Medical Journal of the
Islamic Republic of Iran

Volume 12
Number 2
Summer 1377
August 1998

Brief Communications

EVALUATION OF THE CYTOGENETIC EFFECTS OF FUNDERMOL BY MICRONUCLEUS ASSAY

Keywords: Micronucleus assay, Fundermol, Burn.

MJIRI, Vol. 12, No. 2, 199-204, 1998.

Micronuclei originate from chromosome material that has lagged in anaphase and has not travelled to the appropriate pole of the spindle, to be included in the main nucleus of the daughter cell. In the course of cell division, this material is distributed to only one of the daughter cells. Micronuclei are stored in cells that have passed their first post-treatment mitotic stage when chromatin fragments derived from chromosome breakage have formed small nuclei outside the main nucleus.[1]

Since 1925, micronucleus assay has been used as a method for detecting the reduction or breakage of chromosomes.[2-4] This assay can be used for different tissues, for example, liver, bone marrow cells, peripheral blood and even cultured cells and derm tissue.[5,6]

Fundermol is an ointment used for treating different kinds of burns. This drug is composed of lawrone, curcumin, tannic acid, fatty acids and bees wax. In this research the cytogenetical effects of fundermol have been studied on Balb/c mice post burn (1% of total surface), by micronucleus test on 15 groups [one group as normal (no burn and no fundermol), seven groups as control (only burn) and seven groups as treated (burn and fundermol)] at 1, 2, 3, 5, 10, 20 and 30 days post burn. Sampling was done at the end of each period.[7-13]

The results of the micronucleus assay are shown in Table I and Fig. 1. There is a minimum of micronuclei in the normal group (i.e., 12 micronuclei in 5000 PCE), and the maximum number of micronuclei was seen on day one of control and treated groups (i.e., 17 micronuclei in 5000 PCE). According to the results depicted in Table I and Fig. 1, the frequency of micronuclei is maximum at early days and minimum at later days. This result corresponds with other studies that have reported the maximum frequency of micronuclei to be present 30-36 h post-treatment.[9,16] The interesting subject in this research is that there are no significant differences between control and treated groups compared to the normal group (Table I). Cell proliferation rate was obtained by use of the equation PCE/(PCE + NCE). The bone marrow cell

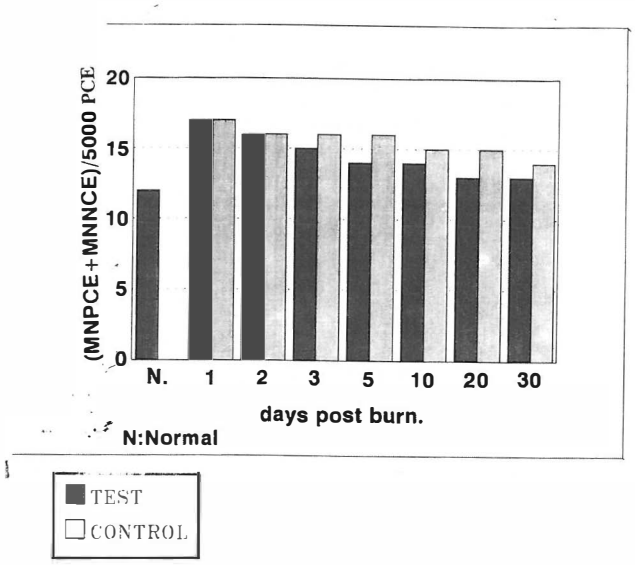

Fig. 1. Effects of fundermol on the formation of micronuclei over days post-burn.

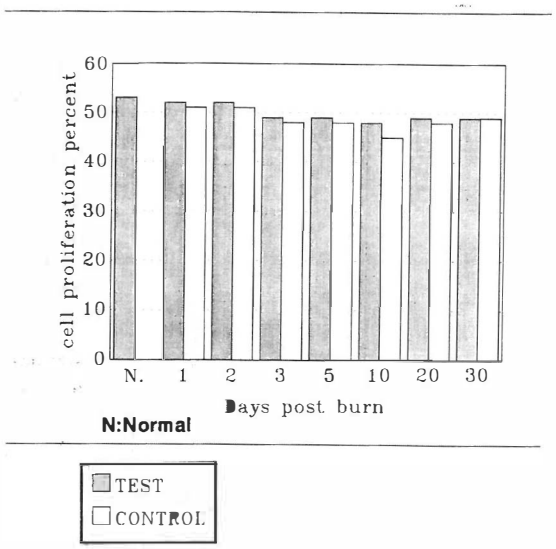

Fig. 2. Effects of fundermol on the cell proliferation rate over days post-burn.

Table I. Effects of fundermol on the frequency of micronuclei induced on Balb/c mice post-burn.

Days post-burn	Group	No.	Number of micronuclei in 1000 PCE					Number of micronuclei in 5000 PCE
0	N	5	3	2	3	3	1	12
1	C	5	3	4	3	4	3	17
1	T	5	3	3	4	4	3	17
2	C	5	4	2	4	3	3	16
2	T	5	3	3	4	2	4	16
3	C	5	3	3	3	4	3	16
3	T	5	4	3	3	2	3	15
5	C	5	3	4	2	4	3	16
5	T	5	4	2	2	3	3	14
10	C	5	4	2	2	3	4	15
10	T	5	3	2	3	4	3	14
20	C	5	4	4	3	3	1	15
20	T	5	3	2	2	3	3	13
30	C	5	3	2	2	3	4	14
30	T	5	3	2	2	3	3	13

C: Control (only burn)
T: Test (burn and fundermol)
N: Normal (no burn and no fundermol).

Table II. Effects of fundermol on the cell proliferation rate of Balb/c mice post-burn.

Days post-burn	Group	No.	Cell proliferation percent $(\frac{PCE}{PCE+NCE} \times 100)$					Mean	Results
			1	2	3	4	5		
0	N	5	56	55	52	53	49	53	
1	C	5	52	53	49	52	49	51	
1	T	5	53	52	51	49	55	52	
2	C	5	48	51	53	49	55	51	
2	T	5	52	53	50	53	52	52	
3	C	5	46	51	49	50	44	48	*$p<0.05$
3	T	5	50	46	51	50	48	49	*$p<0.05$
5	C	5	47	45	47	50	51	48	*$p<0.05$
5	T	5	51	51	46	49	48	49	*$p<0.05$
10	C	5	44	46	46	46	43	45	*$p<0.001$
10	T	5	49	46	46	48	49	48	*$p<0.001$
20	C	5	47	50	49	47	47	48	*$p<0.01$
20	T	5	47	51	50	47	50	49	*$p<0.01$
30	C	5	50	50	47	48	54	48	*$p<0.01$
30	T	5	51	50	47	50	46	49	*$p<0.05$

C. Control (only burn)
T. Test (burn and fundermol)
N: Normal (no burn and no fundermol)
* Significantly different from normal

proliferation rates are given in Table II and Fig. 2. As shown, cell proliferation is greatest in the normal group and the least in the 10 day group (control and treated) post burn. Statistical analysis also shows that there is no significant difference between all control and treated groups.

The frequencies of cell proliferation rate are less than the normal group in both control and treated groups. These results may indicate that the reduction in cell proliferation rate is possibly due to the effects of the burn, not fundermol, since these frequencies in treated groups using fundermol are

more than the control groups. Since fundermol has medical, antibacterial, antifungal and antitumoral effects, this possibility is predictable. [10,11,14,15]

The preliminary results of these experiments show that fundermol ointment has probably no noticeable cytogenetic effect. Further research is necessary in order to obtain more information in this regard.

M.R. NOORI-DALOII, H.A. SASAN AND S. MOHAGHEGH HAZRATI***

*From the Department of Biochemistry, Faculty of Medicine, Tehran University of Medical Sciences, the * Department of Genetics, Faculty of Basic Sciences, Tarbiat Modarres University, and the ** Immunology Department, Faculty of Hygiene, Tehran University of Medical Sciences, Tehran, I.R. Iran.*

REFERENCES

1. Mohana PV, et al: Lack of micronucleus induction by "cobatum" in bone marrow erythrocytes of Swiss mice. Mutation Res 361: 23-28, 1996.
2. Heddle JA: A rapid *in vivo* test for chromosomal damage. Mutation Res 18: 187-190, 1973.
3. Miller RC: The micronucleus test as an *in vivo* cytogenetic method. Environment Mutation Res 6: 167-170, 1976.
4. Vanparys P, Vermeirn F, Sysmans M, Temmerman R: The micronucleus assay as a test for the detection of aneugenic activity. Mutation Res 244: 95-103, 1990.
5. Romagna F, Staniforth CD: The automated bone marrow micronucleus test. Mutation Res 213: 91-104, 1989.
6. Witt KL, Gulati DK, Kaur P, Shelby MD: Phenolphthalein: induction of micronucleated erythrocytes in mice. Mutation Res 341 (3): 151-160, 1995.
7. Tucker JD, Vanderlaan M, Kwan TC, Moorell DH, Felton JS: Effects of diet and folate on levels of micronucleated polychromatic erythrocytes. Mutation Res 301: 19-26, 1993.
8. Abend M, Basske FS, Van Beuningen OD: Isolation of micronuclei: high yield by sucrose gradient versus maximum purity by cell sorting. Mutation Res 360 (1): 15-23, 1996.
9. Adler ID: Cytogenetic test in mammals, In: Venitt S, Parry JM, (eds.), Mutagenicity Testing. A Practical Approach. Oxford: IRL Press, pp. 275-306, 1984.
10. Havsteen A: Flavonoids: a class of natural products of high pharmacological potency. Biochemistry Pharmacol: 23: 1141-48, 1983.
11. Malekdeh F: Antimicrobial activity of *Lawsonia inermis*. J Appl Microbiol 16 (4): 663-664, 1986.
12. Muanday R, Smith BL: Hematolytic activity and nephrotoxicity of 2-hydroxy 1-4 naphtoquinone (Lawsone) in rats: J Appl Toxicol 11 (2): 85-90, 1991.
13. Hareel J, Walker E: A standard animal burn. J Trauma 8: 1049-1052, 1968.
14. Moghtaderi M: The anti-inflammatory effect of fundermol in the inflammation of rabbit knee joint. S.C. Thesis, Tarbiat Modarres University, Tehran, 1995.
15. Bagheri H: Effects of fundermol ointment on healing of infected second degree burn wound in rats. S.C. Thesis, Tarbiat Modarres University, Tehran, 1996.
16. Katheen H, Blakey DH, et al: The *in vivo* micronucleus assay in mammalian bone marrow and peripheral blood. Mutation Res 239: 77-80, 1990.