Opinion Paper

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The role of biotin metabolism in the COVID-19 infection

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Abstract: COVID-19 pandemic has become the major health problem in 2020 worldwide and no treatment or cure has been developed until now, however medical doctors use approved anti-viral drugs alone or in combination to treat patients infected by COVID-19. Thus, the outcome and the information of the applied treatments are changing daily basis. One of the changes in the COVID-19 patients has been depilation of the eyebrow and eyelashes. Biotin is a vital cofactor for biotin-dependent enzymes for fatty acids, amino acids, and glucose metabolism. It is known that, biotin deficiency may cause loss of hair, eyebrows and eyelashes. However, either COVID-19 infection or treatment against to cure this infection cause impairment in the biotin metabolism that should be further investigated to better understand possible mechanisms behind the COVID-19 infection and outcomes of the treatment approach to treat it.

Keywords: biotin deficiency; COVID-19; drug therapy; pandemic; viruses.

Özet: COVID-19 salgını 2020 yılında dünya çapındaki en büyük sağlık sorunu haline gelmiştir ve günümüze kadar hiçbir çare veya tedavi geliştirilmemiştir. Ancak tıp doktorları COVID-19 ile enfekte olmuş hastaları tedavi etmek için tek başına veya kombinasyon halinde onaylanmış antiviral ilaçların kullanımına başlamıştır. Bu nedenle uygulanan tedavilerin elde edilen sonucuna göre tedaviler günlük olarak değişmektedir. Bir COVID-19 hastasında

tedavi sonucunda, kaş ve kirpiklerinde dökülme meydana gelmiştir. Biotin, yağ asitleri, amino asitler ve glukoz metabolizmasında biotine bağımlı enzimler için gerekli bir kofaktördür. Biotin eksikliğinin saç, kaş ve kirpik de dökülmeye neden olduğu bilinmektedir. Bununla birlikte, COVID-19 enfeksiyonu veya bu enfeksiyonu iyileştirmeye yönelik uygulanan tedavi, biotin metabolizmasında bozulmaya neden olabilir, COVID-19 enfeksiyonunun arkasındaki olası mekanizmaları ve onu tedavi etmek için uygulanan tedavi yaklaşımının sonuçlarını daha iyi anlamak için daha fazla araştırılması gerekmektedir.

Anahtar kelimeler: biotin eksikliği; COVID-19; ilaç tedavisi; pandemi; virüsler.

COVID-19 infection has become pandemic and affects millions of people worldwide. The number of deaths and COVID-19 infected individuals are increasing every day and the risk for severity of illness from minor type to extreme type is increasing by the individuals' comorbidities and aging are affecting by disease severely [1–3]. COVID-19 patients who have recovered from the infection had lung injury however the information and news are updated daily basis about the COVID-19 and recent news has revealed that there are physiological differences between the before infection/healthy and after COVID-19 infection and drug therapy [4]. There are too many differences between before and after photographs first the change in the skin color and another the critical feature that draws the attention of these patients were depilation of the eyebrow and eyelashes, brittle, lanugo hair [4]. These changes may result from changes in the enzymatic reactions involving in the biotin metabolism and pigment metabolism of the skin since the synthesis of the molecule is mostly relying on the enzyme activities and even in the activity of the enzymes would result in adverse effects of metabolism [5]. The covalent attachment of a molecule or transfer of functional group, a functional moiety on to one target enzyme can modify the function of the enzyme or change the activity of the enzyme activity. There are many types of covalent modifications such as acetylation, phosphorylation, methylation that can take place inside or extracellular matrix of our cells [6, 7].

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Additionally, it seems that some viruses or viral enzymatic products are regulating the hosts' enzyme activities. The HIV-mediated CNS and peripheral cell damage via activation of inflammatory reactions and metabolic alterations have been investigated by Lyons et al. [8].

Any biological process that takes place inside of our cells, in our body that controlled by our enzymes, however, COVID-19 infection or COVID-19 proteins may regulate the enzymes' activity that takes place in biotin metabolism or these viral products may regulate/inhibit the biotinidase enzyme activity. Because two Chinese doctors who survived COVID-19 in Wuhan city most are depilation of the eyebrow and eyelashes, their hair has become brittle and lanugo hair. These prominent signs and symptoms can be seen in biotin and biotinidase deficiencies [9]. There are inherited and acquired types of biotin deficiencies. Biotinidase and holocarboxylase synthetase enzyme disorders are cause of the inherited biotin deficiency [10]. The inherited form of biotinidase deficiency's neonatal type is life-threatening, but newborns respond to high doses of oral biotin very well. However, COVID-19 infected patients have the major signs and symptoms of the biotin deficiency can be seen in the hair and depilated of the eyebrows and eyelashes. Acquired biotin deficiency can be due to malabsorption, alcoholism, prolonged use of antibiotics that interrupt normal flora, medications such as valproic acid, and isotretinoin which is used for the immune system activating drug intake or increased raw egg consumption [5, 9, 10].

The photographs taken from the Wuhan city of patients infected with the COVID-19 signs and symptoms show some abnormalities that can indicate that these patients may have a biotin deficiency. The observed acquired biotin deficiency symptom is depilation of the eyebrow and eyelashes, their hair has become brittle hair may be resulted due to prolonged use of medications. Biotin is a vital cofactor for biotin-dependent enzymes for fatty acids, amino acids, and glucose metabolism. If there is a biotin deficiency due to malabsorption of biotin intramuscular biotin treatment, it may disappear due to the COVID-19 therapy.

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