Immunoglobulin Levels to Sensory Impairment Connected by Study in COVID-19

Researchers investigated whether coronavirus disease 2019 (COVID-19)-related sensory deficiencies are associated with transcriptome changes in the foliate papillae area of the tongue.

Study

In the present study, researchers expanded the SeCoMRI study to investigate the association between sensory perception changes after COVID-19 and foliate papillae transcriptomic alterations among seropositive individuals.

The study involved 158 Munich hospital employees with known SARS-CoV-2 immunoglobulin G (IgG) status who completed sensory perception questionnaires. The researchers matched the participants based on age, gender, and occupational SARS-CoV-2 exposure risk. They supplemented self-report questionnaires with objective taste assessments and transcriptomic microarray analyses of ribonucleic acid (RNA) from the tongue's foliate papilla.

Sensory tastes tested included metallic, spiciness, sweetness, sourness, and bitterness. The researchers asked the participants to assess the degree of sensory change in eight common food categories: tea, coffee, cheese, chocolate, meats, fruits, vegetables, and bread. Two weeks after completing the original questionnaire, 141 individuals participated in a qualitative taste perception study that comprised standard taste samples and forced choice tests vs. water.

The study divided individuals into four groups depending on their sensory impairments and SARS-CoV-2 immunoglobulin G (IgG) serostatus, utilizing diagnostic techniques such as paramagnetic particle chemiluminescent immunoassay, total antibodies, and enzyme-linked immunosorbent assays (ELISA) for IgG against spike-1 protein. Baseline samples were collected from August to September 2020, during the first wave of the pandemic in Germany, and a median of three months following SARS-CoV-2 immunoglobulin G detection.

The researchers conducted a sensory experiment to determine the relationship between reduced metal perception among IgG+ individuals and lower RNA transcript levels of metal perception-associated genes. In total, 43 patients provided tongue swabs for complete transcriptome research. They used gene ontology analysis to examine taste and smell genes differently expressed in foliate papillae of the tongue. They performed supervised-type partial least squares discriminant analysis (PLS-DA).

Findings

IgG+/SSI+ participants had impaired metallic taste and smell perception. IgG+/SSI+ individuals also had reduced expression levels of 166 olfactory receptors and nine taste-associated receptors, with olfactory receptor family-1 subfamily A member 1 (OR1A1), OR1A2, olfactory receptor family-2 subfamily J member 2 (OR2J2), olfactory receptor 5K1 (OR5K1), and olfactory receptor family-1 subfamily G member 1 (OR1G1) connected to metallic perception. The findings point to olfactory involvement in the distortion of metal taste.

Taste and smell receptors are a part of the adenylate cyclase-modulating G protein-coupled receptor signaling system, downregulated following the SARS-CoV-2 infection. All IgG-negative and IgG+ subjects correctly recognized sweet and spicy solutions, but 80% of IgG+ and 78% of IgG-negative individuals detected metallic solutions.

In total, 790 genes showed increased transcript levels with positive fold changes exceeding 1.4 among SSI+ IgG+ patients, whereas 5,356 genes showed lower transcript expression with negative fold changes exceeding 1.4 compared to other groups. The three most enriched gene ontology keywords (detection of chemical stimulus involved in sensory smell perception, detection of chemical stimulus involved in sensory perception, and sensory smell perception) indicate the biological function of smell.

Among SSI+ IgG+ patients, transcript expression of two smell-associated genes, olfactory receptor 6C4 (OR6C4) and olfactory marker protein (OMP), were higher, with fold changes exceeding 1.4. Ten smell-related genes had reduced transcript expression and fold changes exceeding 1.4 in tongue foliate papillae. Eight genes encode bitter-sensing Taste receptor-2 member 38 (TAS2R) receptors, whereas taste receptor type 1 member 1 (TAS1R1) showed reduced transcript levels with fold changes exceeding 1.4.

In addition, SSI+ IgG+ individuals had greater transcript expression of metal regulatory transcription factor 1 (MTF1) than other groups. Olfactory receptors OR2J2, OR1A2, OR1G1, and OR1A1 were related to metallic taste perception and had decreased messenger RNA (mRNA) levels.

Conclusion

The study found that a high SARS-CoV-2 IgG titer might induce problems with metallic iron gluconate perception after infection. It also found lower mRNA expression levels of 166 olfactory receptors on the tongue in IgG+ and SSI+ subjects, indicating that they may play a functional role in chemosensory perception.

TAS1R1 downregulation indicates lower umami taste perception, but decreased expression levels of eight TAS2R bitter receptors correspond to sensory tasting testing. Future studies should investigate other viral illnesses that hinder metal perception and whether olfactory receptors on the tongue interact with taste receptor pathways.

Source:

https://www.news-medical.net/news/20240709/COVID-19-and-metallic-taste-Study-connects-immunoglobulin-levels-to-sensory-impairment.aspx