Open Access Journal of
Gerontology & Geriatric Medicine
ISSN: 2575-8543

Juniper Publishers
key to the Researchers

Mini Review
Volume 1 Issue 1 – March 2017
DOI: 10.19080/OAJGGM.2017.01.555555

OAJ Gerontol & Geriatric Med

Aging and Resiliency

Donald A Jurivich D O*

Department of Geriatrics, University of North Dakota, USA

Submission: March 06, 2017; **Published:** March 09, 2017

***Corresponding author**: Donald A Jurivich D O, Department of Geriatrics, University of North Dakota, School of Medicine and Health Sciences, Eva Gilbertson Distinguished Professor of Geriatrics Chairman, USA.

Mini Review

Resiliency is the ability to bounce back from a physical or emotional problem. An emerging public health concept is that attenuation of the aging process with improved resiliency will extend healthy lifespan. By slowing the rate of aging a health dividend is expected whereby the human population will manifest fewer chronic conditions or delay the onset and duration of chronic disabilities that consume over 90 percent of health care costs. In this conceptual framework the European Union has set a public health goal of extending current average life expectancy of the population by a modest 2 years [1-5].

This effort comes at a time when several countries are experiencing a continuous and steady improvement in life expectancy while others, such as the United States, show the opposite trend, likely due to the obesity and opioids epidemics. Thus far, the most convincing anti – aging approaches have been caloric restriction and increased physical activity, but neither of these interventions work uniformly and their alleged global impact often differ between genders. Accordingly, investigators look to oral supplements that improve bioenergetics and metabolism while reducing so –called inflammation. Additional anti – aging approaches include senilities that expunge senescent cells and rejuvenation strategies that employ stem cells. All these approaches attest to the likelihood that no approach alone will achieve healthy lifespan and optimize cognitive, musculoskeletal, cardiovascular and metabolic functions throughout the human lifespan [6-8].

One marker of successful health span interventions is the ability to strengthen resiliency. In essence, human resiliency is the ability to confront a biological or psychological perturbation and return to normal functionality sometime after the disturbance. Figure 1 presents a theoretical graph of how people with high and low resiliency might recover after an acute illness such as community acquired pneumonia. Current health outcomes data suggest at least 5 trajectories of recovery after an acute illness, ranging from rapid recovery to no recovery at all. In the elderly population, the consequence of hospitalization can result in roughly one of three outcomes they return to pre-hospitalization function, they improve their pre-hospitalization function, or they permanently lose a percentage of their pre – hospitalization function. A few clinical studies suggest that the window for recovery is approximately 60 days, thereafter little gains in recovery are made. Conceptually, the rate of recovery post – hospitalization could be a strong marker of resiliency. In a similar fashion, physiologic recovery from maximal exercise may be a surrogate marker of resiliency. Loss of physiologic reserves and homeostasis with age impair resiliency and one concept is that people with the largest homeostatic reserve early in life maintain their adaptation to stress for a longer period of time than those with lower homeostatic reserve [9]. Stress resistance in the long live mouse models give credence to this concept of "more is better" in terms of robust early life resiliency. Given that rates of human aging exhibit a bell shaped curve, a key question is whether those who rapidly age can be transformed to normal aging as manifest by improved resiliency.

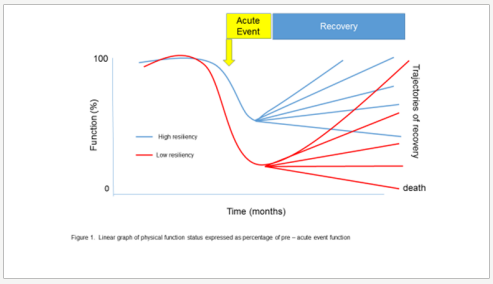

Figure 1: Theoretical graph of how people with high and low resiliency might recover after an acute illness such as community acquired pneumonia.

Physical activity has long been associated with improved resiliency, especially against cardiovascular disease risk. Recent evidence suggests that the intensity and duration of exercise is proportional to the cardiovascular risk reduction. In many ways, intermittent exercise resembles the concept of hormesis whereby periodic stressors improve overall resilience. Exercise reverses telomere shortening, improves oxidant stress responsively, strengthens bioenergetics, optimizesproteostasis, and reverses age – dependent loss of insulin sensitivity. Given

the general benefits of exercise, emerging studies are examining the potential benefit of physical activity during acute illnesses to expedite post – hospitalization recovery processes.

In addition to exercise, nutritional interventions may enhance resiliency with aging. High dose berry extracts and other food products appear to have anti-oxidant properties. Some common spices such as turmeric have clear anti-inflammatory properties and are used as bio-equivalents to salicylate in clinical conditions such as inflammatory bowel disease. Caloric restriction has a mixed review on its efficacy as a promoter of resiliency in aging. On one hand, caloric restriction appears to improve cellular response to stress, oxidation, and inflammation. But on the other hand, long term caloric restriction has been linked to poor immunologic responses perhaps as a consequence of NK and T cell suppression. Additionally, caloric restriction appears to suppress wound healing and recent human studies suggest that it accelerates osteopenia. Collectively, these observations suggest that longevity extension alone does not necessarily confer higher levels of resiliency. Whether combination caloric restriction and exercise provide synergistic effects on longevity and resiliency has not been substantiated, and in animal studies the combination has adverse effects [10].

The impact of Methuselah compounds on age - dependent changes in resiliency are variable, despite their ability to extend longevity. Rapamycin, a macrolide originally derived from Easter Isle bacteria, inhibits the mTOR signaling pathway that has been associated with the rate of aging. Similar to observations with caloric restriction, rapamycin improves stress resistance at the cellular level, but its immunosuppressive effects may not protect elderly from acute infections. Additionally, the molecular response to stress appears to be inhibited when the mTOR pathway is attenuated, thus raising concerns that rapamycin may further reduce an age – dependent decline in cytoprotective response or proteostasis. Metoformin, another longevity compound which interferes with AMPK activation, may interfere with acute cellular stress responses. As metformin therapy for human aging enters a randomized controlled trial, it will be useful to monitor its effect on resiliency as participants experience hospitalizations from acute infections, strokes and other ischemic and metabolic insults.

Other conceptual approaches to enhance resiliency in aging include removal of senescent cells and stem cell therapy. The idea of "senilities" is to reduce senescent associated secretory phenotypes (SASP) that accelerate aging through secretion of adverse cytokines and non – youthful intercellular products. The cell growth inhibitor and heat shock stimulator, quercetin has been reported as a senolytic in combination with a tyrosine kinase inhibitor. This and other efforts to reduce SASP appear to improve different physiologic functions in rodents, but no evidence exists whether resiliency against infection or acute insults also improves. The impact of stem cell therapy on age-dependent loss of resiliency is less certain, however, gradual loss of organ vitality is thought to be due to changes in the stem cell pool due to epigenetic drift, environmental issues, and somatic mutations. Old donor stem cells can be rejuvenated by plasma from young donor animals (parabiosis) thus suggesting that one approach to improve tissue resiliency is to "transfuse" old donors with a stem cell concoction. Another thought is to suppress age – dependent stimulants of stem cell mutagenesis such as oxidant injury and inflammation, thus preserving a more functional pool of stem cells as we age.

Conclusion

In summary, interventions to extend lifespan do not necessarily improve resiliency, and efforts to create healthy lifespan must take both outcomes into consideration for successful aging. Lifestyle issues, such as robust exercise and Mediterranean – like diets are the most potent stimulants of resiliency, and it remains to be seen whether adjuvants such as Methuselah drugs, senolytics or stem cell therapy, either alone or in combination, optimize healthy lifespan.

References

1. Bickford PC, Flowers A, Grimmig B (2017) Aging leads to altered microglial function that reduces brain resiliency increasing vulnerability to neurodegenerative diseases. Exp Gerontol 5565(17): 30098-300910.
2. Gloscia-Ryan RA, Battson ML, Cuevas LM, Zigler M, Sindler AL, et al. (2016) Voluntary aerobic exercise increases arterial resilience and mitochondrial health with aging in mice. Aging 8(11): 2897-2914.
3. Goodell MA, Rando TA (2015) Stem Cells and Healthy Aging. Science 350: 1199- 1204.
4. Huffman DM, MJ Schafer, NK LeBrasseur (2016) Energetic interventions for healthspan and resiliency with aging. Exp Gerontology 86: 73-83.
5. Kirkland JL, Stout MB, Sierra F (2016) J Gerontology: BiolSci 71 (11): 1407 - 1414
6. Newman JC, Milman S, Hashmi SK, Nir Barzilai (2016) Strategies and Challenges in Clinical Trials Targeting Human Aging. J Gerontology Biological Sciences 71 (11): 1424-1434.
7. Nosraty L, Enrouth L, Raitanen J, Antti Hervonen, Marja Jylha (2015) Do successful agers liver longer ? The Vitality 90+ Study. J of Aging and Health 27 (1): 35 - 53.
8. Sebastiani P, Thyagarajan B, Sun F (2017) Biomarker signatures of aging. Aging Cell 16(2): 329-338.
9. Sabbagh JJ, O'Leary JC, Blair LJ, Torsten Klengel, Bryce A. Nordhues, et al. (2014) Age – associated epigenetic upregulation of the FKBP5 gene selectivity impairs stress resiliency. PLoS One.
10. Whitson HE, Wei DP, Schmader KE, Cohen HJ, Colon-Emeric CS, et al. (2016) Physical resilience in Older Adults: Systematic Review and Development of an Emerging Construct. J Gerontology Medical Sciences 71 (4): 489 - 495.

How to cite this article: Donald A J D O. Aging and Resiliency. OAJ Gerontol & Geriatric Med. 2017; 1(1): 555555. DOI: 10.19080/OAJGGM.2017.01.555555

DOI: 10.19080/OAJGGM.2017.01.555555

How to cite this article: Donald A J D O. Aging and Resiliency. OAJ Gerontol & Geriatric Med. 2017; 1(1): 555555. DOI: 10.19080/OAJGGM.2017.01.555555