

# Study Sheds Light on Atopic Dermatitis Infections

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VIENNA — Levels of some of the skin's key innate antimicrobial peptides are abnormally low in atopic dermatitis patients, perhaps accounting for the high rate of bacterial and viral superinfections in this population, Jurgen Harder, M.D., said at the annual meeting of the European Society for Dermatological Research.

The explanation for the low skin levels

of antimicrobial peptides may lie in the high levels of Th2 cytokines typically present in atopic skin. These cytokines appear to sharply inhibit secretion of the antimicrobial peptides by keratinocytes, added Dr. Harder of the University of Kiel (Germany). He presented evidence from in vitro studies done in Kiel showing that high concentrations of the Th2 cytokines interleukin-4 (IL-4), IL-10, and IL-13 greatly dampen the normally robust induction of an important antimicrobial peptide in

normal skin, human  $\beta$ -defensin-2, by *Pseudomonas aeruginosa*.

Expression of human  $\beta$ -defensin-2 was reduced in response to *P. aeruginosa* by 80%-90% in keratinocytes exposed to high levels of IL-4, by 70%-80% with IL-13, and by 20%-30% with IL-10.

These laboratory findings are consistent with the hypothesis that bacterially mediated induction of human  $\beta$ -defensin-2 and other inducible antimicrobial proteins is disrupted in atopic der-

matitis patients and that the culprit is high levels of the Th2 cytokines.

These studies also suggest a novel potential strategy for prevention of cutaneous superinfections in patients with atopic dermatitis: treatments aimed at decreasing the elevated Th2 cytokine levels, Dr. Harder said. It's worth noting, he added, that levels of innate antimicrobial proteins are high in the skin of psoriasis patients. This might explain their relatively low rate of bacterial superinfections despite the often severe damage to the skin's barrier function.

**Treatments aimed at decreasing the elevated Th2 cytokine levels are a novel potential strategy for fighting superinfections in this population.**



Brief Summary (for full Prescribing Information and Patient Information, refer to package insert.)

#### INDICATIONS AND USAGE

AndroGel® is indicated for replacement therapy in males for conditions associated with a deficiency or absence of endogenous testosterone:

- Primary hypogonadism (congenital or acquired) – testicular failure due to cryptorchidism, bilateral torsion, orchitis, vanishing testis syndrome, orchiectomy, Klinefelter's syndrome, chemotherapy, or toxic damage from alcohol or heavy metals. These men usually have low serum testosterone levels and gonadotropins (FSH, LH) above the normal range.
- Hypogonadotropic hypogonadism (congenital or acquired) – idiopathic gonadotropin or luteinizing hormone-releasing hormone (LHRH) deficiency or pituitary-hypothalamic injury from tumors, trauma, or radiation. These men have low testosterone serum levels but have gonadotropins in the normal or low range.

AndroGel® has not been clinically evaluated in males under 18 years of age.

#### CONTRAINDICATIONS

Androgens are contraindicated in men with carcinoma of the breast or known or suspected carcinoma of the prostate.

AndroGel® is not indicated for use in women, has not been evaluated in women, and must not be used in women.

Pregnant women should avoid skin contact with AndroGel® application sites in men. Testosterone may cause fetal harm. In the event that unwashed or undried skin to which AndroGel® has been applied does come in direct contact with the skin of a pregnant woman, the general area of contact on the woman should be washed with soap and water as soon as possible. *In vitro* studies show that residual testosterone is removed from the skin surface by washing with soap and water.

AndroGel® should not be used in patients with known hypersensitivity to any of its ingredients, including testosterone USP that is chemically synthesized from soy.

#### WARNINGS

- Prolonged use of high doses of orally active 17- $\alpha$ -alkyl androgens (e.g., methyltestosterone) has been associated with serious hepatic adverse effects (peliosis hepatitis, hepatic neoplasms, cholestatic hepatitis, and jaundice). Peliosis hepatitis can be a life-threatening or fatal complication. Long-term therapy with testosterone enanthate, which elevates blood levels for prolonged periods, has produced multiple hepatic adenomas. Testosterone is not known to produce these adverse effects.
- Geriatric patients treated with androgens may be at an increased risk for the development of prostatic hyperplasia and prostatic carcinoma.
- Geriatric patients and other patients with clinical or demographic characteristics that are recognized to be associated with an increased risk of prostate cancer should be evaluated for the presence of prostate cancer prior to initiation of testosterone replacement therapy. In men receiving testosterone replacement therapy, surveillance for prostate cancer should be consistent with current practices for prostatic cancer (see PRECAUTIONS: Carcinogenesis, Mutagenesis, Impairment of Fertility and Laboratory Tests).

- Edema with or without congestive heart failure may be a serious complication in patients with preexisting cardiac, renal, or hepatic disease. In addition to discontinuation of the drug, diuretic therapy may be required.
- Gynecomastia frequently develops and occasionally persists in patients being treated for hypogonadism.
- The treatment of hypogonadal men with testosterone esters may potentiate sleep apnea in some patients, especially those with risk factors such as obesity or chronic lung diseases.

- ALCOHOL BASED GELS ARE FLAMMABLE. AVOID FIRE, FLAME OR SMOKING UNTIL THE GEL HAS DRIED.

#### PRECAUTIONS

Transfer of testosterone to another person can occur when vigorous skin-to-skin contact is made with the application site. The following precautions are recommended to minimize potential transfer of testosterone from AndroGel®-treated skin to another person:

- Patients should wash their hands immediately with soap and water after application of AndroGel®.
- Patients should cover the application site(s) with clothing after the gel has dried (e.g., a shirt).
- In the event that unwashed or undried skin to which AndroGel® has been applied does come in direct contact with the skin of another person, the general area of contact on the other person should be washed with soap and water as soon as possible. *In vitro* studies show that residual testosterone is removed from the skin surface by washing with soap and water.

Changes in body hair distribution, significant increase in acne, or other signs of virilization of the female partner should be brought to the attention of a physician.

#### General

The physician should instruct patients to report any of the following:

- Too frequent or persistent erections of the penis.
- Any nausea, vomiting, changes in skin color, or ankle swelling.
- Breathing disturbances, including those associated with sleep.

#### Information for Patients

Advise patients to carefully read the information brochure that accompanies each carton of AndroGel® single-use packets or AndroGel® Pump.

#### Advise patients of the following:

- AndroGel® should not be applied to the scrotum.
- AndroGel® should be applied once daily to clean dry skin.
- After application of AndroGel®, it is currently unknown for how long showering or swimming should be delayed. For optimal absorption of testosterone, it appears reasonable to wait at least 5-6 hours after application prior to showering or swimming. Nevertheless, showering or swimming after just 1 hour should have a minimal

effect on the amount of AndroGel® absorbed if done very infrequently.

- Since alcohol based gels are flammable, avoid fire, flame or smoking until the gel has dried.

#### Laboratory Tests

- Hemoglobin and hematocrit levels should be checked periodically (to detect polycythemia) in patients on long-term androgen therapy.
- Liver function, prostatic specific antigen, cholesterol, and high-density lipoprotein should be checked periodically.
- To ensure proper dosing, serum testosterone concentrations should be measured (see DOSAGE AND ADMINISTRATION).

#### Drug Interactions

**Oxyphenbutazone:** Concurrent administration of oxyphenbutazone and androgens may result in elevated serum levels of oxyphenbutazone.

**Insulin:** In diabetic patients, the metabolic effects of androgens may decrease blood glucose and, therefore, insulin requirements.

**Propranolol:** In a published pharmacokinetic study of an injectable testosterone product, administration of testosterone cypionate led to an increased clearance of propranolol in the majority of men tested.

**Corticosteroids:** The concurrent administration of testosterone with ACTH or corticosteroids may enhance edema formation; thus, these drugs should be administered cautiously, particularly in patients with cardiac or hepatic disease.

#### Drug/Laboratory Test Interactions

Androgens may decrease levels of thyroxine-binding globulin, resulting in decreased total T4 serum levels and increased resin uptake of T3 and T4. Free thyroid hormone levels remain unchanged, however, and there is no clinical evidence of thyroid dysfunction.

**Carcinogenesis, Mutagenesis, Impairment of Fertility**

**Animal Data:** Testosterone has been tested by subcutaneous injection and implantation in mice and rats. In mice, the implant induced cervical-uterine tumors, which metastasized in some cases. There is suggestive evidence that injection of testosterone into some strains of female mice increases their susceptibility to hepatoma. Testosterone is also known to increase the number of tumors and decrease the degree of differentiation of chemically induced carcinomas of the liver in rats.

**Human Data:** There are rare reports of hepatocellular carcinoma in patients receiving long-term oral therapy with androgens in high doses. Withdrawal of the drugs did not lead to regression of the tumors in all cases.

Geriatric patients treated with androgens may be at an increased risk for the development of prostatic hyperplasia and prostatic carcinoma.

Geriatric patients and other patients with clinical or demographic characteristics that are recognized to be associated with an increased risk of prostate cancer should be evaluated for the presence of prostate cancer prior to initiation of testosterone replacement therapy.

In men receiving testosterone replacement therapy, surveillance for prostate cancer should be consistent with current practices for prostatic cancer (see PRECAUTIONS: Carcinogenesis, Mutagenesis, Impairment of Fertility and Laboratory Tests).

**Pregnancy Category X (see CONTRAINDICATIONS)** – Teratogenic Effects: AndroGel® is not indicated for women and must not be used in women.

**Nursing Mothers:** AndroGel® is not indicated for women and must not be used in women.

**Pediatric Use:** Safety and efficacy of AndroGel® in pediatric patients have not been established.

#### ADVERSE REACTIONS

In a controlled clinical study, 154 patients were treated with AndroGel® for up to 6 months (see Clinical Studies). Adverse Events possibly, probably or definitely related to the use of AndroGel® and reported by  $\geq 1\%$  of the patients are listed in Table 1.

Table 1. Adverse Events Possibly, Probably or Definitely Related to Use of AndroGel® in the Controlled Clinical Trial

Adverse Event	Dose of AndroGel®		
	5 g	7.5 g	10 g
Acne	1%	3%	8%
Atropia	1%	0%	1%
Application Site Reaction	5%	3%	4%
Asthenia	0%	3%	1%
Depression	1%	0%	1%
Emotional Lability	0%	3%	3%
Gynecomastia	1%	0%	3%
Headache	4%	3%	0%
Hypertension	3%	0%	3%
Lab Test Abnormal*	6%	5%	3%
Libido Decreased	0%	3%	1%
Nervousness	0%	3%	1%
Pain Breast	1%	3%	1%
Prostate Disorder**	3%	3%	5%
Testis Disorder	3%	0%	0%

\* Lab test abnormal occurred in nine patients with one or more of the following events: elevated hemoglobin or hematocrit, hyperlipidemia, elevated triglycerides, hypokalemia, decreased HDL, elevated glucose, elevated creatinine, or elevated total bilirubin.

\*\* Prostate disorders included five patients with enlarged prostate, one patient with BPH, and one patient with elevated PSA results. The following adverse events possibly related to the use of AndroGel® occurred in fewer than 1% of patients: amnesia, anxiety, discolored hair, dizziness, dry skin, hirsutism, hostility, impaired urination, paresthesia, penis disorder, peripheral edema, sweating, and vasodilation.

In this clinical trial of AndroGel®, skin reactions at the site of application were occasionally reported with AndroGel®, but none was severe enough to require treatment or discontinuation of drug. Six (4%) patients in this trial had adverse events that led to discontinuation of AndroGel®. These events included the following: cerebral hemorrhage, convulsion (neither of which were considered related to AndroGel® administration), depression, sadness, memory loss, elevated prostate specific antigen and hypertension. No AndroGel® patients discontinued due to skin reactions.

In an uncontrolled pharmacokinetic study of 10 patients, two had adverse events associated with AndroGel®; these were asthenia and depression in one patient and increased libido and hyperkinesia in the

other. Among 17 patients in foreign clinical studies there was 1 instance each of acne, erythema and benign prostatic adenoma associated with a 2.5% testosterone gel formulation applied dermally.

One hundred six (106) patients have received AndroGel® for up to 12 months in a long-term follow-up study for patients who completed the controlled clinical trial. The preliminary safety results from this study are consistent with those reported for the controlled clinical trial. Table 2 summarizes those adverse events possibly, probably or definitely related to the use of AndroGel® and reported by at least 1% of the total number of patients during long-term exposure to AndroGel®.

Table 2. Incidence of Adverse Events Possibly, Probably or Definitely Related to the Use of AndroGel® in the Long-Term, Follow-up Study I

Adverse Event	Dose of AndroGel®		
	5 g	7.5 g	10 g
Lab Test Abnormal*	4.2%	0.0%	6.3%
Peripheral Edema	1.4%	0.0%	3.1%
Acne	2.8%	0.0%	12.5%
Application Site Reaction	9.7%	10.0%	3.1%
Prostate Disorder**	2.8%	5.0%	18.8%
Urination Impaired	2.8%	0.0%	0.0%

\* Lab test abnormal included one patient each with elevated GGTP, elevated hematocrit and hemoglobin, increased total bilirubin, worsened hyperlipidemia, decreased HDL, and hypokalemia.

\*\* Prostate disorders included enlarged prostate, elevated PSA results, and in one patient, a new diagnosis of prostate cancer; three patients (one taking 7.5 g daily and two taking 10 g daily) discontinued AndroGel® treatment during the long-term study because of such disorders.

#### DRUG ABUSE AND DEPENDENCE

AndroGel® contains testosterone, a Schedule III controlled substance as defined by the Anabolic Steroids Control Act.

Oral ingestion of AndroGel® will not result in clinically significant serum testosterone concentrations due to extensive first-pass metabolism.

#### OVERDOSAGE

There is one report of acute overdosage by injection of testosterone enanthate: testosterone levels of up to 11,400 ng/dL were implicated in a cerebrovascular accident.

#### DOSAGE AND ADMINISTRATION

The recommended starting dose of AndroGel® 1% is 5 g delivering 5 mg of testosterone systemically, applied once daily (preferably in the morning) to clean, dry, intact skin of the shoulders and upper arms and/or abdomen. Serum testosterone levels should be measured approximately 14 days after initiation of therapy to ensure proper dosing. If the serum testosterone concentration is below the normal range, or if the desired clinical response is not achieved, the daily AndroGel® 1% dose may be increased from 5 g to 7.5 g and from 7.5 g to 10 g as instructed by the physician.

AndroGel® is available in either unit-dose packets or multiple-dose pumps. The metered-dose pump delivers 1.25 g of product when the pump mechanism is fully depressed once.

AndroGel® must not be applied to the genitals.

If using the multi-dose AndroGel® Pump, patients should be instructed to prime the pump before using it for the first time by fully depressing the pump mechanism (actuation) 3 times and discard this portion of the product to assure precise dose delivery. After the priming procedure, patients should completely depress the pump one time (actuation) for every 1.25 g of product required to achieve the daily prescribed dosage. The product may be delivered directly into the palm of the hand and then applied to the desired application sites, either one pump actuation at a time or upon completion of all pump actuations required for the daily dose. Please refer to the chart below for specific dosing guidelines when the AndroGel® pump is used.

Prescribed Daily Dose	Number of Pump Actuations
5 g	4 (once daily)
7.5 g	6 (once daily)
10 g	8 (once daily)

If using the packet(s), the entire contents should be squeezed into the palm of the hand and immediately applied to the application sites. Alternately, patients may squeeze a portion of the gel from the packet into the palm of the hand and apply to application sites. Repeat until entire contents have been applied.

Application sites should be allowed to dry for a few minutes prior to dressing. Hands should be washed with soap and water after AndroGel® has been applied.

#### HOW SUPPLIED

AndroGel® 1% is supplied in non-aerosol, metered-dose pumps. The pump is composed of plastic and stainless steel and an LDPE/aluminum foil inner liner encased in rigid plastic with a polypropylene cap. Each individual packaged 88 g AndroGel® Pump is capable of dispensing 75 g or 60 metered 1.25 g doses.

AndroGel® 1% is also supplied in unit-dose aluminum foil packets in cartons of 30. Each packet of 2.5 g or 5 g gel contains 25 mg or 50 mg testosterone, respectively.

NDC Number	Package Size
0051-8488-33	75 g pump (dispenses 60 metered 1.25 g doses)
0051-8488-88	2 x 75 g pumps (each pump dispenses 60 metered 1.25 g doses)
0051-8425-30	30 packets (2.5 g per packet)
0051-8450-30	30 packets (5 g per packet)

Keep AndroGel® out of the reach of children.

Manufactured by:  
Laboratoires Besins International  
Montrouge, France

For:  
United Pharmaceuticals, Inc.  
A Solvay Pharmaceuticals, Inc. Company  
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## Quick Fungal Dx With In Situ Hybridization

BOSTON — In situ hybridization may provide a much faster method of diagnosing dimorphic fungal infections than tissue culturing, Jared J. Abbott, M.D., reported at the annual meeting of the American Society of Dermatopathology.

Although tissue culturing is considered the preferred diagnostic method in current practice, it takes time to complete. Often, tissue cultures are not done, said Dr. Abbott, a resident in pathology at the Mayo Clinic, Rochester, Minn.

Cutaneous fungal infections can be the presenting sign of a systemic infection, and thus the skin infection can be secondary. The prognosis of cutaneous fungal infections is heavily dependent on timely diagnosis and treatment, he said in a poster presentation.

Dr. Abbott and his colleagues diagnosed cutaneous infections of dimorphic fungi (histoplasmosis, blastomycosis, coccidiomycosis, or cryptococcosis) in five patients, four of whom were immunocompromised. Within 36-48 hours, in situ hybridization gave the same results as tissue culturing for all patients.

The investigators determined the presence of dimorphic fungi in all of the skin sections via morphology, but none of the organisms were diagnostically discernible.

The in situ hybridization method used by Dr. Abbott and his associates detected fungal ribosomal RNA elements in paraffin-embedded tissue using labeled, single-stranded DNA oligonucleotide probes.

"In situ hybridization has a potential role in distinguishing between organisms of similar morphology in cutaneous fungal infections," the investigators concluded.

—Jeff Evans