

# Differences in taste between three polyethylene glycol preparations: a randomized double-blind study

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**Background and aim:** Patients suffering from chronic constipation require long-term, regular therapy with laxatives. Literature regarding patient preference and acceptance in polyethylene glycol preparations is scarce. Therefore, this research aimed to identify preference between the three polyethylene glycol 3350, namely *Molaxole*<sup>®</sup>, *Movicol*<sup>®</sup>, and *Laxtra Orange*<sup>®</sup>. Furthermore, taste is one of the most important factors leading to patients' adherence, particularly when the treatment lasts for a long time.

**Methods:** In this randomized, cross-over double-blind study, 100 volunteers were recruited by advertisement. The volunteers were invited to taste the preparations and grade the taste using a five-point hedonic scale (extremely poor taste [1] to extremely good taste [5]). The volunteers were then asked to choose the most palatable preparation.

**Results:** One hundred volunteers with a mean age of 35 years (range 20–61) were randomized (76 females). *Molaxole*<sup>®</sup>, *Movicol*<sup>®</sup>, and *Laxtra Orange*<sup>®</sup> had a mean hedonic score of 2.76 (SD: 0.82), 2.81 (SD: 0.76) and 3.12 (SD: 0.82) respectively. The hedonic taste score for *Laxtra Orange*<sup>®</sup> was significantly better than *Molaxole*<sup>®</sup> ( $P = 0.001$ ) and *Movicol*<sup>®</sup> ( $P = 0.001$ ). No difference was found between *Molaxole*<sup>®</sup> and *Movicol*<sup>®</sup> ( $P = 0.61$ ). *Molaxole*<sup>®</sup> was the most preferred preparation for 19 volunteers (19%), *Movicol*<sup>®</sup> for 24 volunteers (25%) and *Laxtra Orange*<sup>®</sup> for 55 volunteers (56%). Two volunteers had no preference. The order in which volunteers tested the preparations had no influence on the taste results. No significant differences in age or gender were observed.

**Conclusion:** *Laxtra Orange*<sup>®</sup> was most palatable preparation. This may have implications for adherence in patients with chronic constipation.

**Keywords:** constipation, polyethylene glycol, laxative, macrogol, molaxole, movicol, laxtra, medication adherence

## Introduction

Chronic idiopathic constipation is a frequently reported medical disorder and reduces patients' quality of life.<sup>1</sup> The estimated prevalence in Europe is 17% and increases with age, especially in those over the age of 65 years.<sup>2,3</sup>

The initial management of chronic idiopathic constipation includes behavior modification and dietary changes.<sup>4</sup> For patients who do not respond to this management, laxatives present an alternative therapy.<sup>1</sup> Up to 40% of these patients use laxatives.<sup>5</sup>

A variety of laxatives are available for treating constipation: bulk forming, osmotic, and stimulant laxatives. Osmotic laxatives, particularly polyethylene glycol (PEG) preparations are trendsetting in the constipation market. PEG preparations are relatively

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safe, inexpensive, widely used, and are even better than lactulose in improving stool frequency and consistency.<sup>6-8</sup>

Although these modalities may benefit some patients with temporary constipation, most of the patients often need to use these compounds on a regular basis. According to the literature, only 50% of patients who suffer from chronic diseases adhere to treatment recommendations, which results in suboptimal outcomes.<sup>9,10</sup> There are numerous factors that affect adherence, including characteristics of the illness, interaction between physician and patient, the complexity and duration of treatment, side effects of treatment, and cost of treatment.<sup>11</sup> Furthermore, medication palatability is also crucial for adherence. Several studies have addressed the palatability of medication for different disorders, including hypertension, HIV, and Alzheimer's disease.<sup>12-14</sup> Pharmaceutical companies have tried to improve palatability by adding flavors, such as vanilla, strawberry, and citrus, although this is primarily in medication for children.<sup>15-17</sup>

Literature regarding patient preference and acceptance in PEG preparations is scarce.<sup>18-20</sup> Therefore, we aimed to compare three commonly used PEG 3350 preparations, *Molaxole*<sup>®</sup>, *Movicol*<sup>®</sup>, and *Laxtra Orange*<sup>®</sup> in taste and to evaluate preference.

## Patients and methods

A total of 100 volunteers recruited by advertising through posters were included in a cross-over, double-blind, randomized study.

Volunteers were presented with three preparations of 25 mL in a randomized order. After tasting each sample without swallowing, volunteers rinsed their mouths with water. The samples were graded using a five-point hedonic scale (extremely poor taste [1] to extremely good taste [5]). Following this, volunteers were asked to choose the most palatable preparation.

This was an investigator initiated study that was approved by the Ethics Committee of VU Medical Center, Amsterdam, the Netherlands, and was in accordance with the Helsinki Declaration. All patients gave informed consent prior to participation.

## Polyethylene glycol preparations

Three PEG 3350 preparations, *Molaxole*<sup>®</sup>, *Movicol*<sup>®</sup>, and *Laxtra Orange*<sup>®</sup> were chosen as these are the most commonly prescribed product variants. All three PEG 3350 preparations contain similar doses of macrogol, electrolytes and sweetener, namely 3.125 g macrogol 3350, 350.7 mg sodium chloride, 178.5 mg sodium hydroxide carbonate, 46.6 mg

potassium chloride and acesulfame K (E950). *Molaxole*<sup>®</sup> additionally contains lemon flavor, *Movicol*<sup>®</sup> a lime/lemon flavor and *Laxtra Orange*<sup>®</sup> an orange flavor.

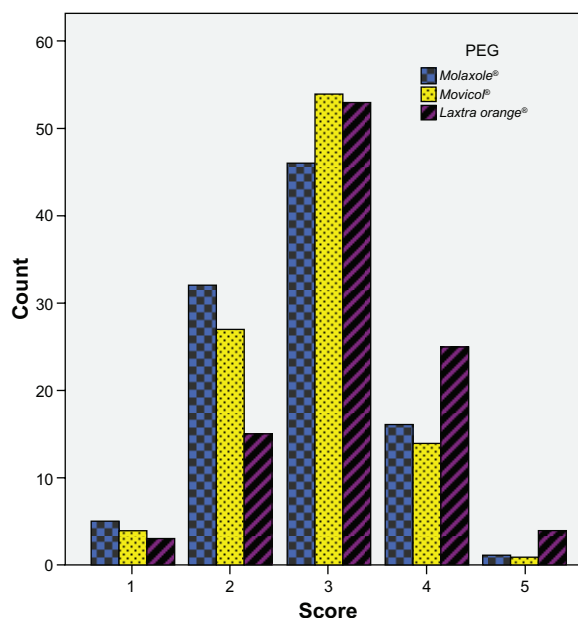
## Statistical analyses

Data analysis was performed using the statistical software SPSS (v 15.0; SPSS, Inc, Chicago, IL). Results were described as means and proportions. The Wilcoxon signed-rank test was used to determine the difference in taste between the preparations. A *P*-value of less than 0.05 was considered statistically significant. When using a Bonferroni correction for three interdependent classes, a *P*-value less than  $\alpha/3 = 0.01667$  was considered statistically significant.

## Results

One-hundred volunteers were randomized (mean age: 35 years [range: 20–61], 76 female). The mean hedonic score was 2.76 (SD: 0.82), 2.81 (SD: 0.76) and 3.12 (SD: 0.82) for *Molaxole*<sup>®</sup>, *Movicol*<sup>®</sup>, and *Laxtra Orange*<sup>®</sup> respectively (Figure 1). The hedonic taste score for *Laxtra Orange*<sup>®</sup> was significantly higher than *Molaxole*<sup>®</sup> (*P* = 0.001) and *Movicol*<sup>®</sup> (*P* = 0.001). No significant difference was found between *Molaxole*<sup>®</sup> and *Movicol*<sup>®</sup> (*P* = 0.61). One volunteer graded all three preparations 1, whereas one volunteer graded all preparations 5 (Figure 1).

The order in which volunteers tested the preparations had no influence on the taste results. Thirty-eight (39%), 24 (24%), and 36 volunteers (37%) found the first, second,



**Figure 1** Hedonic taste score for all polyethylene glycol preparations (PEG) (1 = extremely poor taste, 5 = extremely good taste); the mean hedonic score was 2.76 (SD: 0.82), 2.81 (SD: 0.76) and 3.12 (SD: 0.82) for *Molaxole*<sup>®</sup>, *Movicol*<sup>®</sup>, and *Laxtra Orange*<sup>®</sup>, respectively.

and third tested preparation respectively most palatable. After decoding, *Molaxole*<sup>®</sup> was the most liked preparation in 19 volunteers (19%), *Movicol*<sup>®</sup> in 24 volunteers (25%), and *Laxtra Orange*<sup>®</sup> in 55 volunteers (56%) (Figure 2). Two volunteers had no preference.

There were no significant differences in age or gender observed.

## Discussion

Nonadherence to treatment is a problem of increasing concern. Many patients experience difficulty with taking medication because of aversion to the taste, which results in suboptimal adherence. Although there are no easy solutions to this dilemma, pharmaceutical companies have tried to improve palatability by adding flavors to medications, such as vanilla, strawberry, and citrus.<sup>15–17</sup>

This randomized, double-blind study, which involved 100 volunteers, showed that the orange flavor of *Laxtra Orange*<sup>®</sup> was significantly better tasting than the lemon flavor of *Molaxole*<sup>®</sup>, and the lime and lemon flavor of *Movicol*<sup>®</sup>. No difference was found between *Molaxole*<sup>®</sup> and *Movicol*<sup>®</sup>. No differences between gender, age, or sequence of tasting were found.

PEG preparation with electrolytes is mixed with water. A good suggestion is to mix the PEG preparation with cold water, which makes it more palatable. Since all these PEG preparations contain electrolytes, it cannot be mixed with juice, coffee, or tea. However, recent studies showed that a PEG preparation without electrolytes is as effective and safe as a PEG preparation with electrolytes in the treatment of constipation in elderly patients and children.<sup>21,22</sup>

## Limitations

There are some limitations in our study that need to be considered. The volunteers were only offered a small sip

of each preparation, whereas in the real-world situation, a patient with constipation may need to ingest more than 125 mL of the medication. Therefore, we cannot be sure that the preference is still valid for larger quantities. However, since a more palatable medication can improve adherence,<sup>10</sup> it might be worthwhile to consider *Laxtra Orange*<sup>®</sup> if patient has complaints regarding the taste.

In addition, we acknowledge that the volunteers were relatively young, and therefore our results may not be representative for the whole constipated population. Constipation disproportionately affects older adults and it is well recognized that older adults have less sensitivity in their taste acuity.<sup>23</sup> However, no apparent effect of age was found.

## Conclusion

In conclusion, we found that *Laxtra Orange*<sup>®</sup> was the most favored preparation in a single test. Given the fact that the three tested preparations have a similar PEG and electrolyte content and therefore the same efficacy, for complaints about the taste, switching to *Laxtra Orange*<sup>®</sup> could improve the adherence of the patient.

## Acknowledgment/disclosure

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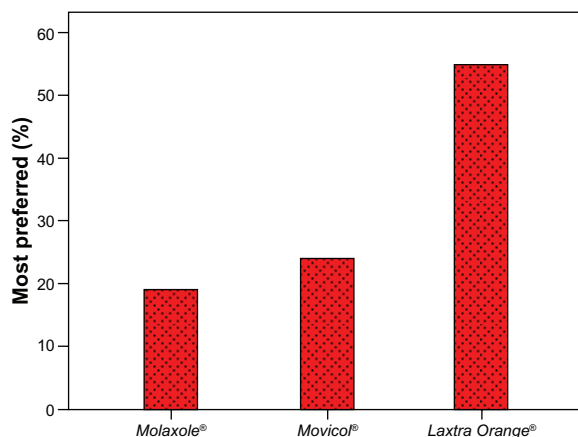


Figure 2 Most preferred preparation in 100 volunteers.

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