List of 18 nutrients that may prevent birth defects

Introduction.

First, let us cover my angle. I am mostly interested in fluoride and want to show off my "discovery" that it may be able to prevent some birth defects. To some degree I compiled this list to get me a place on it. I used to have a patent pending on the use of fluoride to prevent birth defects - but in Dec 2002 gave up on it.

Second, let us quickly give a little credit to the real experts in the field of early pregnancy nutrition. Two of my favorites are Somer and Worthington-Roberts. Some of their books and publications are cited at the end of this paper. I found most of my references from them. However, I will tend to cite the original authors so you can track down the specialists in each nutrient if you are so inclined.

How much proof does it take to get on this list? Well, not a whole lot. As far as I am concerned, these nutrients are safe, and it does not hurt a thing to get a little (or a little extra) in pregnancy. Please note that I suggest very small doses of each.

Even though it is easy to get on my list, it is hard to get into general use. Folic acid had enough evidence to meet my standards back in about 1960 when it was known that the deficiency was common in pregnancy and women whose babies had neural tube defects were especially low in folic acid. It took two more decades for the first human proof, and another for the good trial that was finally accepted. There are thousands of people in wheel chairs that could have been saved by a little timely knowledge and a bowl of spinach.

One of my kids had the mildest type of NTD – he is fine now - but I sometimes think we were a few lucky leaves away from a full blown NTD. And we got pregnant under a doctor's care (infertility), back when they were still actively resisting prescribing folic acid in early pregnancy. I believe there is a need for regular people to discuss this type of research. (The problem could be something like if doctor A recommends a nutrient to prevent birth defects, then if doctor B does not prescribe it, and patient C happens to have the birth defect, lawyer D may sue the pants off doctor B.)

The way I intend for the list to be most useful is when you are considering which vitamin product to take. It should not cost much more to choose one that has all or most of these nutrients. Taking a prenatal vitamin before pregnancy has been well-proven to prevent at least about half of all birth defects. I doubt you will find a better bargain in anything you spend raising your family.

The list:

**1. Folic acid.** This nutrient tops the list in almost every way.

Deficiency? Yes. It is well proven that about 20% of modern pregnant women are deficient. (Stone.) (References are in alphabetical order at the end of this paper.)

Human proof? Yes. There are a half dozen well accepted clinical trials in humans showing it will prevent birth defects. (The one that turned the tide was Czeizel. The most recent is Hernandez-Diaz. “Recent” = 2000 - 2001 when I first wrote this.)

Animal proof? Yes. (I just can not give you a story and reference on every topic, or this will end up a book. In this case the subject is well covered in books like Somer's.)

Logic? Yes. Folic acid is needed to make DNA and RNA, which is in turn needed to make new cells. No folic acid means no new cells can be made. (Folic acid was discovered by Minot. He was studying a type of anemia seen in pregnancy from a lack of new blood cells. Preventing this anemia used to be the main reason to take folic acid in pregnancy.) No new cells means no growth. The logic that makes this a particular problem in early pregnancy is that the embryo just can not wait. The embryo has only a day or so to do each step. For example, the arms form on day 26 and the legs form on day 28. A key step is the closure of the neural tube at the top (where the brain grows) and the bottom (at your tail bone). Apparently each of these closings takes an extra big push of cells. Once the closing is complete - right or wrong - the embryo can no more go back and redo it than you or I can grow a new hand. Folic acid given on the day before the closing will prevent a defect, on the next day it will not. (Many sources, but Worthington-Roberts covers most of this.) (This is the fundamental reason why early pregnancy is so important for nutrition. Adults can wait. Even a screaming baby can wait. A fetus can wait for most things. But an embryo is different, it just cannot wait. They are only the size of a pea and don’t need much, but they only have one quick chance for everything they build.)

Dosage rational? Yes. The dose recommended is reasonable in every way (.8 mg is RDA for pregnancy, .4 - 1.0 mg used in vits). I do not think there is even a toxic level known. The only known problem with folic acid is that it masks a more serious deficiency of another B vitamin, B12, so experts say take both. Folic acid helps in virtually every way ever tested in pregnancy. It helps the anemia (above); it may help prevent miscarriages; babies who get extra folic acid in pregnancy have higher birth weights; folic acid may be able to prevent a genetic type of mental retardation called fragile X and two types of childhood cancer.

Weaknesses? Few. About the only weakness in the folic acid evidence is that most of the trials also had other nutrients in the vitamin product.

**2. Vitamin A.** This nutrient does not have the buzz of folic acid, but I rate it very high. It is in almost all prenatal vitamins anyway.

Deficiency? I think so. I am not sure how many modern women are deficient in vitamin A.

Human proof? Not much. There are not any specific trials of vitamin A, but it was in most of the products used to test for folic acid. There was one small group in one trial (Milunsky) that only had vitamin A, and they showed a 50% reduction in NTD's (neural tube defects, the most common defect tested for in these trials).

Animal proof? Yes. There is a ton of proof in animals that a lack of vitamin A will cause birth defects, and it was the first nutrient so discovered. (Hurley tells this story very well.)

Logic? Yes. The logic is excellent, as vitamin A is needed in signals. In order to grow in the right place at the right time, cells need to talk to each other, and to the matrix between the cells. Vitamin A seems to set the radio frequency or something.

Dosage rational? Yes. The dose used is reasonable (about 5,000 IU, same as the RDA for pregnancy). High doses of vitamin A cause birth defects, and it does not take that much (about 25,000 IU). Vitamin A comes in many forms, from completely non-toxic beta carotene (used by body to make vitamin A if needed) to very toxic forms that the body cannot change (Accutane, Retin A, etc.). The best prenatal vitamins have all or about half of their vitamin A in the ultra safe forms.

Weaknesses? Few. (See deficiency and human proof.)

**3. Manganese.** This is one of 3 nutrients I think is worth going out of your way to get. It is not in all prenatal vitamins. (The other 2 are my favorite, fluoride #5, and iodine #17.)

Deficiency? Maybe not. The main weakness with manganese is that good references say that deficiency is unknown.

Human proof? Little. The only thing in the way of human proof is a test showing mothers of babies with birth defects tended to be a little low in manganese.

Animal proof? Yes. The animal work with manganese is staggering. Not only does manganese deficiency clearly cause birth defects, there are several genetic defects that can be overcome with manganese. Manganese was the favorite subject of one of the early greats in nutrition to prevent birth defects (Hurley).

Logic? Yes. The logic is excellent, as manganese is critical to make matrix and a deficiency of manganese in early pregnancy causes bones to grow abnormally (eg, the long bones of the legs are shortened).

Dosage rational? Not always. The doses seen in manganese products are pretty weird. The adult RDA is 2.5 to 5 mg. If you get a plain manganese supplement at a health food store, it will be for about 50 mg. In the last 10 years many prenatal vitamins have added manganese – yay! Another source for manganese is a mineral product (VRP Advanced Essential Minerals 1-888-362-1699 ). I am not sure what the toxic dose of manganese is, but I would not go over the RDA.

Weakness? One big one. (See deficiency.)

**4. Zinc.**

Deficiency? Maybe not. Zinc also suffers from the "are people really deficient?" problem. An article says women in general are at risk for zinc deficiency. (Journal of Nutrition 2000; 130:1367-1373 / S931-S934.) (From Nutrition Alert Dec 2000, Elizabethsomer.com. She says zinc deficiency leads to increased risk of birth defects.)

Human proof? No. I do not think there is any human proof that it will help with birth defects.

Animal proof? Yes. There are lots of good animal experiments. The most interesting thing about zinc is that short term deficiency can be a problem - as little as 4 days without zinc will cause birth defects.

Logic? Yes. The logic is about DNA control. Apparently zinc is used in "zinc fingers" to literally turn DNA on and off.

Dosage rational? Yes. The pregnancy RDA is 20 mg, and most products have about this dose.

Weakness? Yes. (See human proof.)

**5. Fluoride.** The blurb on this nutrient will take a little longer because this is my favorite subject.

Deficiency? Yes. The main sign of fluoride deficiency is tooth decay. Tooth decay is still the most common disease of humans. Even in the USA with all sorts of ways to get fluoride, half the 5-year-olds still get a few cavities. Basket cases are fairly common.

If you are thinking about having a baby, you are probably too young to have really experienced fluoride deficiency. Since 1961 pediatricians have been prescribing fluoride to just about every kid who was not getting it from his or her water. But if you are older than that - or missed out somehow - you know all about fluoride deficiency.

The earlier you started fluoride, the better it worked. The average of the tests show that if the fluoride starts in pregnancy, it prevents about 80% of cavities. If it starts at birth, the prevention is lower - about 62%. Most people did not get the prenatal fluoride, but about a third in this age group got fluoride from birth. You might even be able to see this in your own mouth. The trick is to find your first permanent molars, which were formed in pregnancy. (These are the 6th teeth back from the front teeth usually. There is one in each corner of the mouth.) If they had cavities, you can usually see the fillings. If you have only 4 fillings in your mouth, just on these four teeth that formed in pregnancy, you can see the protection you got for all the rest of your teeth that formed in childhood while your parents gave you fluoride every day.

Fluoride deficiency is very common if people do not get extra fluoride (as in the case above). My guess is something like half of modern day women are at least a little deficient during early pregnancy.

Providing just a little does wonders for teeth. They look just beautiful. (Before you fall in love with fluoride, read the part about excesses, though.)

There is an excellent (and highly entertaining) book on fluoride in pregnancy and childhood. It is by my favorite experts, Drs. Frances and Darby Glenn. (How to have children with perfect teeth, Glenn FB 2000.)

Human proof? A little. The best human proof that fluoride in early pregnancy can help prevent birth defects is in a Harvard study of water quality. Fluoridated water - specifically in the first 3 months of pregnancy - seemed to reduce birth defects by about 20% and neonatal deaths by about half (Aschengrau).

Another paper found similar results, but the study was too small for statistical significance: A study in Chile showed that heart defects went from 6 cases/2,328 births before fluoridation to 4 cases/2,571 births after fluoride was added to the water supply. Cleft lips went from 3 cases to 1 case after fluoridation. Birth weights dropped by about 2% (Gomez).

When I started my research, the only study existing at that time found no association between birth defects in general and fluoridated water. Its heart data found a 16-30% increase in heart defects in fluoridated areas. This study was much broader (1,387,027 births) but not as specific (county by county data) (Erickson).

I consider some types of deafness a structural birth defect. A study looked at deafness, in areas where children had fluoridated water or not. This was back in the 1940's before all of the other sources of fluoride were popular. In unfluoridated areas, 4.9% of the kids were deaf, versus only 2.8% in the naturally fluoridated areas. (Lewy.)

There is even a little evidence of fluoride deficiency in general growth. It was found that higher than average fluoride in pregnancy seems to lead to better growth in both weight and height during the baby's first year (Bergmann).

(Glenn 1997 is a great paper showing many of the citations about early pregnancy fluoride, and some developmental cells looking better with it.)

Animal proof? No.

Logic. Yes. Before the recent proof came in I was basing my recommendation on logic. Fluoride makes better matrix. Most matrix eventually becomes something structural (like teeth), but early in life matrix is what cells are organized around. If matrix has better structure, cellular growth is more orderly. Matrix also helps control the timing of cellular growth. Fluoride seems to make growth go a little slower. It has not been proven, but I think fluoride gives organs a little more time to finish growing, especially along the seams as they "close". This theory comes from what fluoride does for the shape of teeth. Without fluoride, teeth do not close as well. They end up with "pits and fissures" in the seams. If teeth get fluoride as they are closing, they do not get the pits and fissures (Glenn 1984).

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| M:\Prophy 4-17\molars-pitsandfissures-glennphoto - directly off my site at Hardin 280px.jpg | Fissures in teeth are essentially closure defects, much like those in any other organ system. My hypothesis stretches the fact that fluoride prevents pits and fissures in teeth to the possibility that fluoride could prevent some similar birth defects. |
| M:\Prophy 4-17\cleft_01 Dr Lore cleft lip diretly off my site at Hardin.gif | The most similar birth defects visually are cleft lips. (This photo is from Dr. Lore at <http://people.delphi.com/benoitnpb/cleft2.htm>.)  (Size notes: When we see a cleft lip at birth it seems like a much bigger defect than a wee fissure in a tiny tooth, but when they form it is the other way around. A tooth forms full size later in pregnancy. The size of the entire human embryo when a cleft lip happens at day 42 is about ¼ inch, so the lip area then is smaller than a tooth.) |

(If you want a longer version of this routine, here are more pix of pits and fissures, and about 10 slides on how I think fluoride prevents them. This part is pure guesswork. <https://get.google.com/albumarchive/114685571384513740781/album/AF1QipO6WESBaQthSaRSH33JtI8GB9DyKfHc8ubRhlfV/AF1QipOF_qREd147W2RtCIpQ6DZ9VBpOiLiT5UoxhDnH?authKey=COChjqad58aNTA> On many of these, to read the text you have to click on the little “circle i” in the top right of screen.)

Above we saw that fluoride may reduce heart defects. If so, it would be logical to expect kids with heart defects to show extra signs of fluoride deficiency. There happens to be an excellent study on just that. Kids with heart defects were compared to their own brothers and sisters (Hallett). They have very poor teeth:

\*2X dental decay (dmft 4.2 vs. 2.3)

\*2X enamel defects (52% vs. 23%)

\*3X pit and fissure sealants (21% vs. 6%)

\*5X malocclusion (33% vs. 6%)

The first 3 of these signs of poor teeth have been shown to be prevented by prenatal fluoride (PNF). The last one, malocclusion, is more complicated and does not have solid proof. But it is most likely an early pregnancy effect of fluoride deficiency. Here is a quick list of references: (first 3 are Glenn and also listed at end of paper)

\*Dental decay zero from PNF: Am J Ob Gyn 1982, 143:560-64.

\*Enamel defects reduced by PNF: J Dent Res 1985; 64(3):465-469.

\*Pits and fissures eliminated by PNF: ASDC J Den Child 1984; 51:19.

\*Malocclusion reduced by water fluoride: Moller IJ, 1965. Dental Fluorose Og Caries. Rhodos. The spacing of teeth can be seen by the 11th week of pregnancy: J Dent Res 1979, 58(2):554.)

Dosage rational? Yes. The adult RDA is 1.5 to 4 mg, but I recommend much less, about .5 mg, during early pregnancy. Lots of people recommend much higher doses in pregnancy, including my beloved Drs. Glenn. These higher doses may be fine after the critical first 2 months, but I say go easy in early pregnancy.

Here are some of the higher recommendations.

The RDA people seem to have finally given their tacit support of fluoride in pregnancy, and even to early pregnancy in the sense that they support fluoride for adults in general: "Adults may also derive some benefit [for preventing dental caries] from a fluoridated water supply or a 1-mg fluoride supplement per day...". (National Academy of Sciences 1990. Nutrition During Pregnancy. Page 311.)

A few years later we finally had an official recommendation specifically for pregnancy. The AI (adequate daily intake, which is the lower limit, for F from all sources) for pregnancy has been set at 3.1 mg F. (Institute of Medicine, Dietary Reference Intakes for Calcium, Phosphorus, Magnesium, Vitamin D, and Fluoride, 1997.)

A prominent expert on women's health and nutrition has recommended 2 mg F in the section of her book about early pregnancy. (Somer E. Nutrition for a healthy pregnancy. H. Holt & Co. 1995.)

Watch out for fluoride excesses. I have virtually no specific reason to say excess fluoride is dangerous in early pregnancy. But in general the amount that is too much is just above the amount that is perfect. This is clearly seen in teeth.

When fluoride products were first made, they used the same doses for newborns as three-year-olds. What this caused was white spots on the front teeth of the kids. I see this all the time. The spots are so faint most people do not even notice them, but the people with them do.

(For now my website on infant fluoride is infected with malware so I don’t want to send you there. The site is about a commercial idea my company is pushing: Prophy Research Corporation and the OptiDose® dropper. My company was founded to promote a new medicine dropper to give kids an exact dose based on their body weights. It was based on the work of our chairman, Tom Peebles, M.D., who was both the inventor of the original products and the first person to prove the doses were too high. It took him more than 5 years to get the doses changed. See the Aasenden paper. You'll learn all you need to know about infant fluoride.)

Looking back we can say that it was dumb to use the same doses for all sizes of kids and even dumber to be so slow to change. It was always known that fluoride was fairly dose sensitive. But at the time it seemed OK enough, and it was commercially expedient. It would have been unbearable to have 10 different products for all the sizes of kids from 5 pounds to 50 pounds. If someone had demanded that people would still be getting cavities out the yazoo. I would rather have the spots than the cavities.

I do not want to make the same kind of mistake now in early pregnancy. Even though I do not have much more than my intuition to guide me, I would like to make the following recommendations.

It is my opinion that .5 mg F is a fine dose to use for all modern women. This will not be too much for any woman who is living in normal circumstances. A dose of .5 mg F should be enough even for someone who was getting no other sources of fluoride. However, it is not too much trouble to get a daily dose that is a little more exact:

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| --- | --- | --- |
| Dosage table  Fluoride doses (mg F, NaF equivalent) for early pregnancy | | |
|  | Fluoridated water | Non-fluoridated water |
| Good eater and drinker (= eater of good sources of fluoride and drinker of tap water) | 0.25 | 0.5 |
| Regular eater and drinker | 0.5 | 1.0\*\* |
| High risk\* | 1.0\*\* | 2.0\*\* |

(\* High risk is defined here as parents who already have 1 child with both birth defect and some sign of fluoride deficiency [enamel defects, pits and fissures, caries, or malocclusion], or parents who had birth defects as children and are now having children of their own, or parents-to-be being treated for infertility, or HIV infected mothers-to-be. For details and citations see my site on birth defects.)

(\*\* There are no known risks with any of the doses in this table, and the following cautions may be ignored. However, doses of higher than .5 mg are probably more than a natural meal's intake. For extra care, particularly between day 17 and 57 of pregnancy, intakes of over .5 mg could be taken in separate doses. Care could also be taken to not cause a sudden increase in fluoride intake during early pregnancy. I suggest increasing the dose by .5 mg a day, or starting before pregnancy.)

Some formulations of fluoride (for example, with lots of calcium) have a high mg F, but actually deliver to the bloodstream about a third as much fluoride as an equivalent amount of sodium fluoride.

You can get .5 mg fluoride from any of these sources:

Generic fluoride (take half of the 1 mg tablets commonly prescribed for older children and sometimes adults). This form of fluoride would go well with a prenatal vitamin (see list below).

Adult fluoride vitamin products (o-cal f.a. from Pharmics 800 877-2447 with .5 mg).

Two glasses of fluoridated water (a glass of fluoridated water is .25 mg).

A can of sardines or salmon (eat the bones, that is where the fluoride is). This is about .5 mg of bioavailable F. (The skin of fish is also rich in nutrients, fish oils if nothing else. See the note about that below. Canned fish with the skin and bones is probably close to a miracle food in early pregnancy. The tastiest is the red salmon. Sardines are very economical and I like them with mustard or chili sauce.)

Natural calcium tablets (bone meal, oyster shell, etc), or by eating veggies by the bale.

Calcium-fluoride products (like Monocal or Florical by Mericon 1-800-242-6464).

Florical is a little cheaper (~$16) and more widely available, like online:

<https://www.amazon.com/Florical-Calcium-Fluoride-Supplement-Tablets/dp/B01GAA9Y0U/ref=lp_11861806011_1_10_a_it?srs=11861806011&ie=UTF8&qid=1512306304&sr=8-10>

Monocal seems to be harder to find, and a little more expensive (~$19):

<https://www.amazon.com/Fluoride-Monofluorophosphate-Calcium-Monocal/dp/B000M49Z5A/ref=sr_1_5_a_it?ie=UTF8&qid=1512308133&sr=8-5&keywords=monocal>

(Your local pharmacist can probably bring in Florical in a day or so, about $22 / 100. They tend to have the capsules. I prefer the tablets so I can “bite” off the dose I want. Tablets might take a few days longer?) These are sold “behind the counter” which means you have to ask the pharmacist for them.

One of these (Florical or Monocal tablets) every other day or so is about .5 mg bioavailable F. This is my overall favorite. I take about 2 a week on top of fluoridated water (for me as an adult male). I like to bite off just a little of a pill and chew it as the last step in brushing my teeth. A pill lasts about 3 days, so my dosage is roughly 1 mg F a day at max (the label says the pills are 3 mg F for Monocal and 3.75 for Florical). If you count the calcium effect (tying up the F), it is probably about half that (and maybe even smaller as it is on top of a meal). To me this is a very easy way to get a small, rational increase in fluoride.

Water for infants - all used to have .5 mg F per liter or quart. (Beech-Nut® Spring Water with Fluoride and Hinckley Springs Nursery® Water are two brands.) One quart per day would be fine. (Some brands come with and without F.)

Fluoride is the only nutrient that has serious opposition, from two groups. On one side you have anti-fluoridationists saying fluoride is toxic at all doses and for all ages, and on the other you have the dental lobby saying yes to fluoride in some ways, but no to fluoride in pregnancy and infancy, the two times it does the most good. Neither group mentions that.

Weakness? Yes. There is no well-controlled trial showing fluoride helps in early pregnancy. If you try it in your pregnancy I would like to hear from you.

**6. Chromium.** I have just barely started to look into this nutrient.

Deficiency? It does seem to be commonly deficient and possibly helpful in pregnancy. (I do not have my original references handy. See Mennen for a starter.)

Human proof? The only thing about birth defects is that traces in the water seem to help (Aschengrau).

Animal proof?

Logic?

Dosage rational? I have no clue as to doses, but the adult RDA is .05 to .2 mg. Some prenatal vitamins have about this amount of chromium.

Weaknesses?

**7. Selenium.** This one is also new to me.

Deficiency?

Human proof? One report (Pediatrics June 6, 1995) showed that mothers of newborns with a neural tube defect tended to be low in selenium.

Animal proof?.

Logic? There are lab reports with mice, etc, showing selenium protects DNA from a few chemicals that can cause cancer. (Carcinogens and teratogens are very similar.)

Dosage rational? The adult RDA of selenium is .05 to .2 mg. People are only getting about half that (Clin Sci 2000; 98:593-599). Only a few prenatal vitamins have it.

Weaknesses?

**8. Vitamin B12.** Another new one for me. It is in most vitamin products anyway. (See Lancet January 21, 1995.)

Deficiency?

Human proof?

Animal proof?

Logic?

Dosage rational?

Weaknesses?

**9. Copper.** I'm going to take this from Elizabeth Somer (Nutrition Alert Oct 1998, Elizabethsomer.com). All of the words are hers. I just screwed up her flow to make it fit my format. Copper is the Rodney Dangerfield of trace minerals: it gets no respect. [In a later issue she mentions it does not even have an RDA.] For example, iron and calcium are touted as essential minerals during pregnancy, but researchers at the University of California, Davis state that copper is another mineral essential for normal pregnancy outcome. American Journal of Clinical Nutrition 1998;67:1003-1011 / 1012-1016.

Deficiency? The diets of many pregnant women might be marginal, since blood levels often are low and optimal copper status often is achieved only when women take supplements that contain copper.

Human proof?

Animal proof? Studies on animals show that a copper deficiency during pregnancy can cause birth defects and spontaneous abortions, while increasing copper intake improves survival rates and reduces nerve damage and spontaneous abortions. Copper deficiency during pregnancy results in numerous gross structural and biochemical abnormalities that affect free-radical defenses, connective tissue metabolism, and energy production in fetal tissues.

Logic? Copper is found in all tissues, but is especially high in the brain, heart, kidney, and liver. It is essential for the development and maintenance of a baby's heart, arteries, and blood vessels; the skeletal system; and the nervous system. Copper also is important in the development and maintenance of red blood cells, normal hair, and skin color.

Dosage rational?

Weaknesses?

**10. Vitamin D.** (No evidence, but listed out of respect for Adelle Davis. She was the first popular writer to snap to the whole idea of early pregnancy being important nutrient-wise, including the importance of folic acid in the early 70s, and the shape of the roof of the mouth as an indicator of early pregnancy nutrition. I just do not know but have a hunch it is important. It is in prenatal vits anyway. Vitamin D deficiency during infancy (no info on pregnancy) leads immediately to soft bones and, 2 or 3 decades later, to adult onset diabetes. See Hypponen.)

Deficiency?

Human proof?

Animal proof?

Logic?

Dosage rational?

Weaknesses?

Nutrients that are usually taken separately. I think these are too bulky to fit into a prenatal vitamin.

**11. DHA** (In my original version this was “Fish oil supplements” and back then Elizabeth Somer, M.A., R.D. was my original source. She got it from Arch Dis Childhood 2000; 82:493-494 / 366-369. Now DHA has lots of buzz, and I have not dug thru it. DHA is now in many prenatal vits.)

Deficiency? Many newborns are deficient in these nutrients. They are recommended from early pregnancy through nursing.

Human proof?

Animal proof?

Logic? . Omega-3 fatty acids are critical for brain and vision development.

Dosage rational?

Weaknesses?

**12. Methionine.** There is an article on this one by Shaw in Teratology 1997; 56:295-299.

Deficiency? It is an essential amino acid, but I have not seen anything on deficiency.

Human proof? Shaw found lower NTDs if the moms were not near the bottom in methionine intake.

Animal proof? There are some animal experiments, but I forget the results. Shaw mentions.

Logic?

Dosage rational?

Weaknesses?

**13. Lysine.** Just a hunch.

Deficiency? It is an essential amino acid, and long ago I was taught that it was the one humans were most commonly deficient in, of all the essential amino acids. Deficiency of lysine seems to lead to herpes outbreaks, and taking it knocks them dead for some people.

Human proof?

Animal proof?

Logic? Lysine is critical to make collagen, the main matrix of development and general body maintenance.

Dosage rational? I have not seen any safety concerns.

Weaknesses?

**14. Glutathione.** (I will get full cite later. I read something by Harris C at UM Ann Arbor, in my MTA notes.)

Deficiency?

Human proof?

Animal proof?

Logic?

Dosage rational?

Weaknesses?

**15. Sulfated cyclodextrins.** I know little about this. I doubt it is a nutrient per se. It is made from corn and is apparently safe. It seems to block the actions of many teratogens (poisons that cause birth defects). (Geber, 1992, US 5,100,878).

Deficiency?

Human proof?

Animal proof? The patent gives lots of good animal proof.

Logic?

Dosage rational?

Weaknesses?

**16. Choline.** I read my first bit on this one in the Wall Street Journal, 10-26-04, page D3. It became an essential nutrient in 1998. Experts are Steven Zeisel at UNC, pubbed in J Neurochemistry, and Gary Shaw pubbed in Am J Epidemiology. Apparently it reduced NTD's by about half.

Deficiency? We humans make our own, in our own livers, and it is only during pregnancy and lactation that the supply we make seems to be overly taxed. The experts worry most about preggies who cut out the good supplies - meat, eggs, and milk.

Human proof? Shaw's study compared diets of NTD moms and gave some good comparisons. Very good study, but not based on supplements ahead of time (always a tricky study to do, of course). Human tests have begun.

Animal proof? A study at Duke found animals "performed 30% better on tasks relating to memory and attention than control animals that were not given prenatal choline supplements" for 6 days (I assume during early pregnancy). They could also see physical brain changes that were permanent.

Logic? It is known the fetus and infant draw huge amounts from mom...has three known roles: 1. regulates nutrient flows in and out of cells, 2. part of acetylcholine, a neurotransmitter, and 3. regulates formation of stem cells that form the memory area of the baby's brain.

Dosage rational? Back then the experts were saying eat enough of the good sources like liver, eggs, wheat germ, and salmon. 450 mg per day is the rec for preggies. To get that in beef liver, you would need about 4 oz. Or to get it from eggs, you would need 3 large eggs. Now it is in some prenatal vits.

Weaknesses?

**17. Iodine.** (#17 just because it is new to the list. However, iodine is one of the 3 nutrients that are worth the effort to find a source for. Let us start with quotations from a Reuters Health article by Andrew M. Seaman, his source was Pediatrics, online May 26, 2014.)

Deficiency? Yes. “…about one-third of pregnant women in the U.S. are marginally iodine deficient.” “People typically get the iodine they need from table salt, which in the U.S. is fortified with iodide. Eating processed foods exposes Americans to salt that is not iodized, however.”

Human proof?

Animal proof?

Logic? Yes. “Iodine, which the body can get from iodide, is needed to make the thyroid hormones that are required for children’s brain development before and after birth.”

Dosage rational? Yes. “Women may need to take a supplement with 150 micrograms of iodide to reach that recommended level, but most prenatal and lactation vitamins contain less, according to the Council.” (This is about half to a fourth of a normal intake from a good diet.)

(From about.com) “The NEJM reported on an evaluation that looked at 127 non-prescription and 96 prescription prenatal multivitamins currently marketed in the United States. … Overall, only about half the vitamins evaluated contained iodine …”

(If you have NEJM online, much of this is based on the original work: Leung, Angela M.D. et. al. "Correspondence Iodine Content of Prenatal Multivitamins in the United States,", New England Journal of Medicine , Volume 360:939-940, February 26, 2009, Number 9. The first 2 paragraphs tell the background story well:

“Normal thyroid function in fetuses and breast-fed infants, which is dependent on sufficient maternal dietary intake of iodine, is crucial for normal neurocognitive development. Children of mothers with severe iodine deficiency may have cretinism. Iodine deficiency affects more than 2.2 billion persons (38% of the world's population) and is the leading cause of preventable mental retardation worldwide. Even mild iodine deficiency may have adverse effects on the cognitive function of children.

National surveys [list] have reported a decrease of approximately 50% in adult urinary iodine values since the 1970s in the United States. In the subgroup of women of childbearing age, the median urinary iodine value decreased from 294 to 128 μg per liter. The most recent NHANES survey (2003–2004) reported that 37.2% of this subgroup of women had urinary iodine values below 100 μg per liter, which suggests mild iodine deficiency.” [Citations removed] )

Added 11-17: From the wiki on iodized salt: “In the U.S. in the early 20th century, goitre was especially prevalent in the region around the Great Lakes and the Pacific Northwest.[14] David Murray Cowie, a professor of paediatrics at the University of Michigan, led the U.S. to adopt the Swiss practice of adding sodium iodide or potassium iodide to table and cooking salt. On May 1, 1924, iodised salt was sold commercially in Michigan.[15] By the fall of 1924, Morton Salt Company began distributing iodised salt nationally. There was a gradual increase in average intelligence of 1 standard deviation, 15 points, in iodine-deficient areas and 3.5 points nationally.[16]” (there were some links in the story, too.)

(Me – more and more people eat out more often = commercial salt = no iodine. Ditto things like store bought frozen pizza. And at home more people use “gourmet” salts with somewhere between zero and maybe half of true iodized salt.)

Weaknesses?

**18. Biotin.** I have only skimmed the report from the Linus Pauling Institute at OSU, which is interesting. (I found this one looking at web pages on Joli Mere prenatal.)

Deficiency? Yes

Human proof? No

Animal proof? Yes

Logic? Yes

Dosage rational? Yes (30 mcg)

Weaknesses? Just the usual lack of solid human proof – it is extremely difficult to run a clinical trial to prevent birth defects, period, and with a single nutrient it is almost impossible.

**Recommendations**

Sources that are commercially available: (for most of these nutrients, except fluoride, #5) (Fluoride sources are listed there, under the doses section.)

Ideally I could give you a chart to compare all of the 200-odd prenatal vitamin products, and keep it updated for product changes. LOL (If anyone wants to help, this is where I need it the most.)

Here is one of the online charts:

<http://www.transitiontoparenthood.com/ttp/parented/pregnancy/prenatal_vitamins.pdf>

(“Rainbow Light” looked pretty good in quick scan.)

A few products I have at least skimmed the label and they look pretty good:

“Baby Me Now” by Solaray. It has almost ALL (except fluoride, of course, and a few minors – lysine, glutathione, and sulfated cyclodextrins). And it comes as 5-pills-a-day, so you could just take one with each meal or something. (You could also choose a lower dose if you are getting great food.) It has iodine and manganese. (I think one formulation also has DHA, I did not see it this time.) It is widely available, even at Walmart.

“Prenatal Complete” by Buried Treasure. (It also has all but F) (A liquid, normally mixed with juice, so also easy to take a lower dosage.)

Rx: I have not checked all the options, but your doctor will have more current information. Here are two good ones that have manganese:

Materna by Lederle

Elevit by Hoffmann-LaRoche. (Used in the Czeizel trial.)

I am looking for other good prescription prenatals to recommend. Please let me know if you find one with most of the nutrients that may prevent birth defects. Most are still missing Mn, Cr, and Se. Many now have DHA. (It is a lot of work to change an Rx product and label.)

Fluoride sources (see #5 above)

**References**

(Some of these references are abbreviated, some are full. It is just random / laziness.)

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Mennen B. http://www.hbci.com/~wenonah/hydro/crbacker.htm This site is mostly on chromium and diabetes, but it has two notes on pregnancy: 1. Another interesting fact demonstrated in large numbers of people both in the U.S. and the U.K.--is that chromium tissue levels in humans decrease over our lifetimes. In fact, the highest tissue levels of chromium are found in newborns: they get chromium in the womb across the placenta from their mothers. There is also evidence that pregnancy depletes a woman's chromium stores, which may be one reason that as a total population our bodies show loss of chromium as we age. 2. A recent study that has been reported (which was presented in 1995 at the annual meeting of the American College of Nutrition) showed dramatic improvements in blood sugar using less than one milligram of supplemental chromium picolinate in a group of women who developed gestational diabetes (that is, they showed symptoms and signs of diabetes only during their pregnancies).

Milunsky A, Jick H, Jick SS, Bruell CL, MacLaughlin DS, Rothman KJ, Willet W. Multivitamin/folic acid supplementation in early pregnancy reduces the prevalence of neural tube defects. JAMA 1989; 262(20):2847-52.

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Short list to take shopping

|  |  |  |  |
| --- | --- | --- | --- |
| Nutrient & my rec | IOM rec (mcg = ug) |  |  |
| 1. Folic acid .4-1.0 mg (1.0 mg to be Rx) | .6 mg (600 mcg) |  |  |
| 2. Vitamin A 5,000 IU (=1500 mcg Vit A or 3000 mcg Beta Carotene) or 50-50 = 2500 IU Vit A and 1500 mcg Beta Carotene. (= 2567 IU) | 770 mcg Vit A |  |  |
| 3. Manganese 2.5 to 5 mg (chelate best) | 2.0 mg |  |  |
| 4. Zinc 20 mg to 25 mg (chelate best) | 11 mg |  |  |
| 5. Fluoride .5mg (1.1 mg NaF, 2-3X if Ca) | 3 mg |  |  |
| 6. Chromium .05 to .2 mg 25 mcg ( ~pico) | 30 mcg |  |  |
| 7. Selenium .05 to .2 mg 25 mcg (chelate best) | 60 mcg |  |  |
| 8. Vitamin B12 8 mcg (resin adsorbate) | 2.6 mcg |  |  |
| 9. Copper 2 mg (chelate best) | 1 mg (1000 mcg) |  |  |
| 10. Vitamin D 400 USP units (D3) | 15 mcg (200 USP units) |  |  |
| 11. DHA 200-400 mg | ~100 mg |  |  |
| 12. Methionine? (in chelates?) | (No IOM) |  |  |
| 13. Lysine? | (No IOM) |  |  |
| 14. Glutathione? | (No IOM) |  |  |
| 15. Sulfated cyclodextrins? | (No IOM) |  |  |
| 16. Choline 450 mg | 450 mg |  |  |
| 17. Iodine 150 mcg Ideally from potassium iodide (kelp fine but more variable) | 220 mcg |  |  |
|  |  |  |  |
| 18. Biotin 30 mcg | 30 mcg |  |  |

IOM rec (a few years ago, did not update now 12-2-17)

<http://iom.edu/Activities/Nutrition/SummaryDRIs/~/media/Files/Activity%20Files/Nutrition/DRIs/RDA%20and%20AIs_Vitamin%20and%20Elements.pdf> 12-5-17 link no longer works, the new might be <http://www.nationalacademies.org/hmd/~/media/Files/Activity%20Files/Nutrition/DRI-Tables/2_%20RDA%20and%20AI%20Values_Vitamin%20and%20Elements.pdf?la=en>

IOM for DHA is indirect:

http://www.ncbi.nlm.nih.gov/pubmed/19525100

Other "regular" nutrients for general prenatal vitamin

Vit E (d-Alpha Tocopherol) 30 USP units

Vit C (Ascorbic Acid)

Vit B1 1.7 mg

Vit B2 2 mg

Vit B3 20 mg

Vit B6 10 mg

Pantothenic Acid 10 mg

Ca (Citrate) 500 mg

Fe (Gluconate) 50 mg

Mg (Cl) 150 mg

Mo (Na) 25 mcg

I need help to make a current list of the best products to recommend. I think I would start with companies like Sancilio that have the overall vision of starting before pregnancy and getting you through infancy with fluoride if you need it: <https://www.sancilio.com/products/>

A little real-life caveat: Asking your OB about early pregnancy nutrition (or anything in early pregnancy) is a little bit like talking to a friend who is an emergency room doc, and saying something stupid like, “Hey, I am going to take up rock climbing, and for my first climb I am going to scale El Capitan without a rope, and I wanted to ask you for advice about which route to take”.

Early pregnancy usually goes well enough, but is dangerous in the sense that it is almost impossible for it to be perfect. And sometimes things go way wrong, and nobody wants to be in the witness chair being asked questions like, “So you gave advice XYZ on day 41 of the pregnancy. Her baby was born with a cleft lip. Dr. ScrewedMagoos, when does a cleft lip start forming?” “Er, the answer is on day 42.”

It would not matter if your advice was to quit skydiving, you would still look guilty just from being at the scene of the crime. The legal process could take hours or days or weeks. And if the advice was to start taking something with any spookiness attached to it – certainly fluoride has it by the truckload – you are on your way to being fried.

So if you are approaching early pregnancy should you ask your doctor about what some whacko like me said? I still think you should, just have mercy and make it clear that you are responsible for your own decisions, and you just want the doc to tell you neutral things like, “the nutrient recommendations you found are NOT normal medical practice for early pregnancy, but are within the bounds of what is recommended for adults”.

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