

**CHIEF EXECUTIVE OFFICER**  
Dennis A. Wain, MBA

**CHIEF OPERATING OFFICER**  
Carole A. Jacolick, ME, BS, HCM

**MISSION VIEJO OFFICE:**

**INTERNAL MEDICINE**  
Gerald M. Brennock, M.D., F.A.C.P.  
Abraham K. Gerhard, M.D.  
Held M. Hagman, M.D.  
Murray L. Margolis, M.D.  
Donald J. Pratt, M.D.  
J. William Scheppach, M.D.  
William E. Smith, M.D.  
William S. Sogaard, M.D.  
Michele R. Staunton, M.D.  
Amy L. Underwood, M.D.

**ALLERGY & IMMUNOLOGY**  
**INTERNAL MEDICINE**  
Bruce L. Nelson, M.D., F.A.A.A.I.

**ENDOCRINOLOGY**  
Mim I. Mulford, M.D.  
Michael P.M. Truong, M.D., F.A.C.E.

**CARDIOLOGY**  
Stephen S. Ehlrich, M.D., F.A.C.C.  
Richard Jacobs, M.D., F.A.C.C.  
David T. Kawanishi, M.D., F.A.C.C.  
Daniel L. Kulick, M.D., F.A.C.C.  
Michael I. Miyamoto, M.D.  
Donald E. Rediker, M.D., F.A.C.C.  
Gregory S. Thomas, M.D., F.A.C.C.

**PULMONARY-CRITICAL CARE**  
Valentino F.J. Fernandes, M.D.  
George L. Schiffman, M.D., F.C.C.P.  
Bruce R. Tammelin, M.D., F.C.C.P.

**GASTROENTEROLOGY**  
Ronald N. Adamany, M.D.  
Edward J. Block, M.D.  
Dennis W.T. Lee, M.D.  
Joy W. Marks, M.D.  
Michael J. Santoro, M.D.

**INTERNAL MEDICINE**  
**CRITICAL CARE**  
Dennis Haghighat, M.D.  
Albert E. Sato, M.D.  
Sheff B-Sokkary, M.D.  
Gerald Sugino, M.D.  
David A. Zander, M.D.

**SAN CLEMENTE OFFICE:**

**INTERNAL MEDICINE**  
Theodore Van Dam, M.D., F.A.C.P.  
William S. Sogaard, M.D.

**LAGUNA HILLS OFFICE:**

**ADMINISTRATOR**  
Shirley Burr, R.N.

**INTERNAL MEDICINE**  
Raymond C. Fernandez, M.D.  
Richard A. Ferreras, M.D.  
Mark D. Hauptman, M.D.  
Nader Noorian, M.D.  
Jerome C. Pierce, Jr., M.D.  
John H. Schuett, M.D.  
Maziar Zomani, M.D.

**INFECTIOUS DISEASES**  
**INTERNAL MEDICINE**  
Alan F. White, M.D.

**CARDIOLOGY**  
Arthur H. Lousoracion, M.D.

**NURSE PRACTITIONER**  
Teresa Carpenter, C.R.N.P.

## Airflow Efficiency Testing

**PURPOSE OF THE TEST:** A test was performed to determine the airflow efficiency of a standard N95 filter during strenuous exercise and its effects on oxygenation ventilation and acid-base balance.

**TEST PROTOCOL:** Testing was performed in the pulmonary physiology laboratory at a regional medical and trauma center under the direction of a board-certified physician with extensive experience in exercise physiology. An MVMax Sensormedics Series 229 cardio system was used. The subject was a normal, well-conditioned 53-year-old male.

The subject was fitted with a standard N95 filter with an exhalation valve. The filter was inserted into a Nomex shroud, The Hot Shield®, and was worn by the subject. A bicycle ergometer, an Ergometrics 800 made by Ergoline, was used. A 15-watt ramp protocol as reported previously was used.

The subject's heart rate, respiratory rate and oxygenation were continuously monitored and arterial blood gas measurement was performed at the termination of the exercise. The workload increased from 15 watts to 175 watts and the subject exercised 13 minutes. Testing was terminated because of exhaustion and impaired ventilation. The subject also experienced a prolonged headache following testing.

**RESULTS:** The results of the two tests were as follows:

### N95 filter Workout

Heart rate	149
pH	7.36
pO2	94.0 mmHg
Respiratory rate	36/min

### Xcaper™ Filter Workout

Heart rate	102
pH	7.435
pO2	93.0 mmHg
Respiratory rate	25/min

## INTERPRETATION:

The findings document significantly increased energy expenditure while wearing a standard N95 filter encased in a Nomex shroud. Although there was no adverse effect on oxygenation, there was a significant increase in heart rate and respiratory rate and an associated metabolic acidosis. This level of energy expenditure and metabolic acidosis was not noted while wearing the Xcaper™ Filter using the same exercise protocol.

**MISSION INTERNAL MEDICAL GROUP, INC.**

**CHIEF EXECUTIVE OFFICER**  
Dennis A. Wain, MBA

**CHIEF OPERATING OFFICER**  
Carole A. Jacalick, ME, BS, HCM

**MISSION VIEJO OFFICE:**

**INTERNAL MEDICINE**  
Gerald M. Brennock, M.D., F.A.C.P.  
Abraham K. Gerhard, M.D.  
Heldi M. Hagman, M.D.  
Murray L. Margolis, M.D.  
Donald J. Pratt, M.D.  
J. William Scheppach, M.D.  
William E. Smith, M.D.  
William S. Sogaard, M.D.  
Michele R. Staunton, M.D.  
Amy L. Underwood, M.D.

**ALLERGY & IMMUNOLOGY**  
**INTERNAL MEDICINE**  
Bruce L. Nelson, M.D., F.A.A.A.I.

**ENDOCRINOLOGY**  
Mim I. Mulford, M.D.  
Michael P.M. Truong, M.D., F.A.C.E.

**CARDIOLOGY**  
Stephen S. Ehrlich, M.D., F.A.C.C.  
Richard Jacobs, M.D., F.A.C.C.  
David T. Kawasahi, M.D., F.A.C.C.  
Daniel L. Kulick, M.D., F.A.C.C.  
Michael I. Miyamoto, M.D.  
Donald E. Rediker, M.D., F.A.C.C.  
Gregory S. Thomas, M.D., F.A.C.C.

**PULMONARY-CRITICAL CARE**  
Valentino F.J. Fernandes, M.D.  
George L. Schiffman, M.D., F.C.C.P.  
Bruce R. Tammelin, M.D., F.C.C.P.

**GASTROENTEROLOGY**  
Ronald N. Adamany, M.D.  
Edward J. Block, M.D.  
Dennis W.T. Lee, M.D.  
Joy W. Marks, M.D.  
Michael J. Santoro, M.D.

**INTERNAL MEDICINE**  
**CRITICAL CARE**  
Dennis Haghghat, M.D.  
Albert E. Sotcho, M.D.  
Sheff El-Sokkary, M.D.  
Gerald Sugino, M.D.  
David A. Zander, M.D.

**SAN CLEMENTE OFFICE:**

**INTERNAL MEDICINE**  
Theodore Van Dam, M.D., F.A.C.P.  
William S. Sogaard, M.D.

**LAGUNA HILLS OFFICE:**

**ADMINISTRATOR**  
Shirley Burr, R.N.

**INTERNAL MEDICINE**  
Raymond C. Fernandez, M.D.  
Richard A. Ferreira, M.D.  
Mark D. Hauptman, M.D.  
Nader Noorian, M.D.  
Jerome C. Pierce, Jr., M.D.  
John H. Schuett, M.D.  
Moukar Zamani, M.D.

**INFECTIOUS DISEASES**  
**INTERNAL MEDICINE**  
Alan F. White, M.D.

**CARDIOLOGY**  
Arthur H. Lousararian, M.D.

**NURSE PRACTITIONER**  
Teresa Carpenter, C.R.N.P.

**Airflow Efficiency Testing**  
**Page two**

**This data is available for independent review. Please contact:**

**Dr. Bruce R. Tammelin, MD FCCP**  
**Director of Respiratory Care, MHRMC**  
**26732 Crown Valley Parkway, Suite 131**  
**Mission Viejo, CA 92691**  
**(949) 364-6000**

**or**

**Xcaper™ Industries, LLC.**  
**(949) 852-2021**

**BRT/slh**