Editorial

Alcohol, Drugs, and Diving: Implications for Health and Fitness to Dive

Joris C. Verster[*,§,1], Elisabeth A.M. Kienhorst[1] and Rob A. van Hulst[2]

[1]*Utrecht University, Utrecht Institute for Pharmaceutical Sciences, Division of Pharmacology, Universiteitsweg 99, 3584CG, Utrecht, The Netherlands*

[2]*Royal Netherlands Navy Command, Department Diving and Submarine Medical Center, Naval Base Den Helder, PoBox 10.000/MPC 10A, 1780 CA Den Helder, The Netherlands*

Recreational diving is an increasingly popular leisure activity. It has been estimated that U.S.A. has 1.2 million recreational scuba divers, and this number grows annually [1]. In addition to recreational divers, there is also a growing number of professional divers. Diving is a potentially dangerous activity, which is why divers should be trained and certified. Hyperbaric circumstances itself may negatively affect cognitive and psychomotor functioning [2]. One of the problems divers may experience is nitrogen narcosis, i.e. an altered state of mind, caused by breathing nitrogen at a high partial pressure. Narcotic effects start to appear at a pressure of 4 bar (30 meters of depth) [3]. This effect has been popularly called the "Martini effect", since it has been argued that each 10 meters of diving depth corresponds to a performance impairment as produced by one glass of alcohol. So, at 40 meters of depth, a diver feels and functions like he has consumed 4 alcoholic drinks. It is therefore understandable that various rules apply at diving schools to ensure the health and safety of the diver.

One of these rules is that divers should not use alcohol, medicinal or recreational drugs around the time of diving. Psychoactive drugs may have adverse effects such as drowsiness or dizziness that interfere with safe diving.

Despite rules and recommendations not to use drugs and dive, a great number of divers disregard this advice and report diving shortly after using prescribed or over-the-counter drugs. More than half of N=531 surveyed U.K. divers reported taking over-the-counter drugs within 6 hours before diving, of which analgesics and decongestants were most commonly reported. About 1 in 4 divers reported using prescription drugs within 6 hours of diving [4]. These drugs included cardiovascular and respiratory drugs, but also drugs that cross the blood brain barrier such as anxiolytics, antidepressants, and antihistamines. 26% of divers further reported consuming alcohol within 12 hours before diving. In a second publication, St Leger Dowse *et al*. reported on illicit drug use among UK divers [5]. Although the absolute numbers of drugged divers was low, the use of cannabis, cocaine and ecstasy within 6 hours before diving was reported. Of N=105 divers who reported illicit drug use, 22 did so within 24 hours before diving. These recent data are a reason for concern, since they show that divers do not take regulations and recommendations regarding drug use seriously. Similar data was also reported in studies with Australian divers [6,7].

On land, the pharmacodynamic effects of drugs have been thoroughly investigated. A great number of medicines, alcohol and illicit drugs have adverse effects that compromise daily activities such as driving a car [8,9]. Other drugs however are devoid of these adverse effects, or may even improve performance [10]. Therefore, if a patient wishes to drive a car or is involved in other potentially dangerous daily activities, physicians often can make a choice between the available treatment options. For example, regarding drugs and driving the International Council on Alcohol, Drugs and Traffic Safety categorized drugs into class 1, 2 or 3 to indicate whether driving is safe or not when treated with a particular drug (www.icadts.org).

Surprisingly, such classification of drug effects does not exist for diving. Moreover, there is a huge gap of knowledge on the adverse effects of drugs under hyperbaric conditions. Although this was already noted in the 1970s [11], publications on drug effects under hyperbaric circumstances are mostly lacking, whereas other data (e.g., obtained by the military) is often not publicly available. The few older papers on drugs and diving that have been published are often limited to case reports [12]. The simple recommendation not to use drugs when diving is thus not supported by sufficient scientific evidence. It is more likely fostered by the hypothesis that hyperbaric circumstances will worsen adverse drug effects seen on land and negatively affects diving ability. The opinion that patients should not dive per se also does not take into account the possibility that some drugs which are considered safe on land may also not show adverse effects underwater. That not all drugs make one unfit for diving was illustrated by one of the few clinical trials that did examine drug effects during dry chamber divers [2]. Under hyperbaric pressure simulating a diving depth of 30 meters, pseudoephedrine (60 mg) did not affect cognitive performance, whereas cyclizine (50 mg) did produce performance impairment on the tests.

In conclusion, the advice that it is not safe to dive and use drugs is not supported by scientific evidence from clinical trials examining these drugs under hyperbaric pressure. Also, by simply stating that drug use makes someone unfit to dive,

*Address correspondence to this author at the Utrecht University, Utrecht Institute for Pharmaceutical Sciences, Division of Pharmacology, Universiteitsweg 99, 3584CG, Utrecht, The Netherlands. Tel. +31 30 253 6909, E-mail: j.c.verster@uu.nl

[§]Editor-in-Chief

policymakers disregard the fact that a substantial number of divers do use drugs and therefore disobey diving regulations. Future research should examine the effects of compounds from major drug classes on diving ability and cognitive functioning under hyperbaric circumstances. In addition, more research is needed on both the prevalence and the effects of alcohol consumption and illicit drug use on diving. After filling this gap of scientific knowledge, millions of divers around the world can be given fair and balanced information about the actual risks of both medicinal and illicit drugs on diving, and if available, safe alternatives.

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