The Osaka University Aged Twin Registry (OUATR) is the largest adult twin registry in Japan. Since its establishment in 1974, the OUATR has conducted a number of studies with particular focus on the environmental contribution to physical–cognitive–mental aging, longevity and aging-dependent diseases in later adulthood. The registry consists of 12,000 pairs of Japanese twins born between 1900 and 1935. Two hundred and fifty pairs of twins have undergone comprehensive medical examination to date. Follow-up questionnaires have been mailed out on a regular basis, for the purpose of checking current vital statuses, health conditions, and so forth. The main objective of this longitudinal twin study is to contribute to the prevention of lifestyle-related diseases and the promotion of successful aging.

Scientific interest in twins started developing in Japan in the 1920s. Since then, participants in twin studies conducted in Japan have been almost exclusively young children. The scarcity of twin studies on adult twins is, as in other countries, due to difficulties in collecting a large number of twins in late adulthood. In this regard, the Osaka University Aged Twin Registry (OUATR) has enjoyed a unique position in that it is the only registry in Japan that contains a large number of aged twins. The twin cohort study has been conducted since 1974, with main interest in the influences of environmental factors on physical–cognitive–mental aging, longevity, and aging-dependent diseases in later adulthood. Recently, epigenetic research is underway for the purpose of preventive medicine and health promotion. This article describes the OUATR and its current research results.

Recruitment of Twins

The OUATR was previously called the Kinki University Adult Twin Registry (Hayakawa & Shimizu, 1987). Twin pairs in this registry were recruited by newspaper advertisements, posters in hospitals, referrals from nurse midwives, and the follow-up of previous studies conducted by retired twin researchers (Hayakawa & Shimizu, 1982). The OUATR consists of approximately 12,000 pairs of twins born between 1900 and 1935 in Japan. Approximately 2500 twin pairs have been followed up via mailed questionnaires each year since 1974. Zygosity was determined using methods previously reported (Hayakawa et al., 1987).

Focus of the Study

The focus of this study is on the environmental factors affecting the aging process of physical-cognitive-mental functions in later adulthood. We have conducted comprehensive medical examinations for 250 pairs of twins in the register. Items included in the comprehensive medical examinations were as follows:

1. Blood
   (a) Serum concentration (100 items)
   HDL-cholesterol, LDL-cholesterol, protein analysis, IgG, A, D, E, blood sugar, apolipoprotein (AI,II, B, C2, C3, E), electrolytes, HbA1c, phospholipids, and so on.
   (b) Blood cell
   RBC, WBC, PLT, and so on.

2. Psychological Tests
   Maudsley Personality Inventory (MPI), Wechsler Adult Intelligence Scale (WAIS), Life Satisfaction Index

3. Other Tests
   Hearing ability test, electrocardiogram, tapping, grasping power, anthropological measurement, and so on.

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4. Personal interview
   Nutritional intake, smoking habits, alcohol
   intake, food preference, occupation, family
   tree, and so on.

We have recently started measuring the telomere
length of chromosome in peripheral white blood cells,
and epigenetic analysis.

Study Results
Two hundred and fifty twin pairs living apart in the
community volunteered to visit the university hospi-
tals for comprehensive medical examinations
(Hayakawa & Shimizu, 1987). The heritability esti-
mates of more than 100 health indices have been
assessed, such as the serum concentration of various
lipids, electrolytes, immunoglobulin (G, A, D, E),
apolipoproteins (Allison et al., 1996; Hayakawa,
1988; Hayakawa & Sogi, 2000; Shirakawa et
al., 1996). Longevity and the decline of cognitive
functions with aging have been analyzed from both
genetic and environmental aspects. The results of
WAIS scores indicated a relatively strong environ-
mental influence on cognitive decline in later
adulthood.

Intrapair analysis of adult twins indicated both
genetic and family environmental influences on indi-
vidual differences in health-related behaviors, food
preference, and other lifestyle factors in later adul-
tood (Kato et al., 2002). The concordance rates of
causes of death were generally very low even within
monozygotic pairs, except those for death by breast
cancer (Hayakawa et al., 1992).

Discussion
The main interest of our study is to investigate the
process of human aging phenomenon. We plan to
clarify the environmental backgrounds of the decline
of psychophysiological functions in later adulthood.
In this regard, studying of identical twins discordant
for the degree of aging is extremely important. An
epigenetic study has recently started on methylation
and acetylation of the genomic DNA in identical
twins discordant for the length of telomere and for
aging-dependent diseases. We plan to start a cross-
cultural study with identical twin pairs where one
member lives in Japan and the other has emigrated to
the United States or Brazil before the age of 20.
Collaborations are welcomed and all requests for
collaboration should be directed to the first author,
and will be assessed by the study’s Steering
Committee.

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Table 1
Outline of the Osaka University Aged Twin Registry

<table>
<thead>
<tr>
<th>Name of register</th>
<th>The Osaka University Aged Twin Registry</th>
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<tr>
<td>Country</td>
<td>Japan</td>
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<tr>
<td>Kind of ascertainment</td>
<td>Volunteers (identified by newspaper advertisement, posters in hospitals, referrals from nurse midwives or retired researchers)</td>
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<tr>
<td>Number of pairs</td>
<td>12,000 pairs (monozygotic and dizygotic pairs)</td>
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<td>Age</td>
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<td>Primary interest</td>
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<td>DNA/blood samples</td>
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<tr>
<td>Contact</td>
<td>Prof. Kazuo Hayakawa</td>
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