Help! My Immune System Is Down (And I Can't Get Up)!

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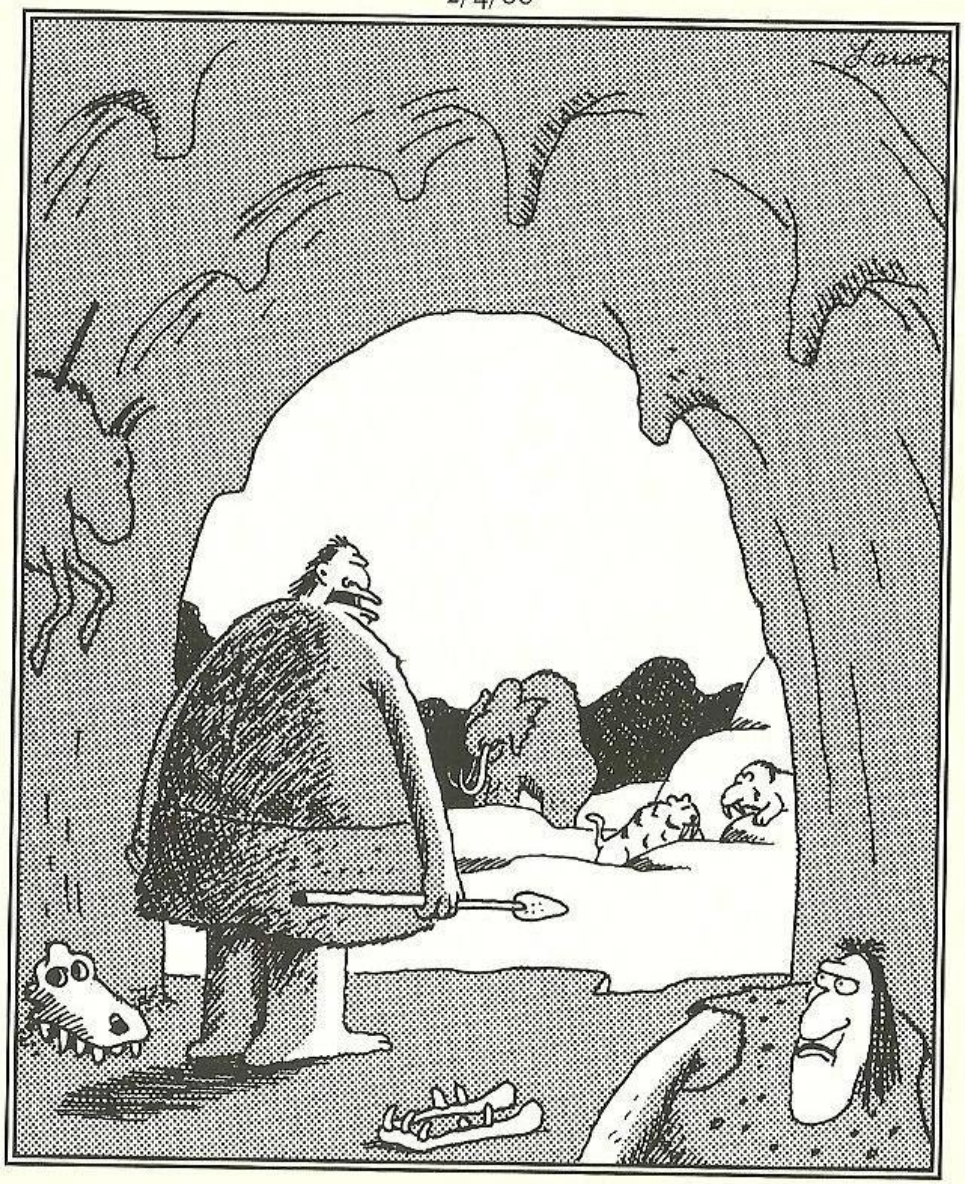
Nutrition

- Is Gluten Free the Way to Be?
- Is Fat Where It's At?
- The effects of carbohydrates on immune function.
- Water
- Organic Fruits and Vegetables (Green Supplements)

2/4/86



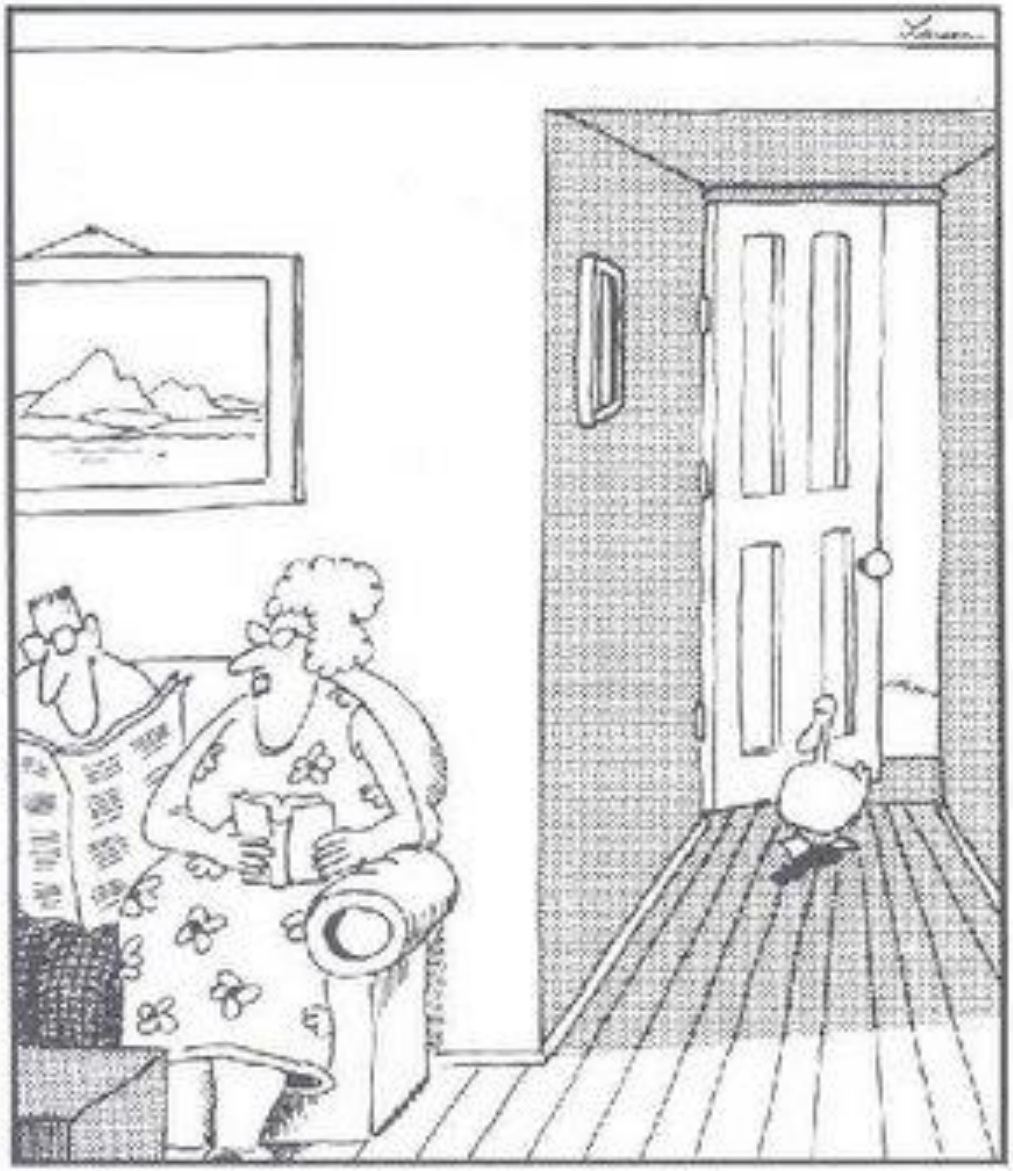
"Once in a while couldn't we just have some pasta?"

Exercise

- The relationship between exercise and upper respiratory tract infections (URTI) may be modeled in the form of a "J" curve.
- Various epidemiological studies suggest that unusually heavy acute or chronic exercise is associated with an increased risk of URTI. The risk appears to be especially high during the one or 2-wk period following marathon-type race events. Among runners varying widely in training habits, the risk for URTI is slightly elevated for the highest distance runners, but only when several confounding factors are controlled for.
- Two randomized experimental trials using small numbers of subjects have provided important preliminary data in support of the viewpoint that moderate physical activity may reduce URTI symptomatology.

Exercise

- Clinical data support the concept that heavy exertion increases the athlete's risk of URTI because of negative changes in immune function and elevation of the stress hormones, epinephrine, and cortisol.
- On the other hand, there is growing evidence that moderate amounts of exercise may decrease one's risk of URTI through favorable changes in immune function without the negative attending effects of the stress hormones.
  - Nieman DC
  - Department of Health and Exercise Science, Appalachian State University, Boone, NC 28608.
  - Medicine and Science in Sports and Exercise [1994, 26(2):128-139]



"Here he comes, Earl. … Remember, be gentle but firm … we are absolutely, positively, NOT driving him south this winter."

Stress Management

- Stress Management Series
- The practice of meditation is the single most important practice we can do, individually or collectively as a species.
- Psychoneuroendocrinimmunology
- www.profoundmeditationprogram.com

Basic Nutritional Protocol (BNP)

For as long as you continue to breathe, the following supplements serve as the foundation for your immunity, health, and life.

- **Multivitamin**: Life Force (Source Naturals), Ultra Preventive X (Douglas Labs), K-Pax (OrthoMolecular)
- **Fish Oils** (EPA/DHA): Carlson, Pure Encapsulations, Arctic Pure, Metagenics with a goal of 2500mg of combined EPA plus DHA per day.
- **'Vitamin' D_3**: Whatever dosage is necessary to reach a blood level of 70-90 ng/dl; usually requires 4000 – 8000 IU per day
- ***Probiotics***: A monthly rotation of good probiotics such as Culturelle, I Flora (Sedona Labs), Ultra Flora Metagenics), Ortho Biotic and ProBiotic 225 (OrthoMolecular)

Supporting & Current Studies

Multivitamins (MVIs) & Well Being

Effect of a multivitamin and mineral supplement on infection and quality of life. A randomized, double-blind, placebo-controlled trial.

Source

- University of North Carolina School of Medicine at Carolinas Medical Center, Charlotte, North Carolina, USA. tbarringer@carolinas.org

Abstract

BACKGROUND:

- Use of multivitamin and mineral supplements is common among U.S. adults, yet few well-designed trials have assessed the reputed benefits.

OBJECTIVE:

- To determine the effect of a daily multivitamin and mineral supplement on infection and well-being.

DESIGN:

- Randomized, double-blind, placebo-controlled trial.

SETTING:

- Primary care clinics at two medical centers in North Carolina.

Multivitamins & Well Being Continued

PARTICIPANTS:

- 130 community-dwelling adults stratified by age (45 to 64 years or >or=65 years) and presence of type 2 diabetes mellitus.

INTERVENTION:

- Multivitamin and mineral supplement or placebo taken daily for 1 year.

MEASUREMENTS:

- Incidence of participant-reported symptoms of infection, incidence of infection-associated absenteeism, and scores on the physical and mental health subscales of the Medical Outcomes Study 12-Item Short Form.

RESULTS:

- More participants receiving placebo reported an infectious illness over the study year than did participants receiving multivitamin and mineral supplements (73% vs. 43%; $P < 0.001$).

Multivitamins & Well Being Continued

RESULTS:

- Infection-related absenteeism was also higher in the placebo group than in the treatment group (57% vs. 21%; $P < 0.001$). Participants with type 2 diabetes mellitus ($n = 51$) accounted for this finding. Among diabetic participants receiving placebo, 93% reported an infection compared with 17% of those receiving supplements ($P < 0.001$). Medical Outcomes Study 12-Item Short Form scores did not differ between the treatment and placebo groups.

CONCLUSIONS:

- A multivitamin and mineral supplement reduced the incidence of participant-reported infection and related absenteeism in a sample of participants with type 2 diabetes mellitus and a high prevalence of subclinical micronutrient deficiency. A larger clinical trial is needed to determine whether these findings can be replicated not only in diabetic persons but also in any population with a high rate of suboptimal nutrition or potential underlying disease impairment.

- Ann Intern Med. 2003 Mar 4;138(5):365-71. Barringer TA, Kirk JK, Santaniello AC, Foley KL, Michielutte R.

Fish Oil & MVIs

Cod liver oil, young children, and upper respiratory tract infections.

Source

- The College of Physicians and Surgeons, Columbia University, St. Luke's-Roosevelt Hospital Center, New York, New York, USA. lall4@columbia.edu

Abstract

- Cod liver oil contains long-chain omega-3 fatty acids, as well as vitamins D and A. It was a traditional source of vitamin D in the United States and was used to prevent and treat rickets.
- In our clinical research, we used liquid cod liver oil of adequate purity and acceptable taste for infants and young children, as well as a children's multivitamin/mineral supplement with selenium and other trace metals.

Fish Oil & MVIs Continued

- In a cluster-randomized study of pediatric visits for upper respiratory illness during the winter and early spring, these nutritional supplements decreased mean visits/subject/month by **36%-58%.**
- Cod liver oil is culturally valued and has been used as a folk remedy by many low-income minorities in the United States. Nutritional supplements cannot be purchased with SNAP benefits (formerly called food stamps).
- Inclusion of cod liver oil in state Medicaid formularies would make it available to low-income children, whose families may not be able to pay for it out-of-pocket.
    - Linday LA. J Am Coll Nutr. 2010 Dec;29(6):559-62.

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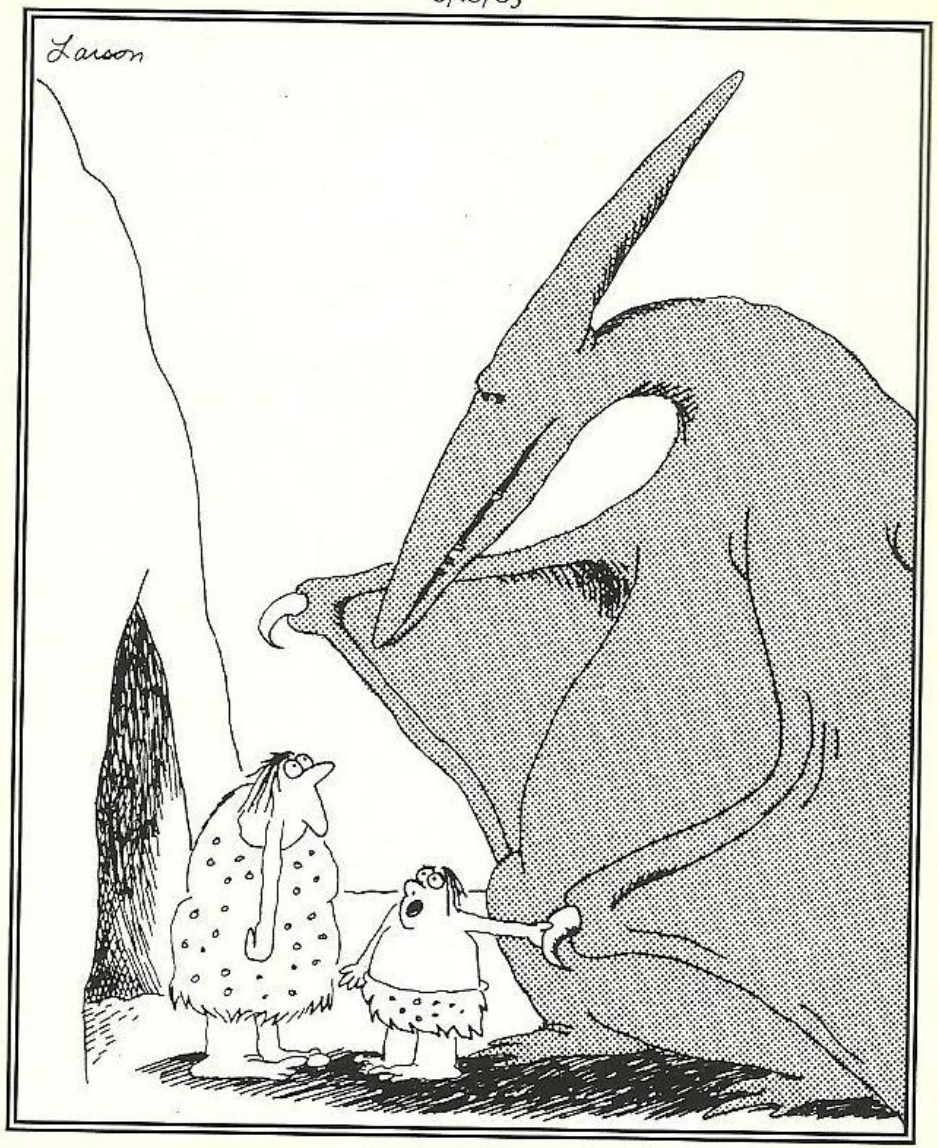

"Oh please, Mom! ... I've already handled him and now the mother won't take him back."

Probiotics & MVIs

Effect of a dietary supplement containing probiotic bacteria plus vitamins and minerals on common cold infections and cellular immune parameters.

Source

- Institute for Physiology and Biochemistry of Nutrition, Federal Research Center for Nutrition and Food, Kiel, Germany.

Abstract

OBJECTIVE:

- A randomized, double-blind, placebo-controlled intervention study was carried out in order to investigate whether consumption of a dietary supplement containing probiotic bacteria plus vitamins and minerals over a period of at least three months in winter/spring affects the duration, frequency, and severity of symptoms of naturally acquired common cold infections as well as cellular immune parameters.

METHODS:

- 477 healthy men and women (aged 36 +/- 13, mean +/- SD) who had not been vaccinated against influenza were randomly assigned to a group who received daily the probiotic multivitamin and mineral supplement (verum) or a placebo, for three (n = 239) or for 5.5 months (n = 238). Cellular immune response was determined in 60 participants per study group by flow cytometry before and after 14 days of supplementation.

Probiotics & MVIs Continued

RESULTS:

- The incidence of respiratory tract infections regarded as being virally induced was 13.6% lower in the verum group compared to the placebo group (p = 0.07). During respiratory tract infection episodes, the subjects recorded common cold and influenza-like symptoms daily. All symptoms were reduced in the verum group. We found a relative reduction of 19% in the total symptom score (p = 0.12), 25% in influenza symptoms (p = 0.09), and 54% in the number of days with fever (p = 0.03). The duration of these infections was not affected. Leukocytes, lymphocytes, in particular T-lymphocytes including CD4+ and CD8+ cells, as well as monocytes were significantly higher increased in the verum group, during the first 14 days of supplementation compared to placebo.

CONCLUSION:

- These data indicate that the intake of a dietary supplement containing probiotic bacteria plus vitamins and minerals during a period of at least three months in winter/spring may reduce the incidence and the severity of symptoms in common cold infections in otherwise healthy adults. This may be due to stimulated cellular immunity.

  - Winkler P, de Vrese M, Laue Ch, Schrezenmeir J. Int J Clin Pharmacol Ther. 2005 Jul;43(7):318-26.

Vitamin D_3 & Immunity

Sinonasal epithelial cells synthesize active vitamin D, augmenting host innate immune function.

Source

- Department of Otolaryngology-Head and Neck Surgery, Johns Hopkins University School of Medicine, Baltimore, MD.

Abstract

BACKGROUND:

- Vitamin D, long recognized for its role in bone metabolism and calcium homeostasis, has been increasingly shown to augment innate immunity. 1-α-Hydroxylase, the enzyme responsible for the synthesis of active vitamin D, has been shown to have extrarenal expression in multiple cell types, including airway epithelial cells. The purpose of this study is to explore whether sinonasal epithelial cells (SNECs) express 1-α-hydroxylase, allowing for the local production of active vitamin D, thereby augmenting innate immune function.

Vitamin D_3 & Immunity

METHODS:

- Human SNECs were grown in culture and stimulated by inactive vitamin D. Expression of 1-α-hydroxylase was measured by real-time polymerase chain reaction and immunocytochemistry. Active vitamin D production was measured by enzyme-linked immunosorbent assay (ELISA). The expression of cathelicidin, an antimicrobial peptide, was measured by real-time polymerase chain reaction and immunocytochemistry.

RESULTS:

- SNECs constitutively express the enzyme 1-α-hydroxylase resulting in active vitamin D production. SNECs exposed to inactive vitamin D had a significant 8-fold increase in cathelicidin expression when compared to controls.

CONCLUSION:

- SNECs can generate active vitamin D, which significantly increases expression of the antimicrobial peptide cathelicidin.
  - Int Forum Allergy Rhinol. 2012 Oct 4. doi: 10.1002/alr.21087. Sultan B, Ramanathan M Jr, Lee J, May L, Lane AP.

Vitamin D_3 & URTIs

Effect of vitamin D3 supplementation on upper respiratory tract infections in healthy adults:
the VIDARIS randomized controlled trial.

Source

- Department of Pathology, University of Otago, Christchurch, PO Box 4345, Christchurch 8011, New Zealand. david.murdoch@otago.ac.nz

Abstract

CONTEXT:

- Observational studies have reported an inverse association between serum 25-hydroxyvitamin D (25-OHD) levels and incidence of upper respiratory tract infections (URTIs). However, results of clinical trials of vitamin D supplementation have been inconclusive.

OBJECTIVE:

- To determine the effect of vitamin D supplementation on incidence and severity of URTIs in healthy adults.

DESIGN, SETTING, AND PARTICIPANTS:

- Randomized, double-blind, placebo-controlled trial conducted among 322 healthy adults between February 2010 and November 2011 in Christchurch, New Zealand.

Vitamin D_3 & URTIs

INTERVENTION:

- Participants were randomly assigned to receive an initial dose of 200,000 IU oral vitamin D3, then 200,000 IU 1 month later, then 100,000 IU monthly (n = 161), or placebo administered in an identical dosing regimen (n = 161), for a total of 18 months.

MAIN OUTCOME MEASURES:

- The primary end point was number of URTI episodes. Secondary end points were duration of URTI episodes, severity of URTI episodes, and number of days of missed work due to URTI episodes.

RESULTS:

- The mean baseline 25-OHD level of participants was 29 (SD, 9) ng/mL. Vitamin D supplementation resulted in an increase in serum 25-OHD levels that was maintained at greater than 48 ng/mL throughout the study.

Vitamin D_3 & URTIs

RESULTS:

- There were 593 URTI episodes in the vitamin D group and 611 in the placebo group, with no statistically significant differences in the number of URTIs per participant (mean, 3.7 per person in the vitamin D group and 3.8 per person in the placebo group; risk ratio, 0.97; 95% CI, 0.85-1.11), number of days of missed work as a result of URTIs (mean, 0.76 days in each group; risk ratio, 1.03; 95% CI, 0.81-1.30), duration of symptoms per episode (mean, 12 days in each group; risk ratio, 0.96; 95% CI, 0.73-1.25), or severity of URTI episodes. These findings remained unchanged when the analysis was repeated by season and by baseline 25-OHD levels.

CONCLUSION:

- In this trial, monthly administration of 100,000 IU of vitamin D did not reduce the incidence or severity of URTIs in healthy adults.
    - JAMA. 2012 Oct 3;308(13):1333-9. doi: 10.1001/jama.2012.12505. Murdoch DR, Slow S, Chambers ST, Jennings LC, Stewart AW, Priest PC, Florkowski CM, Livesey JH, Camargo CA, Scragg R.

Vitamin D_3 & Hep.C

Vitamin D and the racial difference in the genotype 1 chronic hepatitis C treatment response.

Source

- Department of Medicine, St Louis Veterans Affairs Medical Center-John Cochran Division, St Louis, MO, University of Tennessee Health Science Center, Memphis, TN.

Abstract

BACKGROUND:

- African Americans with genotype 1 chronic hepatitis C attain a sustained virologic response (SVR) at only approximately one-half the rate of whites after peginterferon and ribavirin treatment. The serum concentration of 25-hydroxyvitamin D [25(OH)D] has recently been established as a predictor of treatment response.

Vitamin D_3 & Hep.C

BACKGROUND (continued):

- Therefore, the low serum concentrations of 25(OH)D found among African Americans may contribute to the low response rate; however, to our knowledge, none of the studies of vitamin D in chronic hepatitis C treatment have included a significant number of black patients.

OBJECTIVE:

- The objective was to compare the relation between the 25(OH)D concentration and genotype 1 chronic hepatitis C treatment response in African Americans with that in whites.

DESIGN:

- This cross-sectional analysis included 106 African American and 65 white patients with genotype 1 chronic hepatitis C.

Vitamin D_3 & Hep.C

RESULTS:

- Consistent with previous studies, we found that the SVR rate in the white patients increased significantly with an increasing serum concentration of 25(OH)D [SVR rates were 20%, 46%, and 70% for 25(OH)D serum concentrations <20, 20-35, and >35 ng/mL, respectively; P-trend = 0.008]; however, there was no relation between the SVR rate and 25(OH)D serum concentration in the African American patients [SVR rates were 32%, 28%, and 33% for 25(OH)D serum concentrations <20, 20-35, and >35 ng/mL, respectively; P-trend = 0.832].
- We also found an analogous racial difference in the relation between the extent of liver fibrosis and the 25(OH)D concentration.

Vitamin D_3 & Hep.C

CONCLUSION:

- Racial differences in vitamin D physiology or race-specific factors that modify the effects of vitamin D may affect the immune response to genotype 1 hepatitis C virus.
    - Am J Clin Nutr. 2012 Sep 26. [Epub ahead of print] Weintraub SJ, Fleckenstein JF, Marion TN, Madey MA, Mahmoudi TM, Schechtman KB.

Vitamin D_3 & CVD in Type 2 Diabetes

Vitamin D Suppression of Endoplasmic Reticulum Stress Promotes an Anti-Atherogenic Monocyte/Macrophage Phenotype in Type 2 Diabetic Patients.

Source

- Washington University School of Medicine, United States;

Abstract

- Cardiovascular disease (CVD) is the leading cause of morbidity/mortality in patients with type 2 diabetes mellitus (T2DM), but there is a lack of knowledge about the mechanism(s) of increased atherosclerosis in these patients.
- In patients with T2DM, the prevalence of 25-hydroxy vitamin D [25(OH)D] deficiency is almost twice that for non-diabetics and doubles the relative risk of developing CVD compared to diabetic patients with normal 25(OH)D.

Vitamin D_3 & CVD in Type 2 Diabetes

- We tested the hypothesis that monocytes from vitamin D-deficient subjects will have a pro-atherogenic phenotype compared to vitamin D-sufficient subjects in 43 patients with T2DM. Serum 25(OH)D level inversely correlated with monocyte adhesion to endothelial cells even after adjustment for demographic and comorbidity characteristics.
- Vitamin D-sufficient patients (25(OH)D ≥ 30 ng/mL) had lower monocyte endoplasmic reticulum (ER) stress, a predominance of M1 over M2 macrophage membrane receptors, and decreased mRNA expression of monocyte adhesion molecules PSGL-1, β1-integrin, and β2-integrin compared to patients with 25(OH)D <30 ng/mL.
- In vitamin D-deficient macrophages, activation of ER stress increased adhesion and adhesion molecule expression and induced an M2-predominant phenotype. Moreover, adding 1,25(OH)2D3 to vitamin D-deficient macrophages shifted their phenotype toward an M1-predominant phenotype with suppressed adhesion.

Vitamin D_3 & CVD in Type 2 Diabetes

- Conversely, deletion of the vitamin D receptor in macrophages from diabetic patients activated ER stress, accelerated adhesion, and increased adhesion molecule expression. The absence of ER stress protein CEBP homologous protein (CHOP) suppressed monocyte adhesion, adhesion molecule expression, and the M2-predominant phenotype induced by vitamin D deficiency.
- Thus, vitamin D is a natural ER stress reliever that induced an anti-atherogenic monocyte/macrophage phenotype.
  - J Biol Chem. 2012 Sep 24. Riek AE, Oh J, Sprague JE, Timpson A, de Las Fuentes L, Bernal-Mizrachi L, Schechtman KB, Bernal-Mizrachi C.

Probiotics & Bacterial Disease

Fighting fire with fire: is it time to use probiotics to manage pathogenic bacterial diseases?

Source

- Division of General Surgery, Oregon Health & Science University, Portland, 97239, USA.

Abstract

- Probiotics, when considered in clinical practice, have traditionally been used for prophylaxis; however, there is growing data suggesting treatment benefits in numerous disease states. In this review, we focus on probiotics as treatment for and prevention of several acute and chronic infectious processes including Helicobacter pylori, Clostridium difficile, necrotizing enterocolitis, ventilator-associated pneumonia, vancomycin-resistant enterococci, and nonalcoholic fatty liver disease.

Probiotics & Bacterial Disease Continued

- It is inaccurate to generalize findings observed in a single probiotic species to all probiotics. This reasoning is due to the variability of colonizing abilities of native intestinal floras, probiotic or otherwise, secondary to different combinations, doses, and duration of treatments.
- Given these limitations, multiple animal and human studies have shown anti-inflammatory and selective antimicrobial effects of specific probiotics. Some studies suggest a role for probiotics as supplemental treatment, in combination with antibiotics, for the aforementioned disease processes.
- It is apparent from this review that the efficacy of probiotics is widely variable and multifaceted. More focused clinical and basic science research is necessary to better understand the treatment potential of various probiotics.
  - Curr Gastroenterol Rep. 2012 Aug;14(4):343-8. Heineman J, Bubenik S, McClave S, Martindale R.

Probiotics & Atopic Dermatitis

Effects of probiotics on the prevention of atopic dermatitis.

Source

- Department of Food and Nutrition, Research Institute of Human Ecology, Seoul National University College of Human Ecology, Seoul, Korea.

Abstract

- Atopic dermatitis (AD) is an immune disorder that is becoming increasingly prevalent throughout the world. The exact etiology of AD remains unknown, and a cure for AD is not currently available. The hypothesis that appropriate early microbial stimulation contributes to the establishment of a balanced immune system in terms of T helper type Th1, Th2, and regulatory T cell (Treg) responses has led to the use of probiotics for the prevention and treatment of AD in light of various human clinical studies and animal experiments.
- Meta-analysis data suggests that probiotics can alleviate the symptoms of AD in infants. The effects of balancing Th1/Th2 immunity and enhancing Treg activity via the interaction of probiotics with dendritic cells have been described in vitro and in animal models, although such an effect has not been demonstrated in human studies. In this review, we present some highlights of the immunomodulatory effects of probiotics in humans and animal studies with regard to their effects on the prevention of AD.
  - Korean J Pediatr. 2012 Jun;55(6):193-201. Epub 2012 Jun 21. Kim NY, Ji GE.

Astragalus & Kidney Disease

Treatment of idiopathic membranous nephropathy with the herb Astragalus membranaceus.

Source

- Department of Medicine, Loyola University Medical Center, Maywood, IL 60153, USA.

Abstract

- A 77-year-old woman with nephrotic syndrome secondary to idiopathic membranous nephropathy was treated with angiotensin-converting enzyme inhibitors, angiotensin receptor blockers, cyclosporine A, and mycophenolate mofetil, without response.
- After more than 2 years of unremitting nephrosis, she began therapy with the herb Astragalus membranaceus, used by traditional Chinese physicians to treat various immune disorders, including glomerulonephritis.

Astragalus & Kidney Disease Continued

- After institution of Astragalus at a dose of 15 g/d, there was a marked decrease in proteinuria.
- Nephrotic syndrome recurred after temporary cessation of Astragalus therapy, with complete remission of nephrosis observed after its reintroduction.
- The clinical course of this patient suggests that Astragalus may have beneficial effects in patients with idiopathic membranous nephropathy.
  - Am J Kidney Dis. 2007 Dec;50(6):1028-32. Ahmed MS, Hou SH, Battaglia MC, Picken MM, Leehey DJ.

Supplements For Assistance

Astragalus

Using Astragalus for preventive purposes (not the acute treatment of infections):

- Astragalus Jade Screen (Planetary Herbals), a Chinese traditional formula (Yu Ping Feng Wan): 2 tabs twice per day on an empty stomach, can be taken indefinitely

Using Astragalus for the long term treatment of cancer and other conditions:

- Astragalus Max-V (Douglas Labs): 500mg, 1 cap twice per day between meals

Respiratory Infections

For *treating* acute respiratory illnesses, immediately at the onset of symptoms:

1. Vitamin D: 50,000IU three times per day for 3 days only.(especially good for "flu") Yes, 150,000 IU per day for 3 days!
2. Vitamin C: (Systemic C-buffered C with the bioflavonoids quercetin and grape seed extract) 1000 mg every 2-3 hours. Taken for as long as you are ill…
3. Depending on the type of illness, you will add the following supportive supplements:

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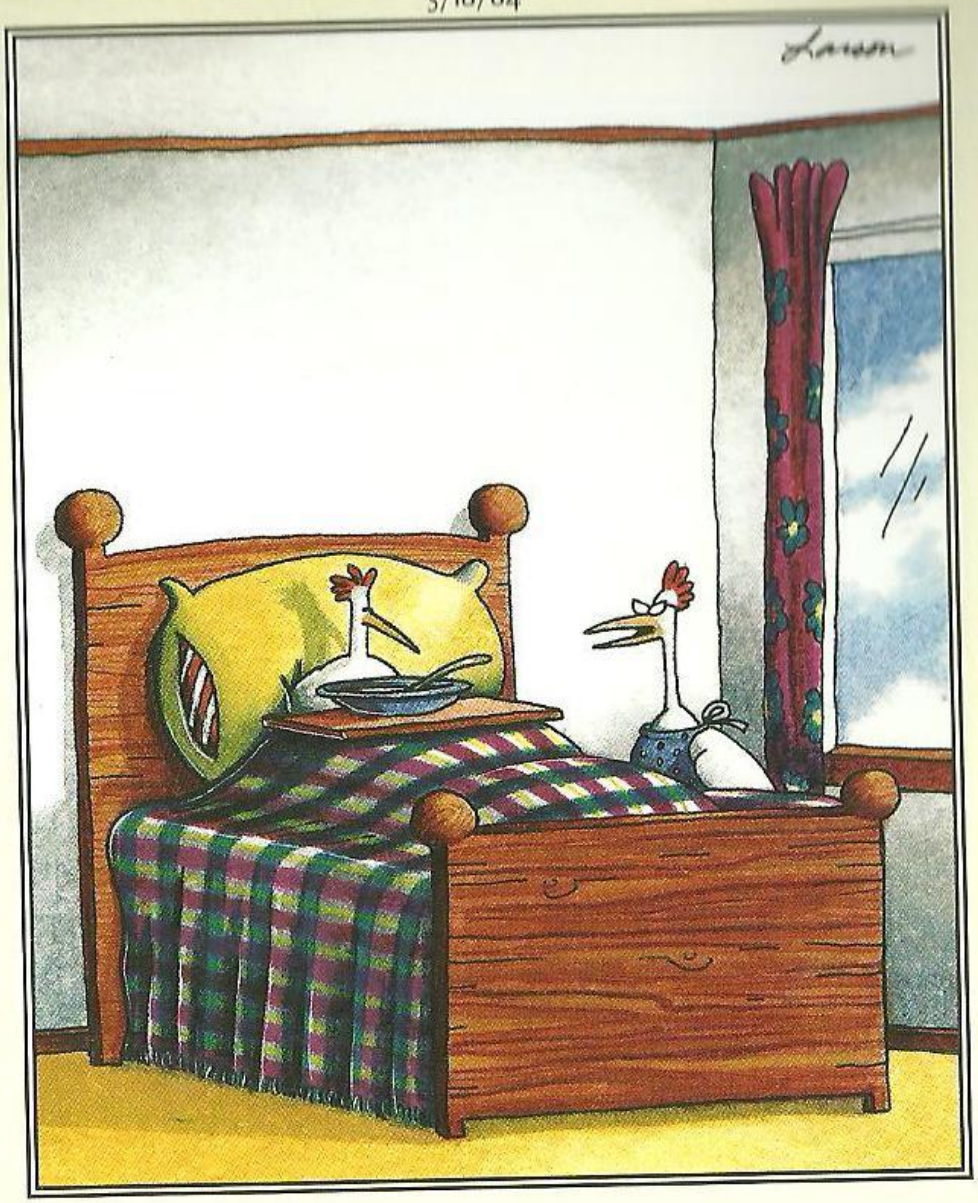

"Quit complaining and eat it! ... Number one, chicken soup is good for the flu, and number two, it's nobody we know."

Pharyngitis

- Zinc gluconate lozenges 23mg, dissolved every 2 hours until illness is over, up to 7 days.

Sinusitis

- As long as your nose is not completely obstructed, utilize the Neti Pot, saline rinse (2x/day)incorporating J's Nose Drops and followed by Nasya oil directly into the nares.
- Argentyn: 2 sprays every 2 hours, each nostril
- Sinatrol: 2 caps twice per day
- If not responding to the combination above within 3days, consider antibiotics. If improving, take for up to two weeks

Bronchitis

- Wellness Formula (Source Naturals)- 3tabs three times per day or
- Andrographis Complete (Planetary Herbals) 2 tabs three times per day and/or
- IV Myer's Cocktail an intravenous immune booster with vitamin C, supportive nutrients, and ours includes germanium as well.
- If not responding to a trial of at least one of the above modalities within two days, consider antibiotics. If improving, above recommendations can be taken for up to two weeks

Symptom Relief

- Nectadyn (Heel):1-2 tsp every4 hours as needed for cough. Especially for acute infection
- Koflet (Himalaya): 1 lozenge dissolved as needed. Especially for post-nasal drip, throat-irritation coughs
- Ivy Calm (ITI): 1-2 tsp every 4 hours as needed, especially for dry, hacking coughs and those coughs that linger on after an infection.

VACCINATIONS

Figure 1. Recommended adult immunization schedule, by vaccine and age group[1]

VACCINE ▼ AGE GROUP ▶	19-21 years	22-26 years	27-49 years	50-59 years	60-64 years	≥ 65 years
Influenza [2]	1 dose annually					
Tetanus, diphtheria, pertussis (Td/Tdap) [3,*]	Substitute 1-time dose of Tdap for Td booster; then boost with Td every 10 yrs					Td/Tdap[3]
Varicella [4,*]	2 Doses					
Human papillomavirus (HPV) Female [5,*]	3 doses					
Human papillomavirus (HPV) Male [5,*]	3 doses					
Zoster [6]					1 dose	
Measles, mumps, rubella (MMR) [7,*]	1 or 2 doses			1 dose		
Pneumococcal (polysaccharide) [8,9]	1 or 2 doses					1 dose
Meningococcal [10,*]	1 or more doses					
Hepatitis A [11,*]	2 doses					
Hepatitis B [12,*]	3 doses					

*Covered by the Vaccine Injury Compensation Program

- For all persons in this category who meet the age requirements and who lack documentation of vaccination or have no evidence of previous infection
- Recommended if some other risk factor is present (e.g., on the basis of medical, occupational, lifestyle, or other indications)
- Tdap recommended for ≥65 if contact with <12 month old child. Either Td or Tdap can be used if no infant contact
- No recommendation

VACCINATIONS

Figure 2. Vaccines that might be indicated for adults based on medical and other indications[1]

VACCINE ▼ INDICATION ▶	Pregnancy	Immunocompromising conditions (excluding human immunodeficiency virus [HIV])[4,6,7,14]	HIV infection[4,7,13,14] CD4+ T lymphocyte count < 200 cells/µL	HIV infection[4,7,13,14] CD4+ T lymphocyte count ≥ 200 cells/µL	Men who have sex with men (MSM)	Heart disease, chronic lung disease, chronic alcoholism	Asplenia[13] (including elective splenectomy and persistent complement component deficiencies)	Chronic liver disease	Diabetes, kidney failure, end-stage renal disease, receipt of hemodialysis	Health-care personnel
Influenza [2]	1 dose TIV annually				1 dose TIV or LAIV annually	1 dose TIV annually				1 dose TIV or LAIV annually
Tetanus, diphtheria, pertussis (Td/Tdap) [3,*]	Substitute 1-time dose of Tdap for Td booster; then boost with Td every 10 yrs									
Varicella [4,*]	Contraindicated			2 doses						
Human papillomavirus (HPV) Female [5,*]		3 doses through age 26 yrs				3 doses through age 26 yrs				
Human papillomavirus (HPV) Male [5,*]		3 doses through age 26 yrs				3 doses through age 21 yrs				
Zoster [6]	Contraindicated				1 dose					
Measles, mumps, rubella (MMR) [7,*]	Contraindicated			1 or 2 doses						
Pneumococcal (polysaccharide) [8,9]		1 or 2 doses								
Meningococcal [10,*]		1 or more doses								
Hepatitis A [11,*]					2 doses					
Hepatitis B [12,*]			3 doses							

*Covered by the Vaccine Injury Compensation Program

For all persons in this category who meet the age requirements and who lack documentation of vaccination or have no evidence of previous infection

Recommended if some other risk factor is present (e.g., on the basis of medical, occupational, lifestyle, or other indications)

Contraindicated

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

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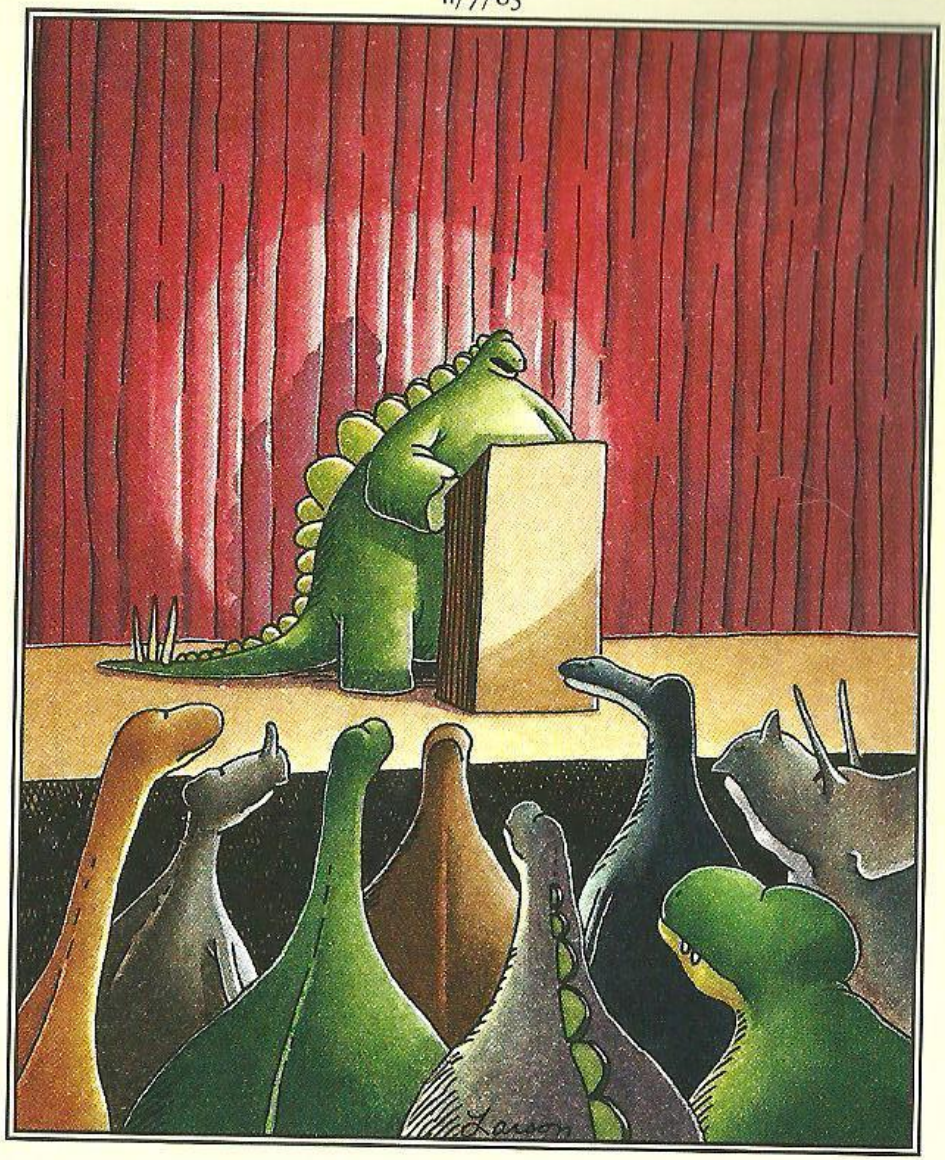

"The picture's pretty bleak, gentlemen. ... The world's climates are changing, the mammals are taking over, and we all have a brain about the size of a walnut."