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Flavonoids and Aging

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Aging is inevitable process, however human comes into aging is in difference way and difference rates. Some of them undergo aging earlier due to degenerative diseases, unable to reach the maximum lifespan and are thus denominated secondary aging (Huebschmann AG, 2011). Some of others undergo aging latter, looked younger than their truely chronological age, have no suffer degenerative disease, able to achieve maximum lifespan and so called primary aging (De la Fuente, 2009; Huebschmann AG, 2011). Maximum lifespan or often called longevity of the species is defined as maximum time that a species belonging to determine how long the species can live, for example maximum lifespan in human beings is 122 years, whereas the lifespan in rats and mouse strains is only 3 and 4 years respectively (De lafuente, 2009). It must be distinguished this longevity from mean or averages longevity. Average longevity can be defined as the average of time that member of population that have been born on the same date live (De la Fuente, 2009). The maximum lifespan is fixed in each species, meanwhile the lifespan of individual subject in the population, even when their genotype are the same and grow in a common environment condition, such as protected from external hazard show marked variability (Kirkwood, 2005).

Now days majority of human beings can only reach the average of lifespan is ranging from 73 – 78 years, unable to achieve maximum lifespan (122 – 140 years; De la Fuente, 2009). It is mostly caused by degenerative diseases such as type 2 diabetes mellitus, cancer, stroke, cognition disorder, hypertension, and many ages related deases. Consequently, the aging left-over life is accompanied by physical frailty, immobility, low agility, and poor cognition (Chou CH, *et al.* 2012). Fries JF also stated that eighty per cent of the years of life lost to nontraumatic and the most of premature death are due to chronic diseases in later years (Fries JF, 1980). Implication of these various condition cause an aging person unable to perform daily activities, even some of them need special nursing at home or at hospital. The number of days with restricted activity and admissions to hospitals and nursing homes increases sharply after 70 years of age (Kosorok MR, 1992). Numerous evidences indicated that degenerative diseases are caused by oxidative stress resulted from imbalances between oxidants and antioxidants (Syslová K, *et al.* 2014). Therefore, prevent the degenerative diseases through antioxidants consumption, particularly from beverages and vegetables is a reasonable choice.

There are growing evidences that flavonoids, substances are available in nature and widespread in plant kingdom are very useful to prevent degenerative diseases and delay aging (Peng C, *et al.* 2014). Numerous publications also demonstrated that degenerative diseases including cardiovascular, cancer, Parkinson's disease (PD), Alzheimer's dementia, and other age related diseases can be delayed even prevented by regularly antioxidant consumption (Patil CS, *et al.* 2003; Kumar S, *et al.* 2013; Kumar S, 2013; Giovannini C, 2012). Therefore, diets with flavonoids enrichment from fruits, vegetables, nuts, seeds, stems and flowers, propolis, and beverages especially tea, coffee, and wine, other than capable of increasing life expectancy as well as prevent degenerative diseases that attributable to their antioxidant capacity. In this concern the French paradox is a good example of how nutritive flavonoids provide benefit to human health and life (Opie LH, 2007). Epidemiological studies indicated that in France population the death rates of cardiovascular disease is low despite high intake of dietary cholesterol and saturated fat (Ferrie`res J, 2004). Moreover, a regression analysis between death rate from cardiovascular disease and consumption of diary fat and wine concluded that the French paradox may be caused by high consumption of wine (Ferrie`res J, 2004). Wine contains a variety of polyphenols derived from grape skin, and flavonoids are the largest class of polyphenols secondary metabolite. In vitro study demonstrated that flavonoids derived from red wine have been proven capable of inhibiting low density lipoprotein (LDL) oxidation (Ferrie`res J, 2004).

Based upon this phenomenon, interest in flavonoids has increased and being primadona in maintaining human health function and increase quality of life. Because of their lower redox potentials, flavonoids are thermodynamically able to reduce highly oxidizing free radicals (redox potentials ranging from 2.13–1.0 V) such as superoxide, peroxyl, alkoxyl, and hydroxyl radicals by hydrogen atom donation (Kumar S, 2013). In addition, due to their capacity to chelate metal ions like as iron and copper, etc. flavonoids also capable of inhibiting free radical generation (Mishra A, *et al.*

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2013). For instance, quercetin is widely distributed in plants and the second largest proportion flavonol which is consumed by human known for its iron-chelating and iron-stabilizing properties (Kumar S, 2013). An invitro study was reported by Watjen W, *et al.* 2005 in H4IIE cells demonstrated that dosing quercetine with concentration as low as 10 – 25 μmol/L was able to protect cellular damages caused by ROS. On the other hand, administration of quercetin at concentration between 50 and 250 μmol/L was capable of inducing DNA strand breaks, DNA fragmentation, apoptosis, and increase caspase activity (Watjen W, *et al.* 2005). Some pharmacokinetic data available in human showed that intake of quercetin 1 – 2 grams/day result in 10 μmol/L and not exeeding 50 μmol/L in plasma (Watjen W, *et al.* 2005). Therefore the consumption of flavonoids for the cytoprotective effect and prevent oxidative stress only need 1 gram/day. On the other hand for purpose of cancer elimination and induce apoptosis higher dosage (5 grams) of flavonoid is needed (Watjen W, *et al.* 2005). However, it needs further clinical research appropriately.

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