



June 8, 2022

The Honorable Carlos Del Toro
Secretary of the Navy
c/o Molly Papermaster, Special Assistant

Via e-mail: molly.papermaster@navy.mil

Dear Secretary Del Toro:

Thank you in advance for your time. I'm writing to you on behalf of People for the Ethical Treatment of Animals U.S.—PETA entities have more than 9 million members and supporters worldwide—and retired Rear Admiral Marion Balsam regarding the U.S. Navy's support of excruciating decompression sickness/illness (DCS/DCI) tests on animals that have already been abandoned by many of our allies. Although the Navy ended funding for these tests at the University of Wisconsin (UW)—Madison following a 2010 PETA exposé, the agency later resumed its support. **Based on the information below, we urge the Navy to stop conducting and funding DCS/DCI and undersea oxygen toxicity experiments using animals.**

Navy Conducts and Funds Cruel DCS/DCI and Oxygen Toxicity Tests on Animals

The Navy has recently funded and conducted painful and often deadly DCS/DCI and oxygen toxicity experiments on animals, both through grants to other institutions and by its own staff. These experiments include the following:

- Experimenters exposed sheep to nearly eight atmospheres of pressure in hyperbaric chambers for 30 minutes, then forced them to decompress—during which time they likely endured DCS/DCI-related crippling joint pain, seizures, nausea, paralysis, vomiting, burning, and deep chest pain—and injected them with a substance of interest, before killing and dissecting them.¹
- Experimenters decapitated rats and exposed parts of their brain tissue to high oxygen concentration and pressure.²
- Experimenters injected mice with a substance of interest, exposed them to nearly eight atmospheres of pressure in hyperbaric chambers for two hours, and then forced them to decompress for two hours before killing and dissecting them.³

¹Cronin WA, Khan K, Hall AA, Bodo M, Mahon RT. The effect of the perfluorocarbon emulsion Oxycyte™ in an ovine model of severe decompression illness. *Undersea Hyperb Med.* 2021;48(1):25-31. doi:10.22462/01.03.2021.3.

²Hinojo CM, Ciarlone GE, D'Agostino DP, Dean JB. Exogenous ketone salts inhibit superoxide production in the rat caudal solitary complex during exposure to normobaric and hyperbaric hyperoxia. *J Appl Physiol.* 2021;130(6):1936-1954. doi:10.1152/jappphysiol.01071.2020.

³Bhopale VM, Ruhela D, Brett KD, Nugent NZ, Fraser NK, Levinson SL, DiNubile MJ, Thom SR. Plasma gelsolin modulates the production and fate of IL-1 β -containing microparticles following high-pressure exposure and decompression. *J Appl Physiol.* 2021;130(5):1604-1613. doi:10.1152/jappphysiol.01062.2020.

PEOPLE FOR
THE ETHICAL
TREATMENT
OF ANIMALS

Washington
1536 16th St. N.W.
Washington, DC 20036
202-483-PETA

Los Angeles
2154 W. Sunset Blvd.
Los Angeles, CA 90026
323-644-PETA

Norfolk
501 Front St.
Norfolk, VA 23510
757-622-PETA

Info@peta.org
PETA.org

Entities:

- PETA Asia
- PETA India
- PETA France
- PETA Australia
- PETA Germany
- PETA Switzerland
- PETA Netherlands
- PETA Foundation (U.K.)

- Experimenters implanted radio transmitter modules into the brains of rats, inserted and sutured electrodes in their torsos, exposed them to five atmospheres of pressure in hyperbaric chambers until the onset of seizures, then likely killed them, although their ultimate fate is undescribed.⁴

Furthermore, it appears that these Navy-funded DCS/DCI and/or oxygen toxicity experiments on animals are continuing:

- UW–Madison’s Marlowe Eldridge lists as a “major area of interest” of his lab “the development of protective decompression strategies following saturation dives using a sheep model.”⁵ A 2020–2022 grant from Naval Sea Systems Command (NAVSEA) titled, “Determining DISSUB Survival Rates of 90 kg Sheep Rescued Using SRDRS Standard Operating Procedures,” is listed under “Current Grant Support” on his lab’s website.⁶
- On October 1, 2021, the Office of Naval Research (ONR) Contract and Grants Awards Management Division published a Broad Agency Announcement (BAA) for Navy and Marine Corps Science and Technology whose deadline is September 30, 2022⁷. One of the “technology areas” that ONR currently pursues is undersea medicine and performance, which includes the following:
 - Basic research to understand the pathology and etiology of decompression illnesses (DCI, i.e., decompression sickness and arterial/venous gas embolism), hyperbaric oxygen toxicity and/or nitrogen narcosis
 - Basic research to understand the cognitive impacts and individual responses of the various exposures in the undersea environment
 - Applied research investigating the efficacy of nonrecompressive prevention and treatment of DCI
 - Applied research investigating prophylactic counter-measures for oxygen toxicity
 - Applied research for thermal modeling and novel protective measures against cold water exposures⁸

Based on a 2019 ONR/NAVSEA report that confirmed a NAVSEA-sponsored DCS experiment involving sheep,⁹ it appears that animals may continue to be involved in the Navy’s applied and/or basic experiments investigating DCS/DCI and/or undersea oxygen toxicity described in the aforementioned BAA published on October 1, 2021.

⁴Posada-Quintero HF, Landon CS, Stavitzski NM, Dean JB, Chon KH. Seizures caused by exposure to hyperbaric oxygen in rats can be predicted by early changes in electrodermal activity. *Front Physiol.* 2022;12. doi:10.3389/fphys.2021.767386.

⁵Department of Pediatrics, University of Wisconsin–Madison. Eldridge Research Group. <https://www.pediatrics.wisc.edu/research/research-groups/eldridge>. Accessed May 9, 2022.

⁶Department of Pediatrics, University of Wisconsin–Madison. Grant Support. <https://www.pediatrics.wisc.edu/research/research-groups/eldridge/grant-support>. Accessed May 9, 2022.

⁷Office of Naval Research Science & Technology. Broad Agency Announcements (BAA), Funding Opportunity Announcements (FOA) and Special Program Announcements. <https://www.onr.navy.mil/en/work-with-us/funding-opportunities/announcements>. Accessed May 16, 2022.

⁸Office of Naval Research Science & Technology. Undersea Medicine and Performance. <https://www.onr.navy.mil/Science-Technology/Departments/Code-34/All-Programs/warfighter-protection-applications-342/undersea-medicine>. Accessed May 9, 2022.

⁹Sobakin, A, Eldridge M. Improving safety of submarine escape and rescue from shallow. *Depth ONR-NAVSEA Undersea Medicine Program Review.* 2019;100-102.

Navy Pulled, But Later Resumed, Funding of DCS Experiments on Sheep at UW–Madison

You may know that in 2010, PETA and Alliance for Animals—a group based in Madison, Wisconsin—jointly petitioned for prosecution¹⁰ after a district attorney ignored his own findings that UW–Madison had violated state law by using decompression to kill sheep in Navy-funded experiments. After reviewing our petition, Circuit Court Judge Amy Smith decided that animal experimenters are not above the law, determining “that probable cause exists to conclude that certain named individuals . . . violated [a state law prohibiting the use of decompression to kill animals], either directly or as party to a crime.”¹¹ In her 24-page decision, Judge Smith also wrote, “[T]he University has apparently engaged in behavior resulting in the above-described animal deaths for years” and noted that “it may well continue to decompress animals to death contrary to law, unless I take action.” Judge Smith appointed a special prosecutor, who wrote in his report, “There is no doubt that the animal suffers during the period from leaving the chamber until the ultimate injection to euthanize the animal,” and concluded that, “the Petitioners’ actions have brought into question the necessity of the continuation of the decompression research. *The Department of the Navy has pulled its grant and the research using the sheep has stopped.*”¹² [Emphasis added.]

However, after UW–Madison subsequently persuaded the state legislature to exempt experimenters from state cruelty-to-animals statutes,¹³ and given the evidence described above, it appears that the Navy has resumed conducting and funding such experiments on animals—even after having pulled its 2010 grant to UW–Madison for DCS/DCI experiments on sheep in 2010.

Navy’s DCS/DCI Experiments on Animals Are Out of Step With International Standards

Both the British and French navies have already ended their respective DCS animal-testing programs.¹⁴ In 2008, then–U.K. Parliamentary Under Secretary of State at the Ministry of Defence Derek Twigg wrote to the British Parliament, stating, “The Ministry of Defence (MOD) has today announced the end of its immediate requirement for testing on live goats as part of its hyperbaric research in support of the MOD’s Submarine Escape Rescue and Abandonment System (SMERAS).”¹⁵ He described the findings motivating this decision:

The testing programme was aimed at improving the accuracy of the information relating to the likely probability and consequence of decompression illness following escape from a submerged submarine in varying depths and internal submarine pressures. This requirement has now been achieved, and the review has concluded that the remaining

¹⁰Lueders B. PETA, Alliance for Animals seek criminal charges against the UW–Madison. *Isthmus*. March 16, 2010. <https://isthmus.com/news/news/peta-alliance-for-animals-seek-criminal-charges-against-the-uw-madison/>. Accessed May 9, 2022.

¹¹*Ibid.*

¹²Final Report of the Special Prosecutor, PETA, Published May 3, 2022. <https://www.peta.org/wp-content/uploads/2022/05/final-report-of-special-prosecutor.pdf> Accessed May 3, 2022.

¹³Finkelmeyer T. Campus connection: UW eyes resuming decompression sickness studies with sheep. *The Capital Times*. August 2, 2012. https://captimes.com/news/local/education/campus_connection/campus-connection-uw-eyes-resuming-decompression-sickness-studies-with-sheep/article_27e7cdff-7e7b-5770-9684-f308bfe6df35.html. Accessed May 9, 2022.

¹⁴Norton-Taylor R. Navy used goats in submarine experiments, MoD reveals. *The Guardian*. February 6, 2008. <https://www.theguardian.com/uk/2008/feb/07/animalwelfare.military>. Accessed May 9, 2022.

¹⁵Hansard House of Commons. Written Ministerial Statements. February 6, 2008. <https://publications.parliament.uk/pa/cm200708/cmhansrd/cm080206/wmstext/80206m0002.htm>. Accessed May 9, 2022.

associated areas of uncertainty in submarine escape and rescue relate to events that are considered highly unlikely, and do not therefore need to be addressed by means of animal testing. The MOD has endorsed these recommendations and as a result, it has no immediate need to continue animal testing of this type.¹⁶

Data From DCS Experiments on Animals Do Not Accurately Translate to Humans

In his May 12, 2010, reply to PETA's March 30, 2010, complaint to then-Navy Secretary Ray Mabus, then-Director of the Navy Medical Research and Development Center W.W. Cheatham, M.D., admitted, "The impact of physiological differences between species with regard to disease processes, to include diving related issues, is well recognized throughout the medical research community."¹⁷ Yet Cheatham then went on to disregard his own acknowledgment of poor cross-species data translation and emphasize the purported need for continued experiments on animals.

Numerous experts have noted the inherent limitations of using animals to predict the effects of DCS/DCI in humans. Diving expert John Lippmann has stated, "The problem with these animal experiments is that no animal model can replicate what happens in a human."¹⁸ The Naval Medical Research Center (NMRC) itself has stated, "[A]nimal DCS in many cases is more severe than that in humans and, therefore, appears 'different' from the average human case. ... Among species, there certainly are differences in tolerance to decompression, with relative susceptibility to DCS tending to increase with species size. ... These observations suggest that response differences among species to the insult of decompression may reflect a combination of factors, including differences in gas exchange and tolerance to excess gas in the body."¹⁹

Superior Non-Animal DCS Research Methods Are Widely Available

The National Hispanic Medical Association (NHMA), representing the interests of 50,000 licensed Hispanic physicians in the U.S., adopted a new position statement earlier this year in support of PETA's Research Modernization Deal²⁰:

The NHMA strongly supports PETA's "Research Modernization Deal." Animals used in laboratory experiments are biologically, physiologically, and anatomically different from human beings, making animal testing a suboptimal and highly error-prone endeavor that costs billions of taxpayer dollars each year while failing more than 90 percent of the time to deliver safe and effective treatments for patients. The need for better medical therapies is urgently increasing, and the solution starts with modernizing the research pipeline. ... Everyone will benefit from replacing animal experiments with more effective human-based medical research, and

¹⁶*Ibid.*

¹⁷ Letter to the Navy Reply, PETA, Published May 3, 2022. <https://www.peta.org/wp-content/uploads/2022/05/letter-to-navy-reply.pdf> Accessed May 3, 2022.

¹⁸Lippmann J. *The Essentials of Deeper Sport Diving: An Overview of the Theory and Requirements of Deeper Diving*. Locust Valley, NY: Aqua Quest Publications; 1992.

¹⁹Lillo RS, Himm JF, Weathersby PK, Temple DJ, Gault KA, Dromsky DM. Using animal data to improve prediction of human decompression risk following air-saturation dives. *J Appl Physiol*. 2002;93(1):216-226. doi:10.1152/jappphysiol.00670.2001.

²⁰ PETA Outlines a New Deal to Revamp Laboratory Research, PETA, Published 2022. <https://headlines.peta.org/research-modernization-new-deal/> Accessed June 7, 2022.

PETA's plan provides a guide for how to achieve this important transition.²¹

Thankfully, modern, non-animal technology is available for studying DCS/DCI based on human tissue and data obtained from human divers.^{22,23,24} For example, *in vitro* studies of human endothelial cells—which led to and were later confirmed by human trials—have provided researchers with evidence in simulated diving conditions of nitric oxide dynamics, a chemical compound that can protect against bubble formation.^{25,26,27} Reanalysis of existing human diver data has led to improved models that may be better able to predict DCS/DCI symptoms and risk factors.^{28,29} Meanwhile, machine-learning techniques may aid in the prediction of symptoms such as seizures during hyperbaric oxygen therapy.³⁰ Modeling can also improve the performance of dive computers to better equip divers in avoiding DCS/DCI,³¹ and laboratory studies using human subjects are yielding novel data.^{32,33}

Request for Action

Secretary Del Toro, in view of these facts, we respectfully urge the Navy to take immediate action to discontinue conducting and funding these agonizing—and often deadly—DCS/DCI and oxygen toxicity experiments on animals.

You can contact me directly at SamuelP@peta.org. Thank you for your consideration of this important and urgent matter.

²¹National Hispanic Health Foundation. NHMA policy statements. <https://www.nhmamd.org/nhma-policy-statements>. Accessed May 9, 2022.

²²Palkovic M, Novomeský F, Zaviacic M, Danihel L, Kovác P, Danisovic L. The use of cell cultures for in vitro decompression sickness simulation, *Soud Lek*. 2007;52(1): 9-16.

²³Jang DH, Owiredu S, Ranganathan A, Eckmann DM. Acute decompression following simulated dive conditions alters mitochondrial respiration and motility. *Am J Physiol Cell Physiol*. 2018;315(5):C699-C705. doi:10.1152/ajpcell.00243.2018.

²⁴Wienke BR. Computer validation and statistical correlations of a modern decompression diving algorithm. *Comput Biol Med*. 2010;40(3):252-260. doi:10.1016/j.combiomed.2009.11.021.

²⁵Hesthammer R, Eide T, Thorsen E, Svardal AM, Djurhuus R. Decrease of tetrahydrobiopterin and NO generation in endothelial cells exposed to simulated diving. *Undersea Hyperb Med*. 2019;46(2):159-169.

²⁶Hesthammer R, Eide T, Thorsen E, Svardal AM, Djurhuus R. Hyperoxia and lack of ascorbic acid deplete tetrahydrobiopterin without affecting NO generation in endothelial cells. *Undersea Hyperb Med*. 2019;46(4):509-519.

²⁷Hesthammer R, Dahle S, Storesund JP, Eide T, Djurhuus R, Svardal AM, Thorsen E. Nitric oxide in exhaled gas and tetrahydrobiopterin in plasma after exposure to hyperoxia. *Undersea Hyperb Med*. 2020;47(2):197-202. doi:10.22462/04.06.2020.4.

²⁸King AE, Andriano NR, Howle LE. Trinomial decompression sickness model using full, marginal, and non-event outcomes. *Comput Biol Med*. 2020;118:103640. doi:10.1016/j.combiomed.2020.103640.

²⁹Cialoni D, Pieri M, Balestra C, Marroni A. Dive risk factors, gas bubble formation, and decompression illness in recreational SCUBA diving: Analysis of DAN Europe DSL data base. *Front Psychol*. 2017;8. doi:10.3389/fpsyg.2017.01587.

³⁰D'Angelo G, Pilla R, Dean JB, Rampone S. Toward a soft computing-based correlation between oxygen toxicity seizures and hyperoxic hyperpnea. *Soft Comput*. 2018;22(7):2421-2427. doi:10.1007/s00500-017-2512-z.

³¹Wienke BR, O'Leary TR. On bubble regeneration and broadening with implications for decompression protocols. *Significances Bioeng Biosci*. 2018;2(4). doi:10.31031/sbb.2018.02.000543.

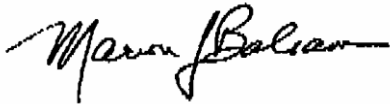
³²Hess HW, Hostler D, Clemency BM, St. James E, Johnson BD. Carotid body chemosensitivity is not attenuated during cold water diving. *Am J Physiol Regul Integr Comp Physiol*. 2021;321(2):R197-R207. doi:10.1152/ajpregu.00202.2020.

³³Hess HW, Hostler D, Clemency BM, Johnson BD. Carotid body chemosensitivity at 1.6 ATA breathing air versus 100% oxygen. *J Appl Physiol*. 2020;129(2):247-256. doi:10.1152/jappphysiol.00275.2020.

Sincerely yours,



Samuel Pons
Research Associate
International Laboratory Methods
Laboratory Investigations Department



Marion J. Balsam, M.D.
Rear Admiral, Medical Corps, U.S. Navy (Ret.)
Former Commander, Naval Medical Center Portsmouth
Former Chief of Pediatrics, Naval Medical Center Bethesda
Bethesda, Maryland

cc: The Honorable Erik K. Raven, Under Secretary of the Navy
(erik.raven@navy.mil)
Capt. Jereal Dorsey, Spokesperson, Office of the Secretary of the Navy
(jereal.e.dorsey.mil@us.navy.mil)