Hyperbaric Oxygen Therapy and Flammability of Topical Skin Care Products

Darlene E. McCord, Ph.D., FAPWCA, Barry E. Newton, B.S.M.E., P.E.
Gwenaël Chiffoleau, Ph.D., Isaiah L. Hankel, B.A.

Abstract
Product selection may determine whether or not proper skin care can be safely provided during hyperbaric oxygen therapy. Independent studies were conducted comparing the oxygen compatibility for six leading skin care products currently on the market. Oxygen compatibility was determined via autogenous ignition temperature (AIT) testing, oxygen index (OI) testing and heat of combustion (HoC) testing. AIT is a relative indication of a material’s propensity for ignition, OI is a relative indication of a material’s flammability, and HoC is the absolute value of a material’s energy release upon burning. Products with a high AIT, a high OI and a low HoC are recognized as being more compatible for application in oxygen-enriched environments. Furthermore, an Acceptability Index based on the above factors is used to rank overall oxygen compatibility. By way of example, the HoC value of Aquaphor Healing Ointment® from Beiersdorf AG was more than five times greater than Remedy Skin Repair Cream™ from Medline Industries, Inc. Subsequently, Skin Repair Cream™ received an Acceptability Index rating of approximately 25 times better than Aquaphor®. Additional skin care products included in the study were Aloe Vesta 2-in-1 Protective Ointment Skin Protectant® from Convatec, Remedy Calazime Protective Paste® from Medline Industries Inc., Cricit Aid Clear Moisture Barrier Ointment® from Coloplast, Nutrashield Cream™ from Medline Industries, Inc. and Secura Protective Ointment® from Smith & Nephew. Application of flammable products during hyperbaric oxygen therapy imposes significant risks associated with ignition and is therefore strongly discouraged. Further studies are recommended to determine which products can provide proper skin protection and healing during hyperbaric oxygen therapy while maintaining strict fire safety standards.

Background
Hyperbaric oxygen therapy has been found useful in the treatment of wounds and wound infections. The therapy consists of 60-120 minute periods of breathing 100% oxygen in a chamber pressurized between 2.0-2.4 ATA. Periodic breathing of high oxygen concentrations increases the transmission of oxygen into the wound. The arrival of excess oxygen stimulates the production of such oxidants as hydrogen peroxide. Oxidant production leads to increased growth factor levels, increased fibroblast collagen synthesis, increased neangiogenesis, and increased bacterial phagocytosis. Physiological risks associated with proper hyperbaric oxygen treatment remain minimal. Numerous studies confirm that hyperbaric chamber sessions do not cause adverse effects on platelet aggregation, erythrocyte or lymphocyte numbers, or the antioxidant status of the plasma. In fact, hyperbaric oxygen therapy is increasingly used in pediatric medicine to safely treat neonates and children. However, there are significant external risks associated with the flammability in oxygen-enriched hyperbaric chambers.

Fire is catastrophic in the confined space of a hyperbaric chamber.

References

HTR Group, Inc.