

## **Vitamin D and Pregnancy**

### **June 2009**

This Vitamin D Newsletter (John Cannell, M.D.) article presents health problems that can arise from a maternal vitamin D deficiency. It contains many links to original research. It is reprinted with permission.

Possible health problems in vitamin C deficient women (in addition to other known causes):

- Increased C-section rate
- Gestational diabetes
- Bacterial vaginitis
- Preeclampsia

Possible infant and child health problems in children born to vitamin D deficient mothers (in addition to other known causes, such as poor maternal nutrition, drugs, vaccinations, etc.):

- Mental health problems
  - Autism
  - Mental retardation
  - Infantile lower respiratory tract infections
  - Lower birth weight
  - Juvenile diabetes
  - Seizures and epilepsy (related to calcium deficiency)
  - Weak bones (related to calcium deficiency)
  - Idiopathic infantile heart failure
  - Brain tumors
  - Craniotabes (softening of the skull bones)
  - Early age cavities
  - Asthma
- 

### **Vitamin D3 and Pregnancy**

#### **The Vitamin D Newsletter**

**Dr. John Cannell, M.D.**

June, 2009

This is a periodic newsletter from the Vitamin D Council, a non-profit trying to end the epidemic of vitamin D deficiency. If you are not subscribed, you can do so on [the website](#).

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In the last 3 years, an increasing amount of research suggests that some of the damage done by Vitamin D deficiency is done in-utero, while the fetus is developing. Much of that damage may be permanent, that is,

it can not be fully reversed by taking Vitamin D after birth. This research indicates Vitamin D deficiency during pregnancy endangers the mother's life and health, and is the origin for a host of future perils for the child, especially for the child's brain and immune system. Some of the damage done by maternal Vitamin D deficiency may not show up for 30 years. Let's start with the mother.

### **Incidence of Gestational Vitamin D Deficiency:**

Dr. Joyce Lee and her colleagues at the University of Michigan studied 40 pregnant women, the majority taking prenatal vitamins. Only two had levels of >50 ng/ml and only three had levels > 40 ng/ml. That is, 37 of 40 pregnant women had levels below 40 ng/ml and the majority had levels below 20 ng/ml. More than 25% had levels below 10 ng/ml.

[Lee JM, Smith JR, Philipp BL, Chen TC, Mathieu J, Holick MF. Vitamin D deficiency in a healthy group of mothers and newborn infants. Clin Pediatr \(Phila\). 2007 Jan;46\(1\):42-4.](#)

Dr. Lisa Bodnar, a prolific Vitamin D researcher, and her colleagues at the University of Pittsburg studied 400 pregnant Pennsylvania women; 63% had levels below 30 ng/ml and 44% of the black women in the study had levels below 15 ng/ml. Prenatal vitamins had little effect on the incidence of deficiency.

[Bodnar LM, Simhan HN, Powers RW, Frank MP, Cooperstein E, Roberts JM. High prevalence of vitamin D insufficiency in black and white pregnant women residing in the northern United States and their neonates. J Nutr. 2007 Feb;137\(2\):447-52.](#)

Dr. Dijkstra and colleagues studied 70 pregnant women in the Netherlands, none had levels above 40 ng/ml and 50% had levels below 10 ng/ml. Again, prenatal vitamins appeared to have little effect on 25(OH)D levels, as you might expect since prenatal vitamins only contain 400 IU of Vitamin D.

[Dijkstra SH, van Beek A, Janssen JW, de Vleeschouwer LH, Huysman WA, van den Akker EL. High prevalence of vitamin D deficiency in newborns of high-risk mothers. Arch Dis Child Fetal Neonatal Ed. 2007 Apr 25.](#)

Thus, more than 95% of pregnant women have 25(OH)D levels below 50 ng/ml, the level that may indicate chronic substrate starvation, that is, they are using up any Vitamin D they have very quickly and do not have enough to store for future use. Pretty scary.

### **Effects on the Mother:**

#### Caesarean section:

The rate of Caesarean section in American women has increased from 5% in 1970 to 30% today. Dr. Anne Merewood and her colleagues at Boston University School of Medicine found women with levels below 15 ng/ml were four times more likely to have a Cesarean section than were women with higher levels. Among the few women with levels above 50 ng/ml, the Caesarean section rate was the same as it was in 1970, about 5%.

[Merewood A, Mehta SD, Chen TC, Bauchner H, Holick MF. Association between vitamin D deficiency and primary cesarean section. J Clin Endocrinol Metab. 2009 Mar;94\(3\):940-5.](#)

#### Preeclampsia:

Preeclampsia is a common obstetrical condition in which hypertension is combined with excess protein in the urine. It greatly increases the risk of the mother developing eclampsia and then dying from a stroke. Dr.

Lisa Bodnar and her colleagues found women with 25(OH)D levels less than 15 ng/ml had a five-fold (5 fold) increase in the risk of preeclampsia.

[Bodnar LM, Catov JM, Simhan HN, Holick MF, Powers RW, Roberts JM. Maternal vitamin D deficiency increases the risk of preeclampsia. J Clin Endocrinol Metab. 2007 Sep;92\(9\):3517-22.](#)

#### Gestational Diabetes:

Diabetes during pregnancy affects about 5% of all pregnant women, is increasing in incidence, and may have deleterious effects on the fetus. Dr. Cuilin Zhang and colleagues at the NIH found women with low 25(OH)D levels were almost 3 times more likely to develop diabetes during pregnancy.

[Zhang C, Qiu C, Hu FB, David RM, van Dam RM, Bralley A, Williams MA. Maternal plasma 25-hydroxyvitamin D concentrations and the risk for gestational diabetes mellitus. PLoS ONE. 2008;3\(11\):e3753.](#)

#### Bacterial Vaginitis:

Dr. Lisa Bodnar and her colleagues found pregnant women with the lowest 25(OH)D level are almost twice as likely to get a bacterial vaginal infection during their pregnancy.

[Bodnar LM, Krohn MA, Simhan HN. Maternal Vitamin D Deficiency Is Associated with Bacterial Vaginosis in the First Trimester of Pregnancy. J Nutr. 2009 Apr 8.](#)

#### **Effects on the child:**

Before we talk about maternal Vitamin deficiency's effect on the fetus, remember that children need lots of Vitamin D. In fact, seventeen experts, many world-class experts, recently recommended:

*"Until we have better information on doses of vitamin D that will reliably provide adequate blood levels of 25(OH)D without toxicity, treatment of vitamin D deficiency in otherwise healthy children should be individualized according to the numerous factors that affect 25(OH)D levels, such as body weight, percent body fat, skin melanin, latitude, season of the year, and sun exposure. The doses of sunshine or oral vitamin D3 used in healthy children should be designed to maintain 25(OH)D levels above 50 ng/mL. As a rule, in the absence of significant sun exposure, we believe that most healthy children need about 1,000 IU of vitamin D3 daily per 11 kg (25 lb) of body weight to obtain levels greater than 50 ng/mL. Some will need more, and others less. In our opinion, children with chronic illnesses such as autism, diabetes, and/or frequent infections should be supplemented with higher doses of sunshine or vitamin D3, doses adequate to maintain their 25(OH)D levels in the mid-normal of the reference range (65 ng/mL) — and should be so supplemented year round (p. 868)."*

That's right. Healthy children need about 1,000 IU per 25 pounds of body weight and their 25(OH)D levels should be >50 ng/ml, year round.

[Cannell JJ, Vieth R, Willett W, Zasloff M, Hathcock JN, White JH, Tanumihardjo SA, Larson-Meyer DE, Bischoff-Ferrari HA, Lamberg-Allardt CJ, Lappe JM, Norman AW, Zittermann A, Whiting SJ, Grant WB, Hollis BW, Giovannucci E. Cod liver oil, vitamin A toxicity, frequent respiratory infections, and the vitamin D deficiency epidemic. Ann Otol Rhinol Laryngol. 2008 Nov;117\(11\):864-70.](#)

What about fetuses, what happens to them later in life if their mother is deficient? Eight years before the above recommendations, Professor John McGrath of the Queensland Centre for Mental Health Research theorized that maternal Vitamin D deficiency adversely “imprinted” the fetus, making infants more liable

for a host of adult disorders. Research since that time has supported McGrath's theory. Consider, for a minute, what it must be like for John McGrath, to know that maternal Vitamin D deficiency is causing such widespread devastation, to know it could be so easily treated, but to also know he must wait the decades that will be required to deal with the problem.

[McGrath J. Does 'imprinting' with low prenatal vitamin D contribute to the risk of various adult disorders? Med Hypotheses. 2001 Mar;56\(3\):367-71.](#)

#### Schizophrenia:

Dr. Dennis Kinney and his colleagues at Harvard published a fascinating paper last month on the role of maternal Vitamin D deficiency in the development of schizophrenia, in support of Dr. McGrath's theory. As they point out, the role of inadequate Vitamin D during brain development appears to "overwhelm" other effects, explaining why schizophrenia has so many of the footprints of a maternal Vitamin D deficiency disorder, such as strong latitudinal variation, excess winter births, and skin color.

[Kinney DK, Teixeira P, Hsu D, Napoleon SC, Crowley DJ, Miller A, Hyman W, Huang E. Relation of schizophrenia prevalence to latitude, climate, fish consumption, infant mortality, and skin color: a role for prenatal vitamin d deficiency and infections? Schizophr Bull. 2009 May;35\(3\):582-95.](#)

#### Autism:

I'll say not more other than to point out Scientific American ran a lengthy article last month on my autism theory but the editors insisted that the author not cite me or my paper, because I'm "not a scientist."

[What If Vitamin D Deficiency Is a Cause of Autism?](#)

#### Mental Retardation:

The only evidence that Vitamin D deficiency is a common cause of mental retardation is from researchers at the CDC who found mild mental retardation is twice as common among African Americans as whites and the politically correct explanation – socioeconomic factors – cannot explain it. If latitudinal studies of mild mental retardation exist, I am unable to locate them.

[Yeargin-Allsopp M, Drews CD, Decoufle P, Murphy CC. Mild mental retardation in black and white children in metropolitan Atlanta: a case-control study. Am J Public Health 1995;85\(3\):324-8.](#)

[Drews CD, Yeargin-Allsopp M, Decoufle P, Murphy CC. Variation in the influence of selected sociodemographic risk factors for mental retardation. Am J Public Health 1995;85\(3\):329-34.](#)

Of course, you are a racist if you believe these studies. In fact, a number of writers have told me their editors will not allow writers to discuss these studies in their stories. I'm glad these studies were conducted by researchers at the CDC although I worry about their political longevity at the CDC after reporting such findings.

I'll mention one other fact, at my peril, and that is the fact that a very smart man, President Barack Obama, was born in the late summer (August) and has a brain that developed in a womb covered in white skin, during the spring and summer, in the subtropics (Latitude 21 degrees North), during an age before sun-avoidance was the mantra (1961). Make what you want to of that fact. My point is that whites living at temperate latitudes may have a huge developmental advantage over blacks, an advantage that begins immediately after conception, an advantage that has nothing to do with innate genetic ability and everything to do with environment.

### Newborn Lower Respiratory Tract Infection:

Newborn babies are vulnerable to infections in their lungs and women with the lowest 25(OH)D level during pregnancy were much more likely to have their newborn in the ICU being treated for lower respiratory tract infections. Drs. Walker and Modlin at UCLA recently presented reasons why viral pneumonia is probably only one of many pediatric Vitamin D deficient infections.

[Karatekin G, Kaya A, Salihoğlu O, Balci H, Nuhoglu A. Association of subclinical vitamin D deficiency in newborns with acute lower respiratory infection and their mothers. Eur J Clin Nutr. 2009 Apr;63\(4\):473-7.](#)

[Walker VP, Modlin RL. The Vitamin D Connection to Pediatric Infections and Immune Function. Pediatr Res. 2009 Jan 28.](#)

### Birth weight:

While conflicting results exist on the effects of maternal Vitamin D deficiency and birth weight, the majority of the studies find an effect. Furthermore, the studies are comparing women who have virtually no intake to women who have minuscule intakes. For example, women who ingested around 600 IU per day were more likely to have normal weight babies compared to women whose intake was less than 300 IU per day. One can only wonder what would happen if pregnant women had adequate intakes? Drs. Scholl and Chen, at the Department of Obstetrics at the University of Medicine and Dentistry of New Jersey, concluded pregnant women need 6,000 IU/day, not the 400 IU/day contained in prenatal vitamins.

[Scholl TO, Chen X. Vitamin D intake during pregnancy: association with maternal characteristics and infant birth weight. Early Hum Dev. 2009 Apr;85\(4\):231-4.](#)

### Diabetes:

My old nemesis, cod liver oil, when given during pregnancy, resulted in children who were three times less likely to develop juvenile diabetes before the age of 15. Of course this was back when cod liver oil had meaningful amounts of Vitamin D (these Norwegian mothers were taking cod liver oil in the 1980s).

[Stene LC, Ulriksen J, Magnus P, Joner G. Use of cod liver oil during pregnancy associated with lower risk of Type I diabetes in the offspring. Diabetologia. 2000 Sep;43\(9\):1093-8.](#)

### Seizures:

Newborns frequently have seizures and those seizures are almost always due to low blood calcium. This problem is so common that many newborns are given a prophylactic injection of calcium. In 1978, researchers found such hypocalcemia can easily be prevented by giving Vitamin D. Sadly, standard treatment remains, not Vitamin D, but calcium and an analogue of activated Vitamin D; such analogues do not correct Vitamin D deficiency. The fact this was known in 1978, and routinely ignored by obstetricians since then, should give you pause. Do not think science will solve the Vitamin D problem. Science simply points the way, activists must change the practice.

[Fleischman AR, Rosen JF, Nathenson G. 25-Hydroxycholecalciferol for early neonatal hypocalcemia. Occurrence in premature newborns. Am J Dis Child. 1978 Oct;132\(10\):973-7.](#)

### Heart Failure:

Idiopathic infant heart failure is often fatal. Of course, idiopathic to whom: the idiot cardiologists who do not recognize severe infantile Vitamin D deficiency. Luckily, for 16 infants, Dr. Maiya, Dr. Burch and colleagues at the Great Ormand Street Hospital for Children, are not among those idiots.

[Maiya S, Sullivan I, Allgrove J, Yates R, Malone M, Brain C, Archer N, Mok Q, Daubeney P, Tulloh R, Burch M. Hypocalcaemia and vitamin D deficiency: an important, but preventable, cause of life-threatening infant heart failure. Heart. 2008 May;94\(5\):581-4.](#)

#### Weak bones:

Dr. Muhammad Javaid and colleagues at the University of Southampton found that children of Vitamin D deficient mothers were much more likely to have weak bones 9 years later. Dr. Adrian Sayers and Jonathan Tobias of the University of Bristol recently found the same thing when they looked at maternal sun-exposure.

[Javaid MK, Crozier SR, Harvey NC, Gale CR, Dennison EM, Boucher BJ, Arden NK, Godfrey KM, Cooper C; Princess Anne Hospital Study Group. Maternal vitamin D status during pregnancy and childhood bone mass at age 9 years: a longitudinal study. Lancet. 2006 Jan 7;367\(9504\):36-43.](#)

[Sayers A, Tobias JH. Estimated maternal ultraviolet B exposure levels in pregnancy influence skeletal development of the child. J Clin Endocrinol Metab. 2009 Mar;94\(3\):765-71.](#)

#### Brain Tumors:

John McGrath's group discovered that children with astrocytomas and ependyomas (brain tumors you do not want your child to have) were more likely to be born in the winter.

[Ko P, Eyles D, Burne T, Mackay-Sim A, McGrath JJ. Season of birth and risk of brain tumors in adults. Neurology. 2005 Apr 12;64\(7\):1317](#)

#### Epilepsy:

Three studies have found that epileptic patients are much more likely to be born in the winter. Dr. Marco Procopio of the Priory Hospital Hove in Sussex has written all three. Here is his last one, which summarizes his first two.

[Procopio M, Marriott PK, Davies RJ. Seasonality of birth in epilepsy: a Southern Hemisphere study. Seizure. 2006 Jan;15\(1\):17-21.](#)

#### Craniotabes:

Craniotabes is softening of the skull bones that occur in 1/3 of "normal" newborns. Recent evidence indicates it is yet another sign and sequela of maternal vitamin D deficiency.

[Yorifuji J, Yorifuji T, Tachibana K, Nagai S, Kawai M, Momoi T, Nagasaka H, Hatayama H, Nakahata T. Craniotabes in normal newborns: the earliest sign of subclinical vitamin D deficiency. J Clin Endocrinol Metab. 2008 May;93\(5\):1784-8.](#)

#### Cavities:

Dr. Robert Schroth from the University of Manitoba reported that mothers of children who developed cavities at an early age had significantly lower vitamin D levels during pregnancy than those whose children were cavity-free.

[Prenatal vitamin D linked to kids' dental health](#)

## Asthma:

The extant data here is conflicting. Two studies have found higher Vitamin D intakes during pregnancy decrease the risk of asthma in later childhood and one has found the opposite. The best review of the issue is by Drs. Augusto Litonjua and Scott Weiss, at Harvard, who conclude that the current epidemic of asthma among our children is related to both gestational and ongoing childhood vitamin D deficiency.

[Litonjua AA, Weiss ST. Is vitamin D deficiency to blame for the asthma epidemic? J Allergy Clin Immunol. 2007 Nov;120\(5\):1031-5.](#)

Furthermore, a very recent study by Dr. John Brehm and the same Harvard group found low Vitamin D levels in asthmatic children were associated with hospitalization, medication use, and disease severity.

[Brehm JM, Celedón JC, Soto-Quiros ME, Avila L, Hunninghake GM, Forno E, Laskey D, Sylvia JS, Hollis BW, Weiss ST, Litonjua AA. Serum vitamin D levels and markers of severity of childhood asthma in Costa Rica. Am J Respir Crit Care Med. 2009 May 1;179\(9\):765-71.](#)

In case you are wondering, black children are four times more likely than white children to be hospitalized or die from asthma.

[Akinbami LJ, Schoendorf KC. Trends in childhood asthma: prevalence, health care utilization, and mortality. Pediatrics. 2002 Aug;110\(2 Pt 1\):315-22.](#)

My experience, both at the hospital and via my readers, is that asthma improves, albeit sometimes slowly, when adequate doses of Vitamin D are taken. However, Vitamin D does not appear to be a cure, like it is in some other conditions. I suspect children with asthma have suffered both gestational and ongoing childhood Vitamin D deficiency that probably altered, perhaps permanently, their immune system.

### **The Vitamin D Council's Effort:**

We recently ran a ¼ page announcement in OB/GYN News and the American Journal of Obstetrics and Gynecology (AJOG). Unfortunately, the editor of AJOG censored our announcement after its first month but we were able to get the full three month run in OB/GYN News. We also sent a very similar email to 18,000 obstetricians in the US. The total cost to the Council for this campaign was about \$12,000.00.

The announcement simply pointed out that the American Academy of Pediatrics (AAP) recently recommended that all pregnant women have a 25(OH)D blood test because Vitamin D is important for normal fetal development (p. 1145):

*“Given the growing evidence that adequate maternal vitamin D status is essential during pregnancy, not only for maternal well-being but also for fetal development, health care professionals who provide obstetric care should consider assessing maternal vitamin D status by measuring the 25-OH-D concentrations of pregnant women. On an individual basis, a mother should be supplemented with adequate amounts of vitamin D3 to ensure that her 25-OH-D levels are in a sufficient range (>32 ng/ml). The knowledge that prenatal vitamins containing 400 IU of vitamin D3 have little effect on circulating maternal 25-OH-D concentrations, especially during the winter months, should be imparted to all health care professionals.”*

[Wagner CL, Greer FR; American Academy of Pediatrics Section on breastfeeding; American Academy of Pediatrics Committee on Nutrition. Prevention of rickets and vitamin D deficiency in infants, children, and adolescents. Pediatrics. 2008 Nov;122\(5\):1142-52.](#)

As the AAP recommendation came from an official medical body, to medical malpractice attorneys it represents evidence of a “standard of care” for future lawsuits. We also reminded obstetricians that the statute of limitations on malpractice suits does not toll (begin) until the injured party recognizes the injury. That is, the parents of a 5-year-old child diagnosed with autism five years in the future may bring suit against that obstetrician for how the child was treated during his time in the uterus, citing the 2008 AAP’s recommendation as a standard of care. Obstetricians are already burdened with numerous lawsuits, but they could decrease the number of suits significantly if they would just take the time to learn about Vitamin D.

Finally, we used our last \$12,000 to produce and run the following TV announcement in the Washington, D.C. TV market.

<http://www.vitamindcouncil.org/videos/vitamin-d-and-pregnancy.wmv>

### **What can you do?**

Most people want to do good – at least some good – in their lives. The endless pursuit of the God-almighty dollar, better clothes, better houses and better vacations than your neighbors eventually leaves a hole in your soul. Here is an opportunity to fill it.

If you don’t feel that soul hole, try a meditation I learned at Esalen Institute in the 1980s and have practiced ever since. Lie on the floor and pretend you are dead in your grave. Feel the worms, smell the rot, sense the finality. Then, when you really feel dead, visualize your gravestone above. What does it say? “Here lies Robert; he had a big fancy house.” “Here lies Vanessa; she wore beautiful clothes and had four face lifts.” Here lies Michael; he made a billion dollars.” Through this meditation, I realized I want my gravestone to say, “Here lies John, he did something good.”

One good thing you can do is simply tell every pregnant woman and women thinking of getting pregnant that she needs to take more Vitamin D, a lot more. Pregnant women need a minimum of 5,000 IU per day and even that dose will not achieve 25(OH)D levels of >50 ng/ml in all women. Why not buy a few bottles of 5,000 IU capsules and hand out the bottles to your pregnant friends. [You can get 250 capsules for 15 bucks](#). Forward this email to her. Show her our Pregnancy and Vitamin D public service announcement.

<http://www.vitamindcouncil.org/videos/vitamin-d-and-pregnancy.wmv>

If you want to do more, why not get a copy of our Pregnancy and Vitamin D public service announcement (email: [webmaster@vitamindcouncil.org](mailto:webmaster@vitamindcouncil.org); the ad is not copyrighted) and then pay to run it on a TV station in your hometown. You can easily add a caption at the bottom saying this public service announcement is being sponsored by your company, combining a good deed with good business.

Alas, no glory will be yours, at least in this life. No woman will ever thank you for the schizophrenic child she never had, for the trips to the emergency room with a breathless child that she never made, for the repetitive moaning of the autistic child she never endured. Although, she may wonder why her pregnancy was so easy and why her infant is so healthy, alert, active and smart.

John Cannell, MD

### **Vitamin D Council**

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