Sebaceous Gland Assays

Sebaceous glands in humans and animals are androgen-sensitive structures. Sebocyte activity depends on androgen stimulation. Without androgens there would be no acne. History informs us of the blemish-free skin of eunuchs. The “miracle” drug isotretinoin nearly completely shuts down sebum production, though not through the classical antiandrogen pathway.

The search for antiandrogens to treat acne systemically or topically has been going on for more than 25 years. Androgen-sensitive tissues include the prostate gland, testes, and seminal vesicles. It is now appreciated that the Golden Syrian Hamster has two androgen-dependent sebaceous gland regions which are very well suited to hormonal experiments. The presently available antiandrogens cyproterone acetate, megestrol acetate, and spironolactone were effectively screened in this system. It has been a frustration that only orally administered antiandrogens are effective in humans.

Flank Organ

The costovertebral flank organ is a paired nipple-like swelling, 3–5 mm in diameter, containing an aggregation of huge sebaceous glands. Three structures of this organ are androgen dependent: the sebocytes, the pigmented coarse hairs, and dermal melanocytes. Castration of male animals causes shrinkage of the sebaceous glands, regression of hairs, and loss of dermal pigment. Androgens stimulate each of the three components in females. Testosterone, after enzymatic conversion to dihydrotestosterone (DHT), binds to androgen receptors. This DHT–androgen receptor complex then binds to DNA. Thereafter protein synthesis via mRNA is stimulated, as is lipid synthesis. The cDNA for androgen-regulated mRNA in the flank organs has been characterized. Antiandrogenic effects can be assayed by a variety of morphological and biochemical methods. One can measure diameters, weight, histologic cross-sectional areas, as well as use radiolabeling techniques to gain insight into cellular kinetics (labeling index, turnover time, transit time), and protein content. All classical antiandrogens work in this system.

Ears

The dorsal and ventral sides of the pinna are studded with many large sebaceous glands, in shape and organization not unlike sebaceous follicles in humans. They have two to three large sebaceous lobules, draining into a common sebaceous duct and follicular infundibulum, with one small vellus hair unit attached. The follicular canal can retain corneocytes and thus build up comedo-like impactions. Access is via the ventral side.
Dozens of sebaceous follicles are available for histologic, morphometric, autoradiographic, and biochemical analyses. As there is no adipose tissue, the ear lobe has a great advantage over the flank organ.

Bacteria do not colonize these follicles. Propionibacterium acnes cannot be implanted. Therefore, bacteria-related phenomena of comedogenesis and inflammatory stages of papulopustules cannot be studied in these animal systems.


