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# An Expert Update on Managing External Genital Warts

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### DISCLOSURES:

**Nurse Dehn** is a consultant to Hologic, Inc, Ortho-McNeil-Janssen Pharmaceuticals, Inc, and Graceway Pharmaceuticals, LLC; she is a speaker for Bayer HealthCare Pharmaceuticals, Genentech, Roche, Cord Blood Registry, and Abbott Labs; and she is a vendor for Cord Blood Registry.

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## External genital warts: diagnosis and burden of disease

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External genital warts (EGW) are caused by the human papillomavirus (HPV), a highly contagious sexually transmitted infection (STI). HPV infects the basal epithelium via microabrasions and tissue disruption of genital skin/mucosa or oral mucosa.<sup>1,2</sup> EGW are only one manifestation of HPV infection; HPV DNA may also integrate into the host genome and may lead to malignant transformation. New clinical practice guidelines from the Centers for Disease Control and Prevention (CDC), *Sexually Transmitted Diseases Treatment Guidelines, 2010*, provide information and recommendations on EGW.<sup>3</sup>

### TYPES OF HPV

More than 100 types of HPV have been identified to date, with about 40

types infecting the anogenital tract.<sup>3</sup> The types are categorized as high or low risk, based on oncogenic potential for causing cervical cancer. The types of HPV that cause EGW are not the same as those that can cause cervical cancer.<sup>4</sup>

Worldwide, HPV types 16 and 18 are responsible for most cervical cancer and are also associated with other anogenital cancers, including vulvar, vaginal, penile, and anal, as well as some oropharyngeal cancers. HPV types 6 and 11 are nononcogenic, and these low-risk types are the cause of 90% of EGW.<sup>3</sup> Tests for HPV types are available but are indicated only for women who are undergoing cervical cancer screening.<sup>3</sup>

In most cases, HPV infection is asymptomatic, with the immune system rendering HPV undetectable within

**TABLE. HPV Epidemiology<sup>4</sup>**

- Anogenital HPV is the most common sexually transmitted infection in the United States.
- Prevalence of HPV is estimated at 20 million.
- An estimated 6 million people are newly infected each year.
- About half of all sexually active adults have HPV at some point in their life.
- More than 500,000 new cases of EGW are diagnosed annually in the United States.
- The incidence of EGW increases every year.

Abbreviations: EGW, external genital warts; HPV, human papillomavirus.

2 years.<sup>4</sup> HPV infection is highly prevalent, with more than 50% of sexually active people becoming infected at least once (TABLE).<sup>4</sup> When oncogenic HPV types persist and do not resolve despite the host’s immune response, an environment for cancer development is created. Co-infection with low- and high-risk types is also possible. Multitype infection increases the risk of persistent infection and acquisition of other HPV types, as well as cytologic abnormalities.

**CLINICAL FEATURES OF EGW**

The differential diagnosis of EGW includes a number of other conditions, including condyloma lata, molluscum contagiosum, lichen nitidus, seborrheic keratosis, benign and dysplastic nevi, verrucous carcinoma, and micropapillomatosis labialis. The typical appearance of EGW is cauliflower-like, but they may be flat, papular, keratotic with a thick and horny layer, or frond-like (FIGURE). EGW may develop on the vulva, groin, perineum, or perianal skin. They may be asymptomatic, or they may cause anogenital pruritus, burning, and/or dyspa-

reunia. EGW may develop at multiple sites in some patients.

**DIAGNOSIS OF EGW**

The diagnosis of EGW is mainly accomplished by visual inspection. A biopsy is needed only if the patient is immunocompromised; the diagnosis is unclear; there is a sudden recent growth of lesion(s); or if the EGW are pigmented, indurated, fixed, ulcerated, or bleeding. An acetowhite test for EGW has a low positive predictive value, and the new CDC guidelines recommend against using it for diagnosis.

**IMPLICATIONS OF EGW**

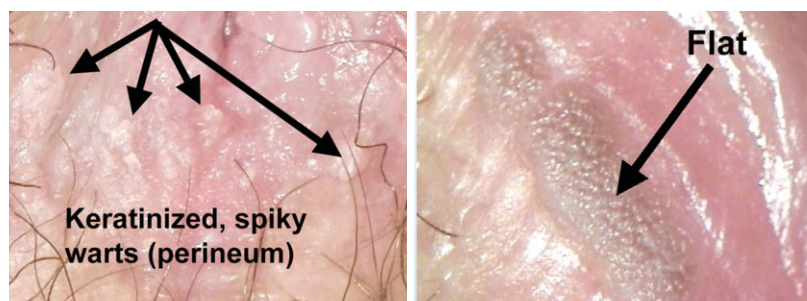
HPV is communicated through genital contact, usually during vaginal or anal sex, but can also be passed through oral sex. Many, if not most, infected people do not realize they are infected, and therefore, the infection can be passed on to a sex partner without their knowledge. Further complicating this is the long incubation from infection to appearance of symptoms, which can range from 3 weeks to 8 months.

The psychosocial impact of EGW is considerable. It can include anger, depression, and shame. Many patients feel there is a stigma associated with an STI, and this often has a negative impact on their relationships and sexual activity and enjoyment. There may be dyspareunia and fear of transmitting the disease to a partner, as well as fear of the possibility of the HPV infection progressing to cancer.

**CONCLUSION**

More than 500,000 new cases of EGW are diagnosed annually in the United States, with the rate increasing every year. EGW cause a substantial psychosocial burden in addition to the clinical burden. ■

**FIGURE. Morphology of External Genital Warts**



Images courtesy of J. T. Cox, MD.

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# Current and emerging options for treating external genital warts

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The variety of therapies for external genital warts allows the clinician, working with the patient, to design a regimen that best suits not only her clinical problem but also her personal preferences and the resources offered by the medical practice.

From a public health perspective, it is the *prevention* of disease that has always had highest priority. So, as physicians deal with patients' clinical problems, they can appreciate the importance of protecting them from infection with human papillomavirus (HPV) and all its sequelae.

For years, the mainstay of preventive advice regarding HPV has been: "Practice safer sex." Stable mutual monogamy with an uninfected partner is, of course, the most salubrious option for sexually active people. But, given the ubiquitous prevalence of HPV and current sexual mores, until recently there has been only the correct and consistent use of the male condom as the means to significantly reduce the spread of HPV.

Regrettably, most people are notoriously poor condom users. In one study, 44% of women who relied on the male condom as their only method of contraception admitted that they had had at least one episode of unprotected intercourse in the previous 2 weeks.<sup>1</sup>

## WHAT THE HPV VACCINE HAS MEANT FOR PUBLIC HEALTH

Introduction of bivalent and quadrivalent vaccines against HPV has created a much more effective way to prevent specific diseases associated with the viral types covered by those vaccines. The quadrivalent vaccine creates humoral immunity to HPV types 6 and 11, which cause 90% of external genital warts (EGW). FDA-approved for both men and women ages 9 to 26 years,

this vaccine offers a means to prevent EGW in men *and* women.

The vaccine also protects women from cervical dysplasia and cancer in 2 ways:

- It directly protects them from the so-called high-risk viral types 16 and 18 that cause 70% of cases of cervical cancer
- It reduces the risk that an unvaccinated woman will be exposed to high-risk HPV by reducing the rate of infection among her sexual partners.

Although uptake of the vaccine has been variable,<sup>2</sup> reports from Australia, where HPV vaccination is mandatory and generally funded for citizens, have documented a remarkable reduction in the numbers of cases of EGW among populations who were likely to have been vaccinated.<sup>3</sup>

## OPTIONS FOR TREATING EGW

The *Sexually Transmitted Diseases Treatment Guidelines, 2010* issued by the Centers for Disease Control and Prevention (CDC) emphasize the point that no single therapy is superior to any other for treating all EGW.<sup>4</sup> The best way to ensure success is to have an array of options available to tailor therapy to an individual patient's presentation and personal preferences. Often, one treatment can be used to provide partial clearance and a second one can be used to complete clearance of remaining lesions.

The primary objective for treating EGW is to eradicate the lesions to ameliorate symptoms. The patient may complain of burning or itching or suffer superinfection, but the presence of abnormal lesions alone provides sufficient rationale to initiate treatment.

The patient needs to understand 2 points before she and the clinician embark on therapy (especially if her lesions are few or small):

**TABLE. Treatments for External Genital Warts**

**Self-administered**

- Podofilox, 0.5% solution or gel
- Imiquimod, 3.75% cream
- Imiquimod, 5% cream
- Sinecatechins, 15% ointment

**Administered by a health care provider**

- Cryotherapy with liquid nitrogen or cryoprobe (repeat application every 1 or 2 wk)
- Podophyllin resin 10%-25% in a compound tincture of benzoin
- Trichloroacetic acid (TCA) or bichloroacetic acid (BCA) 80%-90%
- Surgical removal
  - Tangential scissor excision
  - Tangential shave excision
  - Curettage
  - Electrosurgery

- Watchful waiting may be appropriate, to see if the lesions spontaneously regress; even without therapy, lesions sometimes resolve spontaneously. It is also possible, however, that lesions will persist or even increase in size or number.
- Treatment may remove warts, but it is not designed for, nor is it capable of, eliminating HPV infection. That message is particularly important today, as patients are learning more about HPV infection.

**SPECIFIC CDC TREATMENT OPTIONS**

Available treatments for EGW can be classified by:

- their mechanism of action
- categories of surgical or medical approach
- the location (ie, the facility) at which therapy is provided.

The CDC organizes its discussion of treatments into those therapies that are patient-applied and those that are provider-applied. The TABLE summarizes treatments for EGW, each of which is discussed in detail below.

Selection of an initial treatment plan for any individual depends on several variables.

**The warts.** This refers to their morphology, number, and anatomic location. Warts on moist surfaces or intertriginous areas are most likely to respond to topi-

cal treatment. Those that are well pedunculated are easily removed with simple excision at the interface of the wart and unaffected skin. Multiple, thickly keratinized warts often require ablative therapy.

**The patient.** A patient’s preferences are often paramount and reflect her assessment of (1) her ability to successfully use the method (either by applying an agent at home or returning for additional visits), (2) the impact of potential side effects, (3) insurance coverage, and (4) cost, in time and money. The patient’s immunocompetence must also be considered.

**The health care provider.** What equipment is available? What expertise does she or he have in administering treatment?

Flexibility is also needed in treating a patient who has EGW. If initial therapy is ineffective or if the patient experiences significant side effects, the modality should be changed.

**Provider-administered therapies**

**Cryotherapy** destroys the wart by freezing the water within the mitochondria. Cryotherapy with liquid nitrogen is recommended for vaginal warts, urethral meatus warts, and anal warts.

With this therapy-induced cytolysis, the wart may take days, or weeks, to liquefy and disappear. Careful application of liquid nitrogen or a proper selection of cryotips is important to avoid destroying tissue surrounding the wart.

Pain after application is common and can be reduced by applying a topical local anesthetic before freezing the wart. Injected anesthesia may be helpful for extensive or large lesions.

Treatments can be repeated every 1 or 2 weeks, as long as individual lesions continue to respond to therapy. Allow adequate time between treatments of each wart to prevent depressed or hypertrophic scars. For external lesions, treating only a portion of the lesions at one time may reduce the severity of side effects.

Cryotherapy can be combined with patient-applied treatments (with the caveats listed below, under that discussion). Longer-term pigment changes in treated areas may be noticeable.

**Podophyllin resin 10% to 25% in tincture of benzoin** can be applied to individual warts, but to reduce the risk of systemic absorption, with its attendant neurotoxicity, less than 0.5 mL of podophyllin should be used for any one treatment application and less than a total of 10 cm<sup>2</sup> of warts should be treated at any session.

The solution should never be applied to disrupted skin or open lesions. The solution should be completely air-dried before the patient is allowed to dress, because residual liquid could be spread by clothing to adjacent skin. Repeat treatments can be scheduled each week as long as the lesion continues to respond.

Podophyllin resin preparations are not standardized—they vary in the concentration of active ingredients and contaminants. The shelf life and stability of podophyllin resin compounds are unknown. Consider using a fresh supply of the compound if a patient does not respond to treatment with an older bottle.

**Trichloroacetic acid and bichloroacetic acid (TCA/BCA; 80%-90% solution).** TCA and BCA are recommended for treating vaginal warts and anal warts. These agents destroy the wart by inducing chemical coagulation of proteins. Treatment is likewise nonspecific, inducing damage to all tissue it contacts. Careful technique must therefore be used in applying it to warts. These solutions have low viscosity, compared to water, and spread rapidly. Creating a moat around the wart with petroleum gel or lidocaine ointment can contain spread of the liquid.

Another technique that has been proposed is to pour only a limited amount of the solution into a container (ie, match fluid height to the height of the EGW). Dip the wooden end of the cotton-tipped applicator into the solution and apply only that amount of the TCA/BCA to the wart.

Ensure that all of the solution has completely dried before the patient dresses. Because a burning sensation is most prominent during drying, accelerating drying by using a hair dryer may be helpful—as long as the patient is comfortable with that approach.

Last, if some solution does spill onto other tissues, it can be neutralized with soap or sodium bicarbonate (baking powder). Excess material applied to a wart can be absorbed with talc, sodium bicarbonate, or liquid soap.

**Surgical therapies.** For pedunculated perianal warts that have a slender stalk, tangent excision with scissors or scalpel—separating the base of the wart from underlying upper dermis of the skin—is safe and effective. Hemostasis is generally easy to achieve with pressure, silver nitrate, chemical styptic (aluminum chloride solution) or Monsel's (ferric subsulfate) paste.

Alternatively, a CO<sub>2</sub> laser beam or electrocautery can be used to dissect the wart. Such surgical ablative therapies obviously require additional equipment and specialized training.

After local anesthetic is applied, warts can be destroyed by electrocautery, but attention must be paid to limit the depth of destruction to avoid scarring and future issues with chronic pain (vulvodynia) or hyperesthesia syndromes.

Surgical ablation with a CO<sub>2</sub> laser is also highly effective but is generally reserved for extensive lesions and those that have been demonstrated to be resistant to other therapies. In such cases, the procedure is done with more extensive anesthesia in an operating room. Control of the smoke plume is important because of the potential to release particles of HPV.

Excisional biopsy can be performed in an operating room for extremely large lesions, particularly if they obstruct the vagina, urethra, or rectum. Take care around those structures to avoid scarring or fibrosis.

### Patient-applied therapies

**Podofilox** is an antimitotic drug that destroys warts over time. It is available as a solution that is applied with a cotton swab or as a gel that is applied by finger. Applications are made twice daily for 3 consecutive days, followed by 4 days without treatment. The treatment cycle can be repeated for a total of as many as 4 cycles.

The same restrictions that applied to podophyllin therapy—ie, limiting the total volume of podofilox to 0.5 mL/d and limiting the total wart area to 10 cm<sup>2</sup>—apply here. The area should be washed off 6 to 8 hours after treatment. Mild or moderate pain or local ulceration might develop after application.

**Sinecatechin ointment** is a green-tea extract of catechins from leaves grown on specific farms in China to ensure product consistency. A 0.5-cm strand of ointment is applied 3 times a day with the finger to ensure that a thin layer covers each wart. Treatment is continued until the wart clears, but not for longer than 16 weeks.

The medication should not be washed off after use. All forms of sexual contact (oral, genital, anal) should be avoided while the ointment is on the skin. Use of a latex condom or diaphragm is discouraged because either may be damaged by the ointment.

The most common side effects are local skin reactions. Treatment with sinecatechin ointment is not recommended for immunocompromised persons (eg, HIV-infected or with clinical genital herpes) because the safety and efficacy of sinecatechin have not been established in those settings.

**Imiquimod 5% cream** is an immune modulator

that stimulates local production of cytokines to destroy the HPV-infected cells within the wart. The drug is applied to warts only once daily at bedtime, every other day, for a total of 3 doses in a 7-day period. The regimen can be repeated until the lesion clears, but not for longer than 16 weeks.

Treated areas should be washed with soap and water 6 to 10 hours after application of the drug. Because imiquimod is mixed in a petroleum-based vehicle, latex condoms and a diaphragm should be avoided; couples should wait until the ointment is washed off or use a polyisoprene or polyurethane condom.

Local inflammatory reactions, such as erythema, are common, as these are manifestations of the mechanism of action; irritation, induration, ulcerations, erosions, and vesicles can also develop, however. Hypopigmentation has been reported after treatment.

### A NEW THERAPY

**Imiquimod 3.75% cream.** The original imiquimod 5% cream amplified the natural (innate) cell-mediated immune system response to viral infection. The drug was able to successfully remove existing warts without increasing the risk that T cells recruited from surrounding tissue would leave those areas vulnerable and more prone to developing warts (the classic so-called ring of warts around the treated area).

The original treatment schedule with imiquimod 5% cream (3 nonconsecutive days a week) was selected because it was found that the more straightforward daily application schedule did not significantly reduce duration of therapy or enhance cure rates. It did, however, significantly increase side effects and complications, especially serious skin reactions.

In an attempt to improve the therapeutic success of this compound, a series of formulations containing different concentrations of imiquimod was developed for daily use. The optimal concentration was found to be

3.75%, applied daily for as long as 8 weeks or until the lesion clears, whichever comes first. By simplifying application (daily administration) and by shortening the total treatment duration (8 weeks), without increasing significant side effects, it was hoped that, in the real world, patients would be more likely to adhere to the necessary length of the course of therapy.

The results of the clinical trials have been reported in detail elsewhere<sup>5</sup>; the important findings that may be of particular interest to clinicians are included here.

Overall, the 3.75% concentration was found to be well tolerated and effective, especially for women. Daily application was found to be easy to use.

Direct comparison between the 3.75% formulation and the existing 5% cream cannot be made because the difference in dosing (daily and 3 times a week) cannot be blinded. Comparison of the outcomes of the clinical trials for the 3.75% formulation cannot be made with outcomes of trials of the original 5% formulation, because the definition of “successful outcome” and the rules for patient recruitment have changed greatly over time.

The most important of these changes is the FDA expectation that *all* genital warts be counted when assessing treatment success. Even warts that developed at the very end of the 8 weeks of therapy and had been given little or no treatment must be counted. (For the original 5% preparation, only baseline warts in predefined areas were evaluated; new warts that developed during the 16-week study were not counted.)

This expectation, although stringent, reflects what matters to potential users: that they have *no warts* after treatment is completed. The subjects in the 5% trial had their EGW for (a median of) 4.2 months; in trials of the 3.75% preparation, subjects had their warts for more than 4 times as long (median, 19.2 months).

Clinical trials of the imiquimod 3.75% cream have demonstrated that it is superior to placebo, even taking into account the more stringent study design expectations. In 78 centers, 981 immunocompetent men and nonpregnant, immunocompetent women were enrolled and randomized in a 2:2:1 ratio to receiving imiquimod 3.75% cream, imiquimod 2.5% cream, and placebo.<sup>5</sup> Because results with the 2.5% cream were not statistically significant, the 3.75% formulation was selected for the next phase of the trial.

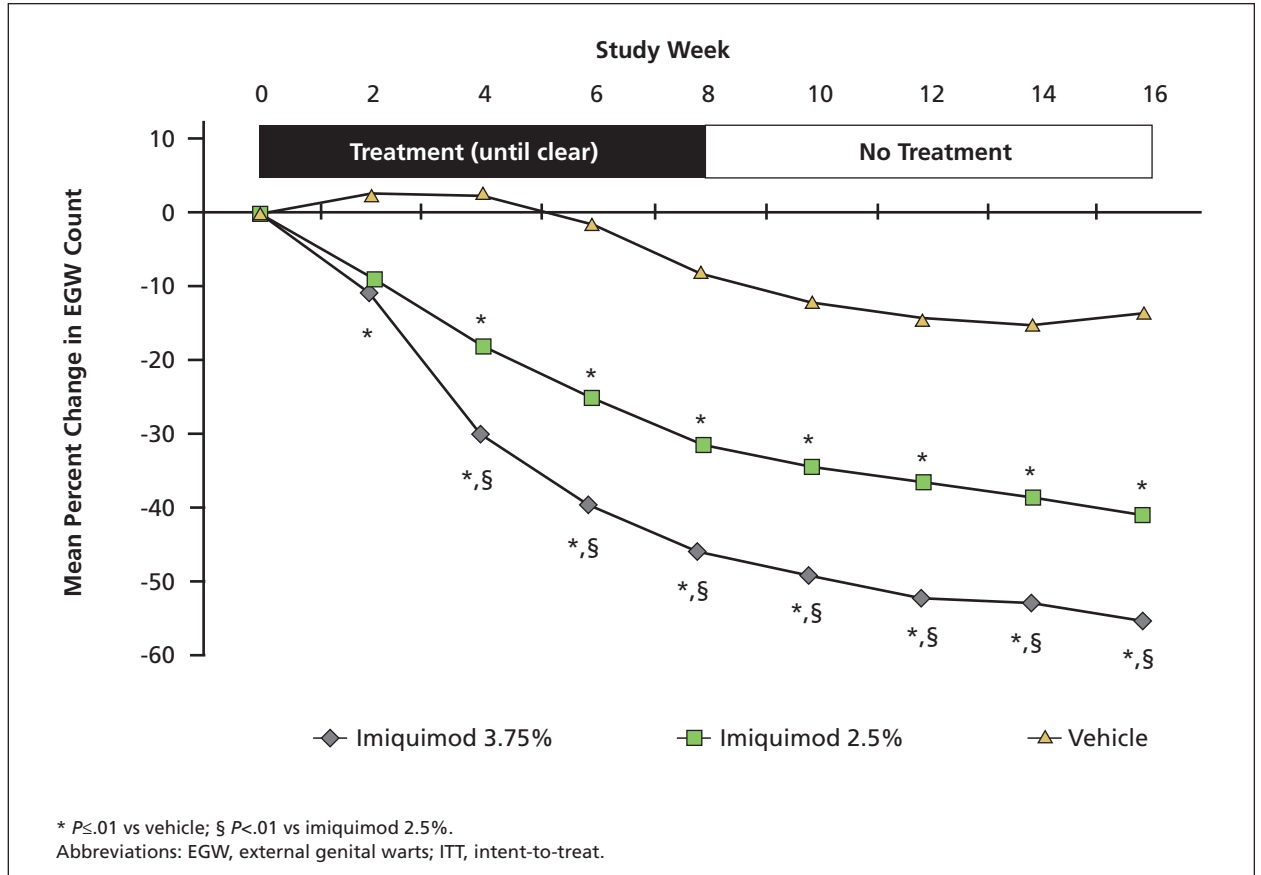
Subjects were instructed to use the 3.75% cream each night and wash it off in the morning. They were followed every 2 weeks for as long as 8 weeks of treat-



Scan this image to access more information about imiquimod 3.75% cream for the treatment of external genital warts.

Unable to scan the code? You can also text “EGW” to 25827 to learn more.

**FIGURE. Mean Percent Change in Wart Count From Baseline Visit: Women (ITT)<sup>5</sup>**



ment. When all warts had cleared completely (ie, no visible external genital warts), subjects were enrolled in a 3-month follow-up observational period to investigate the rate of development of new or recurrent warts.

Recognizing that, once activated, a subject’s immune system might continue to attack HPV-infected cells even after the last dose of study drug, a study element was then added. Subjects whose warts did not all completely clear during the 8-week treatment period were observed off-therapy for an additional 8 weeks. Those whose residual warts all cleared during that 8-week extended observation period were then transitioned into the 12-week follow-up study of recurrence.

Overall, women who applied at least 75% of their protocol-directed doses of the drug had a 43.1% rate of complete clearance; 72.5% had at least a 50% reduction in the number of EGW by the end of the study. The numbers for the intent-to-treat populations were 36.6% for complete clearance and 62.5% for more than 50% clearance.<sup>5</sup>

The timeline for the intent-to-treat women (FIGURE) shows that compared to placebo users, (1) users of the imiquimod 3.75% cream started to clear at 2 weeks and (2) many continued to experience benefits in the weeks after they finished using their cream.<sup>5</sup> This is important for clinicians to recognize, because they may want to delay using other therapies to eradicate remaining warts until the full benefit of the 8-week course of treatment is realized.

Ease of therapy was shown by the fact that 83.7% of users demonstrated correct and consistent use of the cream. The immune-modulating effect of the 3.75% cream was reflected in the relatively low rate (69.6%) of new wart development (ie, recurrence) during the 3 months of follow-up observation.

Only 1.5% of subjects discontinued the trial because of safety concerns. However, 17.5% reported experiencing a treatment-related adverse event at some time during the trial. Only 1.8% had a serious adverse event, and fewer than 0.3% experienced any systemic problems, such as fever, chills, myalgia, or nausea.

Local skin reactions were quite common. Overall, 75.9% had erythema that was noted by the investigator; 44.2% had edema. Only 16.3% had a severe local skin reaction (ie, spread outside the treatment area or requiring treatment with another medication). Most skin changes were well tolerated by subjects.

In short, the lower (3.75%) concentration formulation of imiquimod offers:

- a shorter course of treatment (8 weeks instead of 16 weeks)
- daily dosing (to facilitate ease of use)
- a low rate of severe adverse events
- a low rate of discontinuation because of side effects.

Other emerging treatments are on the horizon but have not yet been fully studied or evaluated and approved by the FDA.

### SUMMING UP...

Long-term management strategies, such as vaccination against HPV strains 6 and 11, have already demonstrated the potential to significantly reduce the prevalence of EGW. For women (and men) who already suffer from EGW, however, the variety of treatments available allows you, and them, to tailor treatment so that the selected regimen best suits not only the clinical problem (eg, the character and location of warts, immunocompetence, whether she smokes) but also the availability of resources (electrocautery, laser) and personal preference (is she willing to apply the prescribed treatment, or does she want her physician to?).

Each approach has its limitations, so patient and provider flexibility is likely to be an important contributor to success.

The availability of a new 3.75% imiquimod cream, which streamlines therapy and makes utilization easier to remember, offers a new option. The low intermediate-term recurrence rate seen with this new formulation will be an important consideration when selecting therapy.

Safer sex practices during treatment (eg, polyisoprene and polyurethane condoms) should always be encouraged. So should treatment of partners who have visible lesions.

As the new imiquimod 3.75% cream finds its way into the therapeutic armamentarium, and as other potential therapies are investigated, the frustration that both patients and providers experience when dealing with EGW may very well diminish. ■

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5. Data on File, Graceway Pharmaceuticals.

# Zyclara® [zi-clar-a]

(imiquimod) Cream  
3.75%

## HIGHLIGHTS OF PRESCRIBING INFORMATION

These highlights do not include all the information needed to use ZYCLARA safely and effectively. See full prescribing information for ZYCLARA Cream.

### ZYCLARA (imiquimod) Cream, 3.75%

For topical use only

Initial U.S. Approval: 1997

### RECENT MAJOR CHANGES

Indications and Usage. (1,2)

03/2011

### INDICATIONS AND USAGE

ZYCLARA Cream is indicated for the topical treatment of

• Actinic keratosis, visible or palpable actinic keratoses (AK) of the full face or balding scalp in immunocompetent adults. (1.1)

• External genital and perianal warts/condylooma acuminata (EGW) in patients 12 years or older. (1.2)

Limitations of Use: Efficacy of imiquimod cream was not demonstrated for molluscum contagiosum in children 2 to 12 years of age. (1.4, 8.4)

### DOSAGE AND ADMINISTRATION

For topical use only; not for oral, ophthalmic, intra-anal or intravaginal use. (2)

• Actinic Keratosis: Once daily to the skin of the affected area (either the entire face or balding scalp) for two 2-week treatment cycles separated by a 2-week no-treatment period. (2.1)

• External Genital Warts: Once daily to the external genital/perianal warts until total clearance or up to 8 weeks. (2.2)

### DOSAGE FORMS AND STRENGTHS

Cream, 3.75%, (3)

### CONTRAINDICATIONS

• None (4)

### WARNINGS AND PRECAUTIONS

• Intense local inflammatory reactions can occur (e.g., skin weeping, erosion). Dosing interruption may be required. (2, 5.1, 6)

• Flu-like systemic signs and symptoms including fatigue, nausea, fever, myalgias, arthralgias, and chills can occur. Dosing interruption may be required. (2, 5.2, 6)

• Avoid concomitant use of ZYCLARA Cream and any other imiquimod cream because of increased risk for adverse reactions. (5.4)

• Treatment of urethral, intra-vaginal, cervical, rectal or intra-anal human papilloma viral disease is not recommended as it has not been studied. (5.5)

### ADVERSE REACTIONS

Most common Adverse Reactions (>2%) are local skin reactions (erythema, edema, weeping/exudate, flaking/scaling/dryness, scabbing/crusting and erosion/ulceration), headache, fatigue, nausea and fever. (6.1, 6.2).

To report SUSPECTED ADVERSE REACTIONS, contact Graceway Pharmaceuticals, LLC at 1-800-328-0255 or FDA at 1-800-FDA-1088 or [www.fda.gov/medwatch](http://www.fda.gov/medwatch).

See 17 for PATIENT COUNSELING INFORMATION and FDA-approved patient labeling.

Revised: 03/2011

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## FULL PRESCRIBING INFORMATION

### 1 INDICATIONS AND USAGE

#### 1.1 Actinic Keratosis

ZYCLARA Cream is indicated for the topical treatment of clinically typical visible or palpable, actinic keratoses (AK), of the full face or balding scalp in immunocompetent adults.

#### 1.2 External Genital Warts

ZYCLARA Cream is indicated for the treatment of external genital and perianal warts (EGW)/condylooma acuminata in patients 12 years or older.

#### 1.3 Limitations of Use

Imiquimod cream has been evaluated in children ages 2 to 12 years with molluscum contagiosum and these studies failed to demonstrate efficacy [see *Use in Specific Populations* (8.4)].

Treatment with ZYCLARA has not been studied for prevention or transmission of HPV.

#### 1.4 Unevaluated Populations

The safety and efficacy of ZYCLARA Cream have not been established in the treatment of:

- urethral, intra-vaginal, cervical, rectal or intra-anal human papilloma viral disease.
- actinic keratosis when treated with more than one 2-cycle treatment course in the same area.
- patients with xeroderma pigmentosum.
- superficial basal cell carcinoma.
- immunosuppressed patients.

## 2 DOSAGE AND ADMINISTRATION

For topical use only; ZYCLARA Cream is not for oral, ophthalmic, intra-anal or intravaginal use.

### 2.1 Actinic Keratosis

ZYCLARA Cream should be applied once daily before bedtime to the skin of the affected area (either entire face or balding scalp) for two 2-week treatment cycles separated by a 2-week no-treatment period. ZYCLARA Cream should be applied as a thin film to the entire treatment area and rubbed in until the cream is no longer visible. Up to 2 packets of ZYCLARA Cream may be applied to the treatment area at each application. ZYCLARA Cream should be left on the skin for approximately 8 hours, after which time the cream should be removed by washing the area with mild soap and water. The prescriber should demonstrate the proper application technique to maximize the benefit of ZYCLARA Cream therapy.

Patients should wash their hands before and after applying ZYCLARA Cream.

Avoid use in or on the lips and nostrils. Do not use in or near the eyes.

Local skin reactions in the treatment area are common [see *Adverse Reactions* (6.1)]. A rest period of several days may be taken if required by the patient's discomfort or severity of the local skin reaction. **However, neither 2-week treatment cycle should be extended due to missed doses or rest periods.** A transient increase in lesion counts may be observed during treatment. Response to treatment cannot be adequately assessed until resolution of local skin reactions. The patient should continue dosing as prescribed. Treatment should continue for the full treatment course even if all actinic keratoses appear to be gone. Lesions that do not respond to treatment should be carefully re-evaluated and management reconsidered.

ZYCLARA Cream is packaged in single-use packets, with 28 packets supplied per box. Patients should be prescribed no more than 2 boxes (56 packets) for the total 2-cycle treatment course. Unused packets should be discarded. Partially-used packets should be discarded and not reused.

### 2.2 External Genital Warts

Patients should apply a thin layer of ZYCLARA Cream once a day to the external genital/perianal warts until total clearance or for up to 8 weeks. Up to one packet of ZYCLARA Cream may be applied to the treatment area at each application. ZYCLARA Cream should be applied prior to normal sleeping hours and left on the skin for approximately 8 hours, then removed by washing the area with mild soap and water. The prescriber should demonstrate the proper application technique to maximize the benefit of ZYCLARA Cream therapy.

Patients should wash their hands before and after applying ZYCLARA Cream.

Local skin reactions at the treatment site are common [see *Adverse Reactions* (6.2)], and may necessitate a rest period of several days; resume treatment once the reaction subsides. Non-occlusive dressings such as cotton gauze or cotton underwear may be used in the management of skin reactions.

ZYCLARA Cream is packaged in single-use packets with 28 packets supplied per box, which contain sufficient cream to cover the wart areas. Prescribe up to 2 boxes (56 packets) for the treatment course. Use of excessive amounts of cream should be avoided. Partially-used packets should be discarded and not reused.

### 3 DOSAGE FORMS AND STRENGTHS

Cream, 3.75%, white to faintly yellow cream.

### 4 CONTRAINDICATIONS

None.

### 5 WARNINGS AND PRECAUTIONS

#### 5.1 Local Skin Reactions

Intense local skin reactions including skin weeping or erosion can occur after a few applications of ZYCLARA Cream and may require an interruption of dosing [see *Dosage and Administration* (2) and *Adverse Reactions* (6)]. ZYCLARA Cream has the potential to exacerbate inflammatory conditions of the skin, including chronic graft versus host disease.

Administration of ZYCLARA Cream is not recommended until the skin is healed from any previous drug or surgical treatment.

#### 5.2 Systemic Reactions

Flu-like signs and symptoms may accompany, or even precede, local skin reactions and may include fatigue, nausea, fever, myalgias, arthralgias, malaise and chills. An interruption of dosing and an assessment of the patient should be considered [see *Adverse Reactions* (6)].

Lymphadenopathy occurred in 2% of subjects with actinic keratosis treated with ZYCLARA Cream [see *Adverse Reactions* (6)]. This reaction resolved in all subjects by 4 weeks after completion of treatment.

#### 5.3 Ultraviolet Light Exposure Risks

Exposure to sunlight (including sunlamps) should be avoided or minimized during use of ZYCLARA Cream. Patients should be warned to use protective clothing (e.g., a hat) when using ZYCLARA Cream. Patients with sunburn should be advised not to use ZYCLARA Cream until fully recovered. Patients who may have considerable sun exposure, e.g. due to their occupation, and those patients with inherent sensitivity to sunlight should exercise caution when using ZYCLARA Cream.

In an animal photo-carcinogenicity study, imiquimod cream shortened the time to skin tumor formation [see *Nonclinical Toxicology* (13.1)]. The enhancement of ultraviolet carcinogenicity is not necessarily dependent on phototoxic mechanisms. Therefore, patients should minimize or avoid natural or artificial sunlight exposure.

#### 5.4 Increased Risk of Adverse Reactions with Concomitant Imiquimod Use

Concomitant use of ZYCLARA and any other imiquimod products, in the same treatment area, should be avoided since they contain the same active ingredient (imiquimod) and may increase the risk for and severity of local skin reactions.

The safety of concomitant use of ZYCLARA Cream and any other imiquimod products has not been established and should be avoided since they contain the same active ingredient (imiquimod) and may increase the risk for and severity of systemic reactions.

#### 5.5 Immune Cell Activation in Autoimmune Disease

ZYCLARA Cream should be used with caution in patients with pre-existing autoimmune conditions because imiquimod activates immune cells [see *Pharmacodynamics* (12.2)].

## 6 ADVERSE REACTIONS

Because clinical trials are conducted under widely varying conditions, adverse reaction rates observed in the clinical trials of a drug cannot be directly compared to rates in the clinical trials of another drug and may not reflect the rates observed in practice.

### 6.1 Clinical Trials Experience: Actinic Keratosis

The data described below reflect exposure to ZYCLARA Cream or vehicle in 319 subjects enrolled in two double-blind, vehicle-controlled trials. Subjects applied up to two packets of ZYCLARA Cream or vehicle daily to the skin of the affected area (either entire face or balding scalp) for two 2-week treatment cycles separated by a 2-week no treatment period.

**Table 1: Selected Adverse Reactions Occurring in ≥2% of ZYCLARA-Treated Subjects and at a Greater Frequency than with Vehicle in the Combined Studies (AK)**

Preferred Term	ZYCLARA Cream 3.75% (N=160)	Vehicle (N=159)
Headache	10 (6%)	5 (3%)
Application site pruritus	7 (4%)	1 (<1%)
Fatigue	7 (4%)	0 (0%)
Nausea	6 (4%)	2 (1%)
Application site irritation	5 (3%)	0 (0%)
Application site pain	5 (3%)	0 (0%)
Pyrexia	5 (3%)	0 (0%)
Anorexia	4 (3%)	0 (0%)
Dizziness	4 (3%)	0 (0%)
Herpes simplex	4 (3%)	1 (<1%)
Pain	4 (3%)	0 (0%)
Chest pain	3 (2%)	0 (0%)
Diarrhea	3 (2%)	0 (0%)
Lymphadenopathy	3 (2%)	0 (0%)

**Table 2: Local Skin Reactions in the Treatment Area in ZYCLARA-Treated Subjects as Assessed by the Investigator (AK)**

	ZYCLARA Cream 3.75% (n=160)		Vehicle (n=159)	
	All Grades*	Severe	All Grades*	Severe
Erythema	154 (96%)	40 (25%)	124 (78%)	0 (0%)
Scabbing/Crusting	149 (93%)	22 (14%)	72 (45%)	0 (0%)
Flaking/Scaling/Dryness	147 (92%)	13 (8%)	123 (77%)	2 (1%)
Edema	120 (75%)	9 (6%)	31 (19%)	0 (0%)
Erosion/Ulceration	99 (62%)	17 (11%)	14 (9%)	0 (0%)
Weeping/Exudate	81 (51%)	9 (6%)	6 (4%)	0 (0%)

\*All Grades: mild, moderate or severe

Overall, in the clinical trials, 11% (17/160) of subjects on ZYCLARA Cream and 0% on vehicle cream required rest periods due to adverse reactions.

Other adverse reactions observed in subjects treated with ZYCLARA Cream include: application site bleeding, application site swelling, arthralgia, cheilitis, chills, dermatitis, herpes zoster, influenza-like illness, insomnia, lethargy, myalgia, pancytopenia, pruritus, squamous cell carcinoma, and vomiting.

### 6.2 Clinical Trials Experience: External Genital Warts

In two double-blind, placebo-controlled studies 602 subjects applied up to one packet of ZYCLARA Cream or vehicle daily for up to 8 weeks.

The most frequently reported adverse reactions were application site reactions and local skin reactions. Selected adverse reactions are listed in Table 3.

**Table 3: Selected Adverse Reactions Occurring in ≥2% of ZYCLARA Treated Subjects and at a Greater Frequency than with Vehicle in the Combined Trials (EGW)**

Preferred Term	ZYCLARA Cream 3.75% (N=400)	Vehicle Cream (N=202)
Application site pain	28 (7%)	1 (<1%)
Application site irritation	24 (6%)	2 (1%)
Application site pruritus	11 (3%)	2 (1%)
Vaginitis bacterial*	6 (3%)	2 (2%)
Headache	6 (2%)	1 (<1%)

\*Percentage based on female population of 6/216 for ZYCLARA Cream 3.75% and 2/106 for vehicle cream

Local skin reactions were recorded as adverse reactions only if they extended beyond the treatment area, if they required any medical intervention, or they resulted in patient discontinuation from the study. The incidence and severity of selected local skin reactions are shown in Table 4.

**Table 4: Selected Local Skin Reactions in the Treatment Area Assessed by the Investigator (EGW)**

All grades*, (%)	Severe, (%)	ZYCLARA Cream 3.75% (N=400)	Vehicle Cream (N=202)
Erythema*		70%	27%
	Severe erythema	9%	<1%
Edema*		41%	8%
	Severe edema	2%	0%
Erosion/ulceration*		36%	4%
	Severe erosion/ulceration	11%	<1%
Exudate*		34%	2%
	Severe exudate	2%	0%

\*Mild, Moderate, or Severe

The frequency and severity of local skin reactions were similar in both genders, with the following exceptions: a) flaking/scaling occurred in 40% of men and in 26% of women and b) scabbing/crusting occurred in 34% of men and in 18% of women.

In the clinical trials, 32% (126/400) of subjects who used ZYCLARA Cream and 2% (4/202) of subjects who used vehicle cream discontinued treatment temporarily (required rest periods) due to adverse local skin reactions, and 1% (3/400) of subjects who used ZYCLARA Cream discontinued treatment permanently due to local skin/application site reactions.

Other adverse reactions reported in subjects treated with ZYCLARA Cream include: rash, back pain, application site rash, application site cellulitis, application site exoriation, application site bleeding, scrotal pain, scrotal erythema, scrotal ulcer, scrotal edema, sinusitis, nausea, pyrexia, and influenza-like symptoms.

### 6.3 Postmarketing Experience

The following adverse reactions have been identified during post-approval use of imiquimod. Because these reactions are reported voluntarily from a population of uncertain size, it is not always possible to reliably estimate their frequency or establish a causal relationship to drug exposure.

**Application Site Disorders:** tingling at the application site.

**Body as a Whole:** angioedema.

**Cardiovascular:** capillary leak syndrome, cardiac failure, cardiomyopathy, pulmonary edema, arrhythmias (tachycardia, supraventricular tachycardia, atrial fibrillation, palpitations), chest pain, ischemia, myocardial infarction, syncope.

**Endocrine:** thyroiditis.

**Gastro-Intestinal System Disorders:** abdominal pain.

**Hematological:** decreases in red cell, white cell and platelet counts (including idiopathic thrombocytopenic purpura), lymphoma.

**Hepatic:** abnormal liver function.

**Infections and Infestations:** herpes simplex.

**Musculo-Skeletal System Disorders:** arthralgia.

**Neuropsychiatric:** agitation, cerebrovascular accident, convulsions (including febrile convulsions), depression, insomnia, multiple sclerosis aggravation, paresis, suicide.

**Respiratory:** dyspnea.

**Urinary System Disorders:** proteinuria, urinary retention, dysuria.

**Skin and Appendages:** exfoliative dermatitis, erythema multiforme, hyperpigmentation, hypertrophic scar, hypopigmentation.

**Vascular:** Henoch-Schönlein purpura syndrome.

## 8 USE IN SPECIFIC POPULATIONS

### 8.1 Pregnancy

Pregnancy Category C:

There are no adequate and well-controlled studies in pregnant women. ZYCLARA Cream should be used during pregnancy only if the potential benefit justifies the potential risk to the fetus.

The animal multiples of human exposure calculations were based on daily dose comparisons for the reproductive toxicology studies described in this label. The animal multiples of human exposure were based on weekly dose comparisons for the carcinogenicity studies described in this label. For the animal multiple of human exposure ratios presented in this label, the Maximum Recommended Human Dose (MRHD) was set at 2 packets (500 mg cream) per treatment of actinic keratosis with ZYCLARA Cream (imiquimod 3.75%, 18.75 mg imiquimod) for BSA comparison. The maximum human AUC value obtained in the treatment of external genital and perianal warts was higher than that obtained in the treatment of actinic keratosis and was used in the calculation of animal multiples of MRHD that were based on AUC comparison.

Systemic embryofetal development studies were conducted in rats and rabbits. Oral doses of 1, 5 and 20 mg/kg/day imiquimod were administered during the period of organogenesis (gestational days 6 – 15) to pregnant female rats. In the presence of maternal toxicity, fetal effects noted at 20 mg/kg/day (163X MRHD based on AUC comparisons) included increased resorptions, decreased fetal body weights, delays in skeletal ossification, bent limb bones, and two fetuses in one litter (2 of 1567 fetuses) demonstrated exencephaly, protruding tongues and low-set ears. No treatment related effects on embryofetal toxicity or teratogenicity were noted at 5 mg/kg/day (28X MRHD based on AUC comparisons).

Intravenous doses of 0.5, 1 and 2 mg/kg/day imiquimod were administered during the period of organogenesis (gestational days 6 – 18) to pregnant female rabbits. No treatment related effects on embryofetal toxicity or teratogenicity were noted at 2 mg/kg/day (2.1X MRHD based on BSA comparisons), the highest dose evaluated in this study, or 1 mg/kg/day (115X MRHD based on AUC comparisons).

A combined fertility and peri- and post-natal development study was conducted in rats. Oral doses of 1, 1.5, 3 and 6 mg/kg/day imiquimod were administered to male rats from 70 days prior to mating through the mating period and to female rats from 14 days prior to mating through parturition and lactation. No effects on growth, fertility, reproduction or post-natal development were noted at doses up to 6 mg/kg/day (25X MRHD based on AUC comparisons), the highest dose evaluated in this study. In the absence of maternal toxicity, bent limb bones were noted in the F1 fetuses at a dose of 6 mg/kg/day (25X MRHD based on AUC comparisons). This fetal effect was also noted in the oral rat embryofetal development study conducted with imiquimod. No treatment related effects on teratogenicity were noted at 3 mg/kg/day (12X MRHD based on AUC comparisons).

### 8.3 Nursing Mothers

It is not known whether imiquimod is excreted in human milk following use of ZYCLARA Cream. Because many drugs are excreted in human milk, caution should be exercised when ZYCLARA Cream is administered to nursing women.

### 8.4 Pediatric Use

AK is a condition not generally seen within the pediatric population. The safety and efficacy of ZYCLARA Cream for AK in patients less than 18 years of age has not been established.

Safety and efficacy in patients with external genital/perianal warts below the age of 12 years have not been established.

Imiquimod 5% cream was evaluated in two randomized, vehicle-controlled, double-blind trials involving 702 pediatric subjects with molluscum contagiosum (MC) (470 exposed to imiquimod; median age 5 years, range 2-12 years). Subjects applied imiquimod cream or vehicle 3 times weekly for up to 16 weeks. Complete clearance (no MC lesions) was assessed at Week 18. In Study 1, the complete clearance rate was 24% (52/217) in the imiquimod cream group compared with 26% (28/106) in the vehicle group. In Study 2, the clearance rates were 24% (60/253) in the imiquimod cream group compared with 28% (35/126) in the vehicle group. These studies failed to demonstrate efficacy.

Similar to the studies conducted in adults, the most frequently reported adverse reaction from 2 studies in children with molluscum contagiosum was application site reaction. Adverse events which occurred more frequently in imiquimod-treated subjects compared with vehicle-treated subjects generally resembled those seen in studies in indications approved for adults and also included otitis media (5% imiquimod vs. 3% vehicle) and conjunctivitis (3% imiquimod vs. 2% vehicle).

Erythema was the most frequently reported local skin reaction. Severe local skin reactions reported by imiquimod-treated subjects in the pediatric studies included erythema (28%), edema (8%), scabbing/crusting (5%), flaking/scaling (5%), erosion (2%) and weeping/exudate (2%).

Systemic absorption of imiquimod across the affected skin of 22 subjects aged 2 to 12 years with extensive MC involving at least 10% of the total body surface area was observed after single and multiple doses at a dosing frequency of 3 applications per week for 4 weeks. The investigator determined the dose applied, either 1, 2 or 3 packets per dose, based on the size of the treatment area and the subject's weight. The overall median peak serum drug concentrations at the end of week 4 was between 0.26 and 1.06 ng/mL except in a 2-year old female who was administered 2 packets of study drug per dose, had a C<sub>max</sub> of 9.66 ng/mL after multiple dosing. Children aged 2-5 years received doses of 12.5 mg (one packet) or 25 mg (two packets) of imiquimod and had median multiple-dose peak serum drug levels of approximately 0.2 or 0.5 ng/mL, respectively. Children aged 6-12 years received doses of 12.5 mg, 25 mg, or 37.5 mg (three packets) and had median multiple dose serum drug levels of approximately 0.1, 0.15, or 0.3 ng/mL, respectively. Among the 20 subjects with evaluable laboratory assessments, the median WBC count decreased by 1.42\*10<sup>9</sup>/L and the median absolute neutrophil count decreased by 1.42\*10<sup>9</sup>/L.

### 8.5 Geriatric Use

Of the 160 subjects treated with ZYCLARA Cream in the AK clinical studies, 78 subjects (49%) were 65 years or older. No overall differences in safety or effectiveness were observed between these subjects and younger subjects.

Clinical studies of ZYCLARA Cream for EGW did not include sufficient numbers of subjects aged 65 and over to determine whether they respond differently from younger subjects. Of the 400 subjects treated with ZYCLARA Cream in the EGW clinical studies, 5 subjects (1%) were 65 years or older.

### 10 OVERDOSAGE

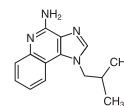
Topical overdosing of ZYCLARA Cream could result in an increased incidence of severe local skin reactions and may increase the risk for systemic reactions.

Hypotension was reported in a clinical trial following multiple oral imiquimod doses of >200 mg (equivalent to ingestion of the imiquimod content of more than 21 packets of ZYCLARA). The hypotension resolved following oral or intravenous fluid administration.

### 11 DESCRIPTION

ZYCLARA (imiquimod) Cream, 3.75% is intended for topical administration. Each gram contains 37.5 mg of imiquimod in a white to faintly yellow oil-in-water cream base consisting of isostearic acid, cetyl alcohol, stearyl alcohol, white petrolatum, polysorbate 60, sorbitan monostearate, glycerin, xanthan gum, purified water, benzyl alcohol, methylparaben, and propylparaben.

Chemically, imiquimod is 1-(2-methylpropyl)-1H-imidazo[4,5-c]quinolin-4-amine. Imiquimod has a molecular formula of C<sub>17</sub>H<sub>17</sub>N<sub>3</sub> and a molecular weight of 240.3. Its structural formula is:



## 12 CLINICAL PHARMACOLOGY

### 12.1 Mechanism of Action

The mechanism of action of ZYCLARA Cream in treating AK and EGW lesions is unknown.

### 12.2 Pharmacodynamics

The pharmacodynamics of ZYCLARA are unknown.

Imiquimod is a Toll-like receptor 7 agonist that activates immune cells. Topical application to skin is associated with increases in markers for cytokines and immune cells.

#### Actinic Keratosis

In a study of 18 subjects with AK comparing imiquimod cream, 5% to vehicle, increases from baseline in week 2 biomarker levels were reported for CD3, CD4, CD8, CD11c, and CD68 for imiquimod cream, 5% treated subjects; however, the clinical relevance of these findings is unknown.

#### External Genital Warts

Imiquimod has no direct antiviral activity in cell culture.

## 12.3 Pharmacokinetics

Following dosing with 2 packets once daily (18.75 mg imiquimod/day) for up to three weeks, systemic absorption of imiquimod was observed in all subjects. ZYCLARA Cream was applied to the face and/or scalp in 17 subjects with at least 10 AK lesions. The mean peak serum imiquimod concentration at the end of the trial was approximately 0.323 ng/mL. The median time to maximal concentrations ( $T_{max}$ ) occurred at 9 hours after dosing. Based on the plasma half-life of imiquimod observed at the end of the study, 29.3±17.0 hours, steady-state concentrations can be anticipated to occur by day 7 with once daily dosing.

Systemic absorption of imiquimod (up to 9.4 mg [one packet]) across the affected skin of 18 subjects with EGW was observed with once daily dosing for 3 weeks in all subjects. The subjects had either a minimum of 8 warts (range 8-93) or a surface area involvement of greater than 100mm<sup>2</sup> (range 15-620mm<sup>2</sup>) at study entry. The mean peak serum imiquimod concentration at Day 21 was 0.488 +/- 0.368 ng/mL. The median time to maximal concentrations ( $T_{max}$ ) occurred 12 hours after dosing. Based on the plasma half-life of imiquimod observed at the end of the study, 24.1±12.4 hours, steady-state concentrations can be anticipated to occur by day 7 with once daily dosing. Because of the small number of subjects present (13 males, 5 females) it was not possible to select out or do an analysis of absorption based on gender/site of application.

## 13 NONCLINICAL TOXICOLOGY

### 13.1 Carcinogenesis, Mutagenesis, Impairment of Fertility

In an oral (gavage) rat carcinogenicity study, imiquimod was administered to Wistar rats on a 2X/week (up to 6 mg/kg/day) or daily (3 mg/kg/day) dosing schedule for 24 months. No treatment related tumors were noted in the oral rat carcinogenicity study up to the highest doses tested in this study of 6 mg/kg administered 2X/week in female rats (7.1X MRHD based on weekly AUC comparisons), 4 mg/kg administered 2X/week in male rats (6.1X MRHD based on weekly AUC comparisons) or 3 mg/kg administered 7X/week to male and female rats (12X MRHD based on weekly AUC comparisons).

In a dermal mouse carcinogenicity study, imiquimod cream (up to 5 mg/kg/application imiquimod or 0.3% imiquimod cream) was applied to the backs of mice 3X/week for 24 months. A statistically significant increase in the incidence of liver adenomas and carcinomas was noted in high dose male mice compared to control male mice (21X MRHD based on weekly AUC comparisons). An increased number of skin papillomas was observed in vehicle cream control group animals at the treated site only.

In a 52-week dermal photo-carcinogenicity study, the median time to onset of skin tumor formation was decreased in hairless mice following chronic topical dosing (3X/week; 40 weeks of treatment followed by 12 weeks of observation) with concurrent exposure to UV radiation (5 days per week) with vehicle alone. No additional effect on tumor development beyond the vehicle effect was noted with the addition of the active ingredient, imiquimod, to the vehicle cream.

Imiquimod revealed no evidence of mutagenic or clastogenic potential based on the results of five in vitro genotoxicity tests (Ames assay, mouse lymphoma L5178Y assay, Chinese hamster ovary cell chromosome aberration assay, human lymphocyte chromosome aberration assay and SHE cell transformation assay) and three in vivo genotoxicity tests (rat and hamster bone marrow cytogenetics assay and a mouse dominant lethal test).

Daily oral administration of imiquimod to rats, throughout mating, gestation, parturition and lactation, demonstrated no effects on growth, fertility or reproduction, at doses up to 25X MRHD based on AUC comparisons.

## 14 CLINICAL STUDIES

### 14.1 Actinic Keratosis

In two double-blind, randomized, vehicle-controlled clinical studies, 319 subjects with AK were treated with ZYCLARA Cream, or vehicle cream. Studies enrolled subjects >18 years of age with 5 to 20 typical visible or palpable AK lesions of the face or scalp. Study cream was applied to either the entire face (excluding ears) or balding scalp once daily for two 2-week treatment cycles separated by a 2-week no-treatment period. Subjects then continued in the study for an 8-week follow-up period during which they returned for clinical observations and safety monitoring. Study subjects ranged from 36 to 90 years of age and 54% had Fitzpatrick skin type I or II. All ZYCLARA Cream-treated subjects were Caucasians.

On a scheduled dosing day, up to two packets of the study cream were applied to the entire treatment area prior to normal sleeping hours and left on for approximately 8 hours. Efficacy was assessed by AK lesion counts at the 8-week post-treatment visit. All AKs in the treatment area were counted, including baseline lesions as well as lesions which appeared during therapy.

Complete clearance required absence of any lesions including those that appeared during therapy in the treatment area. Complete and partial clearance rates are shown in the tables below. Partial clearance rate was defined as the percentage of subjects in whom the number of baseline AKs was reduced by 75% or more. The partial clearance rate was measured relative to the numbers of AK lesions at baseline.

**Table 5: Rate of Subjects with Complete Clearance at 8 Weeks Post Treatment**

	ZYCLARA Cream 3.75%	Vehicle Cream
Study AK1	25.9% (21/81)	2.5% (2/80)
Study AK2	45.6% (36/79)	10.1% (8/79)

**Table 6: Rate of Subjects with Partial Clearance (≥75%) at 8 Weeks Post Treatment**

	ZYCLARA Cream 3.75%	Vehicle Cream
Study AK1	45.7% (37/81)	18.8% (15/80)
Study AK2	73.4% (58/79)	26.6% (21/79)

During the course of treatment, 86% (138/160) of subjects experienced a transient increase in lesions evaluated as actinic keratoses relative to the number present at baseline within the treatment area.

### 14.2 External Genital Warts

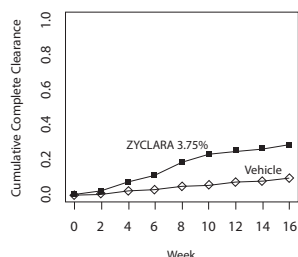
In two double-blind, randomized, placebo-controlled clinical studies, 601 subjects with EGW were treated with 3.75% imiquimod cream, or a matching placebo cream. Studies enrolled subjects aged from 15 to 81 years. The baseline wart area ranged from 6 to 5579 mm<sup>2</sup> (median 60 mm<sup>2</sup>) and the baseline wart count ranged from 2 to 48 warts. Most subjects had two or more treated anatomic areas at baseline. Anatomic areas included: inguinal, perineal, and perianal areas (both genders); the glans penis, penis shaft, scrotum, and foreskin (in men); and the vulva (in women). Up to one packet of study cream was applied once daily. The study cream was applied to all warts prior to normal sleeping hours and left on for approximately 8 hours. Subjects continued applying the study cream for up to 8 weeks, stopping if they achieved complete clearance of all (baseline and new) warts in all anatomic areas. Subjects who achieved complete clearance of all warts at any time up to the Week 16 visit enter a 12 week follow-up period to assess recurrence.

Complete clearance was defined as clearance of all warts (baseline and new) in all anatomic areas within 16 weeks from baseline. The complete clearance rates are shown in Table 7. The proportions of subjects who achieved complete clearance at or before a given week (cumulative proportion) for the combined studies are shown in Figure 1. Complete clearance rates by gender for the combined studies are shown in Table 8.

**Table 7: Percent of Subjects with Complete Clearance of External Genital Warts within 16 Weeks from Baseline**

	ZYCLARA Cream 3.75%	Vehicle Cream
Study EGW1	53/195 (27%)	10/97 (10%)
Study EGW2	60/204 (29%)	9/105 (9%)

**Figure 1: Cumulative Proportion of Subjects Achieving Complete Clearance of External Genital Warts by a Given Week (Combined Studies)**



**Table 8: Percent of Subjects with Complete Clearance of External Genital Warts within 16 Weeks from Baseline by Gender (Combined Studies)**

	ZYCLARA Cream 3.75%	Vehicle Cream
Females	79/216 (37%)	15/106 (14%)
Males	34/183 (19%)	4/96 (4%)

Of the 113 ZYCLARA-treated subjects who achieved complete clearance in the two studies, 17 (15%) subjects had a recurrence within 12 weeks.

No studies were conducted directly comparing the 3.75% and 5% concentrations of imiquimod cream in the treatment of external genital warts.

### 16 HOW SUPPLIED/STORAGE AND HANDLING

ZYCLARA (imiquimod) Cream, 3.75% is white to faintly yellow in color and supplied in single-use packets which contain 250 mg of the cream. Available as: Box of 28 packets NDC 29336-710-28. Store at 25°C (77°F); excursions permitted to 15° to 30°C (59° to 86°F) [see USP Controlled Room Temperature].

Avoid freezing.

### 17 PATIENT COUNSELING INFORMATION

[See FDA-approved patient labeling (Patient Information)]

#### 17.1 Instructions for Administration

ZYCLARA Cream should be used as directed by a physician [see Dosage and Administration (2)]. ZYCLARA Cream is for external use only. Contact with the eyes, lips, nostrils, anus and vagina should be avoided [see Indications and Usage (1) and Dosage and Administration (2)].

The treatment area should not be bandaged or otherwise occluded. Partially-used packets should be discarded and not reused. The prescriber should demonstrate the proper application technique to maximize the benefit of ZYCLARA Cream therapy.

It is recommended that patients wash their hands before and after applying ZYCLARA Cream.

#### 17.2 Local Skin Reactions

Patients may experience local skin reactions during treatment with ZYCLARA Cream. Potential local skin reactions include erythema, edema, erosions/ulcerations, weeping/exudate, flaking/scaling/dryness, and scabbing/crusting. These reactions can range from mild to severe in intensity and may extend beyond the application site onto the surrounding skin. Patients may also experience application site reactions such as itching, irritation or pain [see Adverse Reactions (6)].

Local skin reactions may be of such an intensity that patients may require rest periods from treatment. Treatment with ZYCLARA Cream can be resumed after the skin reaction has subsided, as determined by the physician. However, for actinic keratosis, each treatment cycle should not be extended beyond 2 weeks due to missed doses or rest periods. For external genital warts, treatment should not be extended beyond 8 weeks due to missed doses or rest periods. Patients should contact their physician promptly if they experience any sign or symptom at the application site that restricts or prohibits their daily activity or makes continued application of the cream difficult.

Because of local skin reactions, during treatment and until healed, the treatment area is likely to appear noticeably different from normal skin. Localized hypopigmentation and hyperpigmentation have been reported following use of imiquimod cream. These skin color changes may be permanent in some patients.

#### 17.3 Systemic Reactions

Patients may experience flu-like systemic signs and symptoms during treatment with ZYCLARA Cream. Systemic signs and symptoms may include fatigue, nausea, fever, myalgia, malaise, arthralgia, and chills [see Adverse Reactions (6)]. An interruption of dosing and an assessment of the patient should be considered.

#### 17.4 Patients Being Treated for Actinic Keratosis (AK)

Dosing is once daily before bedtime to the skin of the affected area (entire face or balding scalp) for two 2-week treatment cycles separated by a 2-week no-treatment period. However, the treatment period should not be extended beyond two 2-week treatment cycles due to missed doses or rest periods. Treatment should continue for the full treatment course even if all actinic keratoses appear to be gone [see Dosage and Administration (2.1)].

It is recommended that patients wash their hands before and after applying ZYCLARA Cream. Before applying the cream, the patient should wash the treatment area with mild soap and water and allow the area to dry thoroughly.

It is recommended that the treatment area be washed with mild soap and water 8 hours following ZYCLARA Cream application.

Most patients using ZYCLARA Cream for the treatment of AK experience erythema, flaking/scaling/dryness and scabbing/crusting at the application site with normal dosing [see Adverse Reactions (6.1)].

Use of sunscreen is encouraged, and patients should minimize or avoid exposure to natural or artificial sunlight (tanning beds or UVA/B treatment) while using ZYCLARA Cream [see Warnings and Precautions (5.3)].

Additional lesions may become apparent in the treatment area during treatment [see Clinical Studies (14.1)].

#### 17.5 Patients Being Treated for External Genital Warts (EGW)

Dosing is once daily before bedtime to the skin of the affected wart areas. ZYCLARA Cream treatment should continue until there is total clearance of the genital/perianal warts or for up to 8 weeks.

It is recommended that the treatment area be washed with mild soap and water approximately 8 hours following ZYCLARA Cream application.

It is common for patients to experience local skin reactions such as erythema, erosion, excoriation/flaking, and edema at the site of application or surrounding areas. Most skin reactions are mild to moderate.

Sexual (genital, anal, oral) contact should be avoided while ZYCLARA Cream is on the skin. Application of ZYCLARA Cream in the vagina is considered internal and should be avoided. Female patients should take special care if applying the cream at the opening of the vagina because local skin reactions on the delicate moist surfaces can result in pain or swelling, and may cause difficulty in passing urine.

Uncircumcised males treating warts under the foreskin should retract the foreskin and clean the area daily.

New warts may develop during therapy, as ZYCLARA Cream is not a cure.

The effect of ZYCLARA Cream on the transmission of genital/perianal warts is unknown.

ZYCLARA Cream may weaken condoms and vaginal diaphragms, therefore concurrent use is not recommended.

Should severe local skin reaction occur, the cream should be removed by washing the treatment area with mild soap and water.

Rx Only



Manufactured by  
3M Health Care Limited  
Loughborough LE11 1EP England

Distributed by  
Graceway Pharmaceuticals, LLC  
Bristol, TN 37620

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FDA-Approved Patient Labeling  
Patient Information

# Zyclara® [zi-clar-a]

(imiquimod) Cream  
3.75%

**IMPORTANT:** For use on the skin only (topical). Do not use ZYCLARA Cream in or on your eyes, mouth, anus or vagina or inside your nose.

Read the Patient Information that comes with ZYCLARA Cream before you start using it and each time you get a refill. There may be new information. This leaflet does not take the place of talking with your healthcare provider about your medical condition or treatment. If you do not understand the information, or have any questions about ZYCLARA Cream, talk with your healthcare provider or pharmacist.

#### What is ZYCLARA Cream?

ZYCLARA Cream is a prescription medicine for use on the skin only (topical) to treat:

- actinic keratosis on the face or balding scalp in adults with a normal immune system. Actinic keratosis is caused by too much sun exposure.
- external genital and perianal warts in people 12 years and older.

It is not known if ZYCLARA Cream is safe and effective:

- in people who do not have a normal immune system.
- in the treatment of people with xeroderma pigmentosum.
- in the treatment of superficial basal cell carcinoma.
- in the treatment of actinic keratosis with more than 1 treatment course (two 2-week treatment cycles) in the same affected area.

It is not known if ZYCLARA Cream is safe and effective for the treatment of actinic keratosis in children younger than 18 years old.

It is not known if ZYCLARA Cream is safe and effective in children under 12 years old for external genital and perianal warts.

#### What should I tell my healthcare provider before using ZYCLARA Cream?

Before you use ZYCLARA Cream, tell your healthcare provider, if you:

- have problems with your immune system.
- are being treated or have been treated for actinic keratosis with other medicines or surgery. You should not use ZYCLARA Cream until you have healed from other treatments.
- have other skin problems or sunburn.
- have any other medical conditions.
- are pregnant or planning to become pregnant. It is not known if ZYCLARA Cream can harm your unborn baby. Talk to your healthcare provider if you are pregnant or plan to become pregnant.
- are breast-feeding or plan to breast-feed. It is not known if ZYCLARA Cream passes into your breast milk and if it can harm your baby. Talk to your healthcare provider about the best way to feed your baby if you use ZYCLARA Cream.

**Tell your healthcare provider about all the medicines you take**, including prescription and non-prescription medicines, vitamins and herbal supplements.

Especially tell your healthcare provider if you have had other treatments for actinic keratosis or genital or perianal warts. ZYCLARA Cream should not be used until your skin has healed from other treatments.

#### How should I use ZYCLARA Cream?

Use ZYCLARA Cream exactly as your healthcare provider tells you to use it. **ZYCLARA Cream is for skin use only.**

- Your healthcare provider will tell you where to apply ZYCLARA Cream and how often and for how long to apply it for your condition. Do not apply ZYCLARA Cream to other areas.
- Do not use more ZYCLARA Cream than you need to cover the treatment area. Using too much ZYCLARA Cream, or using it too often, or for too long can increase your chances for having a severe skin reaction or other side effects.
- Talk to your healthcare provider if you think ZYCLARA Cream is not working for you.

#### Applying ZYCLARA Cream:

- ZYCLARA Cream should be applied once a day just before your bedtime.
- Wash the area where the cream will be applied with mild soap and water.
- Allow the area to dry.
- Wash your hands.
- Leave the cream on the treated area for the amount of time your healthcare provider tells you (usually about 8 hours). **Do not** take a bath or get the treated area wet during this time.
- After the right amount of time has passed, wash the treated area with mild soap and water.
- If you forget to apply ZYCLARA Cream, just apply the next dose of ZYCLARA Cream at your regular time.

#### When using ZYCLARA Cream for actinic keratosis:

- **Do not get ZYCLARA Cream in or near your eyes in or on your lips or in your nose.**
- For actinic keratosis: ZYCLARA Cream should be applied once daily before bedtime to the skin of the affected area (either entire face or balding scalp) for two 2-week treatment cycles separated by a 2-week no-treatment period.
- Open a packet of ZYCLARA Cream and apply a thin layer to the affected area on the scalp or face to be treated. You may need to use more than one packet. Do not use more than two packets for each application.

#### When using ZYCLARA Cream for external genital warts:

- **Do not get ZYCLARA Cream in or on your anus or vagina.**
- Apply a thin layer of ZYCLARA Cream **only** to the affected area or areas to be treated. Do not use more ZYCLARA Cream than is needed to cover the treatment area.
- Do not use more than one packet of ZYCLARA Cream on the treatment area a day.
- Rub the cream into your skin until you cannot see the ZYCLARA Cream.
- ZYCLARA Cream is usually left on the skin for approximately 8 hours. Treatment should continue until the warts are completely gone or for up to 8 weeks.
- Uncircumcised males treating warts under their penis foreskin must pull their foreskin back and clean before treatment and clean daily during treatment.
- Female patients treating genital warts must be careful when applying ZYCLARA Cream around the vaginal opening. Female patients should take special care if applying the cream at the opening of the vagina because local skin reactions on the delicate moist surfaces can cause pain or swelling, and may cause problems passing urine. Do not put ZYCLARA Cream in your vagina.

#### What should I avoid while using ZYCLARA Cream?

- **Do not** cover the treated area with bandages or other closed dressings.
- Cotton gauze dressings can be used. Cotton underwear can be worn after applying ZYCLARA Cream to the genital or perianal area.
- **Do not use** sunlamps or tanning beds, and avoid sunlight as much as possible during treatment with ZYCLARA Cream. Use sunscreen and wear protective clothing if you go outside during daylight.
- Do not have sexual contact including genital, anal, or oral sex when ZYCLARA Cream is on your genital or perianal skin. ZYCLARA Cream may weaken condoms and vaginal diaphragms. This means they may not work as well to prevent pregnancy.

#### What are the possible side effects of ZYCLARA Cream?

**ZYCLARA Cream may cause serious side effects**, including:

- **Local Skin Reactions:** Skin drainage (weeping) or breakdown of the outer layer of your skin (erosion). Tell your healthcare provider if this happens.
- **Flu-like symptoms:** Tell your healthcare provider if you have tiredness, nausea, vomiting, fever, chills, muscle pain, and joint pain.

The most common side effects of ZYCLARA Cream include:

- local skin reactions including: skin redness, scabbing, crusting, flaking, scaling, dryness, swelling
- headache
- itching at application site
- tiredness
- nausea
- skin irritation
- pain at the treatment area
- fever
- loss of appetite
- dizziness
- cold sores
- pain
- chest pain
- diarrhea
- swelling of lymph nodes

Tell your healthcare provider if you have any side effect that bothers you or that does not go away.

These are not all the possible side effects of ZYCLARA Cream. For more information, ask your healthcare provider or pharmacist.

Call your doctor for medical advice about side effects. You may report side effects to FDA at 1-800-FDA-1088 or Graceway Pharmaceuticals, LLC at 1-800-328-0255.

#### How do I store ZYCLARA Cream?

- Store ZYCLARA Cream at room temperature, 20° to 25°C (68° to 77°F).
- Do not freeze.
- Safely throw away ZYCLARA Cream that is out of date, unused or partially used.

#### Keep ZYCLARA Cream and all medicines out of the reach of children.

#### General Information about ZYCLARA Cream:

Medicines are sometimes prescribed for purposes other than those listed in the patient information. Do not use ZYCLARA Cream for a condition for which it was not prescribed. Do not give ZYCLARA Cream to other people, even if they have the same symptoms you have. It may harm them.

This patient information leaflet summarizes the most important information about ZYCLARA Cream. If you would like more information, talk with your healthcare provider. You can ask your pharmacist or healthcare provider for information about ZYCLARA Cream that is written for the health professionals.

#### What are the ingredients in ZYCLARA Cream?

**Active Ingredient:** imiquimod

**Inactive ingredients:** isostearic acid, cetyl alcohol, stearyl alcohol, white petrolatum, polysorbate 60, sorbitan monostearate, glycerin, xanthan gum, purified water, benzyl alcohol, methylparaben, and propylparaben.

Rx Only



Manufactured by  
**3M Health Care Limited**  
Loughborough LE11 1EP England  
Distributed by  
**Graceway Pharmaceuticals, LLC**  
Bristol, TN 37620

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This patient information leaflet has been approved by the U.S. Food and Drug Administration.