IS PROPIONIBACTERIUM ACNES FROM THE SCALP A GOOD GUY?

ABSTRACT

Propionibacterium acnes plays an important role in the pathogenesis of acne. However, it is also an important commensal organism of the skin. Recently, typing systems for this bacterium have taken on an increased importance as different types of P. acnes have been found to be associated with different disease states, including acne. In this condition it has been recently reported that P. acnes has a lower incidence in dandruff scalp. Regarding P. acnes of the dandruff versus normal scalp, information on the phylotypes is lacking and could help in understanding pathophysiology (link with dandruff). In this study we have isolated a collection of P. acnes (12 strains) from the scalp (with and without dandruff). The P. acnes genomes were sequenced, annotated and phytopyped according to a method based on whole genome MLST and compared to 60 public genomes. The phytopotyping approach showed that the phylogeny, among our collection of P. acnes strains is slightly different from the phylotypes that have been currently described in literature. The strains were mainly grouping the type IA-1 (n=2); IA-2 (n=5) and II (n=2). In addition, we also observed three strains that did not fit with the current phytopotyping scheme of P. acnes but with the public strain P. acnes SK182B. In-depth inspection of the strains showed that four strains should probably be treated as a novel phylotype (IV), which represents a clearly distinct set of P. acnes genomes, and seems to be exclusively present on the human scalp. Phylotypes IA-2 and IV were mostly found on dandruff scalps, while in normal scalps all four phylotypes were represented. This suggests that maintaining the appropriate community of P. acnes could help to keep a normal scalp.

INTRODUCTION

Although Propionibacterium acnes is an important commensal organism of the healthy skin, it plays an important role in the pathogenesis of acne [1]. In recent studies on French [2], Chinese [3] and Brazilian [4] subjects, Propionibacterium acnes have been identified as one of the main species found on the scalp surface, together with Malassezia restricta and Staphylococcus epidermidis. Moreover, the comparison of the population with dandruff and without dandruff showed that the scalp disorder was correlated with a higher incidence of Staphylococcus spp. and M. restricta and a lower incidence of P. acnes as compared to the control population. These results suggested that 1) dandruff is linked to alterations of the multiple balance interaction between bacteria and fungi and 2) colonization by P. acnes corresponds to a normal healthy scalp. The genome mining of the strains analyzed here showed clear differences in their genetic content, linked to the phylotype distinction. Phylotypes IA-2 and IV were mostly found on dandruff scalps, while in normal scalps all four phylotypes were represented (Figure 2), including type II that is present also on normal skin (face). This suggests that maintaining the appropriate community of P. acnes could help to keep a normal scalp. Even if these findings should be confirmed by a comprehensive study of the P. acnes biodiversity of the scalp on larger panels of subjects, they may help to find a new strategy to prevent dandruff condition.

MATERIALS AND METHODS

Origin of the strains:

Twelve P. acnes strains were isolated from scalp swab samples of caucasian women (25 – 45 years old). Strains were obtained from scalp samples with dandruff scalp (n=5) and normal scalp (n=6). Dandruff normal status as assessed previously reported [2,3].

RESULTS

Figure 1: Comprehensive MLST analysis - 12 strains from L'Oreal (red) and 81 strains from literature (black) were compared. One new phylotypes found IV scalp. It was fit with the current phylotyping scheme of P. acnes but with the public strain P. acnes SK182B. In-depth inspection of the strains showed that four strains should probably be treated as a novel phylotype (IV), which represents a clearly distinct set of P. acnes genomes, and seems to be exclusively present on the human scalp. Phylotypes IA-2 and IV were mostly found on dandruff scalps, while in normal scalps all four phylotypes were represented. This suggests that maintaining the appropriate community of P. acnes could help to keep a normal scalp.

CONCLUSION

The genome mining of the strains analyzed here showed clear differences in their genetic content, linked to the phylotype distinction. Phylotypes IA-2 and IV were mostly found on dandruff scalps, while in normal scalps all four phylotypes were represented (Figure 2). This suggests that maintaining the appropriate community of P. acnes could help to keep a normal scalp. Even if these findings should be confirmed by a comprehensive study of the P. acnes biodiversity of the scalp on larger panels of subjects, they may help to find a new strategy to prevent dandruff condition.

REFERENCES