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## **Oxy Pro** **Oxygen Perfusion Machine by Diamond International Corp Ltd**

Skin in general, and facial skin in particular, is at the end of blood circulation. Therefore, skin is at the end of in vivo oxygen (O<sub>2</sub>) delivery, even though epidermal cells are exposed to the atmosphere, which has about 20% of O<sub>2</sub>. Age, smoking, environmental pollutants, peripheral vascular diseases and skin diseases cause different degrees of the facial skin ischaemia. A way to fight skin ischaemia is O<sub>2</sub> perfusion, which means to force O<sub>2</sub> through skin. In vivo, this is done naturally by blood circulation. Similarly, this can be performed using a transcutaneous O<sub>2</sub> perfusion machine. **Oxy Pro** by Diamond International is such an oxygen machine. Using eight different types of O<sub>2</sub> and liquid minerals perfusion, **Oxy Pro** effectively increases tissue oxygen tension, or partial oxygen pressure (PO<sub>2</sub>), which reflects the beneficial physiological changes and decreases pathological changes in the circulation of the facial skin. In this way, **Oxy Pro** satisfies the patients' need to improve facial skin oxygenation to overcome intermittent and progressive hypoxia.

It has been known for some time that oxygen uptake decreases with aging, as well as at submaximal and maximal work loads (Dobeln et al., 1967). A mathematical equation relates maximal oxygen uptake (VO<sub>2max</sub>) to work load (L), heart rate (H) and age (A):

$$VO_{2max} = 1.29 [L / (H - 60)] \exp (-0.00884 A)$$

Astrand (1967) also showed that aerobic work capacity and many correlated physiological functions all decline with increasing age beyond peak performances attained post-adolescence. Generally, the human body improves its aerobic competence until late teens/early twenties, then declines.

Impediments to oxygenation exist at several points between lungs and cells. While blood is a hydraulic conductance for O<sub>2</sub>, transfer of O<sub>2</sub> to and from red blood cells is impeded by plasma constituents. Navari, Gainer and Hall (1970) showed that plasma proteins and other constituents generate liquid structures that slow down O<sub>2</sub> free-diffusion. Oxygen, glucose and carbon dioxide have impaired diffusion through human plasma with normal range of protein concentrations. Chisolm et al. (1970), then showed that free-diffusion of O<sub>2</sub> in plasma decreases linearly with aging, while concentration of cholesterol increases with aging.

Skin is especially vulnerable to hypoxia because it is the terminal organ for O<sub>2</sub> delivery, its metabolic rate is transient due to environmental temperature and autonomic nervous system's responses to stress deprive skin O<sub>2</sub>. This is especially true for the facial skin, due to its distal location in the body and permanent contact with the dry ambient atmosphere.

Transcutaneous O<sub>2</sub> and CO<sub>2</sub> have been measured in situ in human skin. Dowd et al. (1983) showed a statistical distribution of PO<sub>2</sub> for normal and ischaemic skin. Low end of normal skin overlaps upper end of ischaemic skin, suggesting that human skin in situ has a wide range of ortho/hypoxia under ordinary conditions.

Matsen et al. (1982) showed that elevation of upper limbs against gravity markedly decreased skin O<sub>2</sub> while breathing ambient atmosphere. Evans and Nalyor (1967) showed, however, that inhaling O<sub>2</sub> markedly raised skin tissue O<sub>2</sub> at top and base of an induced blister. Thus, skin circulation and O<sub>2</sub> are highly sensitive to environmental factors.

The most insidious impairment of skin oxygenation is due to cigarette smoking (Soffer, 1986). Inhalation of nicotine-containing smoke, either primary or second-hand causes the release of vasopressin, a powerful vasoconstrictor. Waeber et al. (1984) showed that cigarette smoking markedly decreased skin blood flow and oxygenation.

These studies amply show that skin blood flow and oxygenation declines with aging, depends on limb position/occlusion and is impaired further by environmental pollutants (cigarette smoking). Consequences lead to exacerbation of decubitus ulcers and impaired wound healing.

A further observation is that cigarette smoking increases the perception of agedness, based upon aesthetic perceptions of the human face. Studies done by Borkan and Norris (1980) indicated that faces judged to look functionally older were accompanied by numerous older sub-systems in the body. Circulation and oxygenation of skin are vital to physiological health and to aesthetic perceptions of wellness, fitness, vitality and beauty. Clearly, there is a need to enhance otherwise compromised PO<sub>2</sub> of mature adult and aging human skin.

Scientific evidence strongly encourages the development of ways to enhance oxygenation of skin, facial skin in particular and perhaps all other organs as well. Biochemical studies of skin oxygenation can be standardized by two physiological treatment modalities. It is well known that inhaling orthobaric O<sub>2</sub> raises concentrations of O<sub>2</sub> in plasma and thereby elevates concentrations of O<sub>2</sub> in end-organ skin. By extension, exposure of a limb or entire body to hyperbaric O<sub>2</sub> further elevates plasma O<sub>2</sub> and that of the skin. Responses to topical cosmetic formulation can be compared with skin oxygenated at ortho and hyperbaric conditions.

Laboratory measurements can be done conveniently with transcutaneous O<sub>2</sub>-meter as used in respiratory physiology. Skin PO<sub>2</sub> increases with topical application of O<sub>2</sub>-delivery cosmetic formulations, like **Oxy Pro** O<sub>2</sub>-delivery. Few studies exist in the literature, however, on benefits of topical oxygenation. They are anticipated by numerous testimonials, anecdotal and clinical perceptions of improvement.

There is general lack of appreciating the physiology of mature, adult and aging skin. Otherwise, there would be a major effort to improve blood circulation and oxygenation in adult skin. In addition, cellular systems are protected in vivo to a substantial degree against free radicals generated by cellular basal metabolism. Catalase, glutathione,

vitamin E and vitamin C are part of the body's natural protective system. Using eight different types of O<sub>2</sub> and liquid minerals perfusion, **Oxy Pro** effectively increases facial skin PO<sub>2</sub>, thus improving blood circulation and oxygenation in adult facial skin.

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