

Using Mass Spectrometry to Find Fatty Acid Needs of Babies*

Omega-3 fatty acids, which are required in the human diet, are classified as essential because they cannot be synthesized in the body from other fatty acids and must come from food. People get them in two ways. One is by consuming the long-chain omega-3s primarily from marine sources. The other is by eating them as precursors that the body must convert to long-chain fatty acids, essential for neurological development.

Stable isotope ratio mass spectrometry was used to learn the requirements of fetuses and babies for omega-3 fatty acids, specifically the long-chain polyunsaturated fatty acid DHA. It is present in high concentration in the brain cortex and the retina. Research results indicate that premature and full-term newborns can convert precursors at low rates. Thus it is especially critical that premature infants are breastfed (human breast milk normally contains DHA) or receive formula with DHA because it improves their cognition and their eyesight.

Breastfeeding is best, but some mothers can't or won't. In addition, some infants are lactose intolerant. Outcomes of the research program confirm that DHA should be added to infant formula. Work is continuing to develop highly advanced mass spectrometry procedures for biomedical applications with the goal of learning how much DHA should be in formulas.

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Determining the Rate of Adoption of Technology in Health Care*

The cost of health care is spiraling, most of which is driven by new technologies. Each new device, drug, procedure, or treatment protocol usually costs more than the one it replaced. Yet technology—broadly defined as how a patient is treated for an illness—is also the source for much of the improved health benefits available to many, but not all, Americans. Technology is a critical issue because if technology is adopted smartly, then although spending will go up, the benefit will have been worth it.

Adoption of new technology is influenced by a number of factors.

- New technology adoption is often a decision that is made jointly by the physicians and the hospitals with which they are affiliated.
- Hospitals adopt new technologies if they are not penalized financially.
- Physician adoption of technology is not influenced by where they trained or strongly influenced by the way colleagues in their community treat patients
- Reimbursement by health-care insurance affects adoption.

Considering which patients received newer technology, the research showed clear disparities according to race and form of payment. The data show that—within the same hospital—Medicaid and uninsured patients receiving a particular procedure were less likely to receive the newer technology than private-paying patients. And African American patients were less likely to receive it than white patients. Because health care economics is a constant challenge for policy makers, this research has the potential to inform decisions that address the challenges over time.

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Nano Textiles Are Engineering a Safer World

Faculty are using nanotechnology to create radically new textiles and to enhance convention textiles with greater functionality.

In electrospinning, an electrical field stretches a dissolved polymer into a tiny fiber that is 1,000 times smaller than human hair. The results can be amazing. Nanoscale fibers are very useful in filtration devices because the molecules in air can flow around the fibers without losing momentum. And less power is needed to put the air through the filter.

Modifications to the electrospinning process has enabled the creation of supersensitive biofilters. Because of the combination of the small size of the fibers and the electrical fields created between the fibers, it is possible to capture particles in the 100- to 300-nanometer range. It just so happens that that's the size of viruses and bacteria.

Other applications are being developed. Examples include:

- nanolayers on protective clothing to selectively block hazardous gases and miniscule contaminants;
- fibers that control the movement of medicine through fibers to administer time-released antibacterial and antiallergenic compounds;
- biodegradable fibers saturated with time-released pesticides that could be planted with seeds as an alternative to spraying pesticides.

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Ergonomics and CUErgopods

Many people are now aware of ergonomics: “an applied science concerned with the characteristics of people that need to be considered in designing and arranging things that they use in order that people and things will interact most effectively and safely.”¹ They may be equally aware of the importance of ergonomics related to their use of computers. However, few people have the inclination to find and read impartial sources of information about the optimal arrangement of themselves in relation to their computer components.

Ongoing studies in Human Ecology are conducted on the effects of ergonomic designs of—for example keyboards, mice, chairs, work surfaces—on the posture, comfort, and performance of people. A web site (<http://ergo.human.cornell.edu/>) contains a great deal of information on computer workstation guides that results from the research.

Even more appealing is the result of student work in DEA 470 Applied Ergonomics in spring 2006. Audio and video podcasts were researched, designed, and recorded by the undergraduates to teach people about ergonomic use of laptops. This is an exciting new way of delivering just-in-time educational content in bite-sized chunks that users can select and carry with them to listen to or look at whenever they have time. The podcasts can be viewed online at ergo.human.cornell.edu/CUErgopods/CUErgopods2006.htm or downloaded to an iPod or any MP3 player.

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¹ Mirriam-Webster Dictionary Application, mirriam-webster.exe, Version 3.0.0.0 © 2003.