

# Neonatal acne based on maternal lipidomic profiling prediction.

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## Abstract

Neonatal acne is a self-limiting hereditary disease with approximate 20% incidence rate and unclear mechanism that usually occurs in the first 6 weeks after birth. But there were no US Food and Drug Administration (FDA)-approved guidelines for the treatment of neonatal acne. Though the etiology of neonatal acne is still unclear, there are four main speculated factors: First, newborns affected by the higher maternal androgen through the placenta; Second, more androgen is secreted by the larger reticular structure of the adrenal gland during the neonatal period, Third, the colonization of *Malassezia* and the Forth, family history is also important. Most of the causes are related to changes in lipid composition in skin surface. Therefore facial lipids of the volunteers were analyzed in the paper.

**Keywords:** Acne, Skin lipid, Lipidomic, Anti- inflammatory.

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## Introduction

It was found that most of the neonates with acne had obvious heredity according to statistics by investigation the family history of neonates. Previous studies had found a correlation between sebum production in mothers and babies, and other studies had shown that one or both parents with acne can lead to a child's risk of acne [1]. Therefore, the incidence of acne in neonates according to the mother's facial skin lipid were studied in the paper.

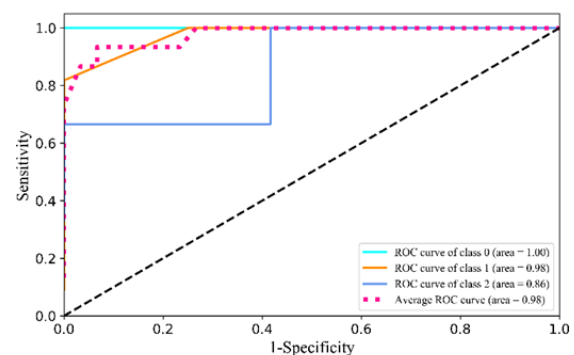
A total of 75 volunteers in Beijing, People's Republic of China (PRC) were selected, including mothers of newborn acne patients (M, 43) and mothers of healthy infants (HM, 19). Among them, 19 HMs were categorized with grade 0, 32 patients in 43(M) with grade 1 (no scar) and 11 patients in 43(M) with grade 2 (scar). The facial lipids of the volunteers and their children's acne grades were obtained, and then the lipids were analyzed by UPLC-QTOF-MS [2]. The obtained lipids were imported into Progenesis QI V2.0 and compared with the LIPIDMAPS database. PLS-DA model was established to analyze the lipids of M and HM. It was found that the two groups could be significantly separated, as shown in the figure, indicating that the lipids of M and HM groups were significantly different. 16 potential biomarkers were calculated by a series of statistical methods.

## Discussion

16 different lipids which belonged to fatty acids, ceramides and triglycerides were obtained in the study, and the Partial Least Squares Discrimination Analysis (PLS-DA) results showed that the contents of Long-chain Fatty Acids (LFAs), cerimides (Cers) and glycerides in HM were significantly higher than that in M. LFAs act as skin barriers and signaling molecules to activate PPAR. PPAR $\gamma$  has anti-inflammatory effects and then inhibit the NF- $\kappa$ B pathway and thus lead to reduce inflammation occurrence [3]. The hydroxyl group of Cers participate in the formation of intermolecular hydrogen bond, produce the interaction, and maintain the stability and integrity

of the structure of cuticle [4]. Triglycerides, which account for about 41% of the sebaceous lipid, also played a role in energy storage and barrier protection.

In order to verify the differential lipids, and to apply the results of the lipidomics study to the diagnosis of neonatal acne, a prediction model based on the strongly correlated differential lipids through random forest were established in the study.



**Figure 1.** ROC curve was used to evaluate the accuracy of the RF prediction model. The final accuracy was 98%.

The population was divided into training set and test set by 8:2. By establishing a random forest model to predict the neonatal acne, the accuracy of the model was 98%. According to the ROC curve, the prediction accuracy of healthy infants was 100%, grade 1 acne was 98%, and grade 2 acne was 86%. As shown in the figure, the prediction accuracy of severe acne still needs to be improved, but the prediction results were higher than 80%, indicating that the model has credibility. The model can accurately predict the incidence of neonatal acne by the facial lipids of the mothers [5].

## Conclusion

The contents of LFAs, Cers and glycerides in HM were significantly higher than that in M. The prediction model of

neonatal acne based on lipid with strong correlation was established with 98% accuracy. However, there are some limitations in the experiment. In order to further improve the model, we should continue to expand the sample and provide more accurate lipid data.

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