Stanford-Taiwan ALDH2 Deficiency Research (*STAR*) Consortium

Scope and Mission

ALDH2 deficiency is the most common human enzymopathy in the world, affecting 560 million East Asians (Han-Chinese) or 8% of the world population. Taiwan ranks the highest in the world with 45-47% of its population being ALDH2 deficient subjects. ALDH2 deficiency is caused by a single point mutation or amino acid substitution, which renders the enzyme inactive in metabolizing toxic and reactive aldehydes, common ingredient in our diets, in the environment and products of normal metabolism. This aberrant gene is known as ALDH2*2. Carriers of the ALDH2*2 variant can be easily genotyped by probing the SNP designation of rs671.

ALDH2 deficiency causes the well-known "Asian Alcohol Facial Flushing Syndrome", due to the accumulation and sensitivity to acetaldehyde toxicity after alcohol consumption. Acetaldehyde is classified as Group 1 carcinogen by WHO (IARC) since 2007, especially for ALDH2 deficient humans[1]. Ample scientific studies have shown that ALDH2 deficiency is not only associated with alcohol-related diseases (*e.g.* head and neck, upper GI cancers and liver disease), but is linked with the risk and pathology of a wide range of other human diseases[2,3]. The health risk of ALDH2 deficiency and acetaldehyde toxicity remain under-recognized in Taiwan and many other East Asian countries, such as Japan, Korean and China, which have significantly high prevalence rates of ALDH2 deficiency.

The scope of STAR consortium is to combine efforts and expertise from both Stanford University and academic institutes and government in Taiwan for the study of ALDH2 using a multidisciplinary approach. We aim to establish a comprehensive research platform of ALDH2 encompassing different areas of basic research, clinical research, epidemiology, public health, drug development, food and environmental safety.

Our goals are 1) to seek research support from both the U.S. and Taiwanese institutions and government; 2) to network and promote interdisciplinary and international collaboration between Stanford University and Taiwan; 3) to host annual research and educational symposiums and workshops on this nescient field and 4) to promote translation and innovation from basic research and public health/education to drug discovery, clinical development and personalized medical care; 5) to raise public awareness of ALDH2*2 deficiency and issues related to acetaldehyde toxicity.

We believe that Taiwan should lead this effort in precision medicine for carriers of the ALDH2*2 subjects in East Asia. Our mission is to connect researchers, clinicians and educators from different institutes and, through a collaborative effort, to establish Stanford University and Taiwan as the international leaders of ALDH2-related research, public education, healthcare and precision medicine.

1. *Carcinogenicity of alcoholic beverages. Baan R, Straif K, Grosse Y, Secretan B, El Ghissassi F, Bouvard V, Altieri A, Cogliano V; WHO International Agency for Research on Cancer Monograph Working Group. Lancet Oncol. 2007; 8:292-3.*
2. *Targeting aldehyde dehydrogenase 2: new therapeutic opportunities. Chen CH, Ferreira JC, Gross ER, Mochly-Rosen D. Physiol Rev. 2014; 94:1-34.*
3. *A personalized medicine approach for Asian Americans with the aldehyde dehydrogenase 2*2 variant. Gross ER1, Zambelli VO, Small BA, Ferreira JC, Chen CH, Mochly-Rosen D. Annu Rev Pharmacol Toxicol. 2015; 55:107-27.*