monogenic dominant (OMIM 127000) and recessive (OMIM 244460) forms. Indeed, the previously reported family,1 we recently ascertained some more patients in unrelated Bedouin families, who met the criteria for the diagnosis of KCS and had the same traits (microcephaly and psychomotor retardation) as the phenotype in Arab children from the classical profile of KCS.1 In one particular new, non-consanguineous, Bedouin family,1 a brother, who died at the age of 6 months, had the Serious and distinctive features of DiGeorge syndrome (DGS) with major cardiovascular involvement, while his older sister had the Arab phenotype of KCS, without any cardiovascular manifestations. Cardiovascular involvement reappeared in the second child, a male, but with a more severe phenotype, after a molecular link between KCS and DGS.1

The identification of 22q11 microdeletion in only a fraction of patients with KCS is not surprising. In fact, recent microarray studies in some Bedouin patients with the Arab phenotype of KCS has been previously reported and has also been our experience in some of our recently ascertained families. Genetic heterogeneity seems to be present in KCS, as it is in DGS, certainly with room for other possibilities in addition to monosomy 22q11. Because of the clinical overlap between KCS and DGS, it would be reasonable to explore the possibility that, like DGS, some patients with KCS might have some abnormality of chromosome 10p. There is also potential for the possibility of monogenic inheritance, although it is our opinion that the comparison between KCS- and Bernard Soulier syndrome is probably less valid than one may think. It seems more likely that KCS is a contiguous gene syndrome, as is probably the case for DGS, rather than being the result of one or more distinct genes to be located in 22q11, as in the case of Bernard Soulier syndrome. Also, one additional mechanism that could account for the inter-intrafamilial phenotypic heterogeneity in KCS is the result of interactions with individual background genes that would be expected to modify the phenotype.

Although the report by Khan et al, also from Kuwait,7 notes the notion of autosomal recessive inheritance for the Arab variant of KCS, none of the families mentioned in this report was investigated for potential 22q11 hemizygosity. In that report, the presence of consanguinity and several affected family members of both sexes, has been used to point to autosomal recessive inheritance as the mode of inheritance in Bedouin families.1 It is recognised that the presence of consanguinity and multiple affected members in the same sibship would “suggest” autosomal recessive inheritance. On the other hand, the same criteria should not be seen as evidence that “confirms” autosomal recessive inheritance, as the paper by Khan et al emphatically stated, even in the title. In Kuwait, with consanguinity occurring in all marriages, one would expect an excess of recessively transmitted diseases. By the same token, the widespread parental consanguinity among Bedouins tends to reduce the importance of this parameter in the analysis of the mode of inheritance.

Presumably, the presence of some peculiar traits in Arab patients, microcephaly and psychomotor retardation, has caused some confusion in the diagnosis of such cases. To that effect, reports1 of some Arab children with the phenotype described above have been lumped into an isolated category (OMIM 244140) that has been designated “Sanjad-Sahati syndrome” in the McKusick catalogue, after the authors who first reported this phenotype in Saudi Arabia. Surprisingly, the Bedouin patients recently reported by Khan et al have been listed in OMIM as part of the previously autosomal recessive entity of Kenny-Caffey syndrome, despite the fact that they have the same “Arab phenotype”.

We have been prompted to review medical publications for cases with the phenotype mentioned above in an attempt to determine whether they represent a separate syndrome or an Arab variant of KCS. The details of this review are described elsewhere.1 Our results indicate that the main features of the Arab phenotype are very similar, if not identical, to the KCS phenotype. At least in part, the presence of microcephaly in Arab patients is probably apparent, considering the global reduction in head size. This is still an important characteristic which is also observed in the syndrome. Thus, the result of a recent evaluation of the Arab phenotype may be underestimated since in some of the reports describing this Arab phenotype, there was no mention of any radiological assessment to verify the presence or absence of a microcraniopharyngeal stenosis. Finally, there are some different possible alternative mechanisms to explain the association of the Arab variant of KCS with some peculiar traits. One attractive possibility, for example, is the interaction with certain background ethnic specific mutations.

Again, we would like to re-emphasise the coexistence of both DGS and Kenny-Caffey syndrome (or its Arab variant) in the same sibship, as described previously, which indicates that these syndromes should be seen as a spectrum of a host of traits rather than being rigidly classified into separate entities. In conclusion, for the evaluation of the genotypic/phenotypic heterogeneity encountered in KCS and its Arab variant, more thorough effort is needed through a world wide collaboration between different centres.

M A SABRY
M ZAKI
A SHALTOUT
Kuwait Medical Genetic Centre and Paediatric Department, Farawansy and Amiri Hospitals, Kuwait

2 Sabry MA, Zaki M, Hassan SJA, et al. Kenny-Caffey syndrome (or its Arab variant) in the same sibship: as described previously, which indicates that these syndromes should be seen as a spectrum of a host of traits rather than being rigidly classified into separate entities. In conclusion, for the evaluation of the genotypic/phenotypic heterogeneity encountered in KCS and its Arab variant, more thorough effort is needed through a world wide collaboration between different centres.

Tricuspid atresia in sibs

Tricuspid atresia is a rare cardiovascular malformation (CVM) and familial recurrence is uncommon. In the Baltimore-Washington Infant Study (BWIS),1 one girl (of 93 probands) with tricuspid atresia had a sister with an unspecified CVM. Weigel et al reviewed the occurrence of heart defects in 210 sibs of 96 probands with tricuspid atresia. One boy had an older sister with atrial septal defect (not specified whether secundum or primum type) and another older sister had mitral valve prolapse. Grant et al described a boy with tricuspid atresia and pulmonary stenosis whose younger sister had Ebstein anomaly. We report the first instance of tricuspid atresia in sibs.

The proband, an Italian boy, was diagnosed prenatally by echocardiography and catheterisation with classical tricuspid atresia. He had levocardia with situs solitus of the atria and visceris, right atriocentral valve atresia, D ventricular loop, and normally related great arteries. At age 5 months, he had surgery for a right atrial-pulmonary artery Fontan anastomosis, but died shortly afterward of heart failure.

The younger brother, now 7 years old, was born eight years later to the same parents. He had the same cardiac anatomy as his brother and was treated with a Glenn superior venous cava-pulmonary artery shunt. He is currently a candidate for a Fontan-type anastomosis.

Neither boy had dysmorphic facial features or non-cardiac malformations. High resolution prometaphase (1250 bands) chromosome analysis was normal in both (46,XY). Fluorometric in situ hybridisation was negative for chromosome 22q11 microdeletion. The family history is negative for cardiovascular malformations. The parents are not related. Auscultation of them was normal; echocardiogram and electrocardiogram were refused. The maternal prenatal negation was negative for exposures.

The recurrence risk for sibs with tricuspid atresia is low, about 1.0%.1,4 The family in this report typifies the challenge of determining accurate genetic counselling for many families with non-syndromic CVMs. Assuming the parents are not affected, the suggested risk of recurrence for two affected sibs triples to 3%.4

The occurrence of tricuspid atresia in two brothers may tempt one to speculate that autosomal or X linked recessive inheritance is present, implying a much higher risk of recurrence. Further evidence for an X linked gene is suggested by the significant odds ratio for males with tricuspid atresia (1.93) in the BWIS, which follows in frequency the more familiar male predominance of d-transposition of the great arteries (2.57) and aortic stenosis (5.5), but had surgery for a right atrial-pulmonary artery Fontan anastomosis, but died shortly afterward of heart failure.

The occurrence of tricuspid atresia in two brothers may tempt one to speculate that autosomal or X linked recessive inheritance is present, implying a much higher risk of recurrence. Further evidence for an X linked gene is suggested by the significant odds ratio for males with tricuspid atresia (1.93) in the BWIS, which follows in frequency the more familiar male predominance of d-transposition of the great arteries (2.57) and aortic stenosis (5.5), but had surgery for a right atrial-pulmonary artery Fontan anastomosis, but died shortly afterward of heart failure.

The occurrence of tricuspid atresia in two brothers may tempt one to speculate that autosomal or X linked recessive inheritance is present, implying a much higher risk of recurrence. Further evidence for an X linked gene is suggested by the significant odds ratio for males with tricuspid atresia (1.93) in the BWIS, which follows in frequency the more familiar male predominance of d-transposition of the great arteries (2.57) and aortic stenosis (5.5), but had surgery for a right atrial-pulmonary artery Fontan anastomosis, but died shortly afterward of heart failure.
BOOK REVIEW

If you wish to order or require further information regarding the titles reviewed here, please write to or telephone the BMJ Bookshop, PO Box 295, London WC1H 9JR. Tel 0171 383 6244. Fax 0171 383 6662. Books are supplied post free in the UK and for BFPO addresses. Overseas customers should add 15% for postage and packing. Payment can be made by cheque in sterling drawn on a UK bank or by credit card (Mastercard, Visa, or American Express) stating card number, expiry date, and full name. (The price and availability are occasionally subject to revision by the Publishers.)

The Science behind Jeans for Genes Day: Teaching Packs for Primary (Key Stage 2) and Secondary (Key Stage 4) Schools. M Pembrey. The Progress Educational Trust.

It is often suggested that if genetics teaching within the national curriculum could be focused on practical issues that could affect students themselves (such as genetic diagnosis and screening), this change in emphasis could help them to learn by involving their natural interest, and also prepare them for the impact of current genetic advances on their adult lives. However, teachers need help from expert geneticists if this is to come about.

Professor Marcus Pembrey has an unusual ability to communicate genetic concepts in imaginative ways, and has put his ability to work in creating these two teachers' packs, adapted to specific stages of the national curriculum. The packs are intended to support teachers in teaching genetics in a realistic way that will be useful for students in later life as well as supporting educational objectives. Each pack consists of (1) a resource book for teachers, the "Progress Guide to Genetics", and (2) a file of four case studies, which can be photocopied for the children: these are the same in both the primary and the secondary packs. There are also (3) teachers' notes, and (4) four worksheets, also to be photocopied: these differ between packs.

The materials are imaginative and attractive. For example, the worksheet for primary schools shows a picture of Professor Pembrey's own family, with clues for drawing up a family tree, the common symbols used, and hints to help young children learn the principles of pedigree drawing. One worksheet explains the structure of DNA, the way it is packed into chromosomes, and the location of the chromosomes in the nucleus of the cell.

Another shows some organs of the human body, challenges the students to place them in a body outline, and explains which of the organs can be affected by the genetic disorders outlined in the case histories. The teachers' notes include suggestions for games that can be used to illustrate, for example, the pairing principle that permits faithful replication of DNA. The secondary school pack uses the same basic resources to develop the basic concepts of genetics further. Subjects tackled include Mendelian inheritance and inheritance of sex, replication of DNA and the function of genes, inheritance of genetic disease, and genetic testing in the family and its uses. The teachers' pack includes information to assist teachers in discussing complex issues, such as prenatal diagnosis and other difficult choices.

The progress guide to genetics also illustrates Professor Pembrey's flair for simple, benign, and graphic illustration, and includes the images used on the worksheets. However, the text is not as clear and simple as the diagrams. It uses a conversational tone, which may be helpful for people who have no previous understanding of genetics, but does not quite match the simplicity and clarity of the worksheets.

This is an excellent resource, not only for teachers, but for nurses, genetic counsellors, and others who sometimes go into schools to help teach pupils about genetic issues.

BERNADETTE MODELL