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Galactose and Coenzyme Q Treatment Ameliorated Two Cases of Anosmia

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Abstract

There is a high prevalence in the population, of olfactory dysfunction, a condition severely affecting quality of life. Here we present a sample of two patients presenting with anosmia with a duration of more than 12 months, for whom classical treatments were ineffective. The first patient was a 36 year-old male and the second a 52 year-old male. Both had a complete clinical assessment, psychophysical testing of olfactory function, and otorhinolaryngological examination including nasal endoscopy, which did not reveal any pathology. The first patient underwent brain computed tomography (CT), and magnetic resonance imaging, while the other just CT scan, both inexpressive. The etiologic diagnose were idiopathic and secondary to acute rhinitis, respectively. Both patients had been treated with topical steroids and anti-histaminic drugs. Our treatment of this condition was dietary integration with galactose (1.5 g), reduced glutathione (0.1 g) and Ubiquinone (Coenzyme Q10, 0.1 g). For assessment of response to treatment, the Italian version of the University of Pennsylvania Smell Identification Test was used. After two months treatment the older patient completely recovered smell and was also able to appreciate some tastes. The younger patient, after one-month treatment experienced cacosmia, and some phantosmia, but after one more month treatment, such symptoms disappeared and he recovered partially normal smell and gustative function. In both cases, the recovery is stable, until now. Results suggest that the new acquisitions in terms of the myelin trophic function allow envisaging a novel neuroprotectant strategy, focused on sustaining its aerobic metabolism.

1. Introduction

Olfactory dysfunction recognizes a number of etiologies, and is a relatively common condition, especially in the elderly [1]. The sense of smell strongly contributes to taste perception, so that patients with hyposmia or anosmia have a great impact on their emotional sphere. The main causes of olfactory dysfunction are inflammatory post-infectious lesions, and post-traumatic disease [2]. However, several other conditions can affect smell, such as toxicants, tumours, neurological diseases (especially Parkinson's disease), and others. In fact, olfactory dysfunction is an early symptom of sporadic Parkinson's disease (PD) [3]. In many cases, no cause can be formally identified and olfactory dysfunction is defined idiopathic [4]. In patients with nasal disease, olfactory impairment is common, being essentially due to inflammation that contributes to neural damage of the olfactory neuroepithelium. In the clinical setting, the olfactory function

can be assessed with non-invasive psychophysical tests. For example the University of Pennsylvania Smell Identification Test (UPSIT) [5]. The UPSIT is a standardized multiple-choice scratch-and-sniff test consisting of four test booklets with 10 items each.

This study describes the sample of two patients with olfaction disorder complaint, reporting amelioration after treatment with emphasis on neuroprotection.

2. Methods

The first patient was a 36-year-old male with a 18-month history of idiopathic bilateral anosmia, and ageusia; the second one was a 52-year-old male, with a 14-month history of bilateral anosmia, and ageusia after acute rhinitis. Both had a sudden onset. Both patients had undergone complete physical examination, including complete otorhinolaryngological examination, including flexible endoscopy, which showed no alterations. Medical history showed absence of history of head trauma or of concomitant neurological signs or neurodegenerative diseases in both cases. Family history was negative for disorders of smell and taste. Computed tomography (CT) and Magnetic resonance imaging (MRI), in the first patient and CT scan in the second showed no pathology.

Standardized University of Pennsylvania Smell Identification Test was applied during patient assessment. The UPSIT adapted to the Italian population was used [6].

Both patients had not reported significant improvement after prolonged treatment with topical and systemic steroids or antihistaminic drugs. By contrast an improvement in symptoms was achieved through neuroprotection, by an oral dietary integration with galactose (1.5 g/die) and Coenzyme Q10 (100 mg/die), and reduced glutathione (100 mg/die), following the evening meal as assessed after two months. Results are maintained through 14 months. Gustatory function was not assessed in this context, except by considering the subjective evaluation.

3. Results

Table 1. Changes in the olfactory identification test prior (Time 1) and after (Time 2) two months dietary supplementation. Patient 1, 36 year-old male with idiopathic anosmia; Patient 2 a 52-year-old male with post infective anosmia.

Italian olfactory identification tests (IOIT)	Patient 1#	Patient 2#
Time 1	6	12
Time 2	26	30

Table 1 shows the UPSIT (Italian olfactory identification tests, IOIT) performance at baseline and after two month treatment in the two patients.

For both patients, IOTI scores demonstrated a qualitative significant olfactory function recovery over time, after dietary integration with galactose (1.5 g/die) and Coenzyme Q10 (100 mg/die), and reduced glutathione (100 mg/die), following the evening meal.

4. Discussion

Also in humans olfaction is an important sensory function, serving for the monitoring of the upper airways, modulating behavior, and determining taste of foods or drinks. It can also influence the quality of life. Moreover, hypo- or anosmia are associated with several neurological conditions, such as PD, to cite only one [3]. The prognosis is more favorable in general in the presence of partial olfactory dysfunction and in younger patients [4], but in our idiopathic case recovery had not occurred in 18 months. Among the standardized olfaction assessment tests developed for the clinical assessment the most commonly used test is the University of Pennsylvania Smell Identification Test (UPSIT) [5], which tests for the 40 most common encapsulated odorants. The total number of odors identified is the UPSIT score. This score allows for the classification of olfactory function as normosmia, mild, moderate, and severe hyposmia, and anosmia. Recently, the UPSIT-40 questionnaire was created and adapted to the Brazilian sociocultural context [7] and then adapted to the Italian population [6]. We have utilized this one.

The results of the present study confirm that post-infectious, and idiopathic causes are among the most common of non-sinonasal-related olfactory dysfunction [1]. Causes have been divided into sensorineural or conduction diseases, however, a neural component is always present.

Regarding treatment, literature reports are controversial. Systemically administered corticosteroids are the first-line-treatment for olfactory dysfunction of nasal origin, however can cause side-effects. Therefore, often like in our cases, topic corticosteroid are used. For example, the topic therapy with beclomethasone was found more effective than that with mometasone [8]. However, in our cases therapy even though long lasting did not ameliorate the symptoms.

Our older patient had lost olfaction after an upper airway infection, therefore his case was diagnosed as post-viral, without any other apparent cause. Some studies suggest that post-viral hyposmia or anosmia should always be investigated through imaging exams, to exclude the presence of intracranial tumors [9].

The neurobiology of olfaction involves activation of odor-evoked action potentials that initiate signaling to the projection neurons in the olfactory bulb, then to the limbic system and higher cortical regions. Bearing this in mind we focused on the axonal damage as a primary cause of smell dysfunction. A trophic role is emerging for myelin sheath [10], which may be also represented by its ability to conduct extra-mitochondrial oxidative phosphorylation [11–15], to sustain the axonal bioenergetics [16]. Galactose, known in literature to increment the oxidative metabolism, appears to be a good respiring substrate for myelin [17]. In particular, Galactose is a preferable substrate for hexose-6-phosphate dehydrogenase (H6PD), a microsomal enzyme that is functional in myelin where, it may be functionally associated to respiratory Complex I, expressed therein [18]. Here we have associated an

integration with CoQ10, to funnel electrons through the whole electron transfer chain and with reduced glutathione, a key antioxidant. Consistently, α -lipoic acid, known for its potential antioxidant effects, but also involved in the glucose oxidative pathway was shown to possess a beneficial effect in the recovery of olfactory function after upper airway infection [19]. Neuroprotection seems to be disregarded recently, likely because our overall knowledge of nervous system biology is still incompletely known in its complexity. Recently, it was discovered that the olfactory cells have a lifelong capacity to regenerate, with a focus on the ability of the axons of olfactory neurons to grow toward the cerebral cortex [20]. It is tempting to presume that the metabolic sustain exerted by myelin sheath for the axon can be supported by a combination of a substrate, like galactose, known to boost aerobic metabolism, ubiquinone and glutathione.

5. Conclusions

Human olfactory disorders have gained attention in recent years, due to their impact on the quality of life, and as markers of neurodegenerative diseases. However, when, like in our cases, the most important and common causes have been ruled out, the relative lack of neuro-protectant strategies can result in failure to cure the patient. Our results establish an interesting role of a novel neuroprotective strategy, for the sake of the olfactory nerve.

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