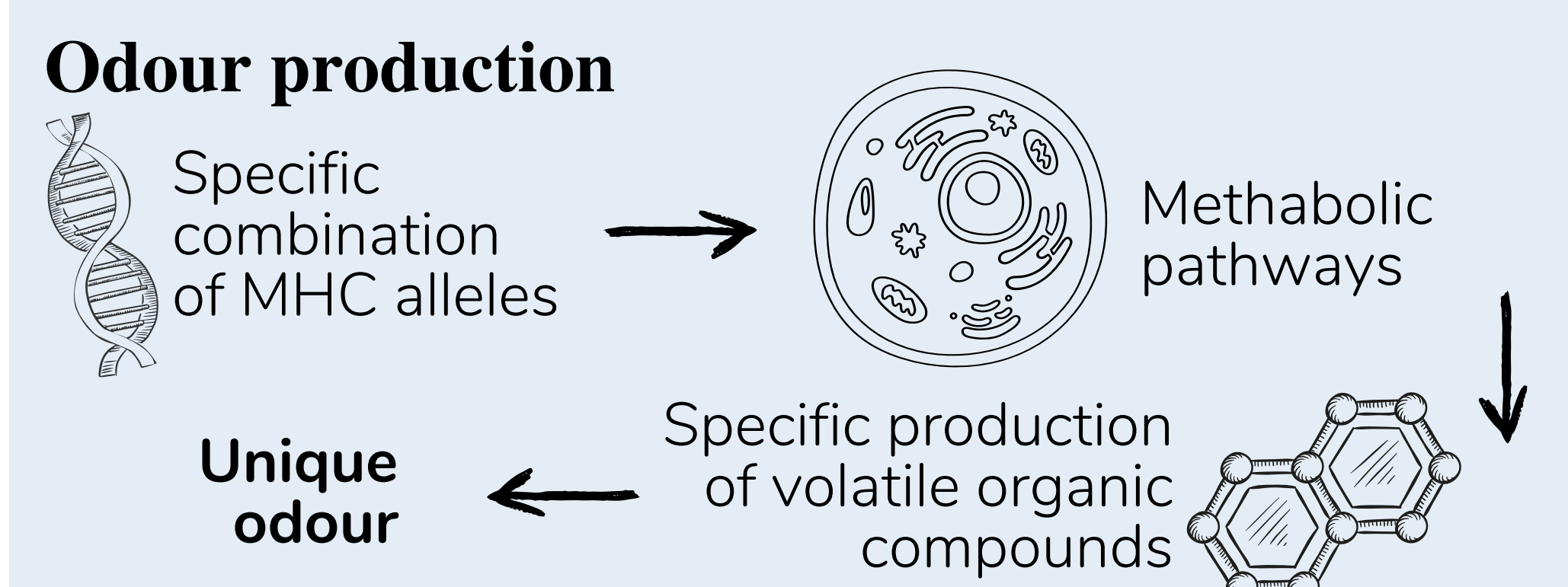


Figure 1. Average score of pleasantness of odour per male by females who are similar or dissimilar on their MHC. Odours were judged by women who did not take oral contraceptives (a) and by women who took oral contraceptives (b). Dissimilar and similar MHC matings are depicted in green and pink, respectively. [2]

Figure 2. Summary of studies on MHC-dependent disassortative mating based on comparative genomics. Indicated populations are Nigeria, Utah, lower Amazon basin tribes, Germany, UK, Ireland, Belgium, Netherlands, Spain, Israel and Japan. Dissimilar and similar MHC matings are depicted in green and pink, respectively. [3]

4.1. Relation between the MHC and organism-specific odour



Odour perception

Self MHC peptide ligands activate the right middle region of the human brain that is involved in self-awareness (Fig. 3).

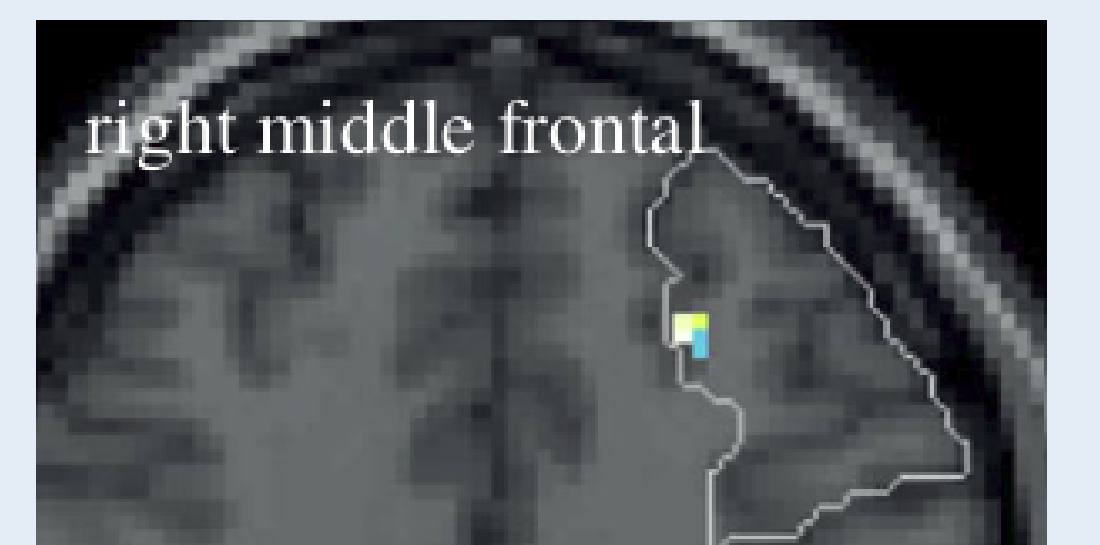
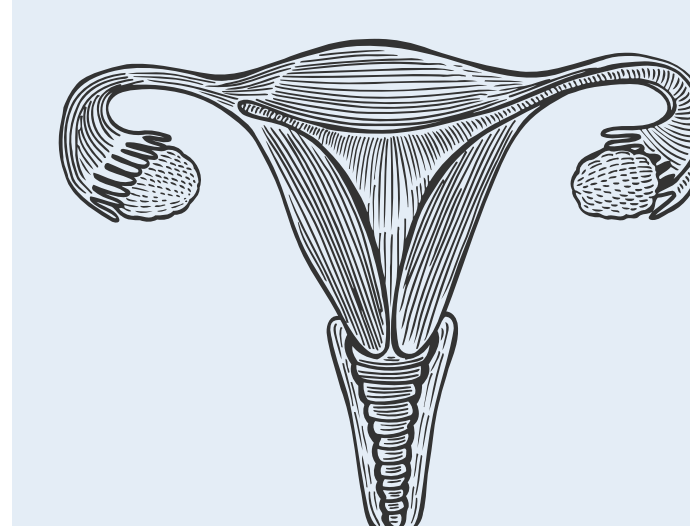


Figure 3. Activation of the right middle frontal cortex by 'self'-peptides that is indicated by blue and yellow. [4]

4.2. Post-copulatory preference for MHC dissimilarity



A selective process called **cryptic female choice** occurs between cervical mucus and sperm that favors the survival and storage of sperm with **dissimilar MHC**.

QUOTES AND FIGURES

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