A SIMPLE, RAPID BLOOD TEST FOR EVALUATING HOMEOSTASIS by monitoring daily changes in health could help doctors treat lifestyle diseases and ageing with functional foods.

The Multimodal Homeostasis Evaluation Development Group Consortium, has developed a quick, effective test that detects subtle changes in the body that may lead to lifestyle related diseases.

A healthy human body exists in a carefully balanced state, with the central nervous system, hormones and innate immunity working together to maintain a stable internal condition, known as homeostasis. Disruptions in homeostasis caused by factors like ageing, smoking and poor diet can lead to lifestyle-related diseases such as diabetes and Alzheimer’s disease.

Now, the consortium, led by Gen-Ichiro Soma at the Control of Innate Immunity TRA, Japan, together with Hiroyuki Inagawa (TRA) and Kimiko Kazumura (Hamamatsu Photonics), has developed a simple and effective method of monitoring homeostasis using trace blood samples.

To maintain homeostasis, the body must eliminate xenobiotics — harmful substances including viruses, bacteria, and waste products generated by the body itself. Immune cells called phagocytes attack and consume xenobiotics before they reach toxic levels. If people could monitor their ability to generate fully-functional phagocytes — and control it by the food they eat — lifestyle diseases could be controlled or prevented.

“Excessive xenobiotics in the body — particularly those generated by natural processes — disturb homeostasis, which leads to a decline in quality of life,” says Soma. “We’ve developed three highly sensitive assays that use optical sensing techniques to measure aspects of blood cell activity.” Results from this ‘Simplified Multimodal Homeostasis Evaluation System’ are achieved in seconds, meaning an individual’s health status can be monitored almost in real time.

One of the assays monitors neutrophil activity, a useful marker of oxidation and inflammation, while another determines how well the body is regulating oxidized LDL, a complex of lipids and proteins linked to heart disease and diabetes.

The third assay monitors phagocyte activity to see if they are eliminating xenobiotics effectively. “We measure phagocyte activity using E. coli cells labeled with a pH-sensitive fluorescent probe,” explains Kazumura, who designed the assays. “When the E. coli cells are phagocytosed by neutrophils in a blood sample, the pH decreases and the fluorescence signal increases.”

Soma’s team hopes that their system could be used to monitor daily changes in health objectively, and inform the best choice of diet — a step closer to what Kazumura calls ‘tailor-made food’.

“We believe our system could monitor differences in homeostatic condition between participants who consume functional foods or a placebo. We are planning an initial human trial with brown rice,” says Inagawa. “We will also use animal models and human case-studies to examine the effects of life-style diseases on homeostasis.”