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Oral Contraceptives Suppress Ovarian Hormone Production

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In "The Cutest Little Baby Face: A Hormonal Link to Sensitivity to Cuteness in Infant Faces," Sprengelmeyer et al. (2009) reported results from three fascinating studies designed to test humans' ability to discriminate among infants on the basis of cuteness. The first study indicated that women of reproductive age are superior to men and older women in this regard, and the second study revealed that premenopausal women perform better than age-matched postmenopausal women. Sprengelmeyer et al. compellingly argued that these findings, taken together, strongly indicate that female reproductive hormones (specifically, the two principal hormones, estrogen and progesterone) play a role in sensitivity to cuteness. The authors sought to explore this possibility in a third study, in which they tested women who were taking exogenous hormones for contraception. They found that such women differentiate cuteness in infant faces better than naturally cycling women do. The authors interpreted this result as consonant with their hypothesis about the contribution of estrogen and progesterone to cuteness detection—that oral contraceptives "raise hormone levels artificially" (p. 149). Although hormonal differences between the two groups may have been responsible for this difference, it is unlikely that the effect was due to elevated levels of estrogen[1] and progesterone in the women using oral contraceptives. Contrary to many researchers' beliefs, oral hormonal contraceptives actually suppress ovarian production of these hormones.

Effects of Hormonal Contraceptives on Estrogen and Progesterone

Combined hormonal contraceptives (i.e., the pill), so called because they contain synthetic versions of estrogen and progesterone, inhibit the natural production of these hormones, essentially eliminating any menstrual-cycle variability (see Fig. 1). Hormonal contraceptives alter the hypothalamic-pituitary-ovarian feedback loop, preventing the maturation of the ovarian follicle, precluding ovulation (Frye, 2006), and inhibiting the rise in estrogen that occurs during the first half of the menstrual cycle (Van Heusden & Fauser, 2002). The increased progesterone that circulates after ovulation is produced mainly in the empty ovarian follicle (Hatcher & Namnoum, 2004); thus, this increase does not occur in pill-taking women, who exhibit lower serum estradiol and progesterone than do naturally cycling women (Arnold, Tóth, & Faredin, 1980; Basu et al., 1992; Thorneycroft & Stone, 1972). The pill has been shown to lower serum levels of these hormones even after discontinuation (Balogh, Ditroi, & Lampe, 1981; Panzer et al., 2006). Moreover, postmenopausal women who have used the pill have lower levels of androgens and estrogens than those who have never used it (Chan et al., 2008). Thus, the evidence clearly shows that combined hormonal contraceptives reduce levels of estrogen and progesterone.

Effects of Hormonal Contraceptives on Psychology

Although total levels of estrogen and progesterone are not elevated in women who use hormonal contraceptives, it is possible that the contraceptive users in the study of Sprengelmeyer et al. displayed superior cuteness detection because of the direct action of the synthetic exogenous hormones themselves. Exploring the role of olfaction in mate selection, Wedekind, Seebeck, Bettens, and Paepke (1995) and Roberts, Gosling, Carter, and Petrie (2008) found reversed preferences in pill users relative to normally cycling women. Wedekind et al. speculated that this pattern may be due to pregnancy-mimicking effects of exogenous hormones. However, the relevance of this example is limited by the absence of measures that directly or indirectly tie these respective hormones to social olfactory preferences.

In contrast, research exploring hormonal mediation indicates that oral contraceptives do not substantially improve performance in domains of social judgment thought to be affected

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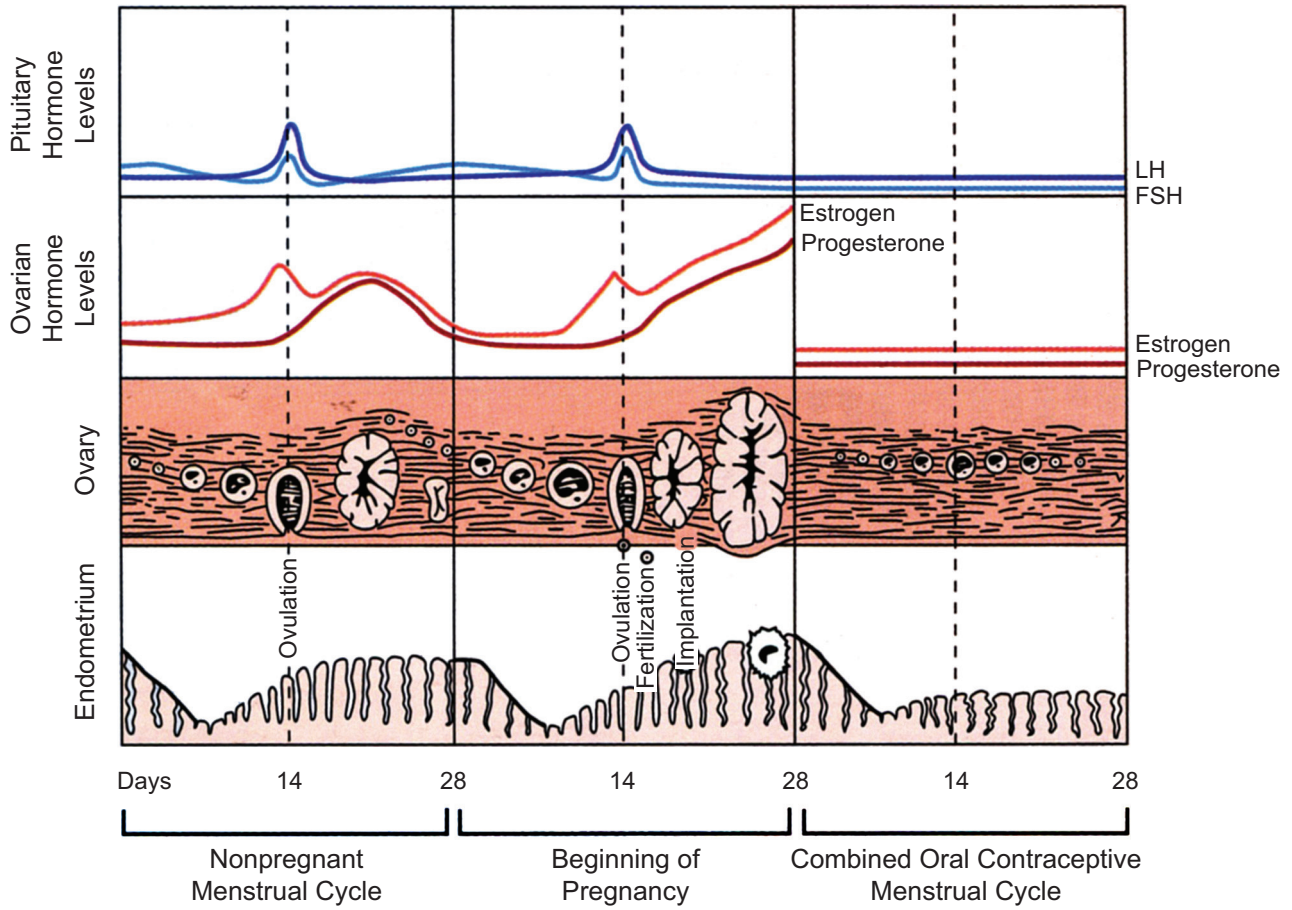

Fig. 1. Levels of estrogen, progesterone, and pituitary hormones, as well as depictions of the ovarian follicle and the uterine lining, in normally cycling women, pregnant women, and women taking hormonal contraceptives. LH = luteinizing hormone; FSH = follicle-stimulating hormone. Adapted from *The Benefits and Risks of Oral Contraceptives Today* (1st ed., p. 12), by J. Drife, 1996, Pearl River, NY: Parthenon Publishing Group. Copyright 1996 by Parthenon Publishing Group.

by estradiol and progesterone. Preferences for facial masculinity in partnered naturally cycling women, thought to be moderated by estrogen, are reversed in partnered women on the pill (Little, Jones, Penton-Voak, Burt, & Perrett, 2002). Preference for healthiness in faces is presumed to be moderated by progesterone, and oral contraceptive users' preference for healthiness in faces is halfway between that of women in the low-progesterone/high-estradiol phase of the menstrual cycle and that of women in the high-progesterone phase (Jones et al., 2005). Likewise, salivary progesterone is positively correlated with disgust sensitivity in naturally cycling women, and pill users exhibit less disgust sensitivity than do nonusers in the high-progesterone phase of the menstrual cycle (Fleischman & Fessler, 2010). Thus, research suggests that the pill does not enhance psychological processes thought to be linked to either estrogen or progesterone. For these reasons, women using the pill are often employed as a quasi-control group for research investigating the effects of hormones and the menstrual cycle on behavior (Kuukasjarvi et al., 2004; Miller, Tybur, & Jordan, 2007; Puts, 2006).

Conclusion

In summary, two observations call into question the explanation of Sprengelmeyer et al. for their finding that contraceptive users displayed elevated sensitivity to infant cuteness relative to nonusers. First, hormonal contraceptives lower circulating levels of estrogen and progesterone. Second, a preponderance of evidence indicates that exogenous versions of estrogen and progesterone do not enhance other forms of social evaluation known or thought to be mediated by these hormones. We propose three alternative explanations for the observations of Sprengelmeyer et al. First, systematic differences between women who choose to take the pill and those who do not (e.g., relationship status, sexual activity, cultural or genetic factors) may underlie the evident differences in sensitivity to cuteness. Second, because Sprengelmeyer et al. tested a relatively small sample of naturally cycling women ($n = 12$), it is possible that most of these women were tested in a menstrual cycle phase in which their interest in infants was substantially diminished. Third, it is possible that the core of Sprengelmeyer et al.'s

interpretation is correct, but that the observed patterns are not due to direct effects of estrogen and progesterone on the mind—rather, hormonal contraceptives may alter other aspects of physiology that, in turn, could influence sensitivity to infant cuteness.

Declaration of Conflicting Interests

The authors declared that they had no conflicts of interest with respect to their authorship or the publication of this article.

Note

1. Following Sprengelmeyer et al., we use the term "estrogen." However, there are three primary types of estrogen: 17β-estradiol, estrone, and estriol. When discussing specific scientific publications, we follow the terminology used by their authors, which is generally the name of the measured hormone, estradiol. Estradiol is the most potent and the most abundant type of estrogen before menopause.

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