

Patch testing with benzoyl peroxide: reaction profile and interpretation of positive patch test reactions

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Background: Patch testing with benzoyl peroxide 1% pet. frequently leads to (weak) positive reactions, often with uncertain clinical relevance.

Objectives: To describe the pattern of patch tests reactions to benzoyl peroxide and to identify patients at risk of a positive reaction.

Methods: Retrospective analysis of data from the Information Network of Departments of Dermatology (IVDK), 1992–2007.

Results: Benzoyl peroxide 1% pet. was tested in 29 758 patients. Weak positive reactions (erythema, infiltration, possibly papules) occurred in 6.5%, and strong positive reactions (erythema, infiltration, vesicles) in 1.3%. According to logistic regression analysis, strong positive reactions to benzoyl peroxide were associated with leg or face dermatitis, work as dental technicians, young age and being female. Patients with atopic dermatitis had a significantly increased risk of weak positive reactions only.

Conclusions: Our analysis confirms that benzoyl peroxide 1% pet. is a problematic patch test preparation. Hence, clinical relevance of reactions to benzoyl peroxide has to be assessed very carefully. Patients with atopic dermatitis are particularly prone to irritant reactions to benzoyl peroxide. True allergic reactions may occur in dental technicians and following the treatment of leg ulcers with highly concentrated benzoyl peroxide in past. In contrast, widely used acne treatments with benzoyl peroxide seems to sensitize only rarely.

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In spite of its widespread use in topical preparations for acne treatment, confirmed cases of contact sensitization to benzoyl peroxide acquired by this route are rare. While typical benzoyl peroxide concentrations used in acne treatment are generally below 5% (up to 10% in exceptional cases), 20% benzoyl peroxide was used to treat leg ulcers in chronic venous insufficiency in the 1980s. In these patients, sensitization prevalences of up to 76% were described (1). Benzoyl peroxide is also used as an initiator of the acrylate and methacrylate polymerization reaction, e.g. in the production of dentures. Handling

the unfinished product, dental technicians may have repeated skin contact with benzoyl peroxide at high concentrations. Allergic contact dermatitis of the fingertips due to contact allergy to benzoyl peroxide has been reported in dental technicians (2). However, in larger studies, no significant increased risk of sensitization to benzoyl peroxide could be proven in this professional group (3, 4). Recently, benzoyl peroxide has been suspected to be a relevant contact allergen in bone cement for orthopaedic implants, where it is also used to start the methacrylate polymerization reaction (5).

For diagnosing contact sensitization, benzoyl peroxide is usually patch tested at 1% in petrolatum (pet.). However, patch testing with this preparation is hampered by high proportions of doubtful and weak positive reactions, respectively resulting in a negative reaction index (RI) and an unfavourable positivity ratio (PR) (6–8). From clinical studies of the German Contact Dermatitis Research Group (DKG) and the department of dermatology in Dortmund, it is known that positive reactions to benzoyl peroxide 1% pet. tend to occur in patients with increased skin irritability, as indicated by a positive (irritant) reaction to sodium lauryl sulfate (SLS) tested as irritancy control (9, 10). Based on this evidence, benzoyl peroxide 1% pet. must be regarded as a problematic patch test preparation (7).

In cases with a weak positive ('+') patch test reaction to benzoyl peroxide, it is debatable whether this truly indicates contact sensitization or just irritation. It is the clinicians' impression that weak positive patch test reactions to benzoyl peroxide often lack clinical relevance. However, there is no reliable data supporting the notion that weak positive reactions are largely irritant.

Against this background, we analysed data of the Information Network of Departments of Dermatology (IVDK) in order to describe the reaction profile of benzoyl peroxide and to identify patient groups at risk for presumably true sensitization to benzoyl peroxide. Our aim was to identify possible clues for the routine assessment of benzoyl peroxide patch test reactions based on the analysis of these large scale data.

Materials and Methods

This retrospective analysis was based on IVDK data from the years 1992–2007. The IVDK is an epidemiological surveillance system in the field of contact allergy. Its organization, routine procedure, and continuous quality control are described elsewhere (11, 12). All patch tests were performed and read according to DKG guidelines (13). This means, morphological scoring was as follows: ?, erythema only; +, erythema and infiltration, possibly papules; ++, erythema, infiltration, vesicles; +++, erythema, infiltration, coalescing vesicles; IR, soap effect or other forms of irritant reactions. For data analysis, patch test reactions at day 3 (D3) were selected. Only in those cases where a reading was done at D4 instead of D3, the D4 reaction was considered.

During the study period, benzoyl peroxide 1% pet. was part of the following DKG patch test series: topical drug series, rubber series, metalworking series (1990 to June 1994); plastics and glue series (1990 to June 1994, and from 1997 on);

denture material series (1990 to 2001); dental technician series (from 2002 on). From November 1993 to June 1994, benzoyl peroxide was tested at two concentrations, i.e. 0.5% and 1% pet., in the respective DKG test series. benzoyl peroxide patch test preparations were produced by and obtained from Hermal, Reinbek, Germany.

Statistical analysis was done using SAS software, Version 9.2 (SAS Institute, Cary, NC, USA). Logistic regression analysis was performed using a polytomous model, where positive reactions were split up into weak (+) and strong (++, +++) positive reactions and contrasted to non-positive reactions as reference. This model yielded risk estimates (odds ratio [OR] with accompanying 95% confidence interval [CI]). Explanatory variables included sex; age, categorized in four groups, according to the quartiles of the test population (<33; 34–47; 48–60; >60 years) with the oldest group serving as standard; past or current atopic dermatitis; leg dermatitis; face dermatitis; past or current work as dental technician. We did not include occupational dermatitis and hand dermatitis as explanatory variables because these items seemed to sum up populations of rather heterogeneous patients which would not be useful with regard to the aims of our study.

Results

In the 16-year study period, altogether 144 814 patients were patch tested in the IVDK. Benzoyl peroxide 1% pet. was tested in 29 758 of these patients (20.5%). The 55 centres testing benzoyl peroxide and the respective physicians responsible are listed in the acknowledgements. Patch test reactions at D3 (or D4, in exceptional cases as described in the methods section) are listed in Table 1. Positive reactions occurred in 2316 patients (7.8%). The highest frequency of positive patch tests was seen in Aachen (13.1%) and the lowest in Mainz (3.8%). In 50% of the centres contributing to this data analysis, the proportion of positive reactions to benzoyl peroxide ranged from 5.3% to 10.5%. Altogether, strong positive reactions (++, +++) were seen in 385 patients (1.3%). Doubtful and irritant reactions were noted in 2889 patients (9.7%).

Table 1. Patch test reactions to benzoyl peroxide 1% pet. at D3 (or D4, if the test was read at D4 instead of D3) in 29 758 patients tested in the IVDK, 1992–2007

Reaction	Number	Percent
neg.	24553	82.5
?	2270	7.6
+	1931	6.5
++	326	1.1
+++	59	0.2
IR	619	2.1

With this constellation, the RI was -0.1 , and the PR was 83.4%.

In the study population, age ranged from 12 to 84 years with a mean and median age of 47 years, the 25% and 75% quartiles being 33 and 60 years, respectively. A description of the total test population, patients with a negative reaction to benzoyl peroxide, patients with a positive reaction to benzoyl peroxide, patients with a weak positive reaction (+) to benzoyl peroxide, and patients with a strong positive reaction (++, +++) to benzoyl peroxide using the MOAHLFA index is given in Table 2. Additionally, this table gives the percentage of (current or former) dental technicians in each group because these professionals might be at higher risk of benzoyl peroxide sensitization, due to their occupational exposure (see above). Unfortunately, the underlying diagnosis 'acne' is not registered in the IVDK, so we could not take it into consideration for data analysis. Compared to patients not reacting to benzoyl peroxide, patients with a positive test reaction to benzoyl peroxide included a greater proportion of women (63.4% versus 58.6%), patients with occupational dermatitis (22.8% versus 20.9%), atopics (18.3% versus 14.0%), patients with face dermatitis (11.8% versus 9.1%), and patients aged below 40 years (39.8% versus 35.2%). In contrast, there were fewer patients with hand dermatitis (30.1% versus 32.1%), while the proportions of patients with leg dermatitis (7.7% versus 7.3%) and of dental technicians (2.5% versus 1.9%) showed no marked differences. Comparing patients with a weak positive benzoyl peroxide reaction to those with a strong benzoyl peroxide reaction, it is remarkable that some of the differences seen between patients with a positive and those with a negative reaction to benzoyl peroxide are more pronounced among those with a strong positive reaction while others are not. As far as female predominance and the increased proportions of patients with occupational dermatitis and of dental technicians are concerned, there is a gradation from the subgroup of patients with negative benzoyl peroxide reaction to + benzoyl peroxide

reaction and lastly to ++ / +++ benzoyl peroxide reaction. The proportions of patients with hand dermatitis and with face dermatitis and of those aged 40 years or more did not really differ in the groups with a weak and a strong positive reaction to benzoyl peroxide, respectively. The opposite was true for patients with leg dermatitis: among patients with a negative benzoyl peroxide reaction and those with a weak positive benzoyl peroxide reaction, their proportion was virtually the same, while it was markedly increased among those with a strong positive reaction to benzoyl peroxide. The highest proportion of patients with atopic dermatitis was noted among those with a weak positive reaction to benzoyl peroxide, while among those with a strong positive reaction the proportion was markedly lower but not as low as among those with a negative benzoyl peroxide reaction.

In order to identify differences in reaction patterns in different groups of patients, we analysed benzoyl peroxide reactions in various subgroups of the test population defined by sex, age, localization, year of patch testing, etc. The results are summarized in Table 3. It can be seen that in the last quarter of the analysis time span, i.e. in the years 2003–2007, markedly fewer positive reactions (5.8%) than in the years before (7.8–8.8%) were observed. Additionally, there is a constant decline of the percentage of positive reactions from 8.7% to 6.9% with age. In all, the proportions of positive test reactions in the subgroups listed ranged from 5.8% to 10.1%, with the majority showing positive reactions in 7–9%. The PR in all subgroups ranged from 79% to 86%, with two exceptions, i.e. patients tested in 2004–2007 (PR 87.4%) and leg dermatitis patients (PR 76.5%). The RI in all subgroups was about -0.1 , with only little variability.

Prompted by the varying percentage of positive benzoyl peroxide reactions in part of the subgroups analysed, we performed a logistic regression analysis in order to see whether some of the factors defining a subgroup are associated with the risk of benzoyl peroxide sensitization, mutually adjusted

Table 2. Description of the total test population, patients with a negative reaction to benzoyl peroxide, patients with a positive reaction to benzoyl peroxide, patients with a weak positive reaction (+), and patients with a strong positive (++, +++) reaction to benzoyl peroxide according to the MOAHLFA index. Additionally, the proportion of (current or former) dental technicians is depicted

Subgroup of patients		Patients tested	Patients reacting negative	Patients reacting positive	Patients reacting +	Patients reacting ++, +++
Number of patients		29 758	24 553	2316	1931	385
Male	M	40.6%	41.4%	36.6%	37.0%	33.5%
Occupational dermatitis	O	21.3%	20.9%	22.8%	22.1%	26.5%
Atopic dermatitis	A	14.7%	14.0%	18.3%	18.8%	15.6%
Hand dermatitis	H	32.1%	32.1%	30.1%	30.2%	29.9%
Leg dermatitis	L	7.2%	7.3%	7.7%	7.1%	10.9%
Face dermatitis	F	9.4%	9.1%	11.8%	11.8%	11.9%
Age ≥ 40 years	A	64.0%	64.8%	60.2%	60.4%	60.0%
Dental technicians		1.9%	1.9%	2.5%	2.4%	3.1%

Table 3. Percentage of positive reactions (% pos.) and of doubtful and irritant reactions (% ?/IR) to benzoyl peroxide 1% pet. in various subgroups of patients. Additionally, the reaction index (RI) and positivity ratio (PR) for each subgroup has been calculated

Subgroup	Number of patients	% pos	PR (%)	% ?/IR	RI
Total study group, years of patch testing					
1992–1995	11167	8.2	83.7	11.5	–0.2
1996–1999	6619	8.8	80.9	10.6	–0.1
2000–2003	5837	7.8	82.6	7.9	–0.0
2004–2007	6279	5.8	87.4	7.2	–0.1
1992–2007: sex subgroups					
Women	17671	8.3	82.6	10.3	–0.1
Men	12087	7.0	84.8	8.8	–0.1
1992–2007: age subgroups (quartiles)					
<34 years	7635	8.7	84.1	10.8	–0.1
34–47 years	7213	8.3	80.5	10.1	–0.1
48–60 years	7861	7.2	84.2	9.6	–0.1
>60 years	6976	6.9	85.1	8.1	–0.1
1992–2007: skin disease subgroups					
Atopic dermatitis patients	4422	9.6	85.6	11.9	–0.1
Leg dermatitis patients	2150	8.3	76.5	7.6	0.0
Face dermatitis patients	2803	9.7	83.2	10.2	–0.0
1992–2007: occupational subgroup					
Dental technicians (current or former)	576	10.1	79.3	11.1	–0.0

Table 4. Logistic regression analysis with a weak positive reaction (+), and a strong positive reaction (+++, +++) to benzoyl peroxide versus non-positive reaction as outcome. Odds ratios (OR), supplemented with 95% CI are given

Explanatory variable	+ Reaction to benzoyl peroxide OR (95% – CI)	++ or +++ reaction to benzoyl peroxide OR (95% – CI)
Age 0–33 years (versus > 60 years)	1.205 ^a (1.047–1.387)	1.564 ^a (1.131–2.163)
Age 34–47 years (versus > 60 years)	1.149 (0.998–1.322)	1.852 ^a (1.358–2.525)
Age 48–60 years (versus > 60 years)	1.041 (0.907–1.196)	1.249 (0.908–1.718)
Female sex	1.176 ^a (1.068–1.295)	1.430 ^a (1.154–1.773)
Atopic dermatitis	1.295 ^a (1.145–1.466)	1.008 (0.757–1.344)
Leg dermatitis ^b	1.114 (0.923–1.343)	1.978 ^a (1.399–2.797)
Face dermatitis ^b	1.267 ^a (1.095–1.466)	1.343 (0.980–1.840)
Dental technicians ^c	1.178 (0.866–1.603)	1.560 (0.867–2.805)

^aSignificantly increased risk.

^bVersus all other sites as reference.

^cVersus all other occupations as reference.

Table 5. Results of parallel patch tests with benzoyl peroxide 1% pet. and benzoyl peroxide 0.5% pet

		Neg.	Benzoyl peroxide 0.5% pet ?/IR	Pos.	Total
Benzoyl peroxide 1% pet.	Neg.	1184	30	18	1232
	?/IR	164	44	9	217
	pos.	94	27	73	194
	Total	1442	101	100	1643

Neg., negative reaction; ?/IR, doubtful or irritant reaction; pos., positive reaction.

for the other factors. The results are shown in Table 4. Young age and female sex were significant risk factors for both, weak, and strong positive test reactions to benzoyl peroxide. Age of 34–47 years and leg dermatitis significantly increased the risk of strong positive reactions only, while atopic dermatitis and face dermatitis were significant risk factors for weak positive reactions only. A certain gradation of the risk could be noted: with the exception of atopic dermatitis, all factors increased the risk of a strong positive reaction to benzoyl peroxide more pronounced than the risk of a weak positive reaction

to benzoyl peroxide. In contrast, only atopic dermatitis (significantly) increased the risk of a weak positive benzoyl peroxide reaction, but not the risk of a strong positive reaction to benzoyl peroxide.

From November 1993 to May 1994, benzoyl peroxide was patch tested in parallel at 1% pet. and 0.5% pet. in 1643 patients in 19 centres. Of these, 194 patients (11.8%) reacted positively to benzoyl peroxide 1% pet. (167+, and 27++ or +++), and 100 (6.1%) to benzoyl peroxide 0.5% pet. (88+, and 12++ or +++); 73 patients reacted to both concentrations (see Table 5). This means that 27% of those reacting to the lower patch test

concentration did not react positively to the higher concentration. RI of the test preparation benzoyl peroxide 1% pet. was -0.056 , PR was 86.1% (167/194). With benzoyl peroxide 0.5% pet., RI was -0.005 , and PR was 88.0% (88/100).

Benzoyl peroxide 1% pet. and SLS 0.25% aqu. were patch tested in parallel in 4713 patients. Of these, 1299 (27.6%) showed an irritant reaction to SLS, while 3414 (72.4%) did not. When comparing patch test results to benzoyl peroxide 1% pet. in patients with and without reaction to SLS, respectively, it could be seen that among those with an irritant SLS-reaction, there were significantly more patients with an erythematous or irritant benzoyl peroxide reaction (11.8% versus 6.2%; $P < 0.0001$) and with a weak positive (+; erythema and infiltration, but no vesicles) benzoyl peroxide reaction (9.0% versus 4.1%; $P < 0.0001$). However, the proportion of patients with a strong positive reaction (+++, +++) to benzoyl peroxide did not differ significantly (0.85% versus 0.64%; $P = 0.44$).

Discussion

Our large-scale data confirm that benzoyl peroxide 1% pet. is a patch test preparation which is not perfect as far as discrimination of irritant and allergic reactions is concerned. With a RI of -0.1 and a PR of about 84%, it is one of those test preparations that often elicit reactions that cannot be clearly identified as allergic or irritant from morphology alone (7). Benzoyl peroxide is known to be a strong irritant. From a DKG multicentre study, it is known that patients with an irritable skin, as indicated by an irritant patch test reaction SLS, have a higher risk of erythematous, irritant, and weak positive reactions to benzoyl peroxide (9). This finding could be confirmed by the present data analysis, which was to be expected because data used for this analysis shows a large overlap with the DKG multicentre study data (9). Therefore, to interpret 'weak positive' ('+') reactions to benzoyl peroxide 1% pet. correctly as allergic or irritant, particular care when taking the patient's medical history is necessary.

In order to reduce irritancy of a particular patch test preparation, reduction of the test concentration has been helpful in many cases. However, the results of the parallel patch test with benzoyl peroxide at 1% pet. and 0.5% pet. showed that decreasing the patch test concentration did not improve the situation. The proportion of positive reactions was halved, but RI and PR largely remained unchanged, so in the end, interpretation of the (fewer) reaction was not easier. For this reason the DKG decided to maintain the higher patch test concentration in their test series, and also because the higher test

concentration presumably has a higher diagnostic sensitivity. Obviously, some allergens do have an inherent irritant potential (which is unwanted for diagnostic purposes) that can hardly be separated from the (wanted) ability to indicate sensitization. This phenomenon has been seen for instance in *N*-(cyclohexylthio)phthalimide (14)). Obviously, the same applies to benzoyl peroxide.

As was to be expected due to their occupational exposure, dental technicians were found to be more prone to having a positive reaction to benzoyl peroxide. The fact that the OR indicating the risk of reacting positively to benzoyl peroxide was not *significantly* higher, can be explained by the very small size of this subpopulation among the total test population, rendering the risk estimate imprecise. However, this data analysis confirms what is known: dental technicians are at risk of benzoyl peroxide sensitization, even if in larger studies no *significant* risk increase can be proven (3). The clinical relevance of a positive reaction to benzoyl peroxide in a dental technician has to be assessed according to the individual's history.

In other industries too, cases of occupationally acquired sensitization to benzoyl peroxide may occur, because benzoyl peroxide is also used in the manufacturing of plastic materials, resins, and elastomers and as a bleaching agent in the production of candles. Corresponding cases have been reported in the literature (15–19). In our study population, there was a considerable proportion of patients with occupational dermatitis among those reacting to benzoyl peroxide. However, professions were rather heterogeneous (data not shown in detail) and we were not able to trace a presumptive or proven benzoyl peroxide exposure at the workplace in every case. In this context, it is noteworthy to mention that benzoyl peroxide has been banned as a flour bleaching agent more than 50 years ago, and that nowadays, benzoyl peroxide is no longer an occupational allergen in bakers (20–23).

According to our results, young individuals had more positive reactions to benzoyl peroxide than older people. One presumptive explanation may be that among younger patients, there were more individuals suffering or recently having suffered from acne, and having received benzoyl peroxide therapy. This would mean that among young dermatological patients, the exposure to benzoyl peroxide – and accordingly the risk of sensitization – is higher. However, this is speculation, and we cannot prove this connection because the diagnosis 'acne' unfortunately is not registered in the IVDK yet. A similar assumption might explain why patients with face dermatitis had an increased risk of sensitization to benzoyl peroxide in our study. A dermatitis localized in the face might be a surrogate marker for acne

treatment, or even adverse reaction to topical benzoyl peroxide preparations. However, just as with the factor 'young age', this explanation is speculative. When patch testing the skin irritancy control SLS, patients with face dermatitis have no higher risk of an SLS reaction (24). Therefore, one cannot assume that these patients are more prone to develop an irritant reaction to benzoyl peroxide. This would speak in favour of our explanatory 'acne' hypothesis. Benzoyl peroxide has been the most frequently used topical medicament in the dermatological treatment of comedonal acne in the last decades. There are several case reports of allergic contact dermatitis due to benzoyl peroxide following topical treatment in acne patients [e.g. (25, 26)]. However, there are as many reports of other adverse reactions to benzoyl peroxide with erythema, oedema, contact urticaria, or irritant contact dermatitis, due to benzoyl peroxide acne therapy (27–32). Larger studies on the frequency of contact sensitization to benzoyl peroxide in acne patients having undergone benzoyl peroxide treatment revealed less than 1% positive reactions when patch testing was done using benzoyl peroxide 1% pet. In some of these investigations, benzoyl peroxide was also tested at 5% in petrolatum or gel, which led to a much higher proportion of positive reaction in most cases of no or doubtful clinical relevance (32–36).

In our test population, women were more prone to have a positive, in particular a strong positive, test reaction to benzoyl peroxide than men. One possible explanation might be that females may be more likely to treat their (minor) acne with benzoyl peroxide than males. It is curious that clinicians rarely see benzoyl peroxide contact allergy in relation to medicaments prescribed by them for treating acne; when reported, reactions tend to be from self-medication. However, there is no reliable data on this issue. One might assume that women have a more sensitive skin but patch testing with the irritant SLS revealed that men more often showed an irritant reaction than women (24). Therefore, it seems improbable that the positive reactions to benzoyl peroxide we registered in women are just irritant reactions, caused by an unspecific effect of benzoyl peroxide to sensitive skin. In this context it should be mentioned that the comparatively large size of our clinical sample rendered most risk estimates quite precise (except in the smaller subgroups, combined with a rarer outcome), i.e. yielded significant estimates. This does not necessarily imply medical relevance, and a 20–25% increase in risk may be considered irrelevant.

Patients with current or former atopic dermatitis had a significantly increased risk of a weak positive reaction to benzoyl peroxide, but not of a strong positive reaction. In our opinion, this particular risk

pattern, together with the known irritant properties of benzoyl peroxide, indicates that the majority of these weak positive reactions is irritant and does not indicate true contact allergy.

The opposite is probably true for patients with leg dermatitis. These had a significantly increased risk of a strong positive benzoyl peroxide reaction; in fact this risk was almost doubled, compared to patients without leg dermatitis. As the beginning of the time span covered by this data analysis was 1992, the most probable explanation is that in this particular subgroup of patients, many were sensitized by the topical treatment of leg ulcers with benzoyl peroxide at high concentrations in the 1980s and early 1990s. In those years, many reports have confirmed that topical treatment with benzoyl peroxide at 10–20% or even more caused sensitization to benzoyl peroxide in a considerable number of patients (1, 37–39).

We could not investigate if patients with a cement-fixed endoprosthesis have an increased risk of benzoyl peroxide sensitization or not because, like acne, this item is not routinely documented in the IVDK. The DKG has performed a separate study on this topic, the results of which are currently being evaluated. Nevertheless, we would like to comment on the current discussion concerning the putative role of sensitization to benzoyl peroxide in patients facing adverse reactions to orthopaedic prostheses. Recently, three cases of positive patch test reactions to benzoyl peroxide in orthopaedic patients have been observed in a group of 13 patients tested, and the authors assumed a possible relevance in one case (5). In bone cement, benzoyl peroxide is used to start the polymerization reaction. It reacts with *N,N*-dimethyl-*p*-toluidine, and after the cement hardening is finished, more than 99% of the benzoyl peroxide has been consumed. It is very unlikely that any remaining benzoyl peroxide is released from the hardened cement and even if it were, the benzoyl peroxide molecule would not be stable for long because, on contact with blood or serum, benzoyl peroxide decomposes to benzoic acid and oxygen within seconds (40). Therefore, it seems improbable that sensitization to benzoyl peroxide could cause long-lasting adverse reactions to bone cement (41).

In conclusion, our data analysis confirms that benzoyl peroxide 1% pet. is a problematic patch test preparation causing a lot of doubtful and weak positive reactions, many of which most likely are irritant, and not allergic. Hence, every reaction to benzoyl peroxide should be assessed very carefully, according to the individual history. Particularly patients with atopic dermatitis are prone to irritant reactions to benzoyl peroxide. True allergic

reactions occur in dental technicians, due to occupational benzoyl peroxide exposure. Occasionally, cases of contact allergy to benzoyl peroxide have been reported from other occupations. The treatment of leg ulcers with benzoyl peroxide at high concentrations in the 1980s and 1990s sensitized many patients. In contrast, according to the literature, acne treatment with benzoyl peroxide, which is used very extensively all over the world, leads to benzoyl peroxide sensitization only rarely.

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