**Brain imaging sheds new light on adolescents and addiction**  
By Dennis Nealon

Armed with new brain imaging techniques, researchers are building momentum toward understanding which adolescents are at risk for addiction and how neuroscience might enhance prevention and treatment.

The technological advances, coupled with increased knowledge about genetics and epigenetics, are shedding new light on how addiction and substance abuse affect brain development during its most intense stages – in the mid-teens to early 20s period.

“We can think of addiction as a disease of the brain,” said Gregory J. DiGirolamo, associate professor in the Department of Psychiatry, University of Massachusetts Medical School (UMMS), UMass Memorial Health Care, and associate professor of psychology at the College of the Holy Cross.

DiGirolamo joined other UMMS Department of Psychiatry faculty presenters at an Oct. 10 program called “Adolescents at Risk: The Challenge of Substance Abuse.” Part of the psychiatry department’s Be Mentally Well lecture series, the event provided a crash course on contemporary addiction research, from the role personality plays in dependency, to recognizing signs of drug and alcohol abuse, to rising concern over the non-medical use of opioid analgesics or “pain killers,” to the increasing prevalence of synthetic marijuana and other so-called designer drugs. The program included a recovering addict’s personal story – a young woman’s moving, eloquent depiction of her winning battle with the ravages and misery of alcohol and drug dependence beginning when she was a teenager.

Addiction researchers have increasingly been focusing on the brain and the changes it undergoes as part of the alcohol and drug abuse cycle. And the debate over addiction as a disease or a behavior manifestation has been ongoing for years or decades. But our understanding of addiction, particularly among adolescents, has been expanding significantly, according to DiGirolamo.

He said young people are the most vulnerable because they are at an age when the brain is undergoing profound maturation. And, not coincidentally, say researchers, addiction finds its perfect storm opportunity in the adolescent brain, which craves reward activity like an adult brain but lacks almost any ability – developed over time in adults – to grasp long-term consequences and alter behavior based on that understanding. So reward becomes king of the young mind, lording over behavior at an optimum time for addiction, when early exposure to drugs can actually make sections of the brain more vulnerable to dependency.

Using imaging technology, researchers are able see changes in the brain as it matures and begins to “prune” itself for maximum fitness and prime functionality. Importantly for the study of addiction, brain imaging allows them to track developmental changes and abnormalities in prefrontal and subcortical regions of the brain during adolescence, according to DiGirolamo.

“But,” he added in his presentation, “we still have to go beyond the chemistry and figure out how to treat the whole person.”

Lisa R. Fortuna, MD, MPH, assistant professor of psychiatry at UMass Medical School, said the “moral model” theory of addiction – that individual personality traits cause abuse – still exists but is increasingly losing ground to the focus on disease and medical models. Those models point toward inherited neurological mechanisms as the culprits that predispose people to addiction, she said.

Fortuna’s research also serves as a warning for adolescents. It has been determined, for instance, that people who begin drinking before age 15 are four times more likely to develop alcohol dependence at some point in their lives, compared with those who have their first drink at age 20 or older.

Elizabeth Belliveau, MSW, LICSW, clinical director of Spectrum REACH, Spectrum Health Systems, said parents still represent the best line of defense in the battle against “the epidemic” of teen drinking and drug use.

Belliveau said parents have to know who their children’s friends are, ask their kids a lot of questions about their activities and relationships, and look for telltale signs of substance abuse like change in appetite or sleep patterns, deterioration in physical appearance, and changes in spending or money habits.

Perhaps not surprisingly, said Douglas M. Ziedonis, MD, MPH, the chairman of the UMMS Department of Psychiatry and psychiatry professor who has worked as an addiction psychiatrist for 25 years, the biggest drug – the “gateway” to addiction for many young people – is still tobacco.

Other presenters in the Adolescents at Risk program included Gerardo Gonzalez, MD, associate professor and director of the Division of Addiction Psychiatry, UMMS Department of Psychiatry; Jennifer L. Carey, Fellow in medical toxicology, UMMS Department of Emergency Medicine; and Emily Myers, assistant, Vocational Internship Program, Transitional Age Program, Center for Living and Working.

The program was organized by Laura H. Myers, MSW, EdD, director, Parent & Community Engagement, Department of Psychiatry, UMMS.