

THE OXIDANT STRESS RESEARCH AND THE OXYGEN INFUSION METHOD IN SPORTS MEDICINE IN THE WORLD

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INTRODUCTION

Most of chemical reactions taking place in living organisms are based on the transfer of two or one electron (alone or bound to a proton as hydrogen atom/s) from a reducing to an oxidant chemical species. In particular, two-electron reactions are involved either in cell catabolism (on behalf of specific dehydrogenases which transfer the couple of electrons to the mitochondrial respiratory chain in order to produce energy as ATP) or in cell anabolism (on behalf of specific reductases which transfer the couple of electrons to small molecules in order to generate big molecules like fatty acids and cholesterol) (1). One-electron reactions are related to metabolism of free radicals and their related chemical species that are involved in cell signalling and immune defences; these latter functions, in turn, are indispensable for cell homeostasis and survival (2).

In both electron transfer reactions the most common final acceptor of electrons is the oxygen which end products are water molecules (for two-electron transfer reactions) and reactive oxygen species or ROS (for one-electron transfer reactions), respectively. Therefore it has been suggested that aerobic metabolism (e. g. the reactions deriving from electron transfer reactions to oxygen as a whole) played a crucial role since the appearance of first human being (1).

Indeed it has been proposed that an increased endurance capacity (which a physiological marker is the so-called maximal oxygen uptake or VO_2 -max) allowed hominid, possibly from the time of *Homo erectus*, to hunt and to obtain sufficient amounts of meat for physical development thus making him undoubtedly highly successful (1).

Moreover it seems that even today the endurance capacity remains still crucial for survival. In fact an optimal VO_2 -max is associated with a decreased risk

in the incidence of many lifestyle-related diseases, including cardiovascular diseases, type-2 diabetes, Alzheimer's dementia and many cancers (especially breast, colon and prostate). On the other hand, an extremely low level of oxygen uptake leading tissues to hypoxia could have serious outcomes such as increased incidences of diseases that lead to early death (1).

Probably, as a result of evolution, humans have evolved to a condition where exercise-induced ROS can stimulate a wide range of metabolic adaptations (e. g. glucose transport, fatty acids consumption, etc.) which essential for life. Noticeably the stone-age human spent about 4,000 Kcal on physical activity daily, compared to the 400 Kcal utilized by the human male in the present century (1). However acute bouts of exercise, or exhaustive exercise, can increase ROS production thus overcoming the physiological antioxidant defences and leading to the electrophilic or oxidative stress, an emerging health risk factor related to early aging and more than one hundred different diseases (2).

Indeed while sedentariness predisposes to overweight and obesity, which in turns, are related to several diseases (e. g. myocardial infarction, stroke, atherosclerosis, dyslipidaemia, diabetes, cancer) an exaggerate exercise too can lead to the same unwanted above mentioned "side effects" on health (the so-called "sport-paradox"). Only moderate exercise and sport by making available an optimal level of oxygen into the cells (i. e. enough to produce energy and to modulate cell homeostasis without the unwanted side effects of high levels of ROS) seem to reduce cardiovascular morbidity and mortality and to ameliorate quality of life (2).

In particular, during endurance exercises, oxidative processes like peroxidation can take place not only in the contracting muscle but also in engaged connective tissue compartments, and in the leukocyte and erythrocyte plasmamembranes. The result of this process could be: inflammation of muscles, connective tissues and related organs (including bursitis and tendinitis), reduced number of leukocytes and rupture of their membranes (with subsequent reduced immune activity and increased susceptibility to infectious diseases) and haemolysis (with subsequent reduced arterial blood oxygen content and oxygen transport capacity). Any of these consequences directly or indirectly could result in reduced physical performance in elite athletes and those enrolled in daily fitness programs (2).

On these basis, exercising peoples and athletes pe-

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riodically should undergo specific biochemical tests in order to improve physical performance, to shorten the recovery period and therefore to tailor the training regimen – also in the light of specific nutritional plans and eventual antioxidant supplementations – thus preventing oxidative injury of joints, tendons and muscles (2). In this context, the d-ROMs test (total oxidant capacity of a blood serum/plasma sample, normal range 250–300 CARR U) and BAP test (i. e. total antioxidant capacity as ability of a blood serum/plasma sample to reduce iron form ferric to ferrous ions, optimal value 2,200 μ M) (Wismerll Ltd, Tokyo, Japan, fro Diacron International s. r. l., Grosseto, Italy) were shown very suitable for the above purposes in sport medicine (3).

Due to the above discussed biological relevance of molecular oxygen and its derivatives like ROS several strategies have been proposed in the last decades with the specific aim to improve the availability of this gas into the skin and accessible mucosae. Among these are ozone (which molecule, O₃, is split into the body in molecular oxygen, O₂, and atomic, reactive oxygen, O) and hyperbaric oxygen (HBO).

METHOD

More recently oxygen propulsion (OXY-PRO), an intermediate and probably more physiological method compared to the latter ones, has been developed in order to make available enough oxygen into the tissues through the epidermis. By this approach a patented medical device (OXY XTRA MED™, Wismerll Ltd, Tokyo, Japan, for Maya Beauty Engineering s.r.l., Bologna, Italy) allows to concentrate molecular oxygen from the air up to a purity degree of 94-98% and to release it on skin surface under a pulsatile pressure of 2.5 atmospheres. In these conditions molecular oxygen is proposed to pass transcutaneously into the underlying soft tissues thus exerting all its potential beneficial effects related to the above mentioned electron transfer reactions (4, 5).

RESULTS

Because preliminary reports suggested a potential usefulness of OXY-PRO in aesthetic medicine, in orthopaedics and arterial/venous peripheral diseases, an observational open study was performed on professional/amateur runners. Noticeably a regular OXY-PRO treatment was associated to a significant decrease of both serum total oxidant capacity and lactate and to a reduced incidence of muscle injuries (compared to year before the trial). Although more evidence is necessary in order to understand the principle and the real biological effects of OXY-PRO on skin and other soft tissues, this system appears as a natural, non-invasive, easy-to-use, and devoid of side effects strategy able to improve muscle cell metabolism and signalling, both depending on an optimal oxygen bioavailability, with a whole positive impact on athletes performance and injury prevention/co-treatment.

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1st Sport & Oxidative stress • Anti-oxidant Seminar

第1回 スポーツと酸化ストレス・抗酸化 セミナー

～2020年東京オリンピック・パラリンピックでの日本代表選手の躍進に向けて～

会場	秋葉原コンベンションホール 東京都千代田区外神田1-18-13 秋葉原ダイビル2F	懇親会	参加費：¥5,000 場所：秋葉原UDX3F「鹿鳴春」 時間：17:30～19:00
日時	2014年10月5日(日) 13:00～17:00(受付12:15～)	主催	株式会社ウイスマー／国際酸化ストレス研究機構(日本)
参加費	一般¥10,000 ユーザー¥5,000円 *通訳付	後援	International Observatory of Oxidative Stress (Italy) 株式会社ディアクロン・ジャパン
定員	100名(定員になり次第締め切らせて頂きます)		



アスリートコンディショニングにおける酸化ストレス・抗酸化力測定の実用と酸素注入法の活用

カラテリ・パネルと呼ばれるd-ROMs(酸化度)・BAP(抗酸化度)テストによる酸化ストレス評価法は世界40か国以上の研究・臨床機関で活用されています。当社は2003年より毎年「酸化ストレス・抗酸化セミナー」を医療従事者向けに開催して参りましたが、近年、酸化ストレス評価法がスポーツ分野で注目されるようになり、この度、「第1回スポーツと酸化ストレス・抗酸化セミナー」を開催させて頂く運びとなりました。

欧州のプロスポーツチームでは、選手に合ったトレーニングメニューの選定、けが予防といった日々の体調管理から、大会でのピークパフォーマンス、試合当日の出場選手の選定などなど、幅広く酸化ストレス評価が応用されています。

国内では福島大学陸上競技部監督、川本和久先生が2011年のイタリアでの研修を契機に、3年以上にわたり継続的に競技者のd-ROMs・BAPテストを行い、酸化バランスから競技者のコンディションを客観的、そして的確に評価できる周期的なシステムを確立されました。

本年の第98回日本陸上競技選手権でも川本先生の多くの教え子が活躍され、特に女子400メートル障害で久保倉里美選手は8連覇という偉業を達成されています。



酸化ストレス・抗酸化力測定の有用性および、酸素注入法をより多くの競技指導者、競技支援者および競技者に知って頂ければ幸いです。

株式会社ウイスマー 代表取締役

関 泰一



特別講演

福島大学人間発達文化学類 教授
陸上競技部監督

川本 和久 先生

演題 酸化ストレス・抗酸化力測定によるアスリートのコンディショニング



基調講演

日本陸上競技連盟 顧問

佐々木 秀幸 先生

演題 2020東京オリンピックの展望と将来スポーツ指導者の育成と期待



教育講演1

三井記念病院総合健診センター 特任顧問
足利工業大学看護学部 教授 学部長

山門 實 先生

演題 酸化ストレス測定の意味とその評価法



教育講演2

国際酸化ストレス研究機構(イタリア)会長/ローマ大学医学部教授

Eugenio Luigi Iorio 先生

演題 世界のスポーツ医学における酸化ストレス研究と酸素注入法



講演1

三重大学教育学部保健体育科 教授

杉田 正明 先生

演題 スポーツパフォーマンスと酸化ストレス及び抗酸化力の関係



講演2

かみちとスポーツクリニック 理事長

上本 宗忠 先生

演題 急性スポーツ外傷に対するOxy Xtra Medの有用性



講演3

外科医、スポーツ医学美容医学専門医(イタリア)

Domenico Amuso 先生

演題 酸素注入法の意味とデモンストレーション



講演4

福島県スポーツ課
福島大学陸上競技部コーチ(女子100m前日本記録11秒98)

二瓶 秀子 先生

演題 アスリートのコンディショニングにおける酸素注入法の活用



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