

In most of the animal studies foetal oxygen content remained relatively stable during significant maternal pO₂ increase. Also there appears to be differences in placental gas transfer between different groups of mammals.

Another consideration of the pregnant scuba diver is that of nitrogen absorption and elimination. The gas nitrogen does not play a significant role in sustaining the life of the foetus. Therefore, exchange of nitrogen through the placenta during a dive probably depends on the tissue half time of the foetus, just like other tissues of the body. After a deep dive or prolonged dive to moderate depths, rapid reduction of ambient pressure can cause nitrogen bubble formation. The presence of these nitrogen bubbles in the foetus can cause serious destruction.

The pregnant diver therefore has to consider two areas that are possibly hazardous to the developing foetus, increased pO₂ and nitrogen bubble formation. The research on mammals and pO₂ elevation in the foetus is reassuring. However, humans have not been studied and the effects of minor increases in foetal pO₂ are not known. The pregnant diver can continue to enjoy the underwater environment but should extend her prenatal care to include limiting the depth of her dives. I recommend depths of 33 feet or less, to avoid even the possibility of problems due to increased pO₂ or to nitrogen bubbles.

Summary

The information presented here may help answer some questions women may have had about their own physiology and its relation to safe and enjoyable scuba diving. In essence, common sense prevails if a question arises about the safety of the scuba diver.

(Reprinted from the *IQ9 Proceedings*)

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PREGNANT DIVER UPDATE

Susan A Bangasser
NAUI 3910, California

The safety of diving while pregnant is a topic that has only recently been investigated. Although there has been much speculation on the subject, very little data is available. Animal studies are being conducted and the information they provide will hopefully be applicable to humans.

In order to gather data on this subject and other related medical areas on the woman diver, I began distributing a survey in the fall of 1977. This was entitled the Medical Aspects of Women Divers Survey. About 680 responses were analysed and of these, 72 respondees dived while pregnant (10.5%). This number included women who made even one dive while pregnant. If the woman quit as soon as she discovered she was pregnant, but had made a dive in the first six weeks, she was included in these results. Twenty-two women stated they did not dive while pregnant; apparently they made no dives prior to being diagnosed as pregnant and then decided not to dive.

Now let us look at the pregnant diver. Thirty-nine percent quit diving during the first trimester (the first three months), usually as soon as she learned she was pregnant. Most of the women (41%) discontinued diving during the second trimester, about the time when increased size becomes a problem. Twenty percent dived during the third trimester. Only seven women continued to dive through the ninth month. Most of the respondees were seasoned divers, with six years as the median (most frequent) number of years diving. Forty-one percent were certified as Basic Scuba divers, 14.5% were Instructors, and the remaining had intermediate levels of

certification. The diving activity of the women before, and or after becoming pregnant was as follows: 22% dived at least once a week, 49% dived six to twelve times a year, 25% dived on vacations only, and 4% seldom dived. During pregnancy the diving activity of the women consisted of 20% diving at least once a week, 18% six to twelve times a year, 34% on vacations only, and 28% seldom. These diving activities were maintained, of course, until the women chose to discontinue diving altogether. Only 28% of the women stated they dived with the same frequency during pregnancy as before pregnancy. The number of women who dived at least once a week remained fairly constant. Most of these women dived in the very warm waters located at diving resorts, and several of them worked as instructors or tour guides. Pregnant women apparently still go on vacation and enjoy the warm, clear waters. There was a large increase in the seldom-dived category.

The potential problems associated with diving during pregnancy includes the possibility of the mother and/or foetus getting decompression sickness. The nitrogen bubbles in a developing foetus could pose serious problems for the foetus (retrolental fibroplasia). Five of the respondees made decompression dives while pregnant. However, no pregnant diver had decompression sickness. The maximum depth obtained by the pregnant diver ranged from 12 to 180 feet, while the median was 60 feet maximum. The average depth ranged from 10 to 100 feet, with a median of 40 feet.

The temperature of the water dived in ranged from 40 to 80 degrees, with most dives made in 70-80 degree water. Women did not avoid diving with wet suits; 48% wore wet suits. However, fitting into the wet suit was one of the problems contributing to the decision to discontinue diving temporarily.



MOTHER-TO-BE-OR NOT TO BE.
THAT IS THE QUESTION!

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pressure differentials. These sphincters do not trap air in the alveolus, but instead actually trap air away from the alveolus, and this away from the area of gas exchange. By maintaining low air pressure in the alveolus, the partial pressure of nitrogen is not driven into solution in the blood in significant quantities to result in the bends.

Thus we can see that nature has provided the dolphin with many and varied adaptations to facilitate his marine existence, just a few of which are mentioned in this article.

Summary

Nature has marvellously adapted the dolphin to his environment. These adaptations include many anatomical and physiological changes. The thoracic structure can collapse without permanent damage, almost to the point of complete atelectasis. This is due to a large supply of distensible veins, elastic pulmonary tissue, and flexible bronchi, trachea and rib cage. The blood has a greater oxygen carrying capacity than that found in land mammals. The muscles are capable of storing up to 50% of the oxygen in the body, to make possible continued muscular activity in spite of widespread peripheral vasoconstriction and a reflex bradycardia. The muscle tissue is also capable of functioning anaerobically and accumulating a large oxygen debt without tissue damage. The brain has a higher tolerance to carbon dioxide and is less sensitive to its signal to initiate breathing. A series of muscular sphincters in the bronchioles permits a low air pressure in the alveolus even while diving to great depths, and thus a low partial pressure of nitrogen exists. This prevents adequate amounts of nitrogen to be dissolved in the blood to result in the bends. All this has been done for the dolphin while man has been adapted for an existence on dry land. Thus what is natural for the dolphin, we must supplement our bodies with machinery to do. So the fascination remains with the beautiful, graceful, diving dolphin

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What about the deliveries? What about the babies? These are the questions we all ask. All the babies were "normal" according to their mothers. Only one baby was under weight, at birth. The male babies outnumbered the females 61% to 39%. The complications that occurred during pregnancy included one premature birth, one septic abortion, and two miscarriages. (One of the women had two miscarriages before learning to dive and two more since diving). The normal rate of spontaneous abortions is 20%, for the general public, the rate among the respondees was less than 3%. There were seven Caesarean sections (12%). This procedure is becoming increasingly popular and the average rate is between 10-15% for the general public. All but one woman continued to dive after delivery.

From this survey, it seems that many women discontinued diving as soon as pregnancy was established, and the reason given was the lack of information on the safety or danger to the foetus. However, most women dived at least during the first trimester, at a time when the foetus is very vulnerable. Those who continued to dive as long as possible did not run into any apparent problems. Even the women who made deep dives reported no mishaps. I believe in good prenatal care and I recommend that pregnant divers limit their maximum depth to 33 feet, take it easy (make the easy dives), avoid overextending oneself, and use common sense.