

# Effects of Hormones in Relation to the Differentiation of Terminal End Buds in the Rat Mammary Glands

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(Yonatan David, and Josh Solomowitz were supported by the Huntington Breast Cancer Action Coalition and the Great Neck Breast Cancer Coalition)

Topic of Presentation: Recent scientific data pertinent to the theme of Extended Environmental Exposures

## BACKGROUND

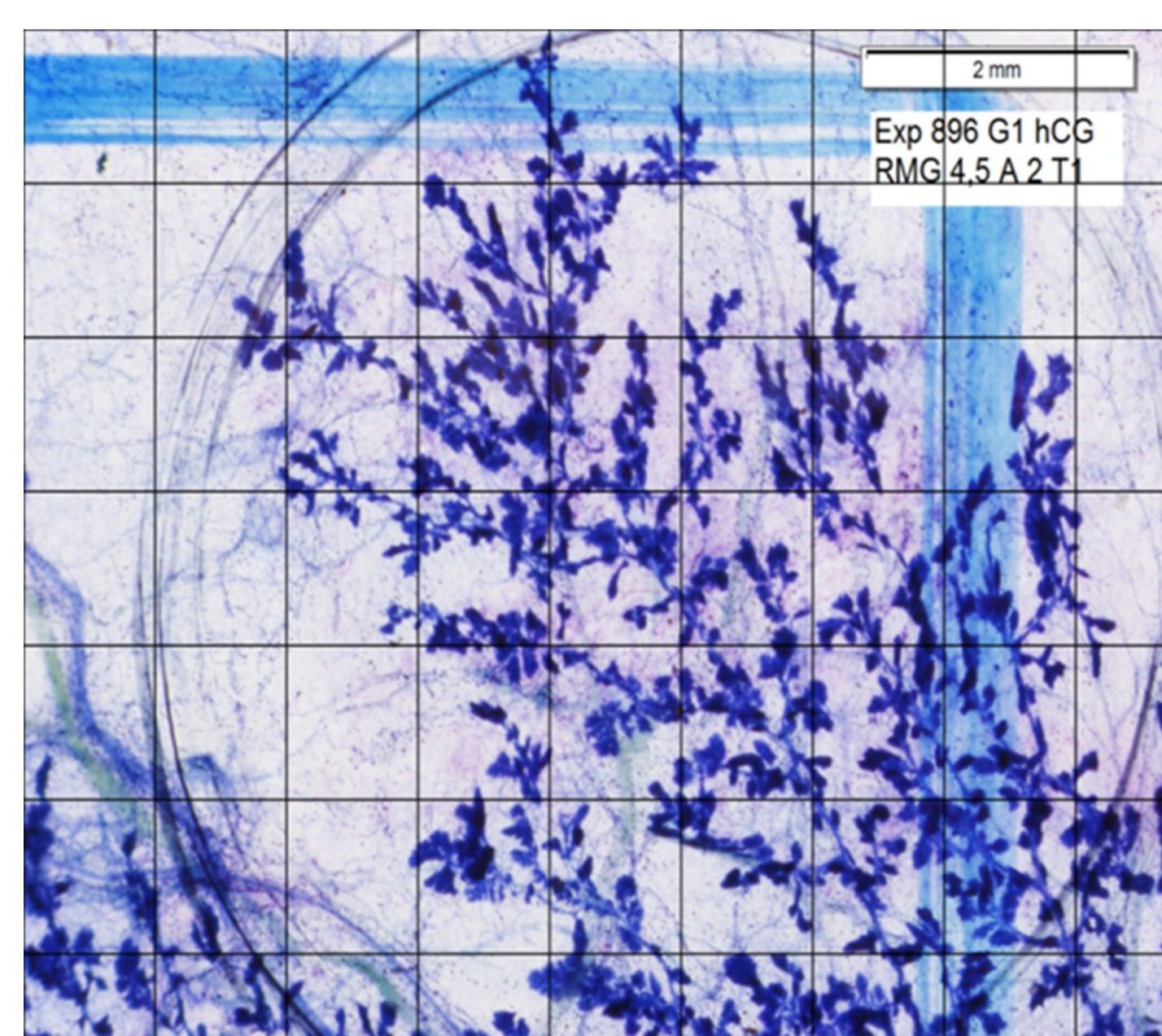
During the summer of 2011, four high school students worked in the Breast Cancer Research Laboratory at Fox Chase Cancer Facility. Fox Chase is a cancer research facility that is also a hospital and treats patients who are afflicted with any type of cancer. Two juniors were supported by the Huntington Breast Cancer Action Coalition (HBCAC) and by the Great Neck Breast Cancer Coalition (GNBCC). The student's main objective was to study environmental effects on breast cancer. Basically, three different hormones were tested in female rats. The students had to determine which hormone reduced the amount of Terminal End Buds the most, which then reduced the risk of acquiring breast cancer. This research was carried throughout the month of July, and was supervised by Dr. Jose and Irma Russo, Dr. Fatima Sharrieff, and Jhazelle Francis.

## PURPOSE

To compare the different effects of hormones/proteins to the rat mammary glands that would be able to further differentiate them, reducing the number of terminal end buds and resulting in a decreased chance of being afflicted with breast cancer.

## HYPOTHESIS

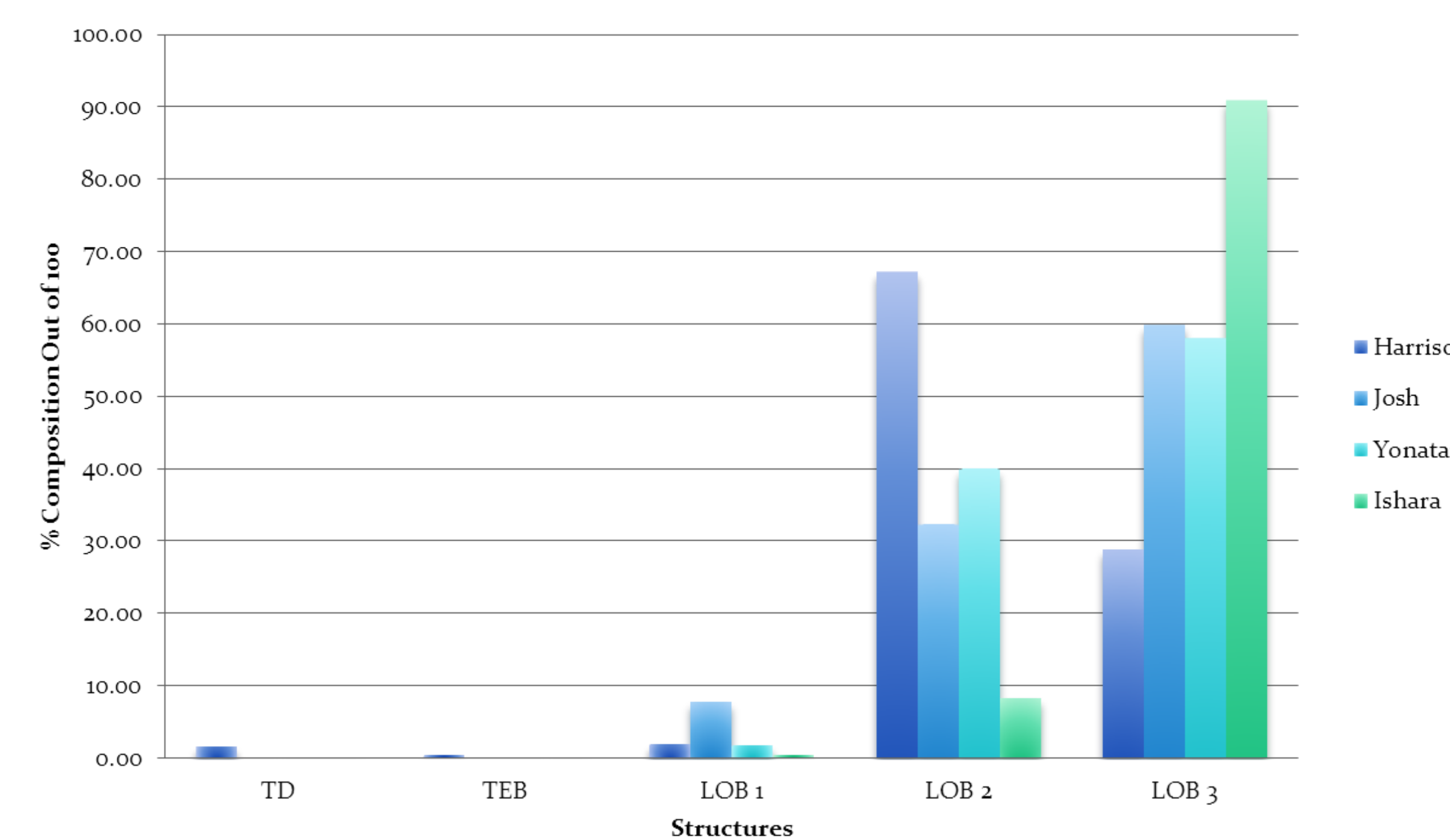
If a treatment decreases the amount of terminal end buds, and differentiates the mammary glands, there is a smaller chance of developing breast cancer.



## PROCEDURE

- Mammary glands dissected from female Sprague-Dawley rats.
- Pictures of wet mount mammary glands taken by an Olympus SZX10 and saved on computer and disc.
- For each grid box, record each amount of structures that appear.
- Analyze the data that was collected, to determine what hormone worked the best.

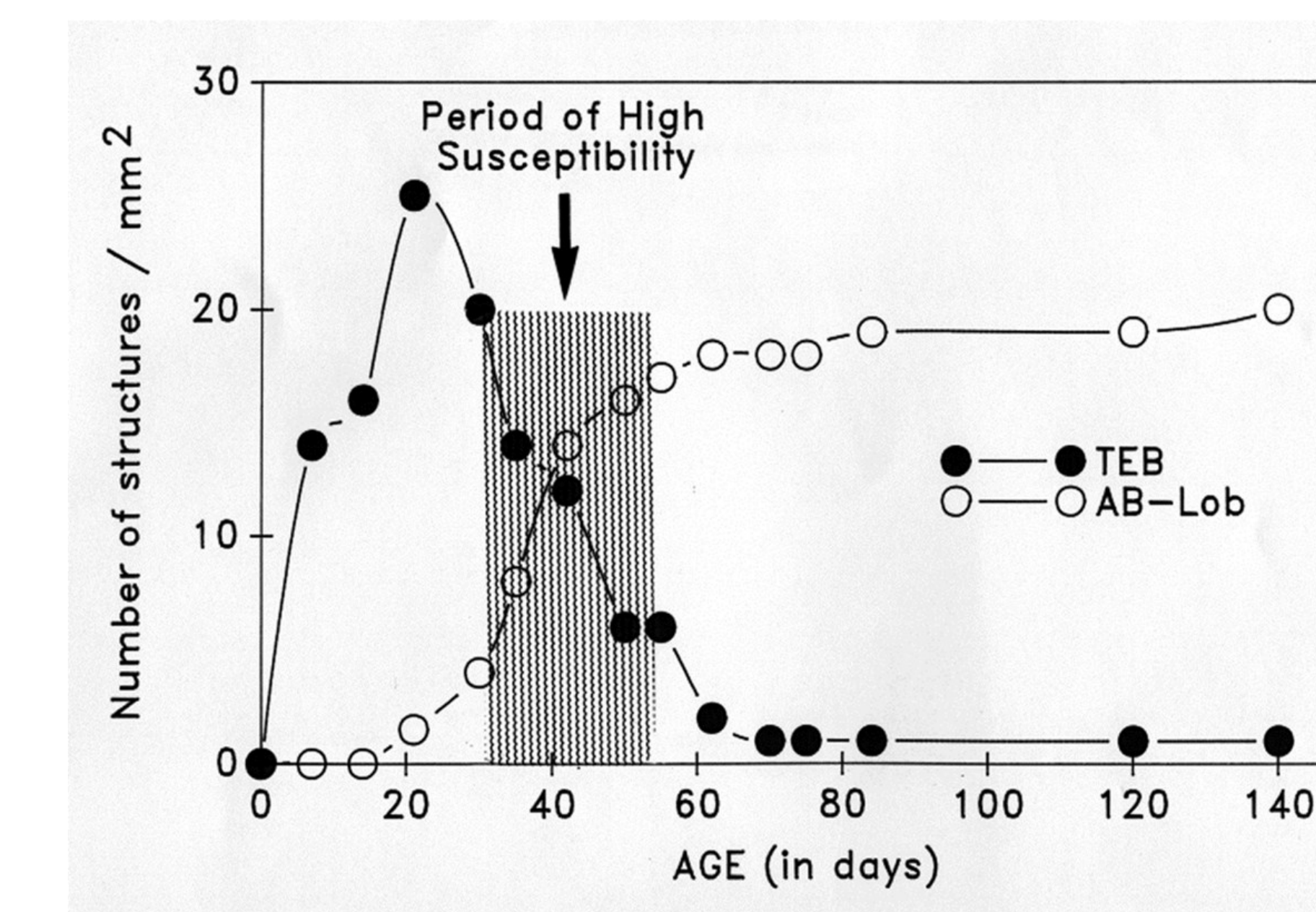
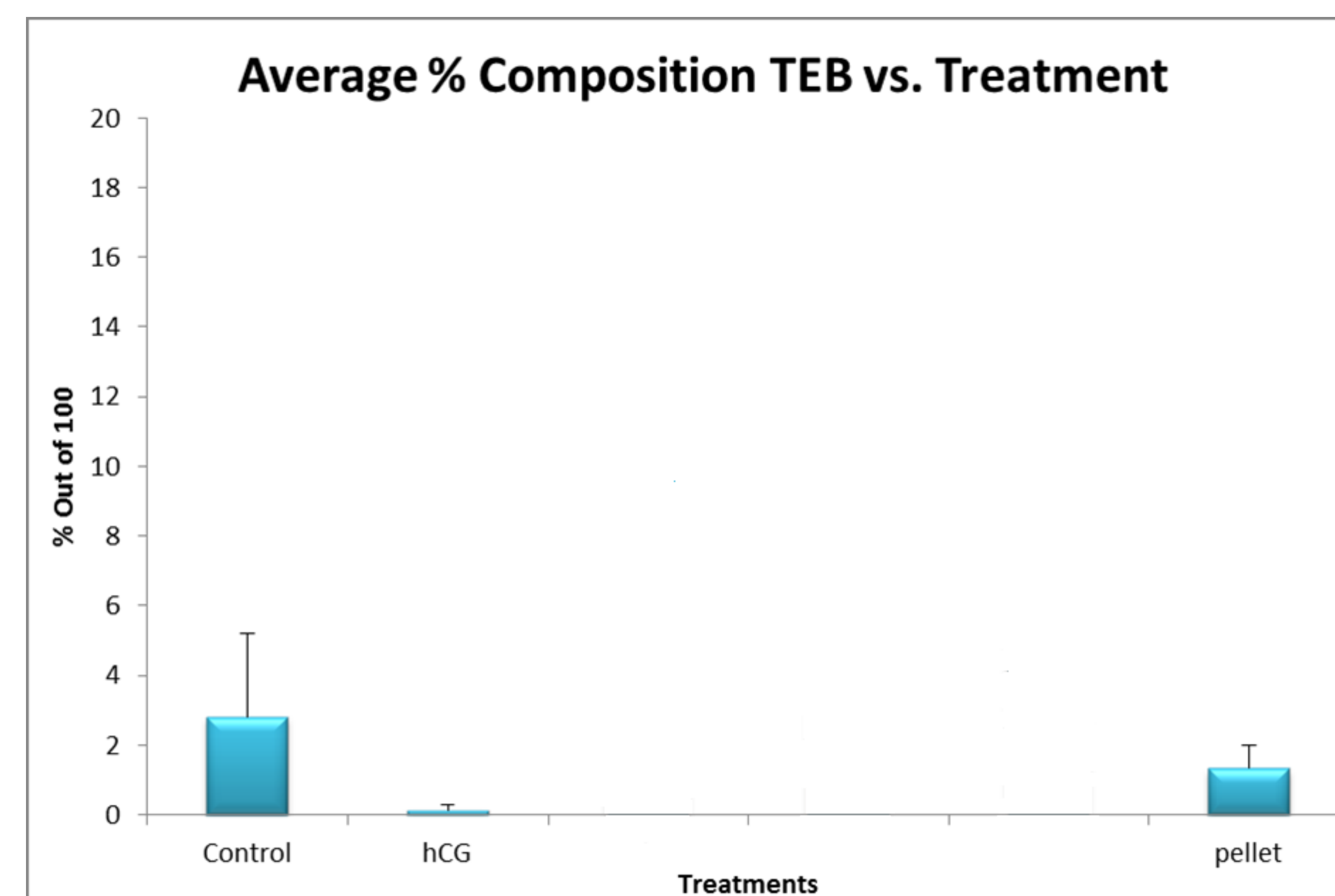
Average % Composition (hCG)



## RESULTS

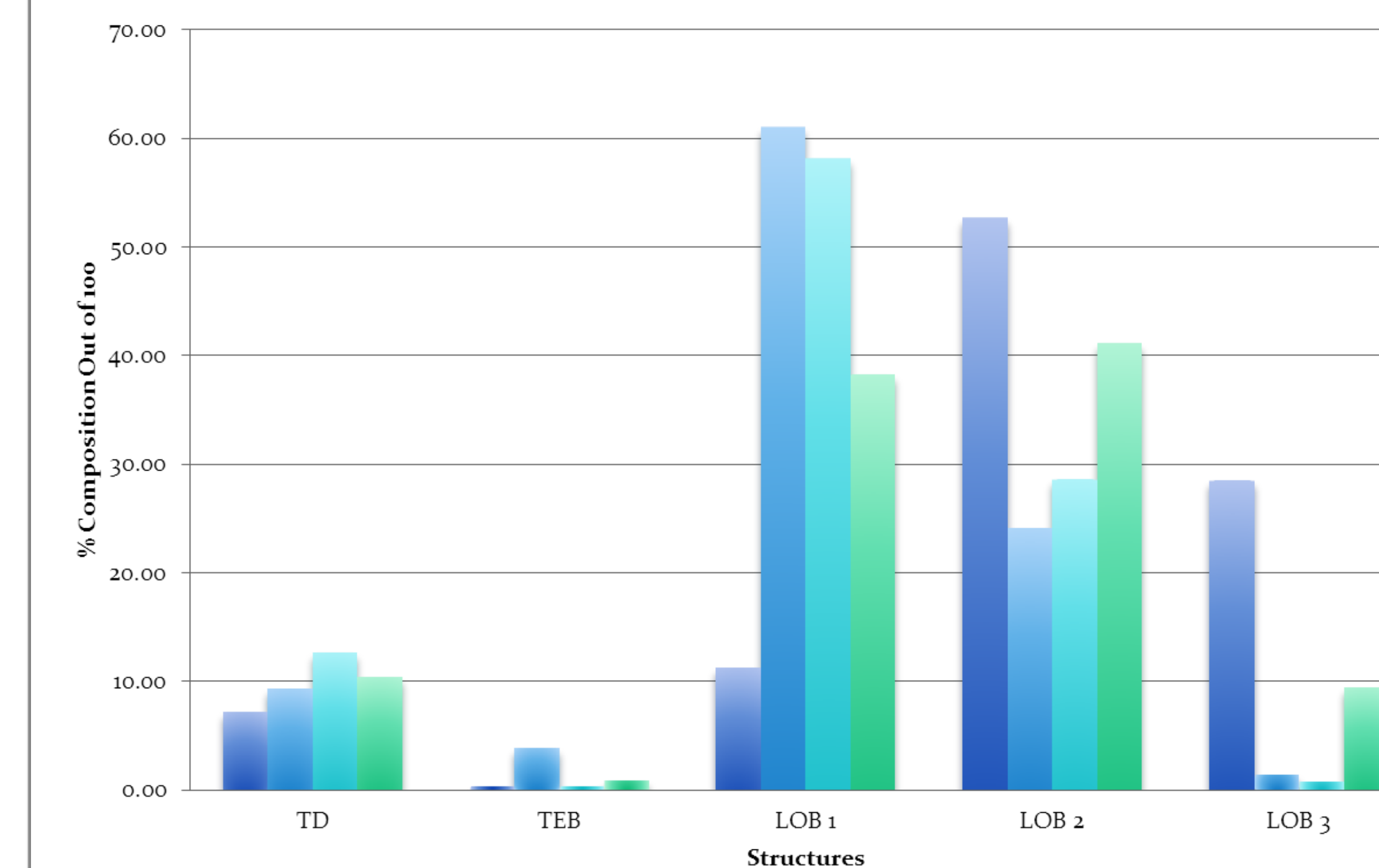
Many mammary glands were observed, with most of them differing in amount of structures based on the treatment given to them. Based on the observations, one hormone proved much more effective than the others in minimizing the total TEB's in the mammary glands. hCG greatly reduced the Terminal End Buds in the mammary glands much more significantly than estrogen and progesterone did.

Average % Composition TEB vs. Treatment



From: Russo J and Russo IH. Cancer Epidemiol Biomarkers & Prevention 3:353, 1994.

Average % Composition (Pellet)



## TERMINOLOGY



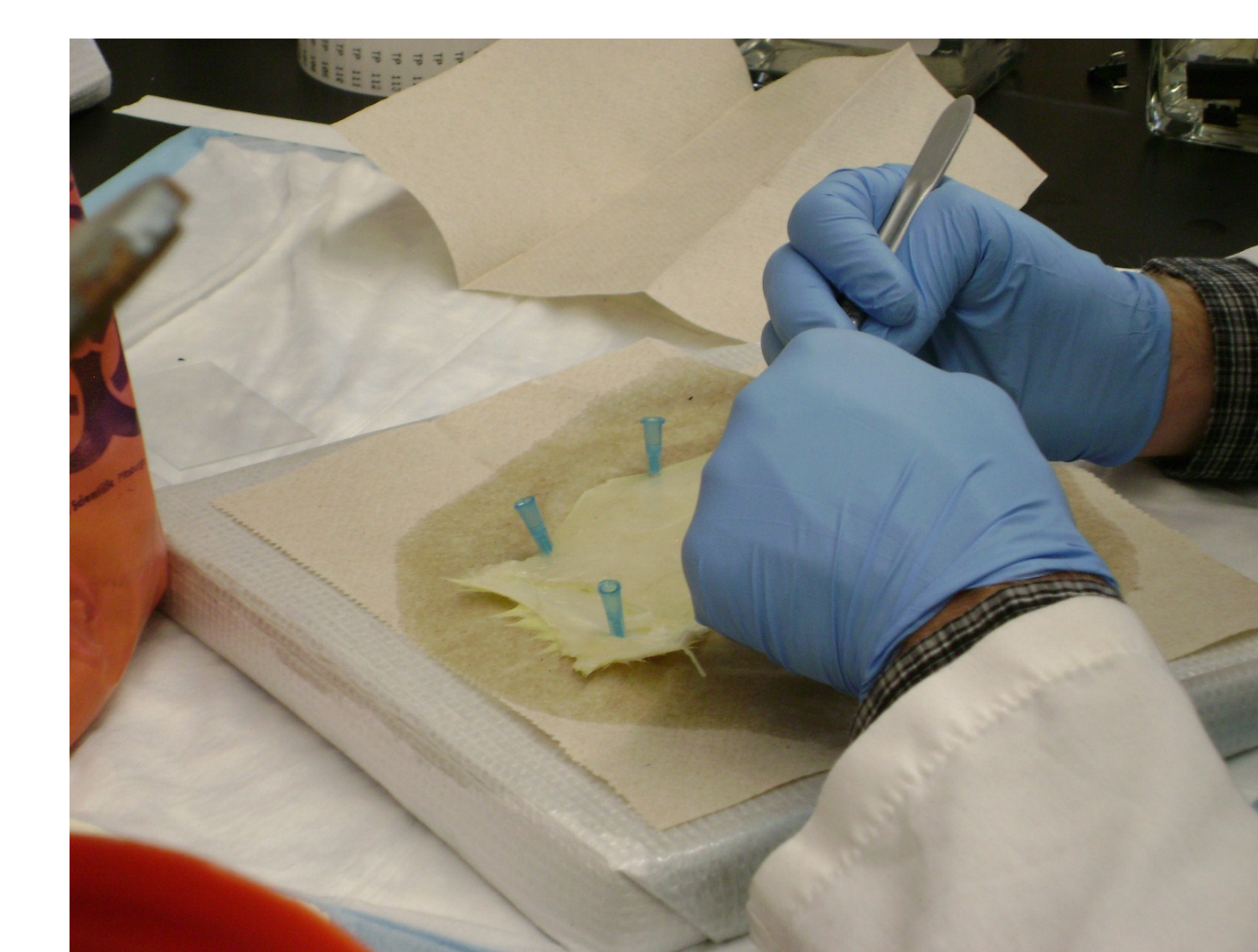
**Mammary Gland-** Any of the milk-producing glands in female mammals, consisting of lobes containing clusters of alveoli with a system of ducts to convey the milk to an external nipple. These glands typically occur in pairs and begin secreting milk when the offspring are born.

**Terminal End Buds (TEB's)-** structure found in the mammary gland that can differentiate into other structures. If exposed to carcinogens, they can become cancerous and will eventually turn into breast cancer.

**hCG (human chorionic gonadotropin)-** Released from the embryo after conception. Functions in maintaining the corpus luteum. Induces differentiation of the mammary gland. Studies have shown that hCG is able to protect against DMBA- induced mammary carcinogenesis, preventing tumor growth in the breast

**Estrogen-** Carcinogenic when given alone. Released in order to mature the uterine lining in case of pregnancy

**Progesterone-** Released by the corpus luteum. —Released from the ovaries in order to form the placenta



## DISCUSSION

The hormones: hCG, estrogen, and progesterone were all tested in rat mammary glands. The purpose was to somewhat reduce the amount of terminal end buds in the gland. Terminal end buds are the only structure in the mammary gland that could become cancerous if exposed to carcinogens. The procedure included counting various mammary glands and totaling the amount of structures that were observed. After much testing, it was proved that hCG was most effective in the reduction of the TEB's.

## CONCLUSION

Out of the three hormones tested, hCG worked the best to reduce the amount of Terminal End Buds. This proved that a hormone can greatly reduce TEB's in the mammary glands by differentiating them into harmless structures that could not become affected by carcinogens.

## FUTURE RESEARCH

If a hormone is found to have anti-tumorigenic properties, it may ultimately reduce the risk of breast cancer. Our research will lead to more experiments that will test other hormones with the goal to achieve better treatments for breast cancer. This research will eventually reduce the rates of breast cancer because the TEB's will have been reduced.