

PREGNANCY & BREAST FEEDING

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This article aims to cover the frequently asked questions relating to "pregnancy & breast feeding". The information has been compiled after reviewing the medical & scientific literature and guidelines from other organizations such as Divers Alert Network and the UK Sports Diving Medical Committee. The aim is to present a balanced overview and general consensus of expert viewpoints.

In reviewing any literature on the topic of pregnancy, it is important to recognise the limitations of the information that is available. Clearly it would not be ethical to expose large numbers of pregnant women to a series of dives, in order to determine the risk involved! So, in the absence of controlled clinical studies, we rely on collecting information from women who have continued to dive during pregnancy and then review the outcomes of the birth. Even this is not straightforward, with variations in depths, times, number of dives, stage of pregnancy, maternal age and diving environment. Studies in animals can help but have been contradictory and inconclusive and may only be relevant to the particular species studied, rendering the extrapolation to humans as questionable.

I am trying to get pregnant, should I stop diving?

As previously alluded to, there is little scientific data available regarding diving while pregnant so the recommendations are largely based on theoretical concerns, anecdotal reports and retrospective surveys.

There are two main areas of theoretical concern: Firstly, the effect of an increased partial pressure of oxygen, caused by the depth of the dives or by any required hyperbaric recompression treatment, on foetal development. Secondly, there is a concern of foetal decompression illness (DCI). The placenta should filter out bubbles formed in the mother but there are some concerns that the bubbles could partially block the blood supply to the foetus causing hypoxia and foetal cell damage. Bubbles in the venous system of the foetus are also of concern. As the lungs are not functioning, any bubbles will pass directly into the arterial circulation via the foramen ovale (passageway between the right and left chambers of the heart). These bubbles could cause serious damage as they can then pass directly to the brain of the foetus.

There is some data to support these concerns. Anecdotally, there is a published case report of numerous birth defects in one child born to a mother who undertook about 20 dives during pregnancy (*Turner G & Unsworth I, 1982*)¹. However, her dives included an emergency ascent from 18m and it is impossible to determine whether this had a significant effect on the outcome, rather than the diving per se. In a larger group of 208 female divers who responded to a questionnaire, the incidence of birth defects was found to be higher (5.5%) in those who dived during pregnancy, however due to the small sample size this was not significantly different from the average of the normal population of 2% (*Bolton, 1980*)². A more recent study has shown that there may be a higher incidence of spontaneous abortion amongst women who dived more than one dive a day, or had made dives with decompression stops whilst pregnant, although again numbers were small and did not reach statistical significance (*St Leger Dowse, Bryson, Gunby et al, 1995*)³. There is also some data which suggest that deep dives (20m +) may be associated with foetal abnormalities (*Betts, 1985*)⁴. However, in some of these cases, other influencing factors were also present such as a rapid ascent.

To put these 'results' into perspective, there are probably thousands of women who have continued to dive whilst pregnant, either unknowing they were pregnant, or choosing to accept the possible increased risk and continue diving, and have produced normal healthy babies. Even surveys conflict one another in their findings. One survey, of 72 women who dived for at least part of their pregnancy, reported that all babies born were normal and the rates of complications were not significantly greater than the general pregnant population (*Bangasser, 1978*)⁵.

So, in answer to the original question, due to the limited data available and the uncertainty of the effects on the foetus, the consensus recommendation from the medical profession is to discontinue scuba diving once pregnancy is recognised, or if planning to become pregnant. The UK Sports Diving Committee advises that if a pregnant women does continue diving, to do so with extreme caution and undertake dives which minimise gas load⁶.

I have just returned from a diving holiday and discovered I am pregnant, what should I do?

Firstly, don't panic. Remember, many women have dived whilst pregnant and had successful and uncomplicated pregnancies with a healthy baby delivered at the end. However, do make an appointment to see a doctor trained in diving medicine. He/she will be able to answer your questions and arrange an ultrasound and any other investigations considered necessary to allay your fears or help decide how the pregnancy should be managed.

If you have conceived at the start of the holiday, there is probably little cause for concern. The embryo does not actually attach to the wall of the uterus for about 7 days and it is at least another 7-10 days before there is an effective maternal-placental circulation. So there is little concern potential bubble damage to the placenta. Also, the very early embryo is composed of cells which have not yet undergone 'differentiation'. That is, one cell isn't yet destined to be the heart, another an arm etc and if a single cell becomes damaged, others can take over to form the needed structures. Only later, after differentiation, is tissue damage likely to result in a malformation. Finally, in the very early stages of pregnancy, there is no foetal circulation, so there are no concerns about bubbles circulating to the foetal brain.

Whilst the recommendation is to discontinue diving once pregnancy is recognised, there is no solid scientific data to prove conclusively that diving is dangerous to the foetus, and therefore no good data to justify a termination of the pregnancy on the basis of scuba diving alone. An ultrasound would be recommended with emphasis on looking at limb and spinal development, heart structures, and the blood vessels surrounding the heart. If any abnormalities are discovered, even then it is not necessarily as a result of the diving, and not necessarily a reason for termination. Those decisions can be made by you and your doctor after an informed discussion.

Am I at a greater risk of DCI, or any other complications, if diving whilst pregnant?

An issue to keep in mind is the risk of decompression illness to the mother due to the physiological changes which occur while pregnant. During pregnancy, maternal body fluid distribution is altered and this redistribution decreases the exchange of dissolved gases in the central circulation. Theoretically, this fluid may be a site of nitrogen retention. Fluid retention during pregnancy may also cause nasopharyngeal swelling, which can lead to nose and ear stuffiness. In regards to diving, these may increase a pregnant women's risk of ear or sinus squeezes.

Pregnant women experiencing morning sickness, which could then couple with motion sickness from a rocking boat, may have to deal with nausea and vomiting during a dive. This is an unpleasant experience and could lead to more serious problems if the diver panics.

What if I am pregnant and I did get "bent" (DCI)? Would I still be treated in a recompression chamber?

As mentioned earlier, there are theoretical concerns over the potential effect of hyperbaric oxygen (HBO) on foetal development, especially in later pregnancy. Effective treatment in a recompression chamber usually requires breathing 100% oxygen at a depth equivalent to 18m, thus exposing mother and foetus to a partial pressure of oxygen (ppO₂) of 2.8 ata, (ie: more than 10 times the ppO₂ of breathing air at the surface). In theory, this high ppO₂ may cause harmful changes in the blood supply to the foetus and premature closing of certain specialised blood vessels. Clinically however, there are no good data to show that HBO harms the foetus. In fact, many pregnant women have been treated with HBO for carbon monoxide poisoning without any recognised adverse effect.

If a pregnant woman were to develop DCI, the treating physician would carefully evaluate the expected benefit of treating the mother, against the possible risk to the foetus. Depending on the severity of the DCI, in most cases the benefit of treating DCI with HBO would outweigh any potential risk to the unborn child.

When can I return to diving after giving birth?

After an uncomplicated pregnancy and a normal vaginal delivery women can generally resume most exercise routines and sports participation after 3-4 weeks. This depends on several factors: prior level of conditioning; exercise and conditioning during pregnancy; pregnancy-related complications; postpartum fatigue; and anemia, if any. Obstetricians generally recommend avoiding immersion in water for 21 days after the birth. This allows the cervix to close, decreasing the risk of introducing infection. Diving Medicine Physicians recommend waiting at least 4-6 weeks after delivery before returning to diving, but this is of course dependent on general condition and fitness, and any maternal anaemia or fatigue.

After a caesarean delivery, wound healing has to be included in the equation and most obstetricians will advise waiting at least 4-6 weeks before resuming normal activity. Because diving involved some additional physical exertion, Diving Medicine Physicians recommend waiting at least 8 weeks before returning to diving.

Complications during pregnancy, premature birth or twins are likely to delay the return to diving and a medical screening and clearance is advised prior to returning to diving.

Can I dive whilst I am breast feeding?

There seems to be a misperception that maternal milk will contain many bubbles of nitrogen after a dive and that these bubbles lead to concerns of nitrogen accumulation in the baby as it feeds. In actual fact, the mother's breast milk is not unduly affected. Although nitrogen accumulates in all of the tissues and fluids of the body, washout after a dive occurs quickly. Therefore, insignificant amounts of this nitrogen would be present in the mother's breast milk and there is no risk of the infant accumulating this nitrogen.

As far as the mother is concerned, there is no medical reason for a woman who is breast-feeding her child to avoid diving, provided there is no infection or inflammation of the breast.

What do the medical associations and professional agencies recommend?

Divers Alert Network (DAN) present a balanced view of the information available and summarise: "Due to the limited data available and the uncertainty of the effects of diving on a fetus, diving represents an increased exposure for the risk of injury during pregnancy. There's a baseline incidence of injury including cases of decompression illness in diving. One must consider the effects on the fetus if the mother must undergo recompression treatment." ⁷

The South Pacific Underwater Medicine Society (SPUMS) statement reads: "The safety of diving while pregnant has not been established. Risks of diving to the foetus are under investigation but pregnancy shall be considered a contraindication to diving" ⁸.

The Recreational Scuba Training Council (RSTC) guidelines, which are endorsed by the Undersea and Hyperbaric Medical Society and used by dive training agencies such as PADI (Professional Association of Diving Instructors) defines pregnancy as a severe risk contraindication. "Pregnancy: The effect of venous emboli formed during decompression on the foetus has not been thoroughly investigated. Diving is therefore not recommended during any stage of pregnancy or for women actively seeking to become pregnant" ⁹.

The British Sub Aqua Club (BSAC) Sports Diving Medical Association safe diving practices read: "Medical evidence as to the safety of diving whilst pregnant is not conclusive. However there is evidence that deep diving may cause harm to the foetus. Certainly decompression illness and its subsequent treatment could be harmful to the foetus. Consequently if a woman is pregnant, or is trying to become pregnant, she is strongly advised not to dive". They also advise: "Those women who decide they wish to continue to dive whilst pregnant, or trying to become pregnant, should only undertake shallow dives, ideally less than 10m and no deeper than 20m, and remain well inside no-stop times. Even at shallow depths there remains a risk of pulmonary barotrauma which could require recompression treatment and cause harm to the foetus" ⁶.

Summary:

Clearly, the current view of the diving medical professionals is once a woman becomes aware that she is pregnant, she should not scuba dive. This is a carefully considered consensus opinion of medical experts after an evaluation of the potential to the foetus and/or mother, arising from the effects of diving, decompression illness, or the requirement for recompression treatment.

Whilst there is no clear scientific evidence concerning the risk of diving causing foetal abnormalities, neither is there clear cut scientific evidence to suggest there is no increased risk to the foetus. If a woman is planning to become pregnant and wants to be sure that any problem that arises cannot be attributed to scuba diving, then she should stop diving prior to conception. However, in reality, there is probably little risk from scuba diving during the very early stages of pregnancy and a history of diving alone is not justification for terminating a newly discovered pregnancy.

The UK Sports Diving Committee recognises that some women may be unwilling to follow this advice. They advise that, women who wish to continue diving whilst pregnant should do so with extreme caution and with the aim of minimising the gas load.

After a straightforward pregnancy and normal delivery, an otherwise healthy woman should be able to return to diving 4-6 weeks after the birth, if she so desires.

Further information:

For individual professional medical advice contact a doctor who has the appropriate knowledge and training in diving medicine. A list of doctors who have additional training in diving medicine can be found on the SPUMS website¹⁰.

References:

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