



# References for Hormone Receptors on Vocal Folds

Compiled by MeredithColby.com

Hormone receptors are found in the nucleus and cytoplasm of cells in the vocal fold with statistically significant differences in age and gender distribution. Voice is considered a secondary sex organ, and a hormonal target organ.

## The impact of hormonal fluctuations on female vocal folds

<https://typeset.io/papers/the-impact-of-hormonal-fluctuations-on-female-vocal-folds-2d2x1kwpxl>

Early studies that explored this relation were based merely on subjective impressions of voice quality, recent studies have used more objective tools for examining this relation, including histologic observations (the study of tissues), stroboscope (a device which uses flashes of light to examine moving objects), electroglottography (EGG) - an instrument used to measure electrical signals generated by contact between two surfaces like vocal cords or lips-and computerized acoustic analyses – using computers for analyzing sound waves produced by speech or singing . In these studies, the larynx was shown to be a hormonal target organ and, as such, sex hormones affect its morphology, histology, and function, similar to their effect on the genitals and other organs.

This paper concludes that sex hormones have a significant effect on the vocal folds and laryngeal function of females. It also suggests that examining this relation could help clinicians better diagnose medical conditions related to voice production.

MC notes: this study measures the sound components of voices at certain ages. Hormone fluctuation is assumed. Impossible to determine how much change is based on hormones and how much is simply from the cumulative effects aging.

# Differential Responses to Steroid Hormones in Fibroblasts From the Vocal Fold, Trachea, and Esophagus

Shigeyuki Mukudai, Ken Ichi Matsuda, Takeshi Nishio, Yoichiro Sugiyama, Hideki Bando, Ryuichi Hirota, Hirofumi Sakaguchi, Yasuo Hisa, Mitsuhiro Kawata

*Endocrinology*, Volume 156, Issue 3, 1 March 2015, Pages 1000–1009,  
<https://doi.org/10.1210/en.2014-1605>

Fibroblasts in connective tissues secrete extracellular matrix (ECM) components such as collagen, elastin, and glycosaminoglycans that establish the structural framework of most tissues. Fibroblasts in many regions are targets of steroid hormones including androgen, estrogen, and glucocorticoids (1–17) and express receptors for these steroid hormones (3, 11, 18–22). Fibroblasts exhibit different characteristics depending on the tissue or organ (4) and may have different gene expression programs depending on their anatomic site of origin (23, 24). However, to date, evaluation of the action of steroid hormones on fibroblasts from specific tissues or organs has been limited (4, 24, 25).

The vocal folds are part of the phonatory system and a primary target of steroid hormones. In humans, the male vocal folds lengthen and thicken during puberty when blood levels of androgens increase, causing a deepening of the voice (26). Prevention of pubertal development of the voice by castrating young male singers was a well-known practice, especially in Italy beginning in the 16th century. The “castrati” had a small larynx and vocal folds and were well known for their clear, high-pitched voices (27). In women, fluctuations in estrogen and progesterone levels during the menstrual cycle are accompanied by variations in the pitch of the voice (28, 29). Administration of laryngeal corticosteroids is used for treatment of vocal fold scars (30), whereas inhalation of corticosteroids for treatment of bronchial asthma occasionally induces vocal fold atrophy (31). However, the detailed mechanisms of steroidal effects on fibroblasts in the vocal folds remain to be determined.

MC notes: further reading indicates there may be concentrated populations of receptors at the macula flava (2 pairs, anterior and posterior).

## What Voice-Related Metrics Change with Menopause? (meta analysis)

[Filipa M B Lã<sup>1</sup>](#), [Diego Ardura<sup>2</sup>](#)  
<https://pubmed.ncbi.nlm.nih.gov/32660847/>

Given the heterogeneous nature of the primary studies, random-effects models were applied to pool the estimates. Eight articles were considered eligible for meta-analyses, assessing the effects of menopause on 6 voice metrics: mean fundamental frequency ( $f_0$ ), extracted from (1)

speech and (2) from sustained vowel /a/; frequency perturbation measures (3) jitter, (4) shimmer and (5) noise-to-harmonics ratio; and (6) maximum phonation time.

MC notes: This draws from very limited and skewed data. The conclusion is consistent with data but inconsistent with lived experience of voice users. I include this meta analysis mostly because it's a good reference for research.