Introduction
Dandruff is a skin condition that is visible to other people and is embarrassing for many dandruff sufferers. Fortunately, there are a number of anti-dandruff products available in the market to help to reduce the visible dandruff. In order to prove the efficacy of an anti-dandruff product we describe here an evaluation based on three pillars, 1. a visual subjective score system, 2. an image analytical test and 3. a home-in-use test with self assessment.

Study design
To standardize hair conditions all test subjects need to undergo a two or three week washout period with a basic cleansing shampoo during which they shampoo their hair daily or at least twice a week. The next step includes a four to six week treatment phase, followed by a two to four week rinsing phase using a basic cleansing shampoo. Test subjects enrolled in the study need to use the assigned treatment at least three times per week. It is advisable to examine the dandruff status prior to the conditioning phase (week 0 or 3), at the beginning of the treatment (baseline, week 0) and then weekly or at least fortnightly during treatment as well as in the rinsing phase (Fig. 1).

Evaluation of the product efficacy
Scalp flake scoring
The first step in order to determine the efficacy of an anti-dandruff product is a visual subjective evaluation of the dandruff status of each individual test subject done by a qualified examiner. For this purpose the head is divided into 4 sections: front – back – right – left. Initially the 4 quadrants are evaluated separately according to a scale ranging from 0 to 4 (very dense dandruff) (Tab. 1). The final score (sum of the grades for all 4 quadrants) and the mean value for each test subject are calculated. Furthermore, the mean values and standard deviations per test group are determined.

Image analytical test
Parallel to the visual scalp flaking scoring, an image-analytical test procedure, which was co-developed in our institute, is applied. In this procedure the scalp flakes are counted or shaked off the hair under defined conditions, transferred into a petri dish and evenly distributed in the measuring field with a fine brush and then, the scales are illuminated by white LED light, arranged circularly. The dandruff program calculates the total number of scales and analyses the frequency distribution of the scale sizes in per cent. In addition, the percentage part of scales of the total area in comparison to the background is analyzed.

Overall cosmetic evaluation
A high quality anti-dandruff product not only has to provide a good efficacy but also the same excellent cosmetic and hair care benefits are essential. Not at least for reasons of gelling parameters, cosmetic appearance, skin compatibility and efficacy of all tested substances are evaluated in a home-in-use test using a special questionnaire for self assessment.

Test of an antifungal azole shampoo and the corresponding placebo
Scalp flaking score
The scalp flaking scores were assessed fortnightly for 8 weeks and compared to the scores at baseline. Initially, the dandruff became worse after the conditioning phase. This can often be observed and indicates that the test subjects had used different hair care products before. The overall dandruff score declined statistically throughout the treatment period for the antifungal azole shampoo. The reduction in mean total dandruff scores was 36.5% at 4 weeks of treatment and showed a slight increase during the rinsing phase. As expected, the overall dandruff score did not change significantly during the course of the study in the placebo control group (Fig. 2).

Image analytical test
Test subjects treated for 4 weeks with the antifungal azole shampoo showed an increase of 21 % of flakes classified in category I, that are invisible to the naked eye. In contrast all other scales increased in category II to IV. The scalp flake sizes (category II to V) showed a decreased percentage part of scales compared to baseline. In the rinsing phase, flakes classified in category I decreased continually and scale areas versus the larger scales increased (Fig. 3).

Test of two different basic formulations with the same active ingredient
Scalp flaking score
Treatment with the test substances formulation A or formulation B showed a significant decrease (p<0.01) of the dandruff by 49%, and 53 %, respectively (measuring time week 0 and week ≥4). During the rinsing phase with a neutral shampoo, there was a slight increase in the number of scales (Tab. 3).

Image analytical test
The evaluation of the image-analytical data showed a significant decrease (p<0.01) of flakes classified in category II to V compared to the baseline (Tab. 3).

Home use test with self assessment
However, the efficacy of a product doesn’t make any statement regarding the cosmetic acceptance among the dandruff sufferers and should not be underestimated especially when it comes to compliance. With an overall assessment of 2.27, the acceptance of the test product anti-dandruff formulation A by the test subjects was good. However, with an overall assessment of 2.53, the acceptance of the test product anti-dandruff formulation B was rated only good to fair by the test subjects. In summary, both test substances are effective anti-dandruff shampoos, but in a home-in-use test the subjective evaluation of the antifungal shampoo formulation A was on first place compared to formulation B (Fig. 4).

Conclusions
The image analytical test contributes to a more objective assessment of the effect of an anti-dandruff treatment and supplements the visual scoring. Especially the classification of scale sizes in 9 categories gives a more detailed picture of the scalp conditions and pathogenesis of the dandruff. In addition, we suggest to perform home-in-use tests with self assessment, which are most useful to cosmetics like anti-dandruff shampoos and complete the picture of a product.

References