



# The Communicator

## Exercise and the MH Patient: Is There A Problem?

*Abstract provided by Henry Rosenberg, MD, President of MHAUS, regarding the article by Wappler, F., Fiege M., Antz M., Hemodynamic and metabolic alterations in response to graded exercise in a patient susceptible to MH, Anesthesiology 2000 92:268-72.*

**C**an MH susceptible patients develop signs of MH without exposure to anesthetic trigger drugs? This has been one of the most persistent and nagging questions that continues to evade definitive answers. Certainly physical and psychological stress can trigger MH in certain pig breeds, but MH in pigs and MH in other animals are not alike.

Several studies have examined whether controlled exercise will lead to signs of MH (e.g. fever, muscle breakdown, acidosis, etc. ) in MH patients. None found differences between MH susceptibles and normal controls.

In this study by the MH investigative group in Hamburg, Germany, some startling results were found. The patient was a 34-year-old who described temperature elevation to 102°F, fatigue and muscle aches and cramps with mild exercise and “stress.” There were no other abnormalities or a history of anesthetic problems. Two brothers did not have such problems.

Testing with the halothane caffeine ryanodine contracture test was positive for the patient (i.e., he is MHS). No abnormalities were noted on microscopic exam of the muscle. Genetic testing revealed a mutation that has been associated with MH in others.

The patient’s response to exercise on a bicycle was assessed over a 12 minute graded exercise

regimen. The investigators found that the patient’s body temperature rose by about 3°F. Blood acid content (lactate) rose by 9 fold, about twice what others had found. His CK rose from 91 to 453 (other studies have not found such changes). Carbon dioxide levels in the blood did not change. All of these findings were suggestive of changes that can be seen with MH. All resolved when the exercise was stopped.

The authors caution though, that comparing this response to “normals” is fraught with danger since the exercise protocol is not standardized and the fitness level of patients and controls is variable.

They suggest that a small subset of MH patients may display muscle damage and perhaps other more ominous signs with stress of exercise and perhaps with other stresses. This is the first paper clearly demonstrating that a proven MHS patient might have “awake” signs of MH (fortunately reversible). Perhaps others with a mutation similar to this patient’s will also have such a problem.

The study implies that patients who have symptoms and signs of fever or muscle breakdown without drug intervention should be tested for MH susceptibility. Controlled exercise study protocols should be developed in order to scientifically assess what biochemical changes occur in patients with a history of stress-induced fever and muscle fatigue.

The goal is laudable, but since MH is an uncommon disorder, funding to conduct such investigations is extremely difficult to obtain in North America. The study also demonstrates that we have a long way to go in order to understand the manifestations of the complex disorder we know as MH. ■

The Communicator is published four times each year by the Malignant Hyperthermia Association of the United States (MHAUS) and is made possible by a generous grant from Procter & Gamble Pharmaceuticals, manufacturers of Dantrium. The Communicator is intended to serve the information needs of MH susceptible families, health care professionals, and others with an interest in malignant hyperthermia.

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Malignant Hyperthermia (MH) is an inherited muscle disorder which, when triggered by potent inhalation anesthetics and some other drugs, may cause a life-threatening crisis. The incidence of MH is low, but, if untreated, the mortality rate is high. Since the advent of the antidote drug, dantrolene sodium, and with greater awareness of the syndrome, the mortality rate has decreased.

Great advances in our understanding of MH have been made since it was first recognized in the early 1960s, but the nature of the fundamental defect(s) is still unknown.

MHAUS advocates that all surgical patients undergoing general anesthesia should receive continuous temperature monitoring, that adequate supplies of dantrolene be stocked near the OR and that thorough family histories be obtained.

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## Silent Auction of “Fun Items” to Benefit MHAUS In July...

**T**hroughout the year, MHAUS conducts many different campaigns and fundraisers to help support its mission to educate medical professionals and assist MHS individuals and families.

This July, we will be trying something new, fun, and a little different. A Silent Auction will be held with participants able to send in bids via email ([www.mhaus.org](http://www.mhaus.org)), fax, or mail.

“We are always looking for fresh ways to fund our projects,” says Janice Bays, Executive Director of MHAUS, “and many other organizations have had success with silent auction events. Friends of MHAUS have been happy to

donate some wonderful items, and we think our supporters will enjoy participating. After all, it’s for a great cause.”

So far, the items available include a Maple Products gift pack, a Letterhead/Envelope graphic design, printing of letterhead and envelopes, an autographed copy of Charlie Palmer’s Great American Food cookbook, plus an Escape for Two.

For more information about this event or the available items, call the MHAUS office at 1-800-98-MHAUS or visit MHAUS on the Internet at [www.mhaus.org](http://www.mhaus.org).

## From the Mailbag

Dear Dr. Rosenberg,

*Thanks for your kind letter. I've used your Hotline several times in the past...nothing happened on those occasions but it was reassuring that you were there...someone to talk to and know that the latest information on MH is available. Office based anesthesia will be a problem especially if administered by non-anesthesia providers who are blissful in their ignorance. I've enclosed an additional contribution.*

Best wishes,

Thomas Walker, MD, Green Bay, Wisconsin

**For more information or for materials on malignant hyperthermia or MHAUS' programs, call 1-800-98-MHAUS; write MHAUS, 39 East State St., P.O. Box 1069, Sherburne, NY 13460; or visit us on the Internet at [www.mhaus.org](http://www.mhaus.org).**

**To contact the North American Malignant Hyperthermia Registry, call (412) 692-5260, or write NAMHR, Children's Hospital, Anesthesiology Department, 3705 5th Avenue, Pittsburgh, PA 15213.**

# Memorial Funds Go A Long Way To Help Education and Research



While countless families have been touched by MH, the ways in which each family has dealt with their own situation are just as numerous. In past issues of *The Communicator*, we have seen how people like George Harris, Mary Ann Whitehill, and Ingrid Skillings are working for positive changes in their families and their communities to help stop the threat of MH. We salute their efforts and encourage all MHS families to get similarly involved.

And we also salute the Rosenberg, Napolitano, Lewis and Duell families. Over the years, they have each created a Memorial Fund in the name of a loved one to further the educational and/or research goals MHAUS has set forth.

Marilyn Lewis Glassman began the Jerry and Lila Lewis Memorial Fund in memory of her parents and dedicated it to MH research, a pursuit critical in saving lives.

"I began this fund to honor my parents," she says, "and to safeguard others from experiencing this threat that my son suffered when malignant hyperthermia almost took his life."

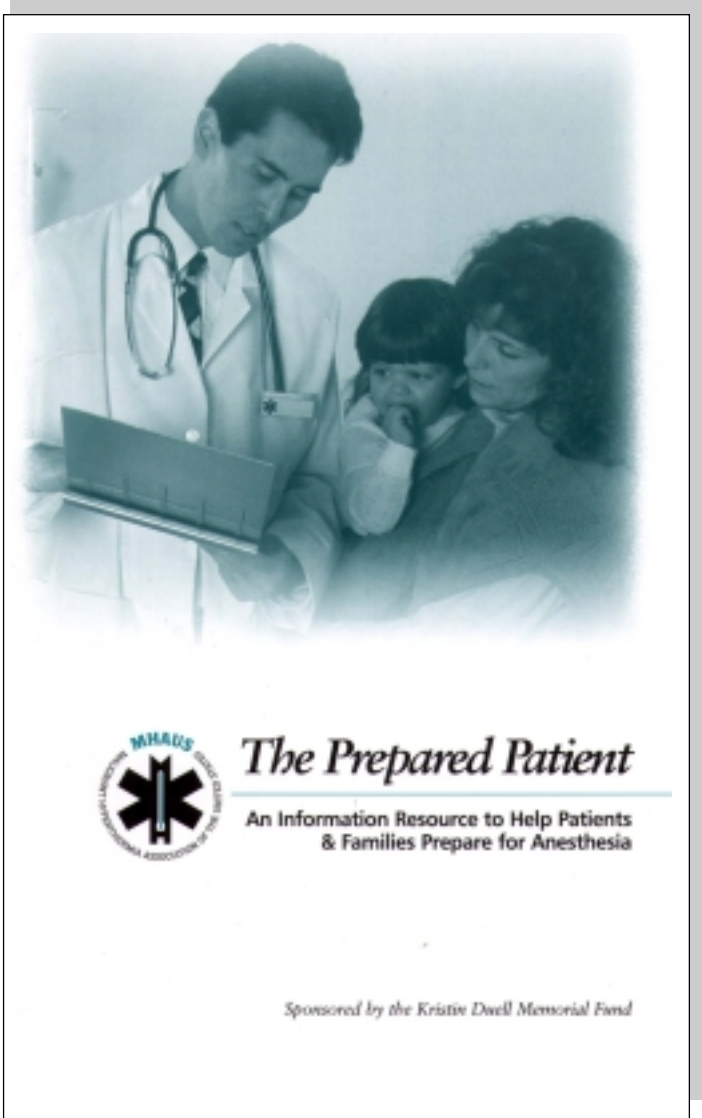
"No one was able to help my husband," recalls Jeanne Napolitano, "because they (the doctors who treated him) didn't understand what to do."

She started her husband's memorial fund, "because I thought that would have a more immediate impact on the general public. My hope is that all nurses and doctors will recognize the symptoms of MH should they see them, and know what to do to treat them."

Our newest memorial fund, The Kristin Duell Fund, was created by her parents two years ago after the tragic death of their sixteen year old daughter. The first project to come from that fund is *The Prepared Patient Brochure* (pictured right) which lists what every patient should know before going into surgery.

For your copy of that brochure, or for more information about getting involved, including how to set up your own memorial fund, call 1-800-98-MHAUS.

*Thanks to the Duell Memorial Fund,  
The Prepared Patient Brochure Helps Patients  
Know What Questions to Ask Before Surgery >*



***The Malignant Hyperthermia Association of the United States is a not-for-profit organization dedicated to reducing the morbidity and mortality of malignant hyperthermia and other heat-related disorders by: improving medical care related to MH; providing support information for patients; and improving the scientific understanding and research related to MH and other kinds of heat-related syndromes.***

# Question: Why Do So Many MH Victims Have No Prior History Related to MH?

**A:** There are various possibilities. Many patients have never had a prior anesthetic, or their prior anesthesia involved non-triggers. The MH susceptible patient has a silent (sub-clinical) myopathy that alters function of the ryanodine receptor ( $Ry_1$ ) in a manner that is undetectable in the absence of MH triggers. Thus there are no unique symptoms or problems referable to skeletal muscle. Symptoms that might signal a muscle problem, e.g., muscle cramps, strabismus, have the same incidence in MHS patients as in the general population.<sup>1-3</sup>

Perhaps a prior triggering anesthetic was too brief and there was insufficient time for MH to develop. Statistical analysis has demonstrated that many MH cases develop insidiously, more than an hour into the case.<sup>4</sup> Depressants and non-depolarizing muscle relaxants attenuate an MH episode and delay

its onset.<sup>5</sup> Mild hypothermia diminishes the development of MH,<sup>6</sup> the opposite effect of increased temperature, which facilitates MH triggering.<sup>7</sup>

Unknown factors diminish the ability to trigger MH. Many MH susceptible patients have had prior triggering anesthesia without evidence of MH.<sup>8,9</sup> This may in part be due to various drugs or mild hypothermia, but who knows which environmental factors may alter susceptibility?

Humans in general are heterozygotes for MH; this may result in varying degrees of response to triggers. Once MH is triggered, the cyclic resurgences and additive effects bring MH to a wild metabolic mayhem regardless of degree of susceptibility (at least in swine, and presumably in humans).

Certain ions and various substances alter  $Ry_1$  responses<sup>10-14</sup> due to the ease of reactions with multiple interactive points on the  $Ry_1$  receptor. This may also alter degree of susceptibility, acutely and temporarily. If anesthesia exposure occurs during this period, MH might be triggered more easily.

by Gerald A. Gronert, MD, Professor Emeritus, University of California, Davis

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## New For MHS Families: Updates to the Frequently Asked Questions and Pregnancy FAQ Sheets



Each time an MHS family joins MHAUS, they are empowering themselves to take control of their susceptibility while proactively ensuring they will have all the latest, up-to-date knowledge available regarding MH.

In our quest to provide that up-to-date information, we at MHAUS have recently updated two of our most **Frequently Asked Question (FAQ)** sheets to help serve those families even better.

The general FAQ sheet includes updates on the status of a blood test, as well as answers to questions like, "Is MH always hereditary? What drugs are safe?"

And now, it also includes the answer to the question, "Are Malignant Hyperthermia susceptible individuals at risk for symptoms/episode if exposed to triggering agents while working in an operating room

or similar environment?"

The answer is, "There are no cases reported of MH patients having problems on exposure to waste anesthetic gases while working in the OR. In addition, the data from pigs indicate that very low concentrations of anesthetics do not trigger MH in these highly susceptible animals."

"There is only one report of muscle cramps and fatigue in a person who worked in a factory where he was exposed to chemicals whose structure is similar to that of potent inhalation agents." For more information on this topic, you may also refer to Dr. Thomas Nelson's article in *The Communicator*, September 1994, page 7.

The second updated FAQ sheet details **Pregnancy and MH**, a topic of large concern to MHS mothers-to-be.

"Is an epidural safe? Should the baby be considered MHS? How will I know if I am having a reaction? Would I be safer to schedule a Caesarean?" These are just a few of the concerns addressed.

Denise Wedel, MD, of the Mayo Clinic has written about these issues for **The Communicator** (April 1990). We hope to bring you an update to that piece in the near future.

For a copy of either of these informative FAQ sheets, please call the office at 1-800-98-MHAUS or visit our Web site at [www.mhaus.org](http://www.mhaus.org). ■

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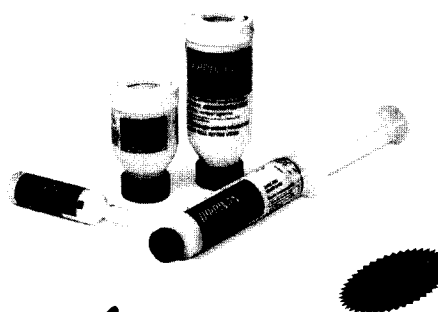
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# Hotline Activity for Oct - Dec 1999

summarized by Charles Watson, MD, FCCM,  
Bridgeport Hospital, Bridgeport, CT



In the last quarter of 1999, eighteen volunteer physician hotline consultants fielded 76 questions about

Malignant Hyperthermia and MH-like conditions. This number is lower than in past because the Hotline Nurses, who initially screen calls, are now trained to answer many questions.

Also, an increasing number of patients and health professionals have taken advantage of information from the MHAUS Internet site and posed either direct phone questions to MHAUS or "on line" questions that can be answered by MH consultants in a less urgent fashion.

## Consultation Profile

The majority of callers were anesthesiologists; however, a wide range of health care professionals including surgeons, primary care physicians, pediatricians, intensive care physicians, staff nurses, several CRNAs, a psychiatrist, and two MH susceptible patients also called the hotline for immediate advice. Several callers reported that they had consulted information on the MHAUS Internet site before seeking more immediate advice from the hotline.

More than half of the calls concerned male patients. Forty came from callers who thought they might need to treat an acute MH crisis. Six calls were about infants less than twelve months of age; thirty were about children from one to eighteen years, and forty involved adults. As reported

earlier, an increasing number of consultations came in the post-operative period.

## Acute Consultation about MH and MH-Like Events

After speaking with the callers, hotline consultants felt that fourteen calls were about acute MH and MH-like hypermetabolic crises and four concerned acute life-threatening reactions in patients who most likely had previously unknown muscular dystrophy or other inherited muscle abnormalities. One caller presented a patient from a plastic surgeon's office who the consultant thought received too much cocaine and lidocaine with epinephrine during a procedure under general anesthesia. This reaction resolved slowly, without long-term problems.

Twenty-five callers presented patients with high fever during or after surgery that consultants felt were caused by infections and other conditions unrelated to MH. Three patients had increased carbon dioxide concentrations during anesthesia, one presented with an unexpectedly rapid heart rate, and two had perioperative rigidity that consultants thought were not associated with MH.

Two callers reported patients who had unexpected masseter muscle rigidity, or jaw stiffness, after beginning anesthesia with the muscle relaxant succinylcholine. Two called about patients who had severe muscle aches and pains several days after anesthesia. One asked about a

patient who had symptom-free evidence of severe muscle injury, dark urine with myoglobin—a muscle break down product that can cause kidney failure—after general anesthesia and surgery.

## Drug and Equipment Safety

Eight callers had questions about safe equipment or drugs for MH susceptible patients or preparation for anesthesia. Several questioned the value and expense of stocking an adequate dose of dantrolene for treatment of unexpected MH during surgery and anesthesia. Three wanted immediate help with patient referral for preoperative evaluation of MH risk by muscle testing.

A psychiatrist asked if the neuroleptic malignant syndrome (NMS) would be more likely to happen in an MH susceptible patient who needed drug therapy for depression. The consultant knew of no cross-reactivity or association between MH and the NMS (which have different settings and triggering agents), although the symptoms and outcome may be similarly lethal.

One man, who knew he was MHS, asked whether it would be safe to visit his wife after surgery. The consultant thought yes, because the caller's wife would not exhale significant triggering anesthesia levels after the first few minutes in the post-anesthetic recovery unit.

Another, a college student, was worried that he might have a MH crisis if he handled ether, a MH triggering agent that was used for anesthesia years ago, in his

## In the U.S. and Canada, the MH Hotline is 1-800-MH-HYPER. Outside the U.S., call 1-315-464-7079.

chemistry lab. The consultant, and colleagues polled on the Internet, were more concerned that this could be dangerous to him, without special precautions, and suggested that he avoid exposure to ether in his lab course.

### A Classic Case of MH

This and previous summaries show that hotline consultants field questions about a number of conditions that mimic MH as well as questions about MH susceptible patients and safe planning for the unexpected MH crisis management in hospitals and other outpatient surgical settings. A primary goal of the hotline has always been to help save patients who suffer the MH crisis.

One typical call came from an anesthesiologist in Michigan about an eight-year-old girl who'd broken her elbow and needed urgent surgery. The anesthesiologist who was caring for the child saw that she had jaw stiffness, elevated carbon dioxide levels, a very rapid heart rate and rising temperature following the start of emergency anesthesia at 10:00PM. He called the hotline and was put through to Dr. Margaret Weglinski, who advised him about dantrolene therapy, acute management, and post-crisis care in the ICU.

Fortunately, a relatively small dose of dantrolene controlled the child's high metabolism before the temperature rose

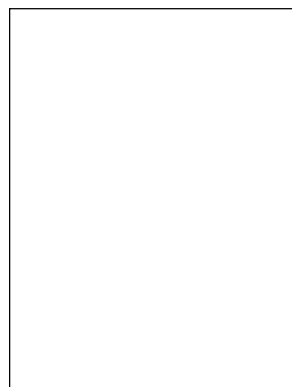
more than two degrees Fahrenheit and symptoms slowly resolved. In her follow-up phone call to the anesthesiologist, Dr. Weglinski learned that muscle enzyme levels rose to 8,000 by 16 hours after the event—about ten to fifteen times greater than expected from the surgical muscle injury that normally is required for elbow pinning.

Aside from this silent indicator of the severity of this child's muscle injury and her close brush with death, she did well and Dr. Weglinski reported that she had no post-operative problems. This was confirmed later by the anesthesiologist who filled out a follow-up questionnaire and a Registry report, saying that Dr. Weglinski's consultation was "very helpful." He referred the child and her family to the Mayo Clinic for evaluation and possible muscle biopsy testing.

Evaluations submitted by callers, hotline nurse consultants, and the hotline peer review committee, continue to show that the time consultants devote to these calls is well spent.

The MH Hotline helps health care workers who are confronted by difficult questions or the management of patients with frightening, unexpected MH symptoms throughout North America. The MH Hotline, a volunteer effort sponsored by MHAUS, has been reproduced by other MH organizations in parts of Europe and South America. It is also the model for the NMS Hotline, a similar volunteer service that brings psychiatrists, muscle experts, and anesthesia intensive care doctors together to help patients stricken with this life-threatening disorder that is triggered by specific neuropsychiatric drugs. ■

## *Meet This Issue's Consultant*



*Dr. Charlie Watson, who prepared this summary of Hotline Activity, is Chairman of Anesthesia at Bridgeport Hospital in Bridgeport, Connecticut. He has been a consultant for the MH Hotline for the past ten years.*

*"The Hotline is a good service for patients and clinicians," he says. "And I like helping. After all the energy we've spent to become experts in MH, we are responsible to pass that expertise on. It's the only way to repay the mentors who taught us."*

*Dr. Watson and his wife have three children and live in Connecticut.*

# MHAUS Happenings, Events, and Notices

❑ **A Salute For Florida:** This past March, Florida passed a ruling to require 36 vials of dantrolene be present wherever major regional or general anesthesia was being used. Previously, they had required only 12 vials. This is a victory for patients in Florida for their continued safety during surgery.

❑ **You can help MHAUS while on the Internet:** Help support MHAUS by shopping all your favorite online sources through Greater Good. Just go to [www.mhaus.org](http://www.mhaus.org) and click on the Greater Good button. MHAUS will receive a percentage of your purchases. Thanks!

❑ **Don't Leave Home Without Us:** MHAUS has bracelets and ID tags to notify medical personnel of your MHS status. Each tag is imprinted with the MH Hotline number, too, which can save precious time in the event of an emergency. Call 1-800-98-MHAUS right now to request more information.

❑ **"The investments in dantrolene and proper management of MH are minimal when compared to the risks of disability and death":** This is the driving idea behind a three part audiotape series for anesthesiologists now accredited by SUNY Upstate Medical University. The series is entitled "Malignant Hyperthermia Risk Reduction Strategies" and was produced by MHAUS through a grant from Procter & Gamble Pharmaceuticals.

This program seeks to reduce liability through preparedness -- both by training staffs what to do and by having the proper equipment and antidote available.

Part one contains background information about classic MH symptoms, treatment, and susceptibility. Part two provides understanding of the medical and legal risks hospitals face. And part three outlines prevention strategies.

For more information, or for your copy of this program, call 1-800-98-MHAUS.

❑ **Will Your Employer Match Your Gift to MHAUS?:** Many businesses and corporations have "matching contributions" programs. These programs are set up as a means for an organization to support its employees by supporting the employee's personal charitable interests.

Some matching programs are 100% matching. This means the employer will "match" each dollar the employee contributes. If the employee contributes \$50 to MHAUS, for example, the employer will also contribute \$50 to MHAUS.

Check with your personnel department to see whether your employer will match your gift to MHAUS. If not, then suggest a matching program be set up. Remind them the employer's contribution is tax-deductible, too!

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