

1 Adverse Histopathological Effects of Antiperspirant Aluminum 2 Chloride on Skin

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4 ¹ SKIMS

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6 **Abstract**

7 The antiperspirating agents are the daily household products used globally by both the
8 genders to minimize excessive sweating. Approximately about 90

10 *Index terms*— dermis, follicle, keratin, glands, almunium chloride.

11 **1 I. Introduction**

12 The use of chemicals is a wide spread practice worldwide for enhancing and improving lifestyle. But along the
13 benefits of these products there is also the potential for adverse effects to the people and the environment.? It has
14 been seen that daily transdermal exposure over long periods of time of metal containing compounds in personal
15 care products has raised some health concern. [5][6][7] The global cosmetic and skin care industry is a highly
16 profitable market worldwide that is concerned with utilization of raw materials, product testing, sophisticated
17 laboratory equipment and new technology testing that is said to focus within the safe limit parameters of cosmetics
18 and toiletries usage development. As such, these cosmetic giant companies spend lavishly more on TV advertising
19 than any other commercial enterprise. Consumers are introduced and used in various cosmetics and personal care
20 products without full disclosure on its package labeling. The average person is misled to believe that such product
21 ingredients have been adequately tested and are safe for public usage. Ironically, this is far from accurate. 8
22 Moreover, males and females individuals, from infancy to old age utilize a huge multivariate variety of shampoos,
23 body soaps antiperspirants and skin creams preparations, some with no known peer knowledge or concern of the
24 preparation's hazardous potential.

25 Thorough scanning of the available literature revealed, dearth of literature regarding the gross and histological
26 effects of aluminium salts (aluminium nitrate and aluminium chloride) on skin. Therefore a curious desire
27 developed to conduct evidence based study of the effects of aluminium chloride on the skin of mammal, the
28 albino rabbit.

30 **2 II. Materials and Methods**

31 The present study was carried out on twenty four inbred adult albino rabbits. The numbers of animals used
32 and procedures to minimize the suffering of the animals are in accordance with ethics committee on animal
33 experiments of Government medical college Jammu. IEC no. pharma/2012/2818. The rabbits were procured
34 from the Central Animal House of Government Medical College, Jammu. Animals were housed in with dust free
35 rice husk as bedding material under laboratory conditions with controlled environment of temperature of 25 ± 2 °
36 , humidity ($16\% \pm 10\%$) and 12 hours light/dark cycle (16-18) as per committee for the purpose of control and
37 supervision of experiment on animals (CPCSEA), Indian guidelines. They were provided standard feed and water
38 ad libitum, before subjecting them for experimentation, animals were given a week's time to acclimatize with
39 laboratory conditions.

40 The animals were divided into following three main groups (A, B and C) as follows: Group A: Experimental
41 group -12 animals Group B: Control group -12 animals These groups were further subdivided into group A1, A2,
42 B1 and B2, containing 6 animals each. Group A1 received 10% aluminium chloride. Group A2 received 20%
43 aluminium chloride. Group B received distilled water.

5 V. CONCLUSION

44 Group B1 animals were taken as control for group A1 animals. Group B2 animals were taken as control for
45 group A2 animals. About 2cm× 2cm area of skin on posterior surface of each ear of each rabbit was used as
46 test areas. The test areas were shaved 24 hours prior to application of drug. Powdered form (98% purity) of
47 aluminium nitrate and aluminium chloride was used. Solutions were prepared in distilled water at 10% and 20%
48 concentrations daily before application. 0.5ml of solution was applied daily with the help of a clean glass rod
49 to the test areas on experimental animals. After application, each experimental animal was kept in individual
50 cages until the applied solution dried up at ordinary room temperature and atmosphere. Procedure was repeated
51 daily for next fifteen days whereas only distilled water was applied to the control groups. On day sixteenth of
52 the treatment right sided test areas of all groups were first examined using a hand lens. Then after proper local
53 anaesthesia with 1ml of 2% xylocaine subcutaneously, 1cm 2 of the test areas were excised under proper aseptic
54 conditions. The wounds left were properly cared for with povidine iodine till complete healing. Povidine iodine
55 was applied twice a day locally on the wound. Left sided test areas were kept without treatment for next 30 days,
56 on 46 th day these test areas were first grossly examined using a hand lens and then 1cm 2 of the test areas were
57 excised after proper local anaesthesia again using 1ml of 2% xylocaine subcutaneously and wounds were taken
58 care of with povidine iodine applied locally twice a day till they healed completely. The macroscopic or gross
59 changes of the skin were seen with the help of hand lens while the histological changes were observed after the
60 tissues were chemically fixed in neutral buffered formalin solution and later processed. Five-micron thick sections
61 were sectioned and stained with Harris's Haematoxylin and eosin stain.

62 3 III. Observations

63 With low and high (10% and 20%) concentration aluminium chloride after 15 days of treatment: -Hyperplasia
64 of epidermis along with hypertrophy of stratum corneum and intercellular oedema in epidermis was observed.
65 Skin treated with 20% Aluminium nitrate showed marked no. of cysts filled with keratin along with epidermal
66 erosions . Dermal oedema, widening of dermal papillae as well as vascularization in dermis was marked with
67 aluminium nitrate 20% as compared to that with aluminium chloride 20%. There was decrease in number of
68 hair follicles, sweat glands and sebaceous glands but increase in number of inflammatory cells and fibroblasts was
69 observed With low and high concentration of aluminium chloride after one month of stoppage of treatment:-Slight
70 hyperplasia of epidermis and slight hypertrophy of stratum corneum persisted .Dermis showed slight oedema.
71 Hair follicles, sweat glands and sebaceous glands showed slight increase in number with decrease in number of
72 fibroblasts and inflammatory cells '

73 4 IV. Discussion

74 The aim of the present study was to evaluate if there are any changes in the skin after use of antiperspirants.
75 The results of present study compares favorably with previous studies.

76 Findings in epidermis with 10% aluminium chloride are consistent with the findings of the Lansdown?, Nasir
77 et al.¹? After one month of stoppage of treatment with 10% aluminium chloride the epidermal changes reverted
78 back to normal skin in the present study. Similar results have also been reported by Nasir et al.¹¹

79 The epidermis showed marked hypertrophy of stratum corneum and hyperplasia of epidermis along with
80 marked intercellular oedema and keratin cysts in the present study after 15 days of treatment with 20% aluminium
81 chloride. These findings are almost in accordance with the findings of Lansdown?, Nasir et al.¹¹

82 After one month of stoppage of treatment with aluminium chloride 20% the changes reverted back to normal
83 with almost complete reversion. Similar changes were also demonstrated by Nasir et al.¹¹ In the present study
84 the dermis showed slight oedema and vascularization, few hair follicles and fibroblasts along with inflammatory
85 cells, rare sweat and sebaceous glands after 15 days of treatment with 10% aluminium chloride whereas dermis
86 showed moderate oedema, vascularization, inflammatory cells, slight fibroblasts and rare sweat and sebaceous
87 glands after 15 days of treatment with 20% aluminium chloride. In addition dermal papillae were elongated and
88 widened. After one month of stoppage of treatment with 10% aluminium chloride and 20% aluminium chloride
89 findings were moderate hair follicles, however sweat and sebaceous glands, vascularization and fibroblast were
90 slight. But there is no literature available to compare these findings.

91 5 V. Conclusion

92 The detailed study showing effects of Aluminium chloride (the antiperspirant) was conducted and the observations
93 were noted, critically analyzed and discussed with the findings of previous workers and hence it was concluded
94 that maintenance of a healthy life style is crucial in daily well being. The antiperspirants containing aluminium
95 chloride even in low dose concentrations, may still cause well defined histological damage to the skin and its
96 appendages, especially after a prolong time period of continuous application but the changes almost reverted
97 back to normal after one month of stoppage of application. And ¹



Figure 1: T

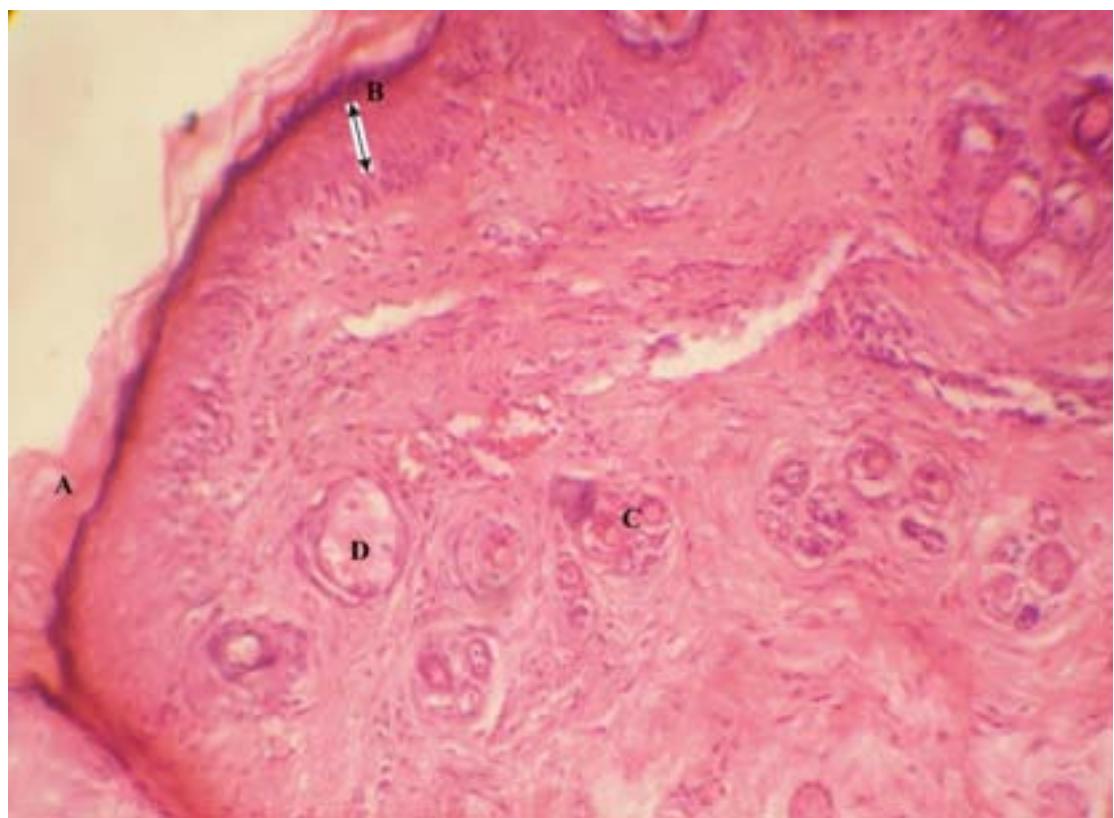


Figure 2:

5 V. CONCLUSION

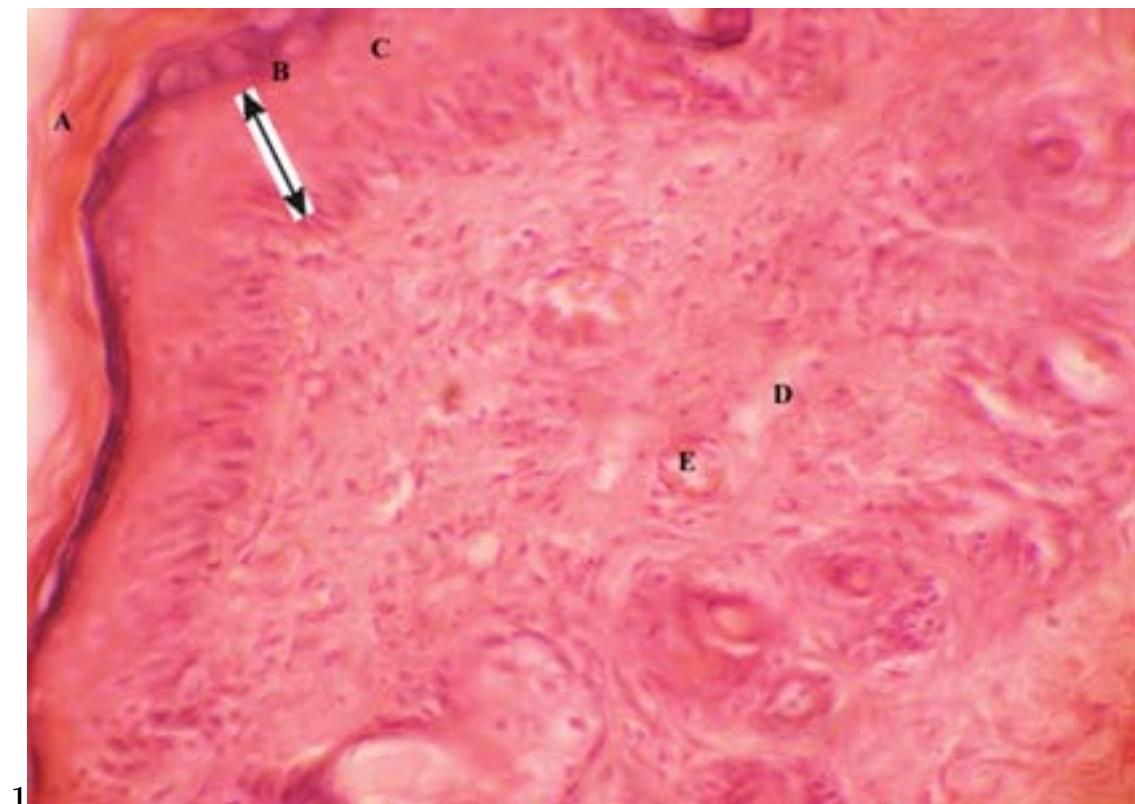


Figure 3: FiguresFigure 1 :

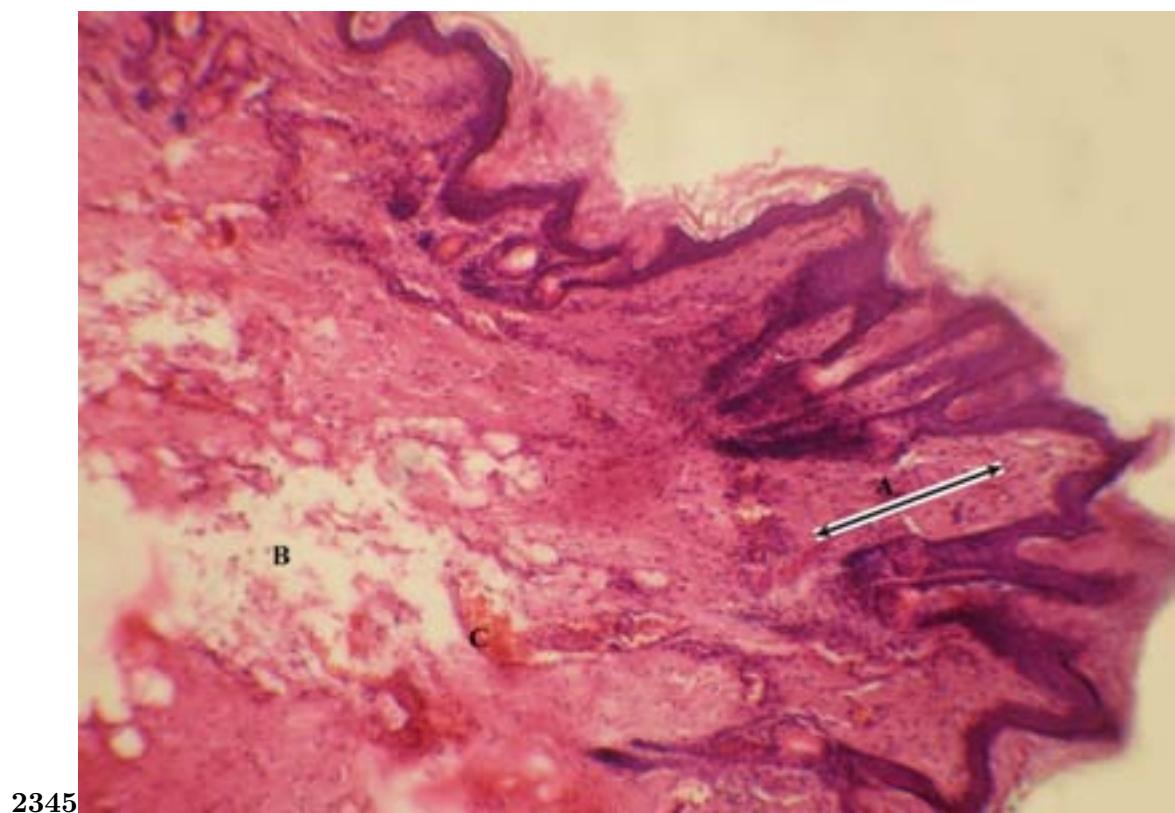


Figure 4: Figure 2 :Figure 3 :Figure 4 :Figure 5 :

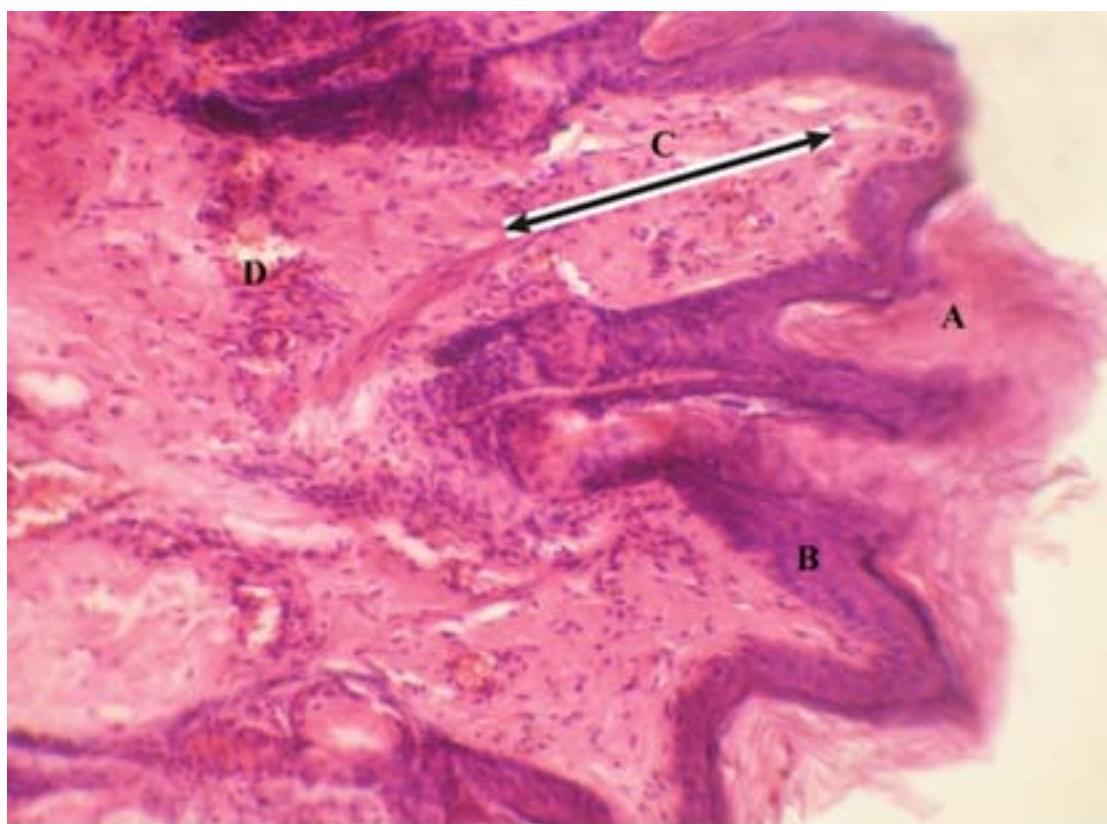


Figure 5:

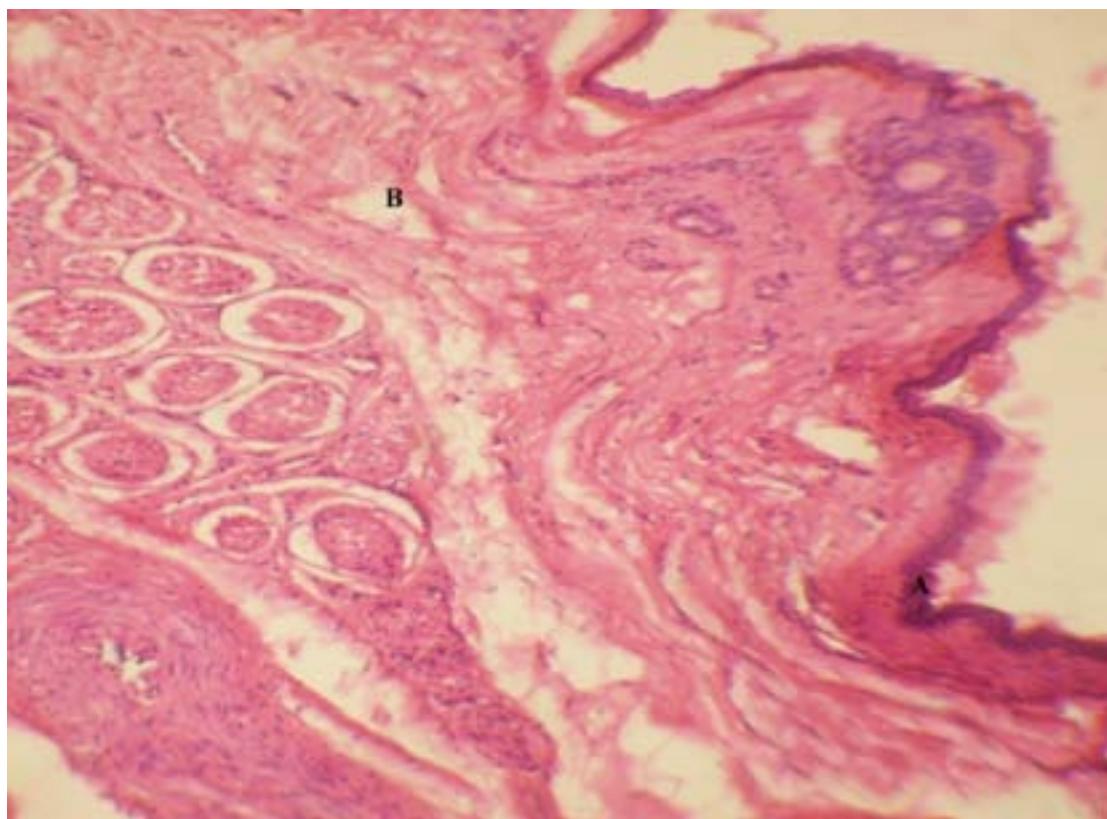


Figure 6:

5 V. CONCLUSION

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Different Findings	Control		After 15 Days of Treatment		After One Month of Stoppage of Treatment	
	Histological		Aluminium Chloride 10%	Aluminium Chloride 20%	Aluminium Chloride 10%	Aluminium Chloride 20%
Hypertrophy of Stratum Corneum	Nil	Moderate		Marked	Slight	Slight
Hyperplasia of Epidermis	Nil	Moderate		Marked	Nil	Nil
Intercellular Oedema	Nil	Moderate		Marked	Nil	Nil
Cysts filled with Keratin	Nil	Slight		Slight	Nil	Nil
Erosion of Epidermis	Nil	Nil		Nil	Nil	Nil

Figure 7: Table :

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Changes	Control	After 15 Days of Treatment			After One Month of Stoppage of Treatment		Year 2 015
		Aluminium Chloride 10%	Aluminium Chloride 20%	Slight	Rare	Volume XV	
Oedema	Nil	Nil					Issue III
Vascularization	Nil						Ver- sion I
Inflammatory cells	Slight	Chloride 20%	Slight				
Fibroblasts	Moderate	Moderate	Slight	Rare	Slight	Slight	
Hair follicles	Slight	Moderate	Slight	Rare	Slight	Moderate	
Sebaceous glands	Slight	Moderate	Slight	Slight	Moderate	Slight	
Sweat glands							

Figure 8: Table :

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