

REDUCTION IN SKIN IRRITATION BY CORTICOSTEROID APPLICATION PRIOR TO USE OF THE GLUCOWATCH G2® BIOGRAPHER

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Background: For people with diabetes, multiple daily glucose measurements are essential for disease management, but compliance is limited due to the pain and inconvenience of traditional skin prick blood glucose testing. The GlucoWatch G2® Biographer (Biographer, Cygnus, Inc., Redwood City, CA) is a device that provides glucose measurements frequently, automatically, and non-invasively, displaying glucose values to the user, with user-settable alarms to facilitate management of hypoglycemia¹. The device samples glucose transdermally using reverse iontophoresis². An *in situ* biosensor uses electrochemical detection to measure the amount of glucose extracted. Like other iontophoretic devices, use of the G2 Biographer can cause mild to moderate skin irritation. The purpose of this work is to determine if pre-application of corticosteroid preparations can reduce skin irritation from iontophoretic current³ from the G2 Biographer, while maintaining ability of the device to provide accurate glucose readings.

Methods: Numerous corticosteroid preparations were screened to identify formulations that did not interfere with adhesion of the device to the skin or biosensor function. Kenalog® (Westwood Squibb Pharmaceuticals Inc., Buffalo, NY, triamcinolone acetonide) and Cortizone-10 Quick Shot® (Pfizer Inc., New York, NY, hydrocortisone) sprays were selected. The sprays were applied to the forearms of 66 diabetic subjects prior to G2 Biographer application. G2 Biographers were worn for 15 hours, with two home blood glucose measurements taken per hour for reference. Irritation was assessed periodically by trained observers using a modified Draize scale and by the study subjects.

Results: Skin irritation was reduced by pretreatment with both corticosteroid sprays, with the fraction of subjects who experienced moderate irritation decreased by 57% and 43%, for the triamcinolone acetonide and hydrocortisone sprays, respectively. The irritation reduction effect from the single pre-application treatment persisted at the one-week assessment. User self-assessment of irritation indicated significant reductions in itchiness and overall perceived irritation. Pretreatment caused no difference in the ability of the device to produce clinically useful glucose readings.

Conclusions: A single preapplication of Kenalog or Cortizone-10 Quick Shot sprays significantly reduced skin irritation, did not adversely affect clinical accuracy, and are a useful method to enable users to gain more benefit from frequent, automatic glucose measurements obtained by the GlucoWatch G2 Biographer.

References:

1. Tamada JA, Garg SK, Jovanovic L, Fermi S, Potts RO, and the Cygnus Research Team, *JAMA*, **282**:1839-1844 (1999).
2. Rao G, Guy RH, Glikfeld P, et al., *Pharm Res* **12**:1869-1873 (1995).
3. Cormier M, Chao ST, Gupta SK, and Haak R, *J Pharm Sci*, **88**:1030-1034 (1999).

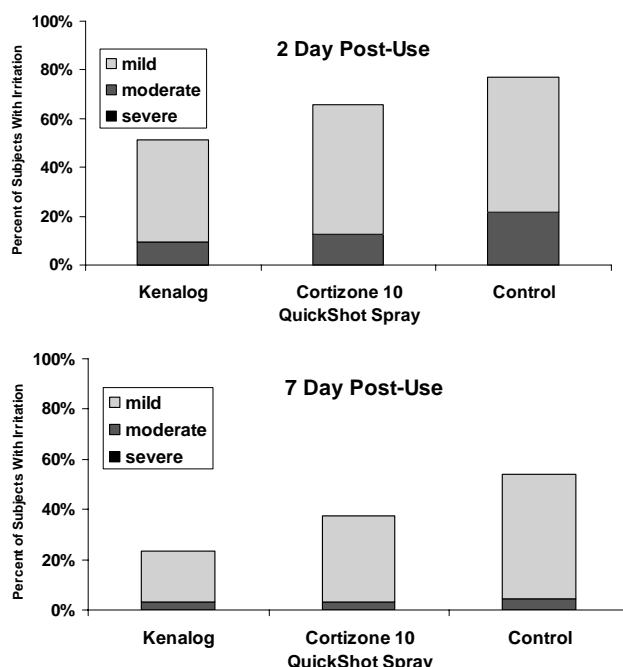


Figure 1. Combined Draize scores (erythema plus edema) by trained observers for skin sites with Kenalog Spray, Cortizone-10 Quick Shot Spray, and Control. No subjects experienced severe irritation in this study. Bar graphs show subjects who had measurable irritation; remaining subjects experienced no visible irritation. Both Kenalog and Cortizone-10 Quick Shot sprays reduced irritation compared to control, with Kenalog (triamcinolone acetonide) spray showing a larger effect than Cortizone-10 (hydrocortisone) spray.

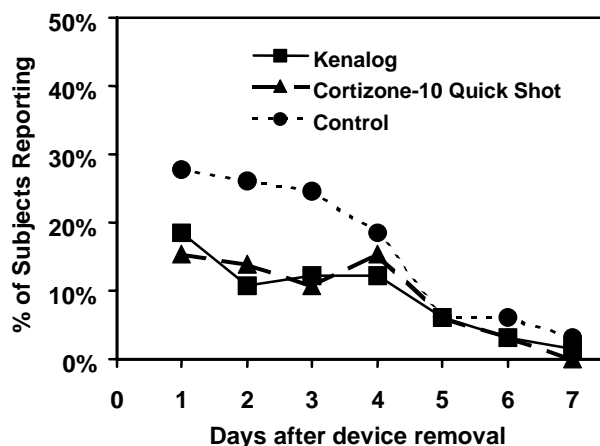


Figure 2. User-reported levels of moderate or above itchiness (Scale: none, mild, moderate, strong, intense). The number of subjects reporting moderate or higher levels of itching was reduced by half with preapplication of the corticosteroids.

	Kenalog		Cortizone-10 QuickShot	
	2 day	7 day	2 day	7 day
BETTER	78%	80%	78%	68%
WORSE	22%	20%	22%	33%
95% CI	(1, 0.646)	(1, 0.667)	(1, 0.651)	(1, 0.53)
p-value	0.0001	0.0001	0.0001	0.0083

24, 29, 27, and 24 subjects out of 64 reported "Same" for Kenalog and Cortizone 10 sprays on 2 and 7 days, respectively.

Table 1. Subject comparison of overall irritation of pretreated site compared to control (same location on opposite arm). Subjects reported significantly less irritation with the corticosteroid preapplication.