

The University Dialogues ■ 2009–2010

TAKING CARE OF SELF AND COMMUNITY

*A University Dialogue
on Health*

Table of Contents

- 3 FOREWORD
by Barbara Prudhomme White
- 5 BUILDING THE FOUNDATION FOR A HEALTHY LIFE: INDIVIDUALS, COMMUNITIES, AND THE STATE
by John Seavey, Josephine Porter, and Barbara Arrington
- 9 IS IT GOOD TO DO GOOD? ALTRUISM AND HEALTH
by Michele Dillon
- 12 WELL-BEING: THE HEART OF BEING HUMAN, THE ART OF BEING WHOLE
by Mary Westfall
- 15 TOO BUSY TO BE HEALTHY? JOIN THE CLUB
by Patricia Halpin
- 17 WHEN YOU WALK, DO YOU FEEL LIKE YOU ARE DANCING?
by Deborah Kinghorn
- 20 CALMING THE MIND, HEALING THE BODY: CAN ALTERNATIVE THERAPIES HELP COLLEGE STUDENTS IMPROVE THEIR HEALTH?
by Carolyn Gamtso
- 23 CAN WE ENGINEER OUR WAY TO GOOD HEALTH?
by Russell Carr
- 26 DODGE THIS: DO ENVIRONMENTAL CHEMICALS IMPACT YOUR HEALTH?
by Gale Carey
- 30 WAR OF THE WORLDS: OUR WORLDS ARE COLLIDING AND INFECTIOUS DISEASE IS WINNING
by Richard French
- 34 DISCOVERY: DEFINING HEALTH AND DISCOVERING PROGRESS
by Ned Helms

Foreword

BARBARA PRUDHOMME WHITE

OCCUPATIONAL THERAPY

FACULTY DIRECTOR, DISCOVERY PROGRAM

WELCOME TO THIS COLLECTION OF ESSAYS, gathered from distinguished members of our university community, inviting us to engage in spirited conversations regarding health—our own, our communities', our planet's. *Taking Care of Self and Community: A University Dialogue on Health* is both timely and provocative. The United States is a wealthy nation. With all of our resources, technology, and wealth many assume that we share the best overall individual health and health care system of any other place on earth. Yet, as you will begin to see in the following pages, and throughout the year, this is not the case. As a nation, we struggle with health care policies that are not working and are burdened by health care costs that continue to rise while at the same time demonstrating no measurable advantages. For example, annual health care spending in the U.S. has been increasing two to five times the rate of inflation since 2000, but we have not seen any measurable changes in life expectancy or infant mortality rates, two standard measures out of many, often used to assess a nation's overall health.¹ In 2007, we ranked 20th in comparison to other countries in infant mortality rates, and 16th in overall life expectancy.² However, we spend more on health care than most other countries. For example, U.S. expenditures by percentage of gross domestic product (GDP) in 2008 were 15.3% (life expectancy of 78.1 years) in comparison to 8.3% of GDP in Great Britain (life expectancy of 79 years), and 8% of GDP in Japan (life expectancy 82.1 years).³ We have clearly arrived at a point when the question is no longer *whether we engage* in health care reform but rather *how do we engage?* Indeed, the current administration, the U.S. House of Representatives, and Senate are all deeply occupied with this issue and are charged with developing a reasonable and sustainable health care plan for the country as swiftly as possible.

However, before we as a people engage in sweeping reforms and create new health care policies and programs, it becomes increasingly important that we first deliberate on what we mean by "health.": How is health

best defined? Who has it and who does not? How can we achieve optimal health for all without leaving others behind? How is personal health linked to both community and environmental health? How can we afford good, sustainable health for all of our citizens? Most of us probably have a sense of our own health and when it is good or deficient. However, health as a construct can be quite elusive to define. Dialogue Authors Seavey, Porter, and Arrington, encourage us to broaden our understanding of health by considering the characteristics and affordances that contribute to good health and offer some models that attempt to define it. Further, the authors discuss questions regarding the roles public policy should have in disseminating information about health promotion and in designing measures for assessing individual and community health.

The World Health Organization defines health as a "state of complete physical, mental and social well-being and not merely the absence of disease or infirmity."⁴ According to Fine and Peters⁵ this definition is limiting in that it does not consider the critical nature of interpersonal relationships for good health, nor does it consider meaningful participation or functional performance within varying task demands and environments. Fine and Peters offer another more contextual definition of health as "the biological, social, and psychological ability that affords an equal opportunity for each individual to function in the relationships appropriate to his or her cultural context at any point in the life cycle" (p. 136). They claim that health is more than absence of disease states or physical and/or mental illnesses but rather an "ambiguous, momentary and situational reality" (p. 136) that is based on the ability to function and adapt within environmental demands, and to maintain emotionally meaningful connections with others.

This broader definition intersects nicely with essays by authors Dillon, Westfall, Halpin, Kinghorn, and Gamtso, who each offer us unique and complementary ways to think about the meaning of health in tandem with relationships, environments, and mind-body connections.

Authors Carr, Carey, and French each add rich and provocative information about the impact of technology and environmental concerns on health, as well as have us consider how connections to other living creatures impact our well-being. We are asked to reflect about our ethical responsibilities in relation to technological advances and possible harmful contaminants of our own creation permeating our environment. Intriguingly, Professor Carey poses the question: Do plastics contribute to obesity? Likewise, Professor Carr explores whether we can afford the technologies we create.

Toward the end of the collection, authors Helms and Porter facilitate our thinking about health care reform. What should our priorities be and how should we develop programs that implement action in ways that fairly distribute resources? While there are not always clear answers, there are suggested pathways in broadly important directions. How will we ensure that as a people, we take them?

Our goals for the University Dialogue include initiating the difficult conversations we should have collectively in order to better define what we mean by “health,” for ourselves, our communities, and our environments. As a nation, our best chance at developing valid and effective health care programs, as well as allocating resources where they will make the greatest impact, will depend on clarity of vision of what we mean by “good health” and what we need to obtain it. Additional goals of the Dialogue are to explore creative and multiple strategies for health promotion. What will be the most effective and sustainable ways to ensure optimal health for all people in the U.S.? We are not alone in this discussion and throughout the year you will have opportunities to learn, both inside and outside of the classroom, about health. Moreover, leaders, practitioners, and consumers who are deeply engaged in U.S. health care reform will visit campus. There will be movies and discussion events, and opportunities to participate in health-related topics where you live, eat, and play. We invite you to engage as part of a community in these events and we challenge each of you to form, confirm, or reshape your values about how you will live your lives forward as healthy human beings.

Here's to your health,

BARBARA PRUDHOMME WHITE

References

1. *The National Coalition on Health Care*. Retrieved July 15, 2009: <http://www.nchc.org/facts/economic.shtml>
2. *Infant mortality rates and life expectancy by selected countries, 2007*. Retrieved July 15, 2009: <http://www.infoplease.com/ipa/A0004393.html>
3. *Comparison of health care spending*. Retrieved July 15, 2009: http://www.npr.org/news/specials/healthcare/health-care_profiles.html
4. *Preamble to the Constitution of the World Health Organization as adopted by the International Health Conference, New York, 19-22 June, 1946; signed on 22 July 1946 by the representatives of 61 States (Official Records of the World Health Organization, no. 2, p. 100) and entered into force on 7 April 1948.*
5. Fine, M. and Peters, J. W. (2007). *The nature of health: How America lost, and can regain, a basic human value*. Oxon, UK: Radcliffe Publishing Ltd.

Building the Foundation for a Healthy Life: Individuals, Communities, and the State

JOHN W. SEAVEY, PhD, MPH

JOSEPHINE PORTER, MPH

BARBARA ARRINGTON, PhD, FACHE

Population Health

SOCIETIES CREATE THE CONDITIONS leading to a population's health or lack thereof. While this is a simplistic statement, it has dramatic consequences as reflected in the variation in levels of health from community to community that have nothing to do with the natural conditions of life. Housing, education, crime, food supply, pollution, employment, access to medical care, unemployment, and other factors not associated with biological processes interdependently create the foundation on which healthy lives are built. What are these factors and how can those be changed to optimize health of individuals and populations? Multiple models have been developed to explain why certain communities are healthier than others. A popular model, developed by Robert Evans and Greg Stoddart in 1990 and re-designed in 2003 takes into account our current understanding of the determinants of health.ⁱ The Evans and Stoddart model comes out of the Canadian Institute for Advanced Research (CIAR) and has been widely used by communities (including the state of New Hampshire) to model the determinants of health.

The model indicates that health begins with individual values and beliefs, and then builds on knowledge gained through experience, our evaluation of what we do (evidence-based medicine/public health) and scientific research. As our knowledge expands so does our understanding of what makes us healthy and how we can restore health. The model has various determinants of health (income and social status, social support systems, education, working conditions, physical environment, biology and genetics, personal health practices, healthy child development, and health services). The income and social status determinant suggests that not only does health differ between the rich

and the poor, but also that there is a social gradient, i.e., as income increases one's health also increases.ⁱⁱ Some of the other determinants (such as education and working conditions) may be correlated with income but also have their own impact on health. The contribution of genetics has become increasingly apparent with the genome-mapping project. However, genetics is not destiny; a genetic predisposition to a disease may or may not materialize given individual behavior or social and physical environmental characteristics. At the bottom of the list of determinants is health care services. While health care is a \$2.7 trillion a year industry in the United States, its contribution for health status is estimated to account for approximately 10 percent of the variation in a country's health status.ⁱⁱⁱ

The Evans and Stoddart model also assigns responsibilities for improving health. Those include the individual, family, community, health care system, and society as a whole. It also delineates various strategies that individuals/societies can use, including reorienting the health system, developing personal skills, creating supportive environments, building healthy public policy, and strengthening community action. Reorient health services is meant to build a health system that focuses more on health promotion and disease prevention rather than fixing people after they are sick or disabled. Building a healthy public policy will be discussed later in this essay.

The Role of the Individual

Individual responsibility is an ever-present consideration in current conversations concerning health and health reform. The word responsibility has many definitions. Responsibility can be legal or moral, an obligation; responsibility can be causal—accountability or fault can be assigned; role responsibilities are parent,

teacher, learner, etc.; and scope of responsibility can range from great to little. Regardless of definition, the central questions are two: Who is responsible? For what? In terms of the “who”, the Evans and Stoddart model shows that responsibility for health is complex and shared, but for what are individuals most directly responsible?

As we come to understand the multiple determinants of health, the list of agents whose actions have a role in its maintenance and restoration grows long—ranging from international organizations to states, communities, employers, insurers, and the health professions...who is responsible for health? ...it is increasingly clear that individual choices...are at least as significant in achieving good health outcomes as costly medical interventions... actions taken can have a marked and positive impact on one’s health while also radiating good effects on other dimensions of life and on other people.^{iv}

It is difficult to be precise as to where individual responsibility begins. For example, many people feel that if a person engages in risky behavior (smoking, drinking alcohol, eating high fatty foods, etc.) that society’s obligation to the individual is diminished. However, it is tricky to lay responsibility on the individual. One must assume that the individual is acting freely and with full knowledge of the consequences. However, that is not always easy to demonstrate. When do you assume that all individuals should know the danger of “X”? Societal/cultural norms as well as economic conditions shape an individual’s expectation of what is acceptable, permissible, and affordable. Is smoking in the South to be treated differently than smoking in the Northeast? How much of a person’s limited income should we expect them to spend on expensive fresh fruits and vegetables? While we tend to fault people for risky behaviors, we do not do so for people that engage in sports that might be dangerous. It is easy to turn individual responsibility into “victim blaming,” blaming people whose choices may be unwise in the larger picture but not truly voluntary or acted upon with clear knowledge of the risks.

It is also not clear where individual responsibility ends. One of the major principles of the German health care system is “obligation,” that the individual has a social obligation to pay for health insurance, to share the burden of caring for illness. This has been adopted by the state of Massachusetts in its requirement for mandatory health insurance and is now being

considered as a cornerstone of health reform at the federal level.

It is easy to suggest that individuals are responsible for their own health; at one level they are. However, it is difficult to draw the line between individual responsibility and the role of other actors such as family, communities, and society as a whole.

Competencies and Skills

At the individual level, much has been written about health literacy. According to the U.S. Department of Health and Human Services, health literacy is “the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions.”^v An individual’s level of health literacy can impact their decisions and outcomes along the continuum of health. Whether or not people understand how infectious diseases spread can impact hygiene, recognizing the consequences of food choices can impact healthy eating habits, and misunderstanding the instructions for medication use can cause adverse drug events.

How an individual becomes health literate is not always clear. Some information is learned in school. Familial and cultural influences can impact health literacy (hand washing and healthy eating). The public health system conveys important health messages. In recent years, advertising about pharmaceuticals has become a major source of “health education.” Many people get health information from the Internet without a way to determine its accuracy. Some argue that improving health literacy is the responsibility of health care providers. The ability to comprehend health information can vary. How well can one understand medical information when it is part of a devastating diagnosis? Do we expect an 85 year old to navigate through the myriad of private pharmaceutical plans available under Medicare?

What role does an individual have in his/her own health care decision-making? Is it the responsibility of the care provider to offer multiple options, or the responsibility of the person to ask? Extensive research on supplier-induced care indicates that^{vi} medical care services will be used to the extent they are available, at times irrespective of actual need. In the face of multiple treatment choices, individuals need to understand the pros and cons of different treatment choices and how those align with personal preferences and values. For this to happen, people need to be active participants in decision-making.

The Role of Public Policy and Health

Any political system has to determine the role of government and individual freedoms/responsibilities. To what extent does society restrain individual actions for the purpose of society as a whole? Erich Fromm describes this as the difference between “freedom from” government and “freedom to” or the use of government to provide the conditions for freedom.^{vii} The recent legislative debate on mandatory use of seatbelts in New Hampshire came down on the side of individual “freedom from.” “Freedom to” can be exemplified by the use of mandatory public education (restricting individual freedom) to provide individuals with the tools necessary to live a full life and participate in a democratic society. For health and medical care, societies are on a continuum, with the United States placing more emphasis than others on individual freedom and responsibility and reliance on market mechanisms.

Within health there are two areas where government policies play a major role, one is in the area of public health and the other is the correction of market forces. The many environmental factors affecting health that are outside an individual’s control (water, air, purity of food and medicines, infectious diseases) are best addressed through public health initiatives. The recent spread of H1N1 virus demonstrates the need for global coordination. All societies (to some degree) attempt to modify behavior of individuals (e.g., smoking) and corporations (e.g., pollution controls) in order to protect the public’s health. All countries have policies to correct defects when the market system fails. In the United States, we have determined that because the market does not work well for the elderly (Medicare), the poor (Medicaid), children (SCHIP) and veterans (Veteran’s Administration) we have public medical care systems or insurance plans. Another example of correcting market failure is to provide assurance that services and products are safe and effective (e.g., the role of the Food and Drug Administration).

The determinants of health are multiple and complex with most of them involving to one degree or another public policy. For example, as seen in the Evans and Stoddart model, education is one of the variables that has a strong relationship with health. The more education one has the better the health for both the individual and a community; education policy becomes health policy. Transportation policy (the creation of sidewalks and bike paths to encourage exercise; mass transit, and lower polluting vehicles to decrease energy consumption and create cleaner air) becomes health

policy. Agricultural policy becomes health policy. Energy policy becomes health policy. During the current year, the Congress and the Presidency will be discussing “health reform.” This is better understood as “Medical Insurance Reform”—changing the ways that people gain and retain medical insurance rather than actually reforming health care. While critically important to individuals without access to medical care, this legislation is unlikely to result in much “health reform” since medical care is a small component of health. Our “health policy” remains focused on medical care rather than on health.

The importance of policy to health is frequently overlooked in this country; we do not consciously consider the health impacts of most enacted policies. In Europe Health Impact Assessment^{viii} is gaining acceptance. This approach analyzes the direct and indirect health impacts of all proposed legislation. Similar to environmental impact statements, there would be an analysis of the health impacts of widening interstate highways as opposed to the construction of rail lines, the health impacts of mandating completion of high school or the health impacts of allowing vending machines in schools. Despite potential methodological and data problems, even at the most basic level, such analyses would sensitize both voters and politicians to the intended and unintended health consequences of policy decisions.

Concluding Statement

The health of individuals and communities depends on a complex web of interdependent interactions among individuals, families, communities, corporations, non-profit organizations, states, nations, and international cooperation. Understanding these interdependencies along with associated individual and collective responsibilities and making informed and effective choices in light of this understanding builds the foundation for a healthy life.

Endnotes

- i. Evans R.G. and Stoddart G.L. Consuming research, producing policy? *American Journal of Public Health*. 2003; 93: 371-379.
- ii. Marmot M.G., Rose G.A., Shipley M.J., and Hamilton P.J.S. Employment grade and coronary heart disease in British civil servants. *Journal of Epidemiology and Community Health*. 1978; 32: 244-249.
- iii. Schroeder S.A. We can do better—Improving the health of the American people. *New England Journal of Medicine*. 2007; 357: 1221-1228.
- iv. Wikler D. Personal and social responsibility for health. *Ethics and International Affairs*. 2002; 16 (2): 47-55. Highbeam Research June 8, 2009 www.highbeam.com.
- v. U.S. Department of Health and Human Services. *Healthy People 2010*. Available at: <http://www.healthypeople.gov/Document/pdf/uih/2010uih.pdf>, accessed June 4, 2009.
- vi. Dartmouth Atlas Working Group. Dartmouth Atlas of Healthcare. Available at: <http://www.dartmouthatlas.org/>, accessed June 4, 2009.
- vii. Fromm E. *Escape from Freedom*. New York: Avon Books, 1941.
- viii. Dannenberg A.L., et al. Growing the field of health assessment in the United States: An agenda for research and practice, *American Journal of Public Health*. 2006; 96: 262-270.

Is it good to do good? Altruism and health.

MICHELE DILLON

SOCIOLOGY DEPARTMENT

THE LAST FEW YEARS have seen an expansion of interest in research on altruism and concern for others (e.g., Post 2007). While some scholars—psychologists, for example—focus on the personality traits that are conducive to care-giving behavior, others such as cultural anthropologists, are more inclined to explore whether different national cultures vary in their capacity to nurture concern for others. From a quite different perspective, there is interest among neuroscientists and evolutionary biologists in the genetic material that may determine altruism. These different researchers all raise intriguing questions about the nature and development of altruism. As a sociologist, my main interest is in the social context and social implications of altruism. In other words, I am interested in whether individuals from different social backgrounds and with different social experiences are more likely than others to engage in altruistic behavior and whether, in turn, concern for others has unintended consequences for the care-giving individual. In accord with this year's Discovery theme, "Taking care of self and community: A University Dialogue on health," I use this essay to simply highlight some research findings informing our knowledge of the impact of care-giving activities on individual health. This is not a clear-cut issue. As is so often the case in studying everyday life, it is not always possible to isolate one set of experiences from another; there are a lot of intricate interconnections that together have an impact on specific outcomes. In general, in social research (in contrast to the laboratory experiments of biologists and physicists), it is hard to say definitively what causes what. In the case of altruism and health, the knotty complication is that altruistic individuals may also be energetic and sociable people who simply like to be involved in all kinds of social activities, regardless of whether those activities show compassionate concern for others. It is difficult, therefore, to identify whether it is precisely altruistic behavior itself or a more general pattern of social engagement that is conducive to good health. Additionally, good health may itself influence who becomes altruistic and who doesn't.

What is altruism?

Altruism is typically defined as selfless concern for others. It is close in meaning to what the influential social psychologist Erik Erikson (1963) called generativity, to refer to the individual's concern for the welfare of future generations and for the world at large, and to the sociologist Pitrim Sorokin's (1954/2002) notion of compassionate love. All of these terms are more or less interchangeable; they assume a positive emotion toward others that extends to all of humanity and that is realized or enacted in care-giving behavior.

When we hear mention of altruism, we might readily think of some extraordinary people such as Mother Teresa of Calcutta or Paul Farmer, a medical doctor who has dedicated his life to improving the life conditions of the poor in Haiti, Peru, and other countries (e.g. Kidder 2003). Undoubtedly, these individuals have helped many extremely disadvantaged individuals and communities. However, a lot of altruistic behavior takes place in local communities far away from the media spotlight. Many Americans give hours of their time every month to volunteering—teaching inner city kids to read, working at a food pantry, visiting with an elderly neighbor who has Alzheimer's, giving free art classes in the community, etc. These activities also count as altruistic.

We know that community service looks good on your resume when you apply to college or for your first job, thus suggesting that care-giving activities may not always be motivated by the selflessness presumed in official definitions. Nonetheless, when social scientists describe someone as altruistic, they must have evidence not only of care-giving activities, but of a warm and caring ethos behind the person's commitment to those activities. It is important to note here the joint importance of both the motivation and the action. Good intentions alone are not enough; individuals must act on their concern for others by engaging in some pro-social care-giving activity. These care-giving activities can take many forms, whether directly helping some underprivileged group or an individual with a specific need, or engaging in less tangible activities such as working on long-term environmental sustainability issues, for example.

Altruism and health: Some research findings

The findings from a longitudinal research project in which I have been involved illustrate the long-term value of an early commitment to care-giving. The study's data were gathered over sixty years from extensively detailed personal interviews conducted at regular intervals across the lifetimes of a community sample of individuals who were born in California in the 1920s. The participants in the study were evenly divided by gender and social class, though reflecting the composition of the region at the time, most were white (see Dillon and Wink 2007 for specific details). The study used well-regarded indicators of altruism that focused on the individual's generosity and giving behavior toward others, emphasized the individual's pro-social competence, and their ability to translate altruistic impulses into care-giving accomplishments.

A key finding from the study was that individuals who were altruistic as adolescents grew up to have successful lives and were in better physical and mental health in late adulthood—in the post retirement years—than their peers who were not altruistic in adolescence. For our study's adolescents (back in the 1930s), gender, church attendance, or whether they came from working class or middle class families did not impact who was and who was not altruistic. By early adulthood (age 30s; 1950s), however, those who were altruistic as adolescents were more likely than others to have graduated from college and to be doing well economically. The altruistic individuals in our study, therefore, were upwardly mobile. Whether or not the pro-social competence that is a component of altruism facilitated their socio-economic success, this success most likely enhanced their access to, and use of, health care resources, resources which, in turn, help individuals maintain good physical and mental health. Thus, as we discovered in late adulthood when the study participants were in their late 60s/early 70s (late 1990s), those who were in good physical health—with no major or chronic illness—and those who were in good mental health who expressed a high level of life satisfaction, reported being peaceful, happy, and calm, and scored low on a widely-used depression scale, were also more likely to have been rated as altruistic during their adolescent years, more than fifty years earlier.

Such long-term positive links between adolescent altruism and good physical and mental health in old age raise questions about what exactly accounts for this relation. Longitudinal data are particularly helpful because with data available for several time points, it is possible to trace the timing of, and any changes in, an

individual's altruistic habits, as well as shifts in their socio-economic status, and the development of any mental and physical health problems, and thus control for these in the statistical analysis.

Longitudinal analyses predicting physical health in late adulthood showed that, after controlling for early adulthood characteristics regarding physical health, mental health, and social class, there was no relation between adolescent altruism and physical health in late adulthood. Thus something other than, or in addition to, altruism itself accounted for the finding that altruistic adolescents grew up to experience good physical health in old age. It is noteworthy, however, that individuals who were altruistic as adolescents were likely to not smoke cigarettes and to drink but to drink less alcohol at mid-life (in the late 1970s/early 1980s) than were their age peers who were not altruistic during adolescence. This finding prompts the suggestion that altruistic teenagers have a certain pro-social inclination that helps them to make smart choices that are beneficial to their current and long-term health (notwithstanding the fact that the negative effects of cigarettes were not publicly known when the study participants were teenagers or young adults).

In parallel analyses predicting mental health in late adulthood (and similarly controlling for early adulthood social class and physical and mental health), the positive association between adolescent altruism and good mental health in old age remained significant. This is an impressive finding: the association between altruism and good mental health spans sixty years. Thus, you can take a 15-year-old adolescent who is altruistic and confidently predict that she/he will be in good mental health when she/he is 70. This finding of a long-term relation between altruism and mental health suggests that good mental health in old age is directly related to the practice of care-giving instilled at a much earlier time in the life course.

Being involved in a purposive activity in the community—either helping specific individuals and/or collaborating with others in some joint activity—integrates individuals into the larger society by attaching them to someone or some cause beyond themselves (e.g., Bellah et al. 1985). Social integration in turn enhances both individual well-being and community bonds. Care-giving activities—whether in the service of other individuals or of the physical environment—also make altruistic individuals feel needed, that they matter, and such positive feelings, independent of their source, whether prompted by altruism or simple friendship, are also conducive to good mental health (e.g., Midlarsky and Kahana 2007).

Yet not all altruistic giving is necessarily healthy. We should recognize that individuals who feel compelled to give beyond their time and material resources (e.g., Schwartz 2007) or who find some care-giving practices emotionally overwhelming (e.g., Post 2005) may experience stresses that debilitate their mental health.

The relation between altruism and mental health is also complicated by the fact that pro-social behavior is not confined solely to volunteerism or altruism; pro-social individuals are also more likely than others to have more friends and acquaintances, and these are important resources in helping individuals cope with the stresses of everyday life (e.g., Oman 2007). The more people you know, no matter how close you are to them, the higher your chance, for example, of having access to information that might help you get a good-paying job (e.g., Granovetter 1973). Employment, rather than unemployment, acts as a buffer against stress, and also provides the individual with the economic resources to afford good health care in the event of illness. Hence the relation between altruism and good health is muddied by the many ways in which altruistic behavior is itself a dimension of a more general pattern of pro-social engagement.

Nevertheless, while many questions about the specific mechanisms linking altruistic behavior to good health outcomes remain to be answered in future research, the pattern of evidence presents a compelling case that overall it is good to do good. When concern for others translates into giving or behavior it is not only beneficial on a communal level but also offers tangible, long-term rewards to the giver. Thus there are good individual and societal reasons to encourage young people to show concern for others in daily life and to provide them with the opportunities for acting on their altruistic impulses.

References

- Bellah, Robert, Richard Madsen, William Sullivan, Ann Swidler, and Steven Tipton. 1985. *Habits of the Heart: Individualism and Commitment in American Life*. Berkeley: University of California Press.
- Dillon, Michele, and Paul Wink. 2007. *In the Course of a Lifetime: Tracing Religious Belief, Practice and Change*. Berkeley: University of California Press.
- Erikson, Erik. 1963. *Childhood and Society*. 2nd edition. New York: Norton.
- Granovetter, Mark. 1973. "The Strength of Weak Ties." *American Journal of Sociology* 78: 1360-1380.
- Kidder, Tracy. 2003. *Mountains Beyond Mountains: The Quest of Dr. Paul Farmer, a Man Who Would Cure the World*. New York: Random House.
- Midlarsky, Elizabeth, and Eva Kahana. 2007. "Altruism, Well-Being, and Mental health in Late Life." Pp. 56-69 in Stephen Post, ed., *Altruism and Health*. New York: Oxford University Press.
- Post, Stephen. 2005. "Altruism, Happiness and Health: It's Good to be Good." *International Journal of Behavioral Medicine* 12: 66-77.
- Post, Stephen, ed. 2007. *Altruism and Health: Perspectives from Empirical Research*. New York: Oxford University Press.
- Oman, Doug. 2007. "Does Volunteering Foster Physical Health and Longevity? Pp. 15-32 in Stephen Post, ed., *Altruism and Health*. New York: Oxford University Press.
- Schwartz, Carolyn. 2007. "Altruism and Subjective Well-Being: Conceptual Model and Empirical Support." Pp. 33-42 in Stephen Post, ed., *Altruism and Health*. New York: Oxford University Press.
- Sorokin, Pitrim. 1954/2002. *The Ways and Power of Love*. Conshocken, PA: John Templeton Press.

Well-Being: The Heart of Being Human, the Art of Being Whole

THE REV. DR. MARY E. WESTFALL

COMMUNITY CHURCH OF DURHAM, SENIOR MINISTER/UNH CHAPLAIN

DEPARTMENT OF PHILOSOPHY, ADJUNCT PROFESSOR

Health is a state of well-being and the capability to function in the face of changing circumstances.

—NH Citizens Health Initiative and Healthy UNH

It was late on a hot August evening. We had finished supper and it was not, yet, dark, so my husband, two children and I set out to take a short walk in our neighborhood. As we were returning home the moon, an enormous orange-gold ball, appeared on the eastern horizon. The dusky sky was still a pale shade of blue with Venus the only other visible light. The trees stood silently, their silhouettes looking like black filigree against the diminishing light. The air was so clear one could see the contours and craters of that stunning orb with unusual clarity. For almost an hour the four of us watched in quiet amazement as the dazzling moon rose slowly and impressively into the night sky.

Later, upon returning home, as we tucked our children into bed, Emma, then six years old, her eyes still shining with joy from the experience, said, “Oh mama, I don’t think I’ve ever seen such a beautiful moon, so big and full. It made my heart feel full just to see it.” Indeed, I too had felt a “full heart” at the exquisite beauty of that moonrise and felt grateful that my young child could feel such joy and wonder. As we turned to leave the room, our ever questioning four year old, Zachary, asked, “do you think the moon was as happy to see us?” Then he smiled and said, more to himself than to us, “I think so,” and closed his eyes in peaceful slumber.ⁱ

It is a scene repeated many times...an experience of awe, a response of joyful gratitude, a deeply felt sense of connection and belonging. Such encounters are often the source of inspiration for artists and writers and provide opportunity to experience a moment of human awareness that can fill one with a deep sense of peace, contentment, and well-being. Even as you read this essay, I invite you to pause and consider when you have had such an experience. What places or circumstances fill you with wonder or awe? In what ways do such experiences add to your sense of peace or well-being?

Though such awareness can arise in a variety of settings, nature often provides an endless source of such healing calm. Poet Wendell Berry describes finding peaceful well-being in the midst of his own frantic and harried life.

When despair for the world grows in me
And I wake in the night at the least sound
In fear of what my life and my children’s lives may be,
I go and lie down
Where the wood drake rests in his beauty on the water,
And the great heron feeds.
I come into the peace of wild things
Who do not tax themselves with forethought of grief.
I come into the presence of still water.
And I feel above me the day blind stars
Waiting with their light

For a time I rest in the grace of the world,
And am free.ⁱⁱ

Most of us know about despair. We look out at a world of increasing environmental degradation, global economic crisis, devastating poverty, terrorism, and the challenges and struggles of our own daily lives. The resulting stress and anxiety can be overwhelming. We do wake in the night with worry and we do fear what the future holds for us, whether it is concern over a job when we complete our education, or if there will even be a livable planet in 40 years. In a nation that enjoys one of the highest standards of living we do not seem to match that with high levels of happiness or personal satisfaction. In fact, many studies report that Americans have much higher rates of depression than their counterparts around the world. According to noted psychotherapist Bruce Levine, this may be due to an extremist

consumer culture that breeds discontent, coupled with medical and therapeutic definitions of what constitutes “health” that are far too limited and limiting.ⁱⁱⁱ Despite a high standard of living many suffer from deep feelings of alienation and despair. One study suggests that this reality stands in stark contrast to that of some of the poorest nations in the world. Nigeria, a nation plagued with rampant poverty, AIDS, and civil strife, is used illustratively on this very point, as their rates of depression are significantly lower than in the United States. Reflecting on this very study in an article about the psychological and spiritual importance of community and sense of belonging, Gregory Boyd comments,

A major difference (between the Nigerians and Americans) has to do with a sense of community. Nigerians generally know they need one another. They don’t have the luxury of trying to live solo, even if they have the inclination to do so. Consequently, they tend to have a sense of belonging that most American’s lack and this provides them with a general satisfaction in life, despite the hardships they endure. Many studies have shown that personal happiness is more closely associated with the depth of one’s relationships and what one invests in others than it is with the comforts one “enjoys.”^{iv}

If Boyd and others analyzing the data are correct, the challenge facing us today in regard to creating patterns of health and well-being within our own lives and communities, may involve intentionally derailing the myth of the consumer culture that claims money can bring happiness and well-being, and instead reclaiming and revaluing the human capacity to experience awe, gratitude, and to create meaningful connections. In the midst of these changing and challenging times, does higher education, itself, have a particular role in helping to derail some of the destructive aspects of consumer culture, and instead promote a more holistic concept of well-being that includes humans and the natural world? Could even the learning community of UNH be a place that promotes the values of awe, wonder, compassion, mystery, curiosity, not as something separate from its educational goals, but as an integral aspect of what it means to become an educated and contributing member of society? Once again, even as you read and seek to digest this essay, I invite you to pause and consider how you experience these issues. What causes despair to arise within you? How would you rate yourself as far as happiness and personal life satisfaction? What experiences bring you peace and a sense of belonging? Do you

believe these themes have relevance within higher education? Within your own life?

Pulling our selves free from a worldview that sees nature exclusively as resource, with life’s goal being to acquire and accumulate, will be no small task. Most of us have inherited a very particular way of viewing the world, nature, ourselves, even the concept of “community.” The American Dream has become one that focuses on getting and having, to the extent that we are now jeopardizing human health and that of our planet. Depression, heart disease, obesity, cancers, other physical and mental health issues are increasingly viewed as by-products of lives that have become out of balance. And that lack of balance has also led to planetary distress in the form of global climate change, the extinction of species, and an increasingly toxic environment. In response to the negative consequences of consumer culture there is a growing movement aimed to restore balance to our lives and to the planet through a shift toward more holistic and sustainable patterns of living. In the groundbreaking book, *Beyond the Limits: Confronting Global Collapse, Envisioning a Sustainable Future*, the authors acknowledge the urgent need to reclaim a deeper sense of what it means to be human and what truly brings health and wholeness. They challenge the perceived human need for cars and clothes and evermore “stuff,” and instead claim that humans need respect and meaning, experiences of beauty, joy, love and a sense of community,^v if we are to find sustaining and sustainable patterns for the future.

The simple story at the beginning of this essay becomes more than just a mother’s tender tale, but may provide a valuable illustration of what these times invite us to be about as we reclaim the heart of being human and the art of being whole. For the story reminds us that the ability to feel awe and wonder is not taught, but is intrinsic to our nature. Czech playwright, former dissident, politician, and respected world leader, Vaclav Havel refers to this as an awareness of the “Miracle of Being,” the human capacity to experience the sheer wonder of life and be filled by the miracle of existence. Retired UNH Philosophy and Religious Studies professor, Dr. Paul Brockelman, in the same spirit as Havel and six-year old Emma, has written extensively about amazement at the jaw-dropping reality of the universe and the ways such experiences can move one to a profound level of gratitude and feeling a part of that larger reality that is life itself.^{vi} And it is that experience of gratitude, the heart-filling sense of appreciation and connection that may be one of our most valuable assets in the quest for well-being and wholeness. “Gratitude

theory” as articulated by psychologists Dr. Robert Emmons and Dr. Michael McCollough states that gratitude can actually lead to good health as it decreases feelings of depression, fear, stress, bitterness, sadness, while helping increase enthusiasm, problem-solving abilities, optimism, and even a better night’s sleep. Their 2004 study involved participants keeping track of their experiences of gratitude and indicates that gratitude has far-reaching implication in regard to health and wellness.^{vii}

The moonrise story also provides an example of the ways we humans are not merely observing nature or our environment, but are intimately connected to it. When the child’s mind envisioned the moon experiencing happiness, he demonstrated a way of viewing nature in an “I-thou,” rather than an “I-it,” relationship (Martin Buber). Such a shift is not insignificant as it places humans in an entirely different context, no longer outside of nature, but truly embedded within and at home in the natural world. Geologist and priest, Thomas Berry refers to this as moving from viewing the natural world as a “collection of objects,” to experiencing the natural world as a “communion of subjects.”^{viii} No longer isolated or alienated from the natural world, the human comes to experience himself or herself as part of a larger, living reality, truly part of a community out of which a deep sense of belonging, satisfaction and peace can arise.

As you conclude your reading of this essay, once more I invite you to consider the role that gratitude plays in your life? Do you note, with appreciation, the vast, vault of blue on an early autumn day, as you look skyward? Do you allow yourself to be “filled” by the alluring call of the geese as they fly toward warmer climes? Does nature serve as the backdrop for your own existence, or the interconnected web that makes your own life and health possible? How might such awareness shape your day or add to your sense of connection and belonging?

Within higher education, indeed within our culture at large, there remains a long history of devaluing the very human capacities this essay seeks to name and celebrate. Descartes’ well-known words, “I think, therefore

I am,” were a break-through that placed new emphasis on the human capacity to think rationally, and has been a defining concept in our understanding of the “educated” person. His understanding, however, does not make room for many other essential qualities that not only bring meaning and texture to life, but also are intrinsic aspects of being a whole and educated person. “I feel therefore, I am.” “I love, therefore I am.” “I experience awe and wonder, therefore I am.” These concepts allow human beings, indeed, well-being itself, to be described and defined in increasingly holistic and dynamic ways. As we think about what it means to create health and well-being in our lives and communities, how might awe, gratitude and a deepening sense of community add to the discussion. Indeed, how might they add to our experience of life itself?

References

- i. Relational Learning For A Just and Sustainable Future: An Eco-Spiritual Model. Doctoral dissertation by Mary E. Westfall, University of New Hampshire, May 2001.
- ii. *The Peace of Wild Things*,” from *Openings*, Harcourt, Brace and Jovanovich, 1968
- iii. Levine, Bruce. *Surviving American’s Depression Epidemic: How to Find Morale, Energy and Community In a World Gone Crazy*. Chelsea Green Publishing, 2007)
- iv. *Created for Community*, Gregory Boyd. “Christian Century” Magazine, May 19, 2009, pgs 21-22.
- v. Meadows, Meadows and Randers. *Beyond the Limits: Confronting Global Collapse, Envisioning a Sustainable Future*. (Mills Post, VT Chelsea Green Publishing Company, 1992)
- vi. Brockelman, Paul. *Cosmology and Creation: The Spiritual Significance of Contemporary Cosmology*. (New York: Oxford University Press, 1999) pg.71.
- vii. Emmons and McCollough. *The Psychology of Gratitude*. (New York: Oxford University Press, 2004)
- viii. Berry, Thomas. *The Dream of the Earth*. (Berkeley: University of California Press)

Too busy to be healthy? Join the club.

PATRICIA A. HALPIN, PH.D.

BIOLOGICAL SCIENCES

UNH MANCHESTER

Obesity and sedentary lifestyles are common today. While obesity has become a global phenomenon, America is leading the way (Chopra, Galbraith and Darton-Hill, 2002). There are a number of national initiatives such as Healthy People 2010 (Kepel and Percy, 2009). However to be successful in empowering a nation to lead healthy and active lives, it has to start with the individual. It is possible that everyone can be more active and make healthy dietary choices. In order for this goal to be achieved, it has to begin with a positive *can do* attitude and peer support. Meeting the goal of obtaining a healthy and active life starts with small changes that can be maintained over a lifetime. We are all in this together and every individual should be active and eat well. This goal can be achieved.

When was the last time you heard someone say they had free time? Most likely it would be difficult to recall. As a nation we are constantly telling each other how busy we are. While I cannot imagine that the lives of our forbearers two hundred years ago were less busy, they had one advantage over our present generation: The lifestyles of our ancestors were more active by nature and necessity. As our activity levels decrease, our obesity levels increase. In 2008, 38.2 % of N.H. residents had a Body Mass Index (BMI) ≥ 25 , which is considered overweight, and 24.2 % had a BMI ≥ 30 , which is considered obese (Center for Disease Control and Prevention, 2008). The implications for this are staggering. The cost to keep this population alive for the remainder of their normal life expectancy will be very high. Yet there is a simple solution—adding more activity to daily life. Many will say it won't make a difference to include small amounts of physical activity into your life as fitness experts say as much as sixty minutes per day is required to stay healthy (U.S. Department of Health and Human Services, 2008). Yet the alternative is not sedentary. Moderate amounts of physical activity and exercise will benefit your overall health.

It may seem as if college students have a disadvantage because their daily course schedule is decided for them. If someone preferred to exercise in the afternoon

and now they have classes or labs every afternoon, they would consider themselves unable to exercise. Instead of complaining, think about the alternatives. Do you have a long walk from where you parked your car to where you have class? Well, you have a heavy backpack on, so pick up the pace and consider it a workout. If you live on campus and have to cross campus to make it to your next class, don't trudge along. Pick up the pace and consider it an addition of activity built into your day. Use the time and distance to your advantage. When you arrive at the building, use the stairs and take them more quickly than you normally would. These are great additions that when first added may seem awkward but when consistently done will become automatic over time.

What other ways are there to add activity every day? First and foremost, invest in your health by purchasing a pair of comfortable sneakers. Second, leave the sneakers and clean socks in your car or by the door in your room. This way they are handy, and you won't need to spend time searching for them. Instead of hanging out after class with your roommate in your dorm room or at the café, put your sneakers on and go for a walk with a friend and discuss the day. Here in Manchester we are lucky to have wide brick sidewalks on both sides our buildings. On one side is the beautiful Amoskeag River, which is always fun to walk along. Look up and you may see one of the resident bald eagles. On the other side is Commercial Street. If you keep walking past the Granite Street Bridge, you will end up at the Merchant-sauto.com stadium, home of the N.H. Fisher Cats.

Enlisting peer support is also a great idea. Walk together and discuss issues. When you have to meet with your adviser or professor, usually a period of time is set aside and agreed upon. If you will not be using technology for your discussion, suggest going outside and talking while you take a short walk around the building. The fresh air and change of scenery is apt to lift your mood as well as resolve the current issue at the same time.

Late afternoon snacking is a habit practiced by many of us. Caffeine is also often used to perk the brain up to ensure that mental capacity remains high throughout the remainder of the day. Instead of a poor choice of snack or caffeine, have a big glass of water and grab something prepackaged. "Prepackaged" in this case means an apple, a box of raisins, or vegetables pre-sliced and ready to go. The benefit is huge and the energy boost will last you until dinner.

Let us all move past the most common excuses for lack of attention to our health. The ones always heard are "I don't have time," and "I don't like to exercise." No one has free time to spare, so you have to schedule exercise into your day. It really does not matter whether we like the exercise, it just matters that we do it. Where do we get the time to Facebook, text message, email, surf the web, Twitter, or blog? Yet that is always a high priority. We are all in this together; everyone needs to eat a healthy diet and remain active. I know your mother told you that you were special, but in this case we all have the same requirements for health.

References

Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, (2008) Behavioral Risk Factor Surveillance System, *Prevalence and Trends Data*, New Hampshire 2008 Overweight and Obesity (BMI). Retrieved on June 18, 2009 from <http://apps.nccd.cdc.gov/brfss/display.asp?cat=OB&yr=2008&qkey=4409&state=NH>.

Chopra, M., Galbraith, S. & Darnton-Hill, I. (2002). A global response to a global problem: the epidemic of over-nutrition [Electronic version]. *Bulletin of the World Health Organization*, 80 (12), 952-958.

Keppel, K.G. & Percy J.N. (2009). Healthy People 2010: Measuring Disparities in Health [Electronic version]. *Chance*, Vol. 22 (1), 6-9.

U. S. Department of Health and Human Services (2008) *Physical Activity Guidelines for Americans*. Retrieved on June 18, 2009 from <http://www.health.gov/paguidelines/guidelines/chapter1.aspx>.

When You Walk, Do You Feel Like You Are Dancing?

DEBORAH KINGHORN

THEATRE AND DANCE

A young man studying at drama school in New York City in the early '70s receives a free ticket to a concert given by the Atlantic City Steel Pier Band. He goes and finds himself the youngest person there. He observes his fellow concert-goers: most of them much older, arriving in taxis, being helped down the aisles, using canes and walkers—unable to walk unassisted. As the band begins to play music of the '30s and '40s, he sees throughout the audience heads nodding in time, then shoulders beginning to keep the beat as well. Pretty soon, feet are tapping, bodies swaying. By intermission, those same people who could not walk unassisted discard their walkers and canes and are up and dancing together in the aisles. It is as if they have rediscovered their youth.

What caused this reversal? Was it, as many poets and philosophers have noted, the “power of music”? Or was there something else happening? How does a body that feels creaky and stiff with age and rheumatism suddenly find the springing step of youth? The answer, it turns out, can be found in the body's natural energy sources.

Arthur Lessac, renowned voice and movement specialist, has been studying the body's natural energy resources and their effects on health and wellness for the past 70 years. He pioneered new ways of improving vocal and physical performance through the study and application of the body's natural energy qualities to every area of human endeavor.

In Lessac voice and movement training in the theatre, we work with “feeling”—not the emotional meaning of the word, but feeling as a sensation. For example, close your eyes and focus inward for just a moment. Do you feel motion in your body? You can feel your heartbeat, your breathing, or the gentle, almost imperceptible, swaying of your body as it works to keep balance. These are all moving actions of the body, and as such, can be felt, or sensed.

What if you could not only feel inner sensation, but you could learn to utilize it to promote better health in yourself, both physically and emotionally? If you could teach yourself to feel love, trust, and happiness rather than hate, anger, and depression, wouldn't you do it?

Consider this: you are living and functioning in two different environments. On the one hand, there is the huge *outer environment*, with everything and everyone else in it, with its widely varied cultures, with its unexplored territories, with its powerful energy forces—like nuclear, electrical, solar, and water—and with its conditioning and patterning, which shapes the way we think and act.

On the other hand, there is your vast *inner environment*, with only you in it, with your unique personal culture, your unexplored inner wilderness, your intrinsic body energies, which promote vitality and create health and well-being, and your own genuine originality.

While there are beneficial elements in the outer environment, there are equally many elements that are unhealthy and even destructive to us, such as chemical additives in our foods, air pollution, or people who display hatred toward us. Unfortunately, these unhealthy elements do not stay in the outer environment—they find their way into our inner environments, where they do major damage. In fact, recent research has made significant connections between emotions and disease, such as anger contributing to heart disease, anxiety causing panic attacks or heart arrhythmia, depression contributing to headaches and back pain. These feelings create more than just discomfort in the body—they create ill-health. They slowly poison us.

The antidote to that poison lies within your *inner environment*. Your inner environment includes the functioning of various systems of the body, such as the nervous, endocrine, circulatory, digestive, musculoskeletal, cellular, respiratory, urinary, and sensory systems. You don't think about their functioning, but the processes of these systems are taking place every second of your life. You continually receive information from them, whether you are aware of it or not. And there are subtler and equally dynamic processes in the inner environment, such as consciousness, imagination, creativity, rhythm, and emotion, among others. Inside this landscape, things function healthfully—until something causes distress or disease. Poisons from the outer envi-

ronment can easily seep through the body's defenses, unless you become aware of them, and learn how to deal with them.

Think of your inner environment, then, as the kind of wilderness we are often trying to protect and preserve in the outer environment—one full of forests, streams, clean air, wildflowers, nature at its purest. If this environment becomes polluted, choked with the detritus of man's daily existence, it quickly becomes uninhabitable. Your inner environment functions the same way. It is polluted by many things from the outer environment—smoke, air pollution, chemical wastes in our drinking supply, and toxic chemicals in the food we eat. It can also be polluted by anger, hate, pain, greed, jealousy, or fear. This is the detritus we find strewn about in our inner environment, and without care, this environment, too, becomes uninhabitable. We must remember that we are the ecologists for both the outer *and* the inner environments. We and they are inextricably intertwined, and our lack of caring for them produces problems in our lives, like sickness, malaise, depression, and acts of hatred toward one another. While we individually exert little control over the whole of our outer environment, we have full control over our inner environment, and we have a responsibility to keep it healthy.

We can do this by utilizing the body's natural energy sources. The body naturally relieves pain and fatigue with three simple, yet effective, actions: yawning, sighing, and shaking. These can be quickly demonstrated if you imagine you have been driving for a long time in a car. When you finally stop and get out, you yawn through your whole body, shake yourself a little, and breathe deeply in and out, which provides you with relief from tension and pain, and then infuses you with energy. The pain relievers evolve into natural "relaxer-energizers," which are always healthful and sensory experiences. Some natural relaxer-energizers include yawning, humming, pleasure sighing, easy shaking, smiling, singing, laughing, and dancing. When you perform any of these actions easily, your body balances, and you feel good. On a higher level, the duality of breathing and posture, which is felt when we breathe easily and instinctively while standing, sitting, or moving with an elongated spine, is a potent relaxer-energizer. Likewise, the sensation of rhythm, which is fundamental to all body movement, is a sophisticated body relaxer-energizer. It is a self-regulating device and provides an esthetic experience of body symmetry, balance, and expression.

And this brings us back to those elderly concert-goers at the beginning of this article. These people responded to the relaxer-energizer of rhythm. They began to nod their heads, tap their feet, shake their shoulders, and then sway to the beat—all forms of shaking, a natural body pain reliever and a natural relaxer-energizer. Feeling the lessening of pain and the increase of energy, these elderly people were soon able to get up and begin dancing—another relaxer-energizer!—which then induced smiling and laughing, singing and humming, and better breathing—all relaxer-energizers. No wonder they feel younger!

When you feel and can sustain the energy qualities in your body, you can apply them to any situation where there is tension, anxiety, stiffness, or pain and feel relief. (For example, studies now show the effects of laughter in reducing cancer.) Likewise, it is impossible to hold onto hate, or any other negative emotion, while you are enjoying the body's natural energy qualities. And this is significant for our communities and our world at large because once you begin to take care of your inner environment, it is a natural step to want to improve the outer environment—both as an act of self-protection and of love. Thus, our own *healthfulness* can open the door to *humaneness*. We share much with other humans: both biological humanness and cultural humanness. All cultures can belong to all of us, because everything that is in another culture can be found in our bodies in the form of natural body energies, including singing, dancing, and humor. Once we accept our shared humanness, *humaneness* can be learned, and all humaneness is healthy. The poisons that can be dealt with through humaneness are the emotional and psychological poisons: hate, prejudice, jealousy, greed, wrathful-anger, lying, fear. First, we must recognize that, for the sake of healthfulness, we **MUST** control them. We must recognize and be utterly convinced that these are indeed the foulest of poisons, and that only an exceedingly selfish desire for healthfulness in ourselves and in our world will eradicate them.

When you walk, do you feel like you are dancing? If so, you are tapping into the fountain of wellness: your own body's energy.

I look forward to further discussion on this and other topics throughout the year.

Bibliography

Lessac, A. 1997. *The Use and Training of the Human Voice: A Bio-Dynamic Approach to Vocal Life*, 3rd edition, Mountain View, CA: Mayfield Publishing Company.

Lessac, A. 1990. *Body Wisdom: The Use and Training of the Human Body*, 2nd Edition, San Bernardino, CA: Lessac Institute Publishing Company.

Lessac, A. and Kinghorn, D. 2009. *The Way of Feeling: Feeling the Way*, unpublished book.

Calming the Mind, Healing the Body: Can alternative therapies help college students improve their health?

CAROLYN GAMTSO

UNIVERSITY OF NEW HAMPSHIRE AT MANCHESTER LIBRARY

A Nation under Stress

In 1991, sociologist Juliet Schor analyzed the amount of time workers spent “on the job” relative to time spent on leisure activities. Her book *The Overworked American* criticized a system that required employees to put in more and more hours at work and, as a result, to enjoy fewer and fewer hours at home. According to Schor, the resulting struggle to balance work and home lives led to a decrease in quality “family time” and a dramatic increase in stress (5).

Unfortunately, not much has changed in 18 years: recent studies indicate that stress and its attendant physical maladies are on the rise. A 2008 poll conducted by the American Psychological Association revealed that a full 80% of Americans are currently worried about money and the economy, a problem that shows no signs of abating. These emotional and psychological concerns are affecting the nation’s physical well-being, with respondents indicating that their stressed mental state has led to sleeplessness, headaches, and muscle soreness. Furthermore, being “stressed out” causes people to develop often unhealthy coping mechanisms such as poor eating habits, further exacerbating the downward spiral of stress and physical malaise (Park).

University students are certainly not immune to the many pressures that can lead to ill health and self-destructive coping strategies. The college years, while a time of excitement and discovery, are also fraught with worry as students learn to deal with a multitude of life changes and new responsibilities. Interviews with college students cite a variety of factors that made freshman year particularly stressful, including homesickness, increased workload, time management issues, sleep disturbances, and roommate conflicts (Rauf, Mosser, and O’Hagan). Other students may find balancing employment, family, and school work particularly challenging. These issues can severely interfere with learning objectives: in an American College Health Association survey, students indicated that the stress in their lives was the leading issue getting in the way of positive academic performance (*Healthy Campus 2010*).

Stress can also lead to many of the health problems that plague students on college campuses, including “fatigue, hypertension, headaches, depression, anxiety, and an inability to cope” (Dusselier, Dunn, Wang, Shelley, and Whalen 16). Students may handle these pressures by turning to strategies that will ultimately only exacerbate stress levels and ill health, such as alcohol and tobacco (Dusselier, Dunn, Wang, Shelley, and Whalen 16).

Clearly, there is a correlation between mental state and physical well-being. Unfortunately, many of the factors that lead to stress are difficult to eliminate: exams and paper deadlines will not disappear, and students will continue to feel nervous in the face of academic and social pressures. Several questions arise: Is it possible to develop strategies that can be employed to mitigate the effects of stressful lives? If it is true that a stressed mind leads to an unhealthy body, then can a relaxed mind lead to a healthy body? By actively working with the power of the mind to calm itself, is it possible to improve psychological and physical well-being?

Mindfulness

According to many ancient healing traditions that employ the concept of “mindfulness” to enhance well-being, the key is not in evading the cause of anxiety, but in controlling one’s *reaction* to the stressful situation. “Alternative” therapies such as meditation and yoga encourage practitioners to harness the deep power of their own minds to achieve a state of calm that then allows them to view problems in an entirely new light. From this place of equilibrium come the necessary resources to confront problems constructively, thus alleviating the negative effects of a busy lifestyle. This deep sense of calm is available to everyone, at any time, in the present moment, if we can train ourselves to truly *live in the moment*.

The concept of mindfulness has its roots in Buddhist philosophy, but today it is practiced by people of all traditions, often in a secular setting. It is being non-judgmentally aware of the present as it unfolds, being con-

scious of thoughts and feelings as they enter the mind moment by moment (Kabat-Zinn 2). It isn't as simple as it sounds. The mind is rarely at peace, hopping from one random thought to another, rarely dwelling in the present but instead remembering the past, anticipating the future. So many things arise to pull the mind out of the current moment as it is being lived—a phone call, a text message, a concern, a regret. Mindfulness practices such as meditation and yoga encourage the practitioner to return to the here and now by focusing the mind on one point—the breath, a sound, a physical posture.

Mindfulness-Based Stress Reduction (MBSR)

One of the most popular mindfulness-based therapies in the West is the Mindfulness-Based Stress Reduction (MBSR) program, developed by Jon Kabat-Zinn at the University of Massachusetts Medical Center to assist patients with chronic pain and health issues manage their symptoms (Kabat-Zinn 1). MBSR encourages the development of mindfulness through the use of seated meditation practice, in which practitioners are taught to center attention on their breath; a body scan technique, which coaches participants to focus on different regions of the body; and gentle yoga poses, which stretch and relax the muscles (West, Otte, Geher, Johnson, and Mohr 24). Practitioners are then encouraged to carry the wisdom gleaned from their experiences into their everyday lives, to focus on daily activities such as eating a meal, doing the dishes, listening to a friend, or studying for an exam with their full awareness on the sensations and emotions of the actual moment. In this way, every lived moment becomes a meditation.

Yoga

Yoga is an ancient Indian “science of life” (Venkataramana, Poomalil, and Shobhasree 89). The term “yoga” derives from a Sanskrit word meaning “to bind, join, attach, and yoke” (Iyengar 19), expressing the fundamental link between the mind and the body. The practice of *hatha yoga* focuses on the body as it moves and stretches. In the West, there is often a strong emphasis on the physicality of yoga; however, in the classic yogic text *The Yoga Sutras*, the Indian sage Patanjali describes yoga as “[t]he restraint of the modifications of the mind-stuff” (Patanjali 3), the control of those mental disturbances that create psychological stress. According to yogic philosophy, from these mental fluctuations arise various physical and emotional ailments (Venkataramana, Poomalil, and Shobhasree 90). By controlling these fluctuations, the practitioner can enhance well-being. Hatha yoga uses a series of postures—or asanas—that improve

health by increasing strength and flexibility. However, yoga's power is in its connection to the mind: practitioners (*yogis*) are taught to use the body's movement as the focus of concentration (in the same way MBSR focuses on the breath). By centering all attention on the body as it moves and stretches, yogis clear the consciousness of its clutter, thus paving the way for a deep relaxation at the end of practice. The beauty of yoga as a physical discipline is its absence of competition and judgment: yoga practitioners are encouraged to accept their bodies as they are, without focusing on physical limitations. It is the attention brought to the practice that yields the desired result—clarity of mind.

Efficacy of Mindfulness Practices

Many studies have concluded that MBSR, yoga and mindfulness practices can positively enhance well-being and can “lead to significant improvements in psychological functioning in a wide range of populations” (Carmody and Baer 24). By centering attention on the present moment—the only thing that can be controlled—mindfulness develops a changed attitude toward stressful situations, developing an ability to disengage from the riot of emotions that often accompanies our reactions to events, and to an increased ability to constructively approach all interactions (Weinstein, Brown, and Ryan 381; Shapiro, Oman, Thoresen, Plante, and Flinders 857). Studies of high school and college students reveal that a regular yoga practice decreases their sense of stress (Venkataramana, Poomalil, and Shobhasree; West, Otte, Geher, Johnson, and Mohr), while research of undergraduates indicates that mindfulness meditation results in long-lasting beneficial effects (Shapiro, Oman, Thoresen, Plante, and Flinders).

Personal Practice

Mindfulness practices such as meditation and yoga, while having an esoteric reputation, are actually simple to incorporate into one's life. Because they can be practiced independent of any religious tradition, they are universal in their appeal. You may find it beneficial to develop a personal mindfulness practice to help with the day-to-day pressures of college life. To begin, sit in a comfortable position, in a chair with your back straight or cross-legged on the floor. While breathing normally, focus attention on the sensation of breathing, such as the feeling of the air as it enters and leaves the nostrils, or the rise and fall of the stomach. If the mind wanders, gently bring attention back to the breath. Observe thoughts passively, without getting caught up in them, acknowledging them and then simply releasing

them. (You may want to visualize them as clouds floating away, or leaves drifting off on a current of water.) Practice this technique for three minutes, then ten, then twenty. Try the practice before an exam, as a break from writing a paper, or before facing a challenging situation. Over time, you will probably find yourself facing everyday stresses with patience and equanimity.

To explore more alternative therapies, try looking into campus resources available through UNH Health Services, including yoga classes (<http://www.unh.edu/health-services/ohep/yoga.html>), massage, acupuncture, and information of various meditation techniques (<http://www.unh.edu/health-services/ohep/holistic.html>). UNH Manchester students can explore the many yoga studios in the area, some of which offer student discounts: http://www.yoga-centers-directory.net/usa/new_hampshire.htm. With time and effort, you will notice the positive effects of mindfulness on your health, your stress level, and your emotional state.

The adverse health consequences of tension and anxiety are well-documented, but individuals can take ownership of their own reactions to the pressures around them—and improve physical and psychological wellness—by training themselves to be mindful in the present moment. Ultimately, meditation and yoga are empowering practices that teach participants to find their own healthy ways to face life's many challenges. The end result is a mind that is calm and at peace, and from that place of clarity arise the conditions that lead to improved health and well-being.

Works Cited

- Carmody, James and Ruth A. Baer. "Relationships between Mindfulness Practice and Levels of Mindfulness, Medical and Psychological Symptoms and Well-Being in a Mindfulness-Based Stress Reduction Program." *Journal of Behavioral Medicine* 31 (2008): 23–33.
- Dusselier, Lauri, Brian Dunn, Yongyi Wang, Mack C. Shelley, and Donald F. Whalen. "Personal, Health, Academic, and Environmental Predictors of Stress for Residence Hall Students." *Journal of American College Health* 54 (2005): 15–24.
- Healthy Campus 2010*. American College Health Association. Web. 6 July 2009. http://www.acha.org/Info_resources/hc2010.cfm.
- Iyengar, B.K.S. *Light on Yoga*. New York: Schocken Books, 1979.
- Kabat-Zinn, Jon. *Full Catastrophe Living: Using the Wisdom of Your Body and Mind to Face Stress, Pain, and Illness*. New York: Delta Trade Paperbacks, 2005.
- Park, Madison. "Study: 8 out of 10 Americans Stressed Because of Economy." *CNN.com* 9 Dec. 2008. Web. 6 July 2009.
- Patanjali. *The Yoga Sutras of Patanjali*. Trans. Sri Swami Satchidananda. Yogaville, Virginia: Integral Yoga Publications, 1990.
- Rauf, Don, Traci Mosser, and Caitlin O'Hagan. "Reality Check: Freshman Survivors Tell All." *Careers & Colleges* 24 (4): 30–34.
- Schor, Juliet B. *The Overworked American*. New York: BasicBooks, 1992.
- Shapiro, Shauna L., Doug Oman, Carl E. Thoresen, Thomas G. Plante, and Tim Flinders. "Cultivating Mindfulness: Effects on Well-Being." *Journal of Clinical Psychology* 64 (2008): 840–862.
- Venkataramana, Hari Lakshmi, Sudha Nair Poomalil and T. Shobhasree. "Effect of Yoga on Academic Stress of High School Students." *Social Science International* 24 (2008): 89–97.
- Weinstein, Netta, Kirk W. Brown, and Richard M. Ryan. "A Multi-Method Examination of the Effects of Mindfulness on Stress Attribution, Coping, and Emotional Well-Being." *Journal of Research in Personality* 43 (2009): 374–385.
- West, Jeremy, Christian Otte, Kathleen Geher, Joe Johnson, and David C. Mohr. "Effects of Hatha Yoga and African Dance on Perceived Stress, Affect, and Salivary Cortisol." *Annals of Behavioral Medicine* 28 (2004): 114–118.

Can We Engineer Our Way to Good Health?

RUSSELL T. CARR, PROFESSOR OF CHEMICAL ENGINEERING

Abstract

Engineering technologies contribute to our health. Purification of drinking water has been of great benefit to public health. Large-scale production of penicillin is another engineering triumph that improved our health.

Medical imaging technology has come a long way since the X-ray. Ultrasound and MRIs are now commonplace. Can imaging technologies be used in new ways in our search for better health? Computer simulations promise greater understanding of physiologic processes in disease and health. Simulations require quantitative mathematical models of physiology.

Digital wireless communications can be used to build a national medical database. The benefits of such a database are great. What challenges must be overcome to make this a reality? The current identity-theft problem indicates that security and privacy are significant hurdles.

Chemistry is now being miniaturized, much like electronics were 50 years ago. EMTs could use “lab-on-a-chip” devices to get an “instantaneous diagnosis” from a drop of blood. Understanding of fluid behavior and chemical reaction on the micro-scale is required to develop a working “lab-on-a-chip.”

The April 1999 issue of Scientific American gave a glimpse of how “tissue engineering” might help health care. “Apligraf,” a tissue engineered skin product, is a shining success. Other efforts have been less successful. After more than 30 years, the search for a small-bore vascular prosthesis continues.

Unfortunately, the more technology we introduce into health care, the more expensive it becomes. Can we make these technologies affordable?

Engineering has a long history of improving public health. One hundred years ago, chlorination of drinking water started in the United States at Jersey City, N.J. In the beginning of the past century, local transportation was still by horses, even in the cities. As a result, animal waste was a major disposal problem and water-borne diseases such as cholera, typhoid, dysentery, and hepatitis A were killing about 25 out of 100,000 people in the U.S. at the time. Today, these diseases are virtually eliminated in America, and this is largely due to the purification and distribution of clean drinking water. The use of filtration and chlorine to halt the spread of water-borne diseases is often considered the most significant public health advance in history. Chlorination works because chlorine is a strong oxidizing agent, which “breaks” down the cell walls of the bacteria in the water. Chlorine activity continues while the water is in storage tanks and pipes so that the bacteria cannot repopulate. Clean drinking water continues to be a great need in many parts of the developing world and the design and construction of purification and distribution systems presents a major

undertaking. Even in “developed” countries, continued vigilance on water purification is required. There was a five-year epidemic of cholera in Latin America starting in 1991 largely because of reduced disinfection of drinking water. This relaxed attitude toward drinking water chlorination was partly due to U.S. reports about disinfection by-products in treated water. Research in water purification today includes the use of ozone and ultraviolet radiation.¹

Alexander Fleming discovered the antibiotic properties of *penicillium notatum* by accident in 1928. A stray spore of *penicillium n.* accidentally landed in a Petri dish that was prepared for a culture of *Staphylococcus*. After incubation, he noticed the presence of mold colonies surrounded by a zone of growth inhibited staph. To further explore the properties of this mold, he grew *penicillium n* in a surface culture on a liquid medium. After a week, the liquid under the growing mold colony, which Fleming called penicillin, was harvested. The introduction of penicillin as a therapeutic drug for medical care on a large scale did not occur until the middle 1940s. Fleming’s penicillin was extremely dilute,

impure, and chemically unstable. In response to fire bombings in England during World War II, a group of Oxford University researchers improved the surface-culture method to make enough penicillin for clinical trials. The dramatic effects of penicillin on wound healing convinced the Allies that the large-scale production of penicillin would save the lives of thousands of servicemen. Chemical engineers, microbiologists, chemists, and biologists from universities, government, and industry set out to mass produce penicillin. They searched for new strains of the mold and created mutant strains with ultraviolet light. They discovered better culture media. They invented a new purification processes. Even freeze drying was explored as a means to stabilize the antibiotic. Perhaps the most important development was the shift from surface culture of the mold to submerged fermentation in huge tanks. Problems in heat and mass transfer and careful control of the environment inside the tanks needed to be solved. By 1944, 100,000 unit vials of penicillin were coming off the end of the line at the Pfizer plant faster than they could be counted. The American Institute of Chemical Engineers considered the large-scale production of penicillin to be one of the greatest chemical engineering achievements of the century. The development and production of therapeutic chemicals is important in chemical engineering today as bioengineering represents a growth area.²

Imaging technology has come a long way from the X-ray. The ability to “see” what is happening inside the body can guide the diagnosis and effect the treatment of illness. Signal processing and the graphical representation of information in a visual format have led to novel ways of producing medically useful images. Computed tomography (CT scans) take a series of X-ray images and computationally reconstructs a 3D image. When my first child was born three decades ago, ultrasound imaging was fairly new. Now it is quite common. In my own family, ultrasound imaging has been used for prenatal care in pregnancy, amniocentesis, and echocardiograms. Magnetic resonance imaging provides greater contrast between “soft” tissues than X-rays and has found widespread use in medicine exploring brain, heart muscle, and cancer tissues. Infrared signals might be useful to detect breast cancer at a very early stage based on differences in the amount heat generated in cancer cells as opposed to normal tissue.³ Image signal processing and “machine vision” might be useful for examining light microscope slides for detecting differences between normal and diseased cells. Can image processing and computer simulations

be used to create “medical simulators” like those used in the training of airplane pilots?

Computer simulations require quantitative mathematical models of physiological processes. My own experimental research has focused on peculiarities of blood flow in small vessels that are incorporated into computer simulations of blood flow in microvascular networks. These types of simulations are used to answer questions about hypertension, vessel remodeling, and drug delivery among others. The use of mathematics to describe physiological phenomena has the potential to quickly advance our understanding of both normal and pathological physiology.⁴

When faced with an unusual or interesting clinical case, sharing information with other physicians can be invaluable to a doctor. In teaching hospitals, Grand Rounds is a formal meeting where doctors discuss current or interesting cases. Patients then receive input from several experienced medical personnel. This also increases the experience base of the doctors. Modern communications technology makes the sharing of information between doctors much easier. Today heart patients with an implanted cardio defibrillator can transmit information from the implant over the telephone to their doctor. This is a step in providing real-time medical monitoring of the patient to the health professional.⁵ Suppose EMTs could have access to information about prescription, allergies, etc. for victims when responding to emergencies. This could be done with a national medical database. What are the challenges of such an enterprise? Who is responsible for input of data? Who can have access to it? Who maintains the database once it is functioning? Can we protect patients’ privacy? Technologically, it appears feasible, but several social questions need answers.

Imagine instantaneous diagnosis from a drop of blood when the EMT arrives in response to a 911 call. This is known as point-of-care testing and is one of the dreams driving the development of a “lab-on-a-chip.” This is a Micro Mechanical Electric Systems, MEMS, device into which a drop of blood flows through a series of small channels, tens of microns in diameter, and chemical reactions are monitored to diagnose the condition of the patient. Such a device requires the understanding of micro-nano- manufacturing, fluid flow in very small channels (microfluidics), and chemical reaction at the micro scale. Although applications are limited today, great potential exists for the contribution of MEMS to health care delivery.⁶

Tissue engineering concerns the use of living cells to improve health. Can we engineer replacement tissues

for humans? The possibility is suggested by the discovery of stem cells and growth factors and the idea of cell differentiation. One of the first growth factors, BMP (bone morphogenetic protein), spontaneously induced the growth of new bony tissue when placed in animals. Not surprisingly, bone and cartilage are two of the first applications of tissue engineering with therapeutic value. The most successful tissue engineered product is human skin equivalent by Organogenesis. This is a product made from two layers of cells in collagen. This product promotes healing for persistent wounds and promoted the migration of host skin cells into the wound to replace the transplanted cells. Other attempts at tissue engineering have not been as successful. After more than thirty years of effort, the search continues for a small bore artificial blood vessel, as well as for cellular-based therapies for liver, pancreas, and heart disease.⁸

The technical possibilities of engineering our way to good health are fascinating. There are many problems to overcome and the journey should be exciting. A final question, however, does need to be considered. Can engineering technology make health care more affordable? In many endeavors, the introduction of more and more technology has made things more affordable. The tremendous research efforts in agriculture have resulted in very affordable food crops in the U.S. Communications, transportation, and housing are more affordable because of the use of technology. Is the same true for health care? The inclusion of innovative technologies into health care delivery has been cited as a major driver of the increase in the cost of health care. Certainly, health care costs have risen with the inclusion of more innovation, but availability of services has also grown.⁹ Finally, can we engineer our way to good health in a manner that we can afford?

Notes:

1. The faculty involved with the Water Treatment Technology Center are very active in projects to maintain our access to healthy drinking water. Professors Ballesterro, Collins, Jacobs, Kinner, and Malley of the Civil Engineering Department are very active in this research. One of the Environmental Engineering courses (ENE 740) is entitled Public Health Engineering.
2. For a fascinating history of the development of penicillin in the 1940s see *Chemical Engineering Progress Symposium Series* Vol 66 No. 100 (Eng TP 1.A62 No.100). PT Vasudevan, chair of the Chemical Engineering Department, teaches a Biochemical Engineering course at UNH (ChE 761) and many of our graduates work in the biopharmaceutical industry. Professor Vasudevan does important research in the area of enzyme kinetics and has developed a rapid assay for total blood cholesterol measurement.
3. Processing and interpretation of signals interacting with biological systems is taught in Biomedical Instrumentation ECE 784. CT scanners were invented at EMI (Electric and Music Industries Ltd) in England. It is often said that the funding for this project came from the success of their music recording business (Beatles, Beach Boys, etc.). Richard Messner of the Electrical and Computer Engineering Department is an expert on video image signal process and pattern recognition and has made attempts to automate the visual screening of malignant cells from Alzheimer's patients. F. William Hersman, Physics Department, polarizes Xenon to enhance MRI images of the lung.
4. See, for example, *Annals of Biomedical Engineering* vol. 33 pp 764-771, 2005. Greg Chini, Mechanical Engineering Department, has done recent work on particle deposition and impingement on thin liquid films in the lung.
5. Real-time monitoring of health parameters (vital signs) provides a measure of both wellness (normal state) and the onset of illness. The following video segment on the Internet may be interesting. <http://spie.org/documents/newsroom/videos/HaroldSzu.mov>
6. Nivedita Gupta, Chemical Engineering Department, has started a new course on Microfluidics ChE 722. The Material Science Program and the Chemistry Department participate in the Center for High-rate Nano-manufacturing, which is involved with MEMS devices.
7. *Scientific American* April 1999 issue starting on page 59. An interesting note: Gary Bowlin, graduate of the Chemical Engineering Department, is very active in tissue engineering research at the Biomedical Engineering Department of Virginia Commonwealth University. <http://www.egr.vcu.edu/FacultyDetail.aspx?facid=5>
8. An interesting view of the price of penicillin is included in the *Chemical Engineering Progress Symposium Series* vol. 66 No. 100 pp 20-21 mentioned earlier. Also see *Annals of Internal Medicine* 142:932-937, 2005 "High and Rising Health Care Costs. Part 2: Technological Innovation" for a recent analysis of technology-related health care costs.

Dodge this: do environmental chemicals impact your health?

GALE CAREY, PH.D.

NUTRITIONAL SCIENCES PROGRAM

MOLECULAR, CELLULAR, AND BIOMEDICAL SCIENCES

My journalist-as-guinea-pig experiment is taking a disturbing turn. A Swedish chemist is on the phone, talking about flame retardants, chemicals added for safety to just about any product that can burn. Found in mattresses, carpets, the plastic casing of televisions, electronic circuit boards, and automobiles, flame retardants save hundreds of lives a year in the United States alone. These, however, are where they should not be: inside my body.

—David Ewing Duncan¹
“The Pollution Within”

Not only are flame retardants detectable in Duncan’s body, he’s swimming in them: his flame retardant level is 10 times the average U.S. resident, and 200 times the average Swede. Is there any consolation in this? Perhaps—if Duncan catches fire, he should not burn...

Who are these chemicals?

Anthropogenic, or man-made, chemicals began appearing on the scene with regularity in the late 19th century. Their production limped along until the 1960s, at which time production exploded exponentially—pesticides, dyes, medicines, flavorings, perfumes, plastics, solvents, plasticizers, preservatives. They have made our life better and easier—medicines to fight disease, plasticizers to create tubing that delivers intravenous fluids, preservatives that prevent wood from rotting. We are now exposed to more than 100,000 chemicals in our daily lives.

We use 2.5 million tons of pesticides each year to prevent diseases like yellow fever, malaria, and West Nile virus. Our use of pesticides has increased 50-fold since the 1950s, and estimates are that not using pesticides would lead to a rise in food prices, a loss in jobs, and an increase in world hunger. But as scientists observed the chemical world around them, especially in the latter half of the 1900s, they discovered two things. The first was that pesticides were harmful to life. Originally developed to kill mosquitoes that carry malaria, DDT

was highlighted in Rachel Carson’s *Silent Spring*² as the culprit responsible for thinning eggshells and reducing survival of the bald eagle, peregrine falcon, and osprey.

The second thing scientists learned was that once we stopped producing pesticides—DDT production was halted in the U.S. in 1972—they didn’t go to that mythological place called “away.”³ They persisted—for decades.^{4,5} In a 2009 survey of 500 U.S. kitchen floors for 24 pesticides, DDT showed up in 41 percent and chlordane (another banned pesticide) in 74 percent of the households.⁶ How unfortunate is it that our children take the brunt of this, being low to the ground and quick to pop curious gravity-bound morsels into their mouths.

Another burgeoning category of chemicals is pharmaceuticals. Ever wondered what happens to the chemicals in a birth control pill? Once the synthetic estrogen prevents pregnancy and is eliminated from the body, it, too, goes “away,” into wastewater, past the treatment plant, and into our waterways. Do these estrogens contribute to the increasing phenomenon of male fish becoming female?⁷ Triclosan, the antibacterial chemical in liquid soaps,⁸ not only skips past wastewater treatment plants and arrives in estuaries and coastal waters of South Carolina and Florida, it gets into the bodies of bottlenose dolphins.⁹ Does that mean these chemicals can get into us?

Enter: Biomonitoring

Biomonitoring is assessing human exposures to natural and synthetic chemicals by analyzing samples of a person's tissues and/or fluids.¹⁰ Chemicals that have entered the body leave their mark—the chemical itself, its breakdown product, or its aftereffects. Blood, urine, breast milk, even hair and nails are common media for biomonitoring.

The U.S. Centers for Disease Control and Prevention conducts a national biomonitoring program and publishes their findings in the National Report on Human Exposure to Environmental Chemicals.¹¹ Blood and urine samples from a random sample of people ages 1–80 across the country are analyzed for chemicals and their metabolites. In their third report, covering 2001–2002, 148 chemicals were measured. What do they find?

First, they find there's no escape. If chemicals are in our soil, air, dust, or water—even if they are not in our food supply—they are in us. Second, they find that biomonitoring data can tell us if situations are getting better or worse. For example, in 1994, 4.4 percent of young children had dangerously high levels of lead in their blood. By 2000, this decreased to 2.2 percent. So our efforts to reduce lead exposure for children are working.

What about locally? We recently completed a biomonitoring study of forty lactating women in the Seacoast area of New Hampshire.¹² We wanted to know the breast-milk levels of flame retardants—the same compounds in David Ewing Duncan's body. Given that the breastfed infant is at the top of the food chain, just what are we inadvertently feeding our children?

Our sample population had levels of flame retardants that were 10–100 times that of breast milk from European women. There was no association between a woman's breast-milk level of flame retardants and her living environment, her age, her body size, and even what she ate, with one exception: the more fruit a woman ate during pregnancy, the lower the flame retardant levels in her milk. So there's pollution within. So what?

What me, worry?

In 1989, Theo Colborn observed that offspring of animals around the Great Lakes were afflicted with abnormalities in reproduction, metabolism, thyroid function, and sexual development—all systems that are driven by hormones. Colborn's work spawned an historic meeting of scientists in 1991 at the Wingspread Conference Center and gave birth to the endocrine disruptor hypothesis: a large number of man-made chemicals released into the environment, as well as a few natural ones, have

the potential to disrupt the endocrine system of animals, including humans.^{13, 14}

Because hormones are the most powerful biochemicals in our bodies, what happens when their actions are disrupted? Can chemicals that masquerade as estrogen cause an earlier start of menstruation in girls?¹⁵ Can chemicals that interfere with thyroid hormones lower a person's metabolism and cause obesity?¹⁶

Research on endocrine disrupting compounds, or EDCs, is thriving,¹⁷ with some 20,000 scientific papers published to date on the topic. UNH is contributing to this effort.¹⁸ Our lab and that of our colleagues has documented that flame retardants given to rats disrupt fat cell response to hormones,¹⁹ promote preference for sweet beverages,²⁰ and cause weight gain.²¹ These data suggest that flame retardants could be obesogens—chemicals that promote obesity.

And that's just the tip of the iceberg. We know that factors like the age, mixture, and dose of chemicals to which you are exposed will determine how your body responds. Note, however, that our experiments are on rats; we can't do these experiments on people. But we can observe, like scientists in Denmark, who have correlated a decline in sperm count with a rise in environmental chemicals. Scientists recognize, however, that correlation is not cause and effect. Case in point: the number of sunbathers at Hampton Beach directly correlates with the number of sunny days. Do sunbathers cause sunny weather? No. So a broader question is: how certain do we need to be about this cause and effect?

Scientists love certainty, or at least knowing the probability of being certain. For example, we know that administering a flame retardant to a rat will reduce its thyroid hormone levels to 20 percent of normal. We can say this with 95 percent certainty (that is, $P < 0.05$), admitting that there's a 5 percent chance that the flame retardant has no effect on thyroid hormone levels. Alas, even in the best of worlds, there's no such thing as complete certainty.

The European Union gets this. It subscribes to the Precautionary Principle: When the health of humans and the environment is at stake, it may not be necessary to wait for scientific certainty to take protective action. So in June 2007, the EU signed REACH—Registration, Evaluation, Authorisation, and Restriction of Chemical substances—into law.²² REACH aims to improve the protection of human health and the environment through the better and earlier identification of the intrinsic properties of chemical substances. Industry is required to gather information on the properties of their chemical substances and register the information

in a central database in Helsinki. What are Americans doing?

Can we dodge this?

Our planet has become our toilet bowl, our “away.” But in a closed system, “away” is “here.” So do we continue to ask “what do these chemicals do to us?” and wait until all the evidence is in and we are certain? Or should we follow the Precautionary Principle and not allow monetary cost (as opposed to human health cost) to drive our moral fiber? American scientists say it’s time to act.²³ But can we? It means choosing health—not only of people, but of the planet—over the status quo.

Individually, environmental chemicals are impossible to dodge. David Ewing Duncan knows this firsthand. He saw his level of phthalates in his urine increase after showering and washing his hair (today’s personal care products are a great source of chemicals), and the level of mercury in his blood double after eating halibut and swordfish caught just beyond the San Francisco Bay.²⁴ It is only collectively—through engaged activism and lobbying for regulation that will decrease human exposure to endocrine-disrupting chemicals—that we can dodge this.

References

1. Duncan, D.E. (2006) The Pollution Within. *National Geographic*, October 2006. Author David Ewing Duncan writes of his experience as a guinea pig. He donated 14 vials of blood to be tested for 320 chemicals. <http://ngm.national-geographic.com/2006/10/toxic-people/duncan-text.html>
2. Carson, R. (1962) *Silent Spring*, Houghton Mifflin Co., Boston.
3. Hirshberg, G. (2009) Commencement address, University of New Hampshire. http://www.unh.edu/president/markhuddleston/speeches/commencement2009_hirshberg.htm
4. Interested to know what pesticides are in your food? Visit a database compiled by the Pesticide Action Network at <http://www.whatsonmyfood.org>
5. Interested to know what chemicals are in your environment? The Environmental Protection Agency, EPA, can be visited at <http://www.epa.gov>. Click on My Environment, and enter your zip code to learn about My Air, My Health, My Water, and My Land.
6. Stout, D.M. et al. (2009) American healthy homes survey: a national study of residential pesticides measured from floor swipes. *Environmental Sciences and Technology* 43: 4294-4300.
7. Gross-Sorokin, M.Y., Roast, S.D. and Brighty, G.C. (2006) Assessment of feminization of male fish in English rivers by the environment agency of England and Wales. *Environ Health Perspectives* 114 (suppl 1):147-151 (2006).
8. Although first introduced into soaps, detergents, and other cleaning and health care products, today antibacterials may also be impregnated into sponges, cutting boards, carpeting, upholstery, and even children’s toys.
9. Fair, PA, et al. (2009). Occurrence of triclosan in plasma of wild Atlantic bottlenose dolphins (*Tursiops truncatus*) and in their environment. *Environmental Pollution* doi:10.1016/j.envpol.2009.04.002.
10. Sexton, K., Needham, L.L. and Pirkle, J.L. (2004) Human Biomonitoring of Environmental Chemicals. *American Scientist*, 92:38-45.
11. U.S. Centers for Disease Control and Prevention (CDC; <http://www.cdc.gov/biomonitoring>) National Report on Human Exposure to Environmental Chemicals.
12. Dunn, R. (2008) Biomonitoring polybrominated diphenyl ethers in lactating women. Ph.D. Dissertation, University of New Hampshire, Durham, N.H.
13. The Wingspread Conference’s official title was “Chemically Induced Alterations in Sexual and Functional Development: The Wildlife/Human Connection.” <http://www.fao.org/agris/search/display.do?f=/1996/v2206/US9545328.xml;US9545328>

14. Colborn, T., vom Saal, F.W. and Soto, A.M. (1993) Developmental effects of endocrine disrupting chemicals in wildlife and humans. *Environmental Health Perspectives* 101: 378–383.
15. Colborn, T., Dumanoski, D. and Myers, J.P. (1996) *Our Stolen Future. Are We Threatening Our Fertility, Intelligence, and Survival? A Scientific Detective Story*. Plume, N.Y.
16. Baillie-Hamilton, P.F. (2002) Chemical toxins: a hypothesis to explain the global obesity epidemic. *Journal of Alternative and Complementary Medicine* 8: 185–192.
17. Krimsky, S. (2000) *Hormonal Chaos: The Scientific and Social Origins of the Environmental Endocrine Hypothesis*. The Johns Hopkins University Press, Baltimore.
18. UNH's Environmental Research Group was founded in 1987. Its mission is to conduct applied and fundamental environmental engineering and science research. Its 15 full and associate faculty members come from three departments (Civil Engineering, Microbiology, Chemical Engineering), reflecting the necessary interdisciplinary team approach to problem solving in today's world.
19. Hoppe, A.A. and Carey, G.B. (2007) Polybrominated diphenyl ethers (PBDEs) as endocrine disruptors of adipocyte metabolism. *Obesity* 15: 2942–2950.
20. Hennigar, S.R., Mirando, A.C., Ronan, A.M, and Tagliaferro, A.R.. (2008) Exposure to flame retardants promotes increased consumption of simple sugars. *FASEB J.* 22: 888.7.
21. Allgood, E.L. and Carey, G.B. (2009) The effect of diet and polybrominated diphenyl ether exposure on adipocyte and whole body metabolism in male Wistar rats. *FASEB J.* 23: 505.3.
22. Visit the REACH web site at http://ec.europa.eu/environment/chemicals/reach/reach_intro.htm
23. Diamanti-Kandarakis, E. et al. (2009) Endocrine-Disrupting Chemicals: An Endocrine Society Statement. *Endocrine Reviews* 30 (4):293–342.
24. Duncan's mercury level reached 12 micrograms/liter. Children suffer IQ losses at 5.8 micrograms/liter.

War of the Worlds: Our Worlds are Colliding and Infectious Disease is Winning

Emerging Diseases and the One Health Initiative

RICHARD FRENCH, DVM., MS., PH.D.

DIRECTOR, NEW HAMPSHIRE VETERINARY DIAGNOSTIC LABORATORY

MOLECULAR, CELLULAR AND BIOMEDICAL SCIENCES

Abstract

Quoting the U.S. Surgeon General (1968), it is time to “close the book” on infectious diseases and shift public health resources to address chronic diseases. But our public health leaders can make mistakes. Around the time the Surgeon General was writing, there were scattered reports of a very interesting wasting disease among Africans that was noticed by missionaries. We now realize that these were the earliest cases of a newly emerging infectious disease: HIV/AIDS. Today, HIV/AIDS and other infectious diseases continue to pose a substantial threat throughout the world. Collectively, infectious diseases are the second leading cause of death globally, following cardiovascular disease, but among young people infections are overwhelmingly the leading cause of death. As we eradicate diseases such as polio and smallpox, something else emerges and takes their place. This is the nature of the perpetual challenge of infectious diseases. We now combat newly emerging diseases, 75 percent of which are associated with animals—zoonoses—and many are of our own creation. Multiple factors, including economic development and land use, human demographics and behavior, and international travel and commerce, contribute to the emergence and re-emergence of infectious diseases. Almost all of these factors reflect, in some measure, the encroachment of human civilization on the environment and on the microbial species that inhabit our environment. This has led to the new concept of a One Health Initiative, an all-inclusive collaboration among physicians, veterinarians, and other scientific-health related disciplines. The human species lives in a deli-

cate balance with microbial, animal and plant species; we should remember, however, that in this balance there is also an ever-present tension. Human beings have somehow separated themselves from the natural world in which we live. We have altered the physical, chemical, and biological systems and thus the balance. Our health depends on the health of other species and a healthy functioning ecosystem. That system is out of balance and we can run from the battles ahead or join the battle in this war of the worlds—the biological diversity, including infectious and emerging diseases

You are at a time in your life when you have the opportunity to ask questions, seek knowledge, and define the direction of your life. Here, I present you with a number of questions and facts. I hope to stimulate your interest and arouse your awareness of the world around you.

FACT: *Every 30 seconds a child dies of infectious disease.*

And we are only speaking of one disease agent. Malaria is a life-threatening disease caused by parasites that are transmitted to people through the bites of infected mosquitoes. And yes, a child dies of malaria every 30 seconds from this disease. There were 247 million cases of malaria in 2006, causing nearly one million deaths, mostly among African children. But what is interesting is that malaria is preventable and curable. Approximately half of the world's population is at risk of malaria, particularly those living in lower-income countries. This is also where the greatest population growth is expected in the world. Travelers from malaria-free areas to disease “hot spots” are especially vulnerable to the disease. More importantly, malaria takes an eco-

conomic toll—cutting economic growth rates by as much as 2 percent in countries with high disease rates. Thus, the disease prevails, winning over the prosperity of a country and continent. The battle to control malaria is ongoing.

FACT: A disease was once regarded as vampirism. When one member of a family died from it, the other members that were infected would lose their health slowly.

According to the World Health Organization (WHO), nearly 2 billion people—one third of the world's population—have been exposed to the tuberculosis pathogen. Annually, 8 million people become ill with tuberculosis, and 2 million people die from the disease worldwide. In 2004, around 14.6 million people had active TB disease with 9 million new cases. The annual incidence rate varies from 356 per 100,000 in Africa to 41 per 100,000 in the Americas. Tuberculosis is the world's greatest infectious killer of women of reproductive age and the leading cause of death among people with HIV/AIDS.

The rise in HIV infections and the neglect of TB control programs have enabled a resurgence of tuberculosis. The emergence of drug-resistant strains has also contributed to this new epidemic. From 2000 to 2004, 20 percent of TB cases were resistant to standard treatments and 2 percent were resistant to second-line drugs. The rate at which new TB cases occur varies widely, even in neighboring countries, apparently because of differences in health care systems.

Before the Industrial Revolution, tuberculosis was sometimes regarded as vampirism. Tuberculosis is a communicable disease that would work its way through a family. Before we understood the disease, people believed that this was caused by the original victim draining the life from the other family members. Furthermore, people who had TB exhibited symptoms similar to what people considered to be vampire traits. People with TB often have symptoms such as red, swollen eyes (which also creates a sensitivity to bright light), pale skin, extremely low body heat, a weak heart and coughing blood, suggesting the idea that the only way for the afflicted to replenish this loss of blood was by sucking blood.

In a recent publication of *The New England Journal of Medicine*, authors documented the transmission of a multidrug-resistant *M. tuberculosis* infection during travel in an airplane. The World Health Organization and the Centers for Disease Control and Prevention (CDC) issued and published guidelines for the airline

industry to help minimize the risk of tuberculosis (TB) and other infectious diseases being passed from passenger to passenger on board aircraft.

FACT: Worldwide, one death in three is from an infectious or communicable disease.

However, almost all these deaths occur in the non-industrialized world. Health inequality affects not just how people live but often dictates how and at what age they die. Can we live with this? Where's our next disease coming from? The answer is that it could come from anywhere in the world—from overflowing sewage in Cairo, from a war zone in Iraq (*Acinetobacter baumannii* is a species of pathogenic bacteria that is naturally resistant to many antibiotics, and there have been many reports of *A. baumannii* infections among American soldiers wounded in Iraq), from an energy-efficient office building in California. Sick building syndrome (SBS) is a combination of ailments associated with an individual's place of work. The World Health Organization suggests up to 30 percent of new and remodeled buildings worldwide may be linked to symptoms of SBS (toxic mold microbes, chemicals, even lighting), from a poultry farm in China (Bird Flu) or Mexico (the Swine Flu). There is a pattern lying beneath the new diseases in the headlines (AIDS, Lyme) and the old ones resurgent (tuberculosis, cholera). As the human population explodes, ecologies collapse and simplify, and disease organisms move into the gaps. As globalization continues, diseases can move from one country to another as fast as an airplane can fly. As Laurie Garrett writes in *The Coming Plague: Newly Emerging Diseases in a World Out of Balance*, "while the human race battles itself... the advantage moves to the microbes' court. They are our predators and they will be victorious if we, *Homo sapiens*, do not learn how to live in a rational global village that affords the microbes few opportunities."

FACT: Infectious disease is on the rise. In 1978 a disease was noted to be transmitted by ticks. In 2009, those same ticks transmit multiple diseases and can transmit them all at the same time.

Lyme disease is the most common tick-borne disease in North America and Europe and one of the fastest-growing infectious diseases in the United States. Of cases reported to the United States CDC, the ratio of Lyme disease infection is 7.9 cases for every 100,000 persons. In the ten states where Lyme disease is most common, the average was 31.6 cases for every 100,000 persons for the year 2005. Although Lyme disease has been reported in 49 of 50 states in the U.S., about 99 per-

cent of all reported cases are confined to just five geographic areas and UNH is in the “hot-zone” of coastal New England. And, in your lifetime—the past two decades—ticks that transmit *B. burgorferi* to humans now carry and transmit several other parasites such as *Theileria microti* and *Anaplasma phagocytophilum*, which cause the diseases babesiosis and human granulocytic anaplasmosis (HGA), respectively. Among early Lyme disease patients, depending on their location, between 2 and 12 percent will also have HGA and between 2 and 40 percent will have babesiosis. The early clinical presentations of Lyme disease, HGA and babesiosis are indistinguishable from many common infectious and noninfectious disease; fever, headache, myalgia and malaise. So, with that next tick bite you may have not 1, not 2, but 3 infectious diseases with potential serious health consequences.

FACT: *Nearly 75% of emerging infectious diseases are zoonotic, transmissible between animals and man.*

In 1963, the respected physician and anthropologist T. Aidan Cockburn made the following statement in a book called *The Evolution and Eradication of Infectious Diseases*: “We can look forward with confidence to a considerable degree of freedom from infectious diseases at a time not too far in the future. Indeed...it seems reasonable to anticipate that within some measurable time...all the major infections will have disappeared.” Five years later, in 1968, the U.S. surgeon general noted that it might be possible with interventions such as antimicrobials and vaccines to “close the book” on infectious diseases and shift public health resources to chronic diseases. However as I mentioned at the outset, even public health leaders can make mistakes. AIDS was first reported June 5, 1981, when the U.S. Centers for Disease Control (CDC) recorded a cluster of other opportunistic diseases. In actuality it was in the U.S. for at least a decade. It took years to realize that there was a *newly emerging infectious disease*: HIV/AIDS. HIV/AIDS has changed the world and the views on infectious disease and the need to approach these new diseases with vigor and respect...a single virus and few gene mutations in a microbe can result in the death of millions.

Among the infectious diseases throughout the world there is the baseline matrix or pattern of infectious diseases that constitutes an ongoing threat. Then there are diseases that occur intermittently, some as little blips on the radar screen and some as major public health issues. At some point in time the matrix diseases have all been

emerging diseases. But after a while they become so entrenched and are considered part of the background matrix and not emerging or re-emerging diseases. So as we eradicate diseases such as polio and smallpox, something else emerges and takes their place. This is the nature of the perpetual challenge of infectious diseases.

What do I mean by a newly emerging disease? A *newly emerging disease* is a disease that has never been recognized before. HIV/AIDS is a newly emerging disease, as is severe acute respiratory syndrome (SARS), Nipah virus encephalitis, Ebola, Hanta virus, new strains of influenza, West Nile virus and variant Creutzfeld-Jakob disease (vCJD). Let’s take this latter disease as an example, vCJD. But, let’s twist it a little with reality in the fact below.

FACT: *The world population has doubled in the last 50 years. The population now exceeds 6 billion. The world population will again double in less than 50 years.*

We can’t seem to manage to provide healthy nutrition or even feed the 6 billion people that exist on this planet. How are we going to manage to feed 12 billion people? Keep in mind that we now turn 30 percent of our grains into biofuels. There is a food crisis. You would not know that visiting the local food market. The problem is not necessarily in your back yard but it certainly affects you. Consider variant Creutzfeld-Jakob disease (vCJD). How did this disease arise? The world needs protein and meat is a primary source. But, how do we raise this meat and how quickly can we do it? One answer has arisen: let’s feed cows to cows, sheep to cows, people to cows. Wait—feed people to cows? Alan Colchester, a professor of neurology at the University of Kent, writing with Nancy Colchester in the September 3, 2005 issue of the medical journal *The Lancet*, proposed a theory that the most likely initial origin of BSE in Britain was the importation from the Indian subcontinent of bone meal which contained CJD-infected human remains. Cattle are normally herbivores. In nature, cattle eat grass. In modern industrial cattle farming, various commercial feeds are used, which may contain ingredients including antibiotics, hormones, pesticides, fertilizers, and protein supplements. Maybe you should be a vegetarian and avoid all these factors surrounding meat. But, then tomatoes are engineered and are raised with pesticides, fertilizers, etc. How do we feed 12 billion people without science aiding in the sustainability of food production and safety? Food for thought!

We have many challenges ahead including the source of protein to feed the world and the challenges of our

healthcare system in the control of costs incurred by the aging population. Maybe the 1973 SciFi classic *Soylent Green*, after the book by Harry Harrison, is to be true. In the film, it's the year 2022. People will do anything to get what they need. And they need SOYLENT GREEN. The Plot: In an overpopulated futuristic Earth, a New York police detective (actor Charlton Heston) finds himself marked for murder by government agents when he gets too close to a bizarre state secret involving the origins of a revolutionary and needed new foodstuff. "SOYLENT GREEN IS PEOPLE..."

FACT: *More than 90 percent of all organisms that have ever lived on Earth are extinct.*

As new species evolve to fit ever changing ecological niches, older species fade away. But the rate of extinction is far from constant. At least a handful of times in the last 500 million years, 50 to more than 90 percent of all species on Earth have disappeared in a geological blink of the eye. Though these mass extinctions are deadly events, they open up the planet for new life forms to emerge. Those that evolve live on. Microbes evolve rapidly to new environments—even those full of antibiotics and pesticides. Humans are a bit slower in the evolutionary processes and thus are at risk to infectious diseases. Who will win out in this battle? We are not separate from the natural world in which we live.

To sustain life on this planet we need to maintain a balance with life. That is to say, human health depends on biodiversity. This is the foundation of the new health initiative, One World, One Health, One Medicine or, as it has evolved, the One Health Initiative. Representatives from the World Health Organization, the UN Food and Agriculture Organization, the Centers for Disease Control and Prevention, the United States Geological Survey National Wildlife Health Center, the United States Department of Agriculture, the Canadian Cooperative Wildlife Health Centre, the IUCN Commission on Environmental Law, and the Wildlife Conservation Society are among the long list of participants.

Phenomena such as species loss, habitat degradation, pollution, invasive alien species, and global climate change are fundamentally altering life on our planet, from terrestrial wilderness and ocean depths to the most densely populated cities. The rise of emerging and resurging infectious diseases threatens not only humans (and their food supplies and economies), but also the fauna and flora comprising the critically needed biodiversity that supports the living infrastructure of our world. The earnestness and effectiveness of humankind's environmental stewardship and our future health

have never been more clearly linked. To win the disease battles of the 21st Century while ensuring the biological integrity of the Earth for future generations requires interdisciplinary and cross-sectoral approaches to disease prevention, surveillance, monitoring, control and mitigation as well as to broad reaching environmental conservation.

It is clear that no one discipline or sector of society has enough knowledge and resources to prevent the emergence or resurgence of diseases in today's globalized world. No one nation can reverse the patterns of habitat loss and extinction that can and do undermine the health of people and animals. Only by breaking down the barriers among agencies, individuals, specialties, and sectors can we unleash the innovation and expertise needed to meet the many serious challenges to the health of people, domestic animals, and wildlife and to the integrity of ecosystems.

Take the lead!

Suggested Readings

The Coming Plague: Newly Emerging Diseases in a World Out of Balance, by Laurie Garrett

Sustaining Life: How Human Health Depends on Biodiversity, by Eric Chivian and Aaron Bernstein

Emerging Diseases of Animals, by Corrie Brown and Carole Bolin

Soylent Green, by Harry Harrison

Emerging Infectious Diseases: Review of State and Federal Disease Surveillance Efforts. United States Government Accountability Office, GAO-04-877, September 2004. <http://www.gao.gov/new.items/d04877.pdf>

Emerging Infectious Diseases of Wildlife—Threats to Biodiversity and Human Health. Peter Daszak, Andrew A. Cunningham, and Alex D. Hyatt. 21 January 2000, *Science* 287 (5452), 443. <http://www.sciencemag.org/cgi/reprint/sci;287/5452/443.pdf>

Emerging diseases go global. Mark E. J. Woolhouse. 21 February 2008, *Nature* 451, 898-899. <http://www.nature.com/nature/journal/v451/n7181/pdf/451898a.pdf>

Global trends in emerging infectious diseases. Kate E. Jones, Nikkita G. Patel, Marc A. Levy, Adam Storeygard, Deborah Balk, John L. Gittleman & Peter Daszak. 21 February 2008, *Nature* 451, 990-993. <http://www.nature.com/nature/journal/v451/n7181/pdf/nature06536.pdf>

Discovery: Defining Health and Discovering Progress

NED HELMS

N.H. INSTITUTE FOR HEALTH POLICY & PRACTICE

In an article in the January 26, 2009 issue of *The New Yorker*, Dr. Atul Gawande provides an insightful analysis about how industrialized nations, except the United States, have come to reform health care, and provide coverage for all their citizens. “In every industrialized nation, the movement to reform health care has begun with stories about cruelty... the stories become unconscionable in any society that purports to serve the needs of ordinary people, and, at some alchemical point, they combine with opportunity and leadership to produce change.”

The question for America is: Has that alchemical moment arrived? Certainly a mountain of facts has convinced almost all major policy makers that something must be done to correct a medical care system greatly out of balance. But we must begin any discussion by finding the most common of grounds: How do we define health?

The Institute of Medicine has a definition that is widely used and accepted which is: “Health is a state of well-being and the capability to function in the face of changing circumstances.” With this definition we have a much richer understanding of health and break away from the limits of simply “sick” or “well.” More than a third of our citizens who are overweight may not be “sick” in the active sense of the term, but they are also not healthy as they are at much higher risk of chronic disease than others. The 45 million Americans who do not have any form of health insurance may not all be “sick” each day, but their health is threatened each day because if their circumstances change they will not have the capability to function in the face of those circumstances as well as someone who does have health care coverage.

I have been involved in Health and Health Policy professionally since 1971. Over those many years there have been times I thought that the moment had arrived when we would produce fundamental change to our health and health care system. I thought that the fact that half of the personal bankruptcies in this country are triggered by health bills would offend the leaders of the wealthiest country in the world. I thought that

the United States ranking 19 out of 19 countries in the category of mortality amenable to health care (that is, lives that could have been saved if treatment was given) would stir us to action. I thought that the fact that about half of American adults have reported some type of poor care coordination that affected them would move us to action. I have been wrong each time. I believe, however, that our time may have come. In part it is a combination of many of the things mentioned above with the added reality of the sheer weight of the cost of care. Here in New Hampshire as an example, the average family premium for private sector employees is the highest in the country.

This movement toward reform has been a very complex and winding path, but there are actually a few very simple principles in place this time that will combine to allow true effective reform to happen. As we follow the debate, the discussion, the polemics, and the posturing that will be a part of any potential transformation, there are five basic parts of that discussion that must be understood.

ONE: *We can achieve universal coverage.*

After all, every other industrialized nation on the face of the Earth has done it. They have not all done it the same way, but they got it done. Those who would argue that we don’t have the capacity as a country to accomplish what everyone else has will find themselves left behind. Ironically, the three basic ways other countries provide coverage all exist to a degree in America. In some countries all health care providers, facilities, and the financing is run by the government. If you are a member of the Armed Forces in the U.S. that is how you get your care. In some countries the providers and the facilities are all private and only the funding is run by the government. If you are on Medicare in the U.S. that is how you get your care. In some countries, providers, facilities, and the funding is all done by private companies. If you get your insurance through work or buy it individually, that is how you get your care. The difference is other countries don’t leave 20 to 25 percent of their citizens without any coverage. We do. And just

as a final point, they cover everyone; they spend about 8 percent of their GDP. We spend 16 percent but they have better health outcomes. As Dr. Gawande asks, has the cruelty reached a point where we must act? There is a difference between not being able to do something and not wanting to do something. We are able.

TWO: To accomplish the goal of coverage in an effective and affordable way, we don't have to do something that we have never done before.

Rather, we have to replicate what high-performing health systems here in the U.S. are doing today. Two recent studies underscore this critical issue. A Milliman Research Report published in February 2009 shows that if all our health care delivery systems were run as well (from financial and quality perspectives) as the country's best, we would reduce our health spending from 16 percent to 12 percent of GDP (still the most of any industrialized country) and be able to cover the 50 million Americans who go without coverage today. They lance the myth that we can only do this if we "ration care" by saying clearly: "We consider 12 percent a target for what is possible, not a budget. We believe rationalizing care is far superior to rationing it." Another study done by Dr. Elliott Fischer and his colleagues at Dartmouth and published in the *New England Journal of Medicine* in February 2009 notes that if we reduced the annual growth in per capita spending for Medicare from its current national average of 3.5 percent to 2.4 percent (which is the actual rate in the San Francisco area) by the year 2023, rather than having a \$660 billion Medicare deficit, we would have a \$758 billion surplus, a \$1.42 trillion savings. So again to those who say, "It can't be done" the proper response is, "It is being done; find out where and how, and replicate it."

THREE: The current dominant form of payment—"fee for service"—needs to be fundamentally redesigned.

Our current payment system is at odds with our goals for a reformed health care system. It fails to adequately incent or support quality and efficiency, and it ignores evidence-based practice and care coordination. As a result, we have witnessed an erosion of primary care and wellness; a continued, yet unsustainable, rate of increase in costs; a deeply fragmented system of care; and a worsening of health status indicators and levels of access.

The Citizens Health Initiative, which the Institute for Health Policy and Practice at UNH leads, initiated

a project in February 2009 to address these challenges. We believe that stakeholders in New Hampshire are uniquely positioned to design and implement a payment system that values, prescribes, and rewards medical care that is tightly coordinated and of superior quality and efficiency.

Our goal is to move to a payment system in New Hampshire that lets us:

- Align payment, goals, and incentives across the systems of care: primary, specialty, behavioral, ancillary, and hospital;
- Align goals and incentives across employers, payers, and systems of care;
- Address the unsustainable rate of growth in health care expenditures;
- Reward explicitly defined quality care;
- Reward excellence in the delivery of evidence-based clinical practices;
- Incent the use health information technology;
- Recognize administrative best practices and lean processes; and
- Serve as a model of transparency.

Similar efforts are taking place in other states and will certainly be a central feature of the national reform effort. But true reform also requires that we look beyond the medical treatment system in our efforts.

FOUR: This is health and health care reform, not just medical system reform.

We must remember the definition of health to initiate true reform. Consider the following. From the year 1900 to the year 2000, life expectancy in the U.S. went up 30 years. Of those 30 years, 25 were the result of public health efforts like clean air, clean water, safe workplaces, immunizations, re-engineered roadways, and safer cars. Only five of those years were as a result of medical treatment advances. While we spend 90 percent of our health care dollars on the treatment of illness, the things that really affect our health are our behaviors, the environment, and heredity. As a result we need to assure that health reform takes place across all aspects of our community. In the city of Keene, N.H., the Cheshire Medical Center and the Hitchcock Clinic are leading a program called Keene 2020. The goal of the project is to make sure that Keene becomes the healthiest community in the country by the year 2020. The effort involves the Community Mental Health Center, community businesses, the school system, so-

cial service agencies, and a wide range of community players. Here at UNH we are launching not only this Discovery discussion on health but also a Healthy UNH effort, which will have as a goal to make UNH the healthiest university in the country by the year 2020. These are the kinds of efforts that will be critical to move beyond our current model of almost exclusive reliance on medical treatment and be about the task of creation of health.

FIVE: There is one final part of reform that will allow us, in the words of the Institute of Medicine, to cross the quality chasm in our systems of care.

Fifth and finally, the acquisition and deployment of Health Information Technology (HIT) and Health Information Exchange (HIE) throughout our system of care is critical. It offers a necessary tool on a path to making substantial progress in improving the health of our people through improved patient safety, enhanced quality, health cost reduction, consumer engagement and empowerment, expanding access, and improved monitoring and provision of public health. The stimulus package that has become law will be providing \$19 billion for the expansion of Electronic Medical Records and other HIT. It will become critical that we spend these dollars not to set up individual electronic islands at practices around our state and country but to assure that we are able to connect those sites so that secure critical information can be available to patients and the many clinicians who help treat them. Done well, the application of these information tools can substantially improve our health and health care system.

So in sum, the opportunity for reform is before us, and it is well within our capacity to create a better system that serves all our people. We cannot stabilize our economic present or secure our economic future without reforming our current health and health care system and making it available to every one of us.

As I have observed, we are already doing it right in many places in this country. The time has come to do it right everywhere in America. The time has come to get on with that job.