

# Periodic Research

## Study of Numerical Aberrations of Chromosomes in Psoriasis Patients

### Abstract

Leucocyte cultures were initiated to obtain large number of cells in metaphase stage. After staining slides with Giemsa chromosome analysis was made on microscope with magnification and film projection. Present research was carried out to study changes in number of chromosomes of psoriasis cases receiving PUVA treatment. Untreated cases were also selected for study. These patients were seven males and three females. Study was also made in normal individuals. Twenty metaphases were analyzed from each patient. It was observed that numerical chromosomal aberrations in psoriasis cases were not much increased compared to normal individuals. Numerical aberrations were observed more in untreated patients.

**Keywords:** Leukocyte, Culture, Chromosome, Numerical Aberrations, Psoriasis.

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### Introduction

Psoriasis is a determined disorder of skin having lesions which often become confluent to form large plaques. Extensive psoriatic lesions are a physical and social handicaps to the patients. It is believed that psoriasis is determined by multifactorial inheritance. Farbar (1967) lend credence that genetic component is at play in the etiology of this disease. Nielsen and Zachariae(1973) studied chromosome aberrations in severe psoriasis cases and concluded there was an increased frequency of gaps, breaks, dicentric chromosomes and acentric fragments compared to 41 controls. When investigated, these patients were not receiving any systemic treatment. The results indicate that chromosomal abnormalities in psoriatics, besides being due to treatment, may reflect the severity of the disease. Methotrexate and other systemic cytotoxic drugs effectively control psoriasis, but have serious side effects such as bone marrow depression, liver and kidney damage which limits their usefulness. (Talwalkar and Gadgil, 1979). Since the first decade of twentieth century, ultraviolet radiation either in the form of natural sunlight or from artificial sources has been utilized in the treatment of psoriasis (Urbach et al, 1976). Photochemotherapy is an approach to the treatment of psoriasis. Psoralen (8-methoxypsoralen) is administered orally 2 hours before irradiation. Radiation is given by a special light system emitting long wave UVA (320-380nm). This mode of treatment is called PUVA. The efficiency of this treatment has been confirmed by numbers of investigators. (Swanbeck et al, 1975; Wolff et al 1976; Melski et al 1977; Roenigk et al 1979) Yongquan (1992) gave specific therapy located chromosomal translocations and leukemia induced by bimolan for psoriasis. Bhalerao and Bowcock (1998) studied the genetics of psoriasis. Kockum et al (2002) studied susceptibility loci for atopic dermatitis on chromosomes 3, 13, 15, 17 and 18 in a Swedish population. Bowcock et al 2004 studied genetics of psoriasis, psoriatic arthritis and atopic dermatitis.

### Aims

Following are the aims of the present study :

1. To study numerical chromosomal aberrations from leucocyte culture of peripheral blood samples of group of psoriatics not receiving any therapy and another group receiving PUVA therapy.
2. To study and analyze numerical chromosomal aberrations relating to sex and period of illness of psoriatics.

### Material and Methods

Peripheral leucocytes cultures were initiated to obtain a large number of cells in metaphase stage. Dalhousie University, Halifax Novascotia method requires only few drops of blood. 8 to 10 drops of blood were dropped directly into each of universal containers having following: 5 ml of Tc 199 medium, 1 ml of serum, .15 ml PHA (Phytohaemagglutinin)

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and 1 – 2 drops of heparin. Culture bottles were kept in water bath at 37°C for 72 hrs. 0.3 ml Colchicine (0.04%) was added to each culture tube on morning of third day. After giving hypotonic treatment, cells were fixed in freshly prepared fixative. Giemsa was used for staining slides. All the stained slides from each aliquot were labelled and screened under lower power for the quality of preparation. Slides were selected for differential count of the metaphases. The chromosome analysis were made on microscope with film projection at magnification. Twenty metaphases were analyzed for each case.

Six cases were under PUVA therapy taking 20mg methoxsalen (melanocyl). PUVA irradiation was given 2 hours after ingestion of tablets with fluorescent black light tubes with suitable reflectors for 30 minutes twice a week.

### Result and Discussion

In the present study leucocytes cultures were initiated from ten patients of psoriasis and fifteen normal individuals for study of chromosomal aberrations. Psoriasis patients were seven males and three females. Normal individuals were nine males and six females. Six cases of psoriasis were receiving PUVA therapy and four cases were not receiving any PUVA therapy.

**Table 1.1**  
**Shows Distribution of Psoriasis Cases According to Sex**

| Sex    | No. of Cases |
|--------|--------------|
| Male   | 07           |
| Female | 03           |
| Total  | 10           |

Table 1.1 shows ten cases of psoriasis were taken for study, seven were males and three were females.

**Table 1.2**  
**Shows Distribution of Cases According to Period of Illness**

| Period of Illness | No. of Cases |
|-------------------|--------------|
| 8 To 16 Years*    | 05           |
| 17 To 24 Years    | 03           |
| 25 Years Onwards  | 02           |
| Total             | 10           |

Period of illness were rounded by taking 6 months or more equal to one year.

### Period of Illness 8 to 16 Years

Five cases were suffering from illness in this period.

### 17 to 24 Years

Three cases were suffering from illness in this period.

### 25 Years Onwards

Two cases were suffering from illness in this period.

**Table 1.3**  
**Shows Distribution of Cases According to Treatment**

| Treatment                 | No. of Cases |
|---------------------------|--------------|
| Received PUVA therapy     | 06           |
| Not Received PUVA therapy | 04           |
| Total                     | 10           |

Table 1.3 shows 06 cases were receiving PUVA therapy and four cases were not receiving any therapy.

**Table – 1.4**  
**Showing Numerical Aberrations in Normal Individual**

| S. No | Cases Number | Hyperploid metaphase | Hypoploid metaphase | Chromosomal pattern of abnormal metaphases |
|-------|--------------|----------------------|---------------------|--|
| 01    | N-1          | -                    | -                   | -  |
| 02    | N-5          | -                    | -                   | -  |
| 03    | N-5          | -                    | -                   | -  |
| 04    | N-6          | -                    | -                   | -  |
| 05    | N-7          | -                    | -                   | -  |
| 06    | N-10         | -                    | 3                   | 45 XY – C                                  |
| 07    | N-12         | -                    | -                   | -  |
| 08    | N-15         | -                    | -                   | -  |
| 09    | N-16         | -                    | 5                   | 45 XX – B                                  |
| 10    | N-18         | -                    | -                   | -  |
| 11    | N-19         | -                    | -                   | -  |
| 12    | N-20         | -                    | -                   | -  |
| 13    | N-22         | -                    | -                   | -  |
| 14    | N-23         | -                    | -                   | -  |
| 15    | N-28         | -                    | -                   | -  |

Table 1.4 shows eight metaphases of two normal individuals showed abnormalities.

**Table – 1.5**  
**Showing Chromosomes Group Affected by Chromosomal Aberrations**

| Chromosomes groups | Hyperploid | Hypoploid |
|--------------------|------------|-----------|
| A                  | -          | -         |
| B                  | -          | 5         |
| C                  | -          | 3         |
| D                  | -          | -         |
| E                  | -          | -         |
| F                  | -          | -         |
| G                  | -          | -         |

Table 1.5 shows Chromosomes of group B and C were affected in normal individuals.

**Table – 1.6**  
**Shows Numerical Aberrations in a Study on Psoriasis Cases**

| S. No | Cases Number | Numerical aberrations |            | Chromosomal pattern of abnormal metaphases |
|-------|--------------|-----------------------|------------|--|
|       |              | Hyperploidy           | Hypoploidy |  |
| 01    | P-1          | -                     | 2          | 45,XX-C                                    |
| 02    | P-2          | -                     | -          | -  |
| 03    | P-3          | -                     | -          | -  |
| 04    | P-4          | -                     | -          | -  |
| 05    | P-5          | -                     | 1          | 45,XX-D                                    |
| 06    | P-6          | -                     | 4          | 45,XX-D                                    |
| 07    | P-7          | -                     | 2          | 45,XX-B                                    |
| 08    | P-8          | -                     | -          | -  |
| 09    | P-9          | -                     | -          | -  |
| 10.   | P-10         | -                     | 2          | 46,XY-A                                    |

In table 1.6 it is seen that 11 metaphases showed aberrations in psoriasis cases. Two hundred metaphases were analyzed from ten patients.

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**Table – 1.7**

**Shows Distribution of Numerical Aberrations According to Affected Chromosomes Groups**

| S. No | Chromosome groups | Hyperploidy | Hypoploidy | Total |
|-------|-------------------|-------------|------------|-------|
| 1     | A                 | -           | 2          | 2     |
| 2     | B                 | -           | 2          | 2     |
| 3     | C                 | -           | 2          | 2     |
| 4     | D                 | -           | 5          | 5     |
| 5     | E                 | -           | -          | -     |
| 5     | E                 | -           | -          | -     |
| 6     | F                 | -           | -          | -     |
| 7     | G                 | -           | -          | -     |
| 8     | Y                 | -           | 2          | 2     |
|       | Total             | -           | 11         | 11    |

Table 1.7 shows that chromosomes of group A,B,C and D were effected in psoriasis cases.

**Table – 1.8**

**Shows Distribution of Numerical Aberrations in Psoriasis Cases According to Sex.**

| Sex.   | Number of Cases | Number of Metaphases Analyzed | Number of Abnormal Metaphases | Numerical Aberrations |            |   |       |
|--------|-----------------|-------------------------------|-------------------------------|-----------------------|------------|---|-------|
|        |                 |                               |                               | Hyperploidy           | Hypoploidy |   |       |
| Male   | 7               | 140                           | 2                             | -                     | 2          | 2 | 1.42% |
| Female | 3               | 60                            | 9                             | -                     | 9          | 9 | 15%   |

Distribution of aneuploid metaphases according to sex in psoriasis.

**Male**

One hundred and forty metaphases were analyzed from seven males. Two metaphases

exhibited hypoploidy in one male.

**Females**

Sixty metaphases were analyzed from three females. Nine metaphases showed hypoploidy in three females.

**Table – 1.9**

**Shows Distribution of Numerical Aberrations According to Period of Illness**

| S. No. | Illness Period in Years | Number of Metaphases Analyzed | Numerical aberrations |               |             | Total |     |
|--------|-------------------------|-------------------------------|-----------------------|---------------|-------------|-------|-----|
|        |                         |                               | Hyper- diploidy       | Hypo-diploidy | Other types | No.   | %   |
| 1.     | 8-16                    | 100                           | -                     | 5             | -           | 5     | 5   |
| 2.     | 17-24                   | 60                            | -                     | 2             | -           | 2     | 3.3 |
| 3.     | 25 onwards onwards      | 40                            | -                     | 4             | -           | 4     | 10  |

It is observed in table 1.9 there is higher percentage of aberrations in patients suffering from disease of psoriasis for long period.

**Table -1.10**

**Shows Distribution of Numerical Aberrations According to PUVA Treated and Untreated Cases.**

| S. No. | Treatment    | Number of metaphases analyzed | Numerical aberrations |               |             | Total |     |
|--------|--------------|-------------------------------|-----------------------|---------------|-------------|-------|-----|
|        |              |                               | Hyper- diploidy       | Hypo-diploidy | Other types | No.   | %   |
| 1.     | With PUVA    | 120                           | -                     | 6             | -           | 6     | 4.0 |
| 2.     | Without PUVA | 80                            | -                     | 5             | -           | 5     | 5.0 |

Distribution of metaphases according to PUVA treated and untreated cases.

One hundred and twenty metaphases were analyzed from six cases who were under PUVA therapy. Six metaphases showed hypoploidy.

Eighty metaphases were analyzed from four cases who were not receiving PUVA therapy, five metaphases exhibited hypoploidy. Thus there is not much difference in aberrations between PUVA treated and untreated cases.

Ryan et al (1965); Jensen (1967) have reported cytogenetic abnormalities in methotrexate treated psoriatic patients. Studies by Ryan et al (1965) revealed an increase number of chromosomal gaps and breaks in a group of eight psoriatics treated with folic acid antagonist methotrexate, when compared with eight non-methotrexate treated psoriatics . Jensen (1964); Cocher and Franz (1967) have also found no significant differences in chromosomal abnormalities between nine methotrexate treated psoriatics and ten healthy individuals. Valenti et al (1970) studied chromosome

in patients of psoriasis treated with amethopterin. No significant increase in the number of chromosomal breaks or aneuploids cells in these patients leucocytes was seen. Swanbeck et al (1975) studied the usefulness of oral treatment of psoriasis with psoralens and long- wave ultra violet light. Chromosome preparations were examined for sister chromatid exchanges and chromosome aberrations in eighteen patients receiving photochemotherapy with 8-MOP and UVA for the treatment of psoriasis, both before starting treatment and again six months later. There was no evidence of chromosome damage in lymphocytes following treatment (Faed,1980). In the present study numerical aberrations were observed in metaphases of 5 cases. It is seen that only eleven metaphases showed aberrations. Aberrations is also seen in normal individuals.

**Conclusion**

It can be concluded that there is not much increase in numerical aberrations compared to normal individuals. Aberrations are seen in normal individuals

also. Chromosomes of group A, B, C and D were affected. Aberrations were more in female. There was not much difference between PUVA treated and untreated cases.

### Suggestions

#### Following are the Suggestions:

1. Studies should be carried out in different areas on large sample.
2. Counseling may help to eradicate the disease.
3. Study on structural aberrations of chromosomes may be conducted.
4. Study at molecular level may be conducted.

### References

1. Bhalerao, J. and Anne, Bowcock, A. M.,(1998). The Genetics of Psoriasis: a complex disorder of skin and immune system. Human molecular genetics. vol 7 p 1537-1545.
2. Bowcock, A. M., et al.(2004).Genetics of psoriasis, psoriatic arthritis and atopic dermatitis. Human molecular genetics. vol 13 p 43-5
3. Farbar,E.M.,Cox ,A.,J.(1971).Psoriasis in Proceedings of International Symposium. Standard University California UniversityPress. P 91
4. Kockum, I., et al. (2002). Susceptibility loci for atopic dermatitis on chromosomes 3, 13,15,17and 18 in a Swedish population. Human molecular genetics. vol 11 p 1539-1548.
5. Melski, J.W. et al.(1977).Oral Methoxsalen Photochemotherapy for the treatment of psoriasis :A co-operative clinical trial. J.Invest. Dermatol.68:328-338.
6. Nielsen, J.,Zachariae,H.(1973).Chromosome aberrations in severe psoriasis.Acta Dermato-Vener53:192-194
7. Ryan,T.,Baldington,M.&Springs,A.(1965). Chromosomal abnormalities produced by folic acid antagonist. Brit. J. Derm.77:541
8. Roenigk, H.H.Jr.,Maibach,H.I.&Weinstein,G.(1972).Use of methotrexate in psoriasis. Arch. Dermatol. 105 :363 -365.
9. Swanbeck,G. et al (1975).Treatment of psoriasis with oral psoralens and long wave ultra violet light..Acta.Dermato-vener 55:367-376.
10. Wolff-Schreiner, et al.(1978).Sister chromatid exchanges in photochemotherapy. Journal of investigative Dermatology p.69:387
11. Wolff, K.(1977).Photochemotherapy Results, follow-up and pathology in psoriasis.British .J.Derm.96:1
12. Yongquan,X., et al (1992).Specific chromosomal translocations and therapy related leukemia induced by bimolan therapy for psoriasis. Leukemia research vol 16 Issue 11, p1113-1123.