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# Different Uses of 5-FLUROURACIL in Dermatology: Review Article

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## ABSTRACT

**Background:** The 5-FLUROURACIL (5-FU) is easily absorbed by all tissues after intravenous injection, even those with active cell proliferation such the spleen, small intestine, and bone marrow. Topical administration of 5-FU is the recommended method for treating dermatological diseases because of the significant cytotoxicity of 5-FU for growing cells. 5-fluorouracil is offered as creams or solutions with concentrations ranging from 0.5 percent to 5 percent. Treatment requires two daily applications, although a controlled-release 0.5 percent microsphere formulation should only be used once daily.

**Objective:** Assessment of uses of 5-FLUROURACIL in Dermatology practice.

**Methods:** The 5-FLUROURACIL, transfer ribonucleic acid and dermatology were all looked for in PubMed, Google scholar, and Science direct. References from relevant literature were also evaluated by the authors, but only the most recent or complete study from March 2003 to November 2021 was included. Due to the lack of sources for translation, documents in languages other than English have been ruled out. Papers that did not fall under the purview of major scientific investigations, such as unpublished manuscripts, oral presentations, conference abstracts, and dissertations were omitted. **Conclusion**: The data we reviewed suggested that 5-FU might be useful for a variety of noncancerous cutaneous causes, including the treatment of scars, pigmentary diseases, cutaneous infections (viral warts, molluscum contagiosum), inflammatory dermatoses, and cosmetics purposes.

**Keywords**: 5-FLUROURACIL, Transfer ribonucleic acid, Dermatology.

## INTRODUCTION

In 1954, **Heidelberger *et al.*** [1] created the 5-fluorinated pyrimidines (it was observed that laboratory mice hepatomas consume radiolabeled uracil more than non-malignant tissues).

One of the most used anti-cancer medications, 5-FU is used to treat a variety of solid tumours, including ovarian, breast, head and neck, and gastrointestinal cancers (including esophageal, gastric, pancreatic, colorectal, anal, and hepatic cancers). The distinction between five-fluorouracil (5-FU), a fluorinated pyrimidine, and plain uracil is its fluorinated number 5 carbon. Fluorouracil is susceptible to light, precipitates at low temperatures, and when left out at room temperature for an extended period of time.

The 5-FU metabolite (FUTP) is widely incorporated into RNA so disrupts normal RNA function and causes toxicity to RNA at several levels. It inhibits the transformation of pre-rRNA (pre-ribosomal ribonucleic acid) into mature rRNA (mature ribosomal ribonucleic acid), and also disrupts post trans-criptional modification of tRNAs (transfer ribonucleic acid**)** [1].

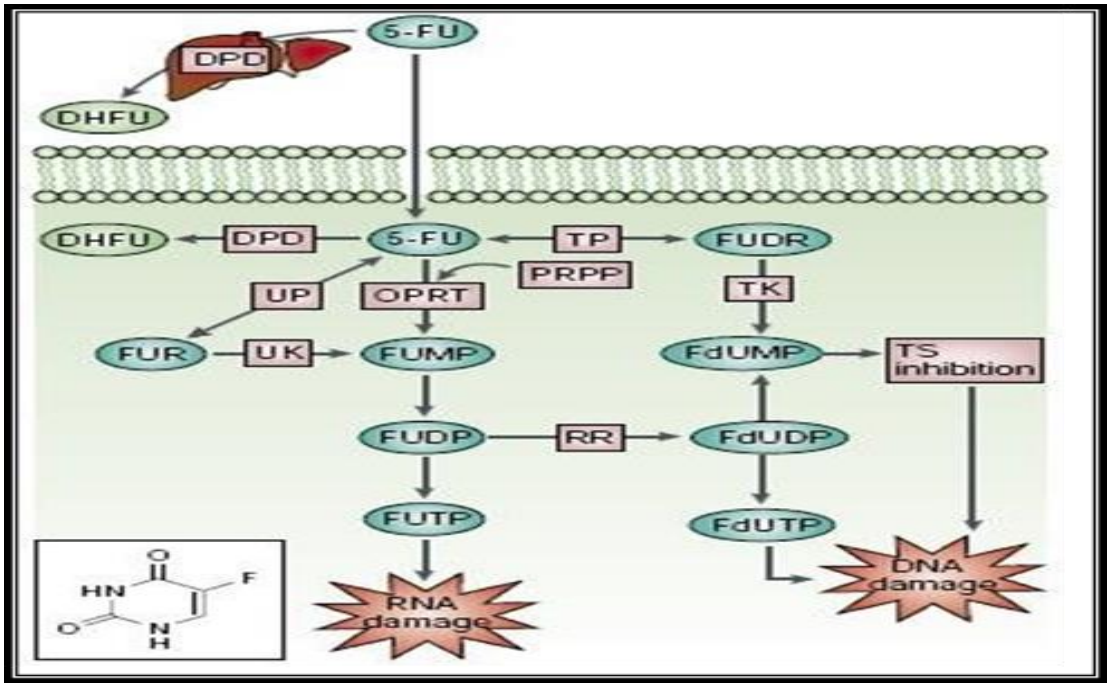


**Figure (1):** Structure and Mechanism of 5-FU action [1].



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**Pharmacokinetic/Pharmacodynamics considerations:**
**Intravenous formulation**

After intravenous administration, 5-FU is readily absorbed by all organs, even those with active cell proliferation, such the spleen, the small intestine, and the bone marrow. Due to its high cytotoxicity against proliferating cells, 5-FU is best administered topically for the treatment of dermatological disorders [(2)].

**Topical formulations**

5-fluorouracil is offered as creams or solutions with concentrations ranging from 0.5 percent to 5 percent. Treatment requires two daily applications, although a controlled-release 0.5 percent microsphere formulation should only be used once daily [(2)].

**Intralesional therapy**

Only 6% of the supplied amount is absorbed, which is not enough to cause harmful systemic effects. Carbon dioxide, urea, and -fluoro-alanine make up the majority of this amount's metabolic waste. Only a minor portion is unchangedly excreted in the urine [(2)].

**Systemic absorption**

Although little 5-FU administered topically is absorbed systemically, this has not been well investigated in people. It was discovered in 1965 that 6% of the 5-FU administered topically was absorbed systemically. However, a later study found that applying 5-FU topically to sick skin has a potential for up to 75 times more systemic absorption than applying it to healthy skin [(3)].

Topical 5-FU has been used extensively in a range of dermatological disorders marked by excessive epidermal cell proliferation, with normal skin cells remaining mostly unaffected. When traditional treatments are not suitable, it was used topically to treat actinic keratosis (AK) and superficial basal cell carcinomas in the USA [(3)].

**Uses of 5-flurouracil**

**1- Cutaneous warts**

Warts have been treated with 5-fluorouracil as an anti-proliferative medication. It was employed because to its capacity to inhibit DNA and RNA synthesis, hence reducing cell proliferation and restricting viral spread. The effects of DNA and RNA deprivation are especially pronounced on HPV-infected cells because they develop more quickly and integrate 5-FU at a higher rate than healthy tissue due to 5-fluorouracil's high affinity for the rapidly expanding epidermis and virally infected cells [(4)].

**2- Genital warts**

One to three times each week, a thin layer of 5-fluorouracil cream is applied to the lesion and left on for 3 to 10 hours before being removed with soap and water. Several weeks of treatment are possible. According to a recent study[(4)], recurrence rates as high as 10% and patient clearance rates ranging from 41 to 68 percent. Vaginal ulceration, moderate to severe itchiness, and a solitary incidence of vaginal adenosis with clear cell cancer were among the side effects recorded.

**3- Actinic keratosis (AK)**

Using 5-fluorouracil to treat AK has been effective for over 40 years. A full course of 5-FU therapy is expected to reduce the number of lesions by 90%, with around 50% of patients achieving complete clearance, according to a thorough research. The inflammatory response influenced by 5-FU therapy has also benefited in the early detection of subclinical lesions [(5)].

**4- Bowen's disease**

**Salim *et al.*** [(6)] separated their 40 individuals with Bowen's illness into two groups. One set of participants were given topical photodynamic treatment, whereas another set were given 5-FU. Treatment with photodynamic therapy resulted in an 88% cure rate, whereas 5-fluorouracil (6-FU) resulted in a 67% cure rate.

**5- Non-melanoma skin cancer**

Non-melanoma skin cancer patients have an effective therapy option in topical 5-fluorouracil (5-FU) 5 percent cream (NMSC). 5-fluorouracil was the first FDA-approved topical medication for the treatment of superficial basal cell carcinomas (BCCs). Based on a study of 54 individuals with 113 superficial BCC lesions, which showed a 93% full clearance rate, this treatment was given the green light [(7)].

**6- Keloid**

In tissue culture, 5-fluorouracil has been shown to inhibit fibroblast multiplication. Additionally, it suppresses TGF-induced type I collagen gene expression in human fibroblasts [(8)].

The 5-FU is beneficial in the treatment of keloids and hypertrophic scars when administered intravenously once weekly or every two weeks. Fourteen patients were split into two groups, each receiving either intralesional triamcinolone acetonide (TAC) alone or TAC with 5-FU once weekly for eight weeks. Although both groups showed improvement across the board, the combination group's gains were more noticeable [(8)].

**7- Vitiligo**

Thirty patients with localised stable vitiligo (at least three lesions each) were given one of three treatments by **Jha *et al.*** [(9)]: exfoliation of the skin followed by seven days of treatment with either a soframycin tulle dressing, a topical 5% 5-FU dressing, or a topical 1% placentrex gel dressing. Results from the three treatments were: 73.3%, 46.7%, and 63.3%. Possible method by which 5-FU improves repigmentation of vitiligo lesions is through overstimulation of follicular melanocytes, which

migrate to the surface epidermis during epithelialization and promote depigmentation.

**8- Basal cell carcinoma**

Superficial basal cell carcinomas that are many or cannot be removed surgically may respond well to topical 5-FU (5 percent cream). If you have invasive basal cell carcinoma, you should not use 5-fluorouracil (5-FU) cream since it just slows down the growth of the tumor's outer layer, making it look like the lesions have disappeared even if the cancer is still progressing into the deeper layers of the skin [(10)].

**9- Keratoacanthoma**

They are lesions that spread quickly and leave ugly scars. Although they are mostly benign neoplasms, patients lament the unsightly cosmetic look of their scars. Topical 5-FU application may be utilised in some circumstances in place of surgical removal to lessen patient suffering and scarring. Additionally, the successful use of intralesional 5-FU as a keratoacanthoma therapy method has been documented [(11)].

**10- Psoriasis**

In the treatment of nail psoriasis, 5-FU has varying degrees of success. Patients with nail psoriasis demonstrated some improvement in their nail region severity scores when one percent 5-FU was coupled with a nail permeability enhancer cream (urea plus propylene glycol) [(12)].

**11- Photoaging**

An early study discovered that 5-FU caused an increase of the molecular indicators of dermal matrix remodelling and wound healing. These findings imply that the improvement in the appearance of photo-damaged skin in individuals receiving topical 5-FU treatment is the result of wound healing and dermal matrix remodelling [(1)].

## CONCLUSION

The data we reviewed suggested that 5-FU might be useful for a variety of noncancerous cutaneous causes, including the treatment of scars, pigmentary diseases, cutaneous infections (viral warts, molluscum contagiosum), inflammatory dermatoses, and cosmetics purposes.

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