

ties have so far been assigned for 80 twins (35%) in both eyes. Once the grading procedure is completed, twin correlations for the different scales will be investigated, and heritabilities will be estimated by univariate genetic models including age among variance components.

### PATERNAL INHERITANCE OF MONOZYGOTIC TWINNING IN ANGLO-NORMAN SCOTTISH FAMILIES

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A direct paternal genetic effect in human twinning has been documented (St Clair & Golubovsky, 2002). This has important genetic/medical implications and may challenge the basis of twins studies (Golubovsky, 2002). A study of paternal inheritance patterns in Scottish Anglo-Norman families of Norse extraction further demonstrates the inheritance pattern through statistical analysis and its association with monozygotic twins. One birth in 81.60 was the general Scottish twinning rate (1856–1961) extracted from published data on approximately 12 million live-births. However, the twinning rate was significantly higher than the average where the father of twins bore the particular Anglo-Norman patronymics Sinclair (28,210 live-births) and Bruce (21,370 live-births), with the twinning rate 1856–1961 respectively 1 in 68 and 1 in 73.69. In similar studies of 2 indigenous Scottish patronymics (18,184 live-births) the twinning rates were lower than average, 1 in 91.5 and 1 in 84.12. The general monozygotic twinning rate for the period 1856–1961 based on Weinburg's differential calculus was projected from available data as one monozygotic set per 337 births. In the case of the Sinclair and Bruce patronymics there were 64 more monozygotic sets of twins than projected (212 instead of 147.2), whereas in the indigenous names, the number of monozygotic twins was slightly less than projected. This uplift in the monozygotic twinning rate would account for the higher than average twinning rate in the Anglo-Norman families.

### BIRTH ORDER: A NEW VARIABLE?

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The perception and importance of birth order in the social processing of twins are neglected areas. Questions about birth order in general have been examined and studied by psychologists and sociologists, resulting in 2 opposing camps: those who conclude that birth order is important in shaping personality and predicting values and interests of individuals, and those who take the opposite view. After critically reviewing birth order research, this study examines the assumptions that there is no significance in birth order for twins and that birth order is not important outside the familial home. It is argued that birth order as applied to twinning is a social anomaly. The cultural significance of birth order for twins and the normalizing strategies different societies adopt are explored. The study analyses questionnaires obtained from parents of twins, twins themselves and sometimes their respective mothers, inquiring into what difference(s) birth order made to them, respectively, at what age parents informed their children or when the twins themselves learned about their birth order, and what the ensuing consequences were, if any. Finally, it is suggested that birth order may pose alternative questions for twins, critical questions of identity that singletons do not have to consider.

### SRI LANKAN TWIN REGISTRY: CHALLENGES, BARRIERS AND LESSONS LEARNED

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As with any new initiatives, we faced many obstacles. Determination, commitment and team work were our strengths. Acquisition of basic knowledge was vital. This demanded networking with experienced international twin researchers. Collaboration was based on mutual benefits and scientific merit, but not on economically cheap and easy research in the developing world. As twin research unites diverse disciplines, forming a multidisciplinary team was essential, but for most local colleagues the concept was new. However, enlisting support was not difficult but consolidating what was achieved was challenging. Funding was the most difficult, as it so competitive and is usually available for people with credentials. Local ethical framework was inadequate. Ethical guidelines had to be developed for informed consent processes, data collection, storage and access to the database and collection, storage and access to the human biological material including genetic material, funding, commercial exploitation, international collaboration, and dissemination of results and authorship. This was to safeguard the Sri Lankan interests as

the moral 'rights' and 'wrongs' are not absolute but vary with the culture. We initiated a volunteer register and worked towards a population-based register. Local capacity building for twin research was one of the main objectives of the project. We have not only managed to achieve this goal of 20,000 population-based twins in one district (25 of such in Sri Lanka) but also gained a wealth of experience through the whole process. These include how to face challenges, barriers and hurdles in establishing an ethical research culture especially in the developing world.

### DETERMINING ADULT TWIN ZYGOSITY BY QUESTIONNAIRE, CLINICAL MEASUREMENTS AND GENOTYPING IN KOREA — HEALTHY TWIN

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Determining zygosity is a basic requirement for twin studies. However, discrimination by genotypes is not always available in some cases, and reasonable tools to classify monozygotic (MZ) and dizygotic (DZ) are necessary. We attempted to determine the zygosity of 720 adult Korean twin individuals in the Healthy Twin study by simple zygosity questionnaire. Comparing the genotypes (standard forensic markers) of 282 individuals, we examined the validity of the questionnaire-based algorithm classifying zygosity. We also explored whether some clinical measurements such as physical characteristics and blood tests, if added, can improve or complement the zygosity estimation algorithm. Matching more than 15 markers (out of 16) between pairs were determined as true MZs (= 121 pairs) and others as DZs (= 20 pairs). The algorithm-based method showed 254 MZ, 66 DZ and 34 of undetermined zygosity (XZ) where co-twins' zygosity conflicted. The algorithm demonstrated good predictive power for MZ (97.1%), however less accuracy for DZ (86.4%), and most of XZ were MZ (10 out of 11 pairs). Most clinical tests, such as high-density lipoprotein cholesterol, QT interval (ECG), FEV1 (PFT), and DEXA fat measurements, did not improve the discrimination power, while certain physical measurements, especially sitting height, correctly predicted the zygosity for XZ, but not for DZ. We concluded that adding clinical measurements may not significantly enhance the zygosity assessment, especially for those confused DZ twins who might share similar physical characteristics. This study was supported by the Center for Genome Science, Korea National Institute of Health budgets (2005-347-2400-2440-215, 2006-347-2400-2440-215 and 2007-090-091-4854-300).

### THE EFFECT OF BIRTHWEIGHT FOR THE DEVELOPMENT OF RHEUMATOID ARTHRITIS

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The objective is to study the influence of birthweight for the development of rheumatoid arthritis using a case-control study of twins discordant for rheumatoid arthritis in the Danish population. Subjects were 8 monozygotic and 19 dizygotic twin pairs discordant for rheumatoid arthritis. Main outcome measures were the difference in birthweight between twin pairs discordant for rheumatoid arthritis. Valid information on birthweight was obtained for 27 twin pairs discordant for rheumatoid arthritis. Eight pairs were monozygotic and 19 pairs were dizygotic. There was no significant difference in birthweight between monozygotic and dizygotic twins with rheumatoid arthritis (2441 g vs. 2660 g, difference -219 g, 95% CI: -694–256). There was no significant difference in birthweight between twins with rheumatoid arthritis and the healthy co-twins; in monozygotic twin pairs (difference -143 g, 95% CI: -557–271); in dizygotic twin pairs (difference -19 g, 95% CI: -214–176) or combined (difference -56 g, 95% CI: -225–113). It is concluded that birthweight is not a risk factor for the development of rheumatoid arthritis.