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Using Genes to Define Motherhood - The California Solution

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centration of low-density lipoprotein (LDL) cholesterol, therefore, the triglyceride value should have been divided by 2.18 instead of 5.

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The authors reply:

To the Editor: Drs. Giral and Bruckert are correct in saying that when plasma cholesterol and triglyceride concentrations are expressed in millimoles per liter the triglyceride value should be divided by 2.18 to calculate the plasma cholesterol concentration. The values in our letter are correct, however, because we calculated the LDL cholesterol levels in milligrams per deciliter and then converted them to millimoles per liter.

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GM-CSF AND ACCELERATED HEMOLYSIS

To the Editor: Many side effects of treatment with granulocyte-macrophage colony-stimulating factor (GM-CSF) have been reported, including bone pain, fever, myalgias, and arthralgias. We describe a patient who had a reaction that we have not seen reported previously.

A 42-year-old woman was admitted to the hospital with fever and neutropenia due to recent chemotherapy for non-Hodgkin's lymphoma. She had originally presented in 1983 with IgM-kappa cold-agglutinin hemolytic anemia with anti-Pr specificity.¹ In 1985 she underwent splenectomy, and the pathological analysis revealed well-differentiated lymphocytic lymphoma. Hemolysis was controlled with pulse doses of chemotherapy. In 1988 biopsy of a new lymph node revealed conversion to diffuse, mixed histiocytic non-Hodgkin's lymphoma. A new chemotherapeutic regimen was begun, with an initial response, but adenopathy recurred and histologic analysis showed diffuse, poorly differentiated non-Hodgkin's lymphoma. The regimen was again changed while the patient underwent evaluation for autologous bone marrow transplantation; transplantation was performed in 1990. Five months later, hemolytic anemia returned and another salvage regimen was started. Because of lymphomatous infiltration of the bone marrow, we decided to give her full-dose chemotherapy followed by GM-CSF (250 mg per square meter of body-surface area per day subcutaneously). This growth factor was chosen rather than granulocyte colony-stimulating factor (G-CSF) because of persistent thrombocytopenia after transplantation and the theoretical possibility of stimulating platelets as well as white cells.

Treatment with GM-CSF was started two days after the completion of chemotherapy, but one day later fever and neutropenia developed. Cultures were performed, a regimen of broad-spectrum antibiotics was begun, and treatment with GM-CSF was continued. On the morning of the fifth day of GM-CSF treatment the patient's hematocrit was 5 percent, down from 18 percent the previous day. Her bilirubin level had risen from 7 mg per deciliter to 37, and her lactic dehydrogenase level had increased from 1200 U per liter to 1650. All findings were thought to be consistent with severe hemolysis. Packed red-cell transfusions were given, treatment with GM-CSF was stopped, and the patient received an eight-hour infusion of vinblastine. The following day her hematocrit was up to 25 percent, and although hemolysis continued, its rate returned to that present at base line. Three days later treatment with G-CSF was started and was continued for 10 days, with no further evidence of accelerated hemolysis. Two more cycles of chemotherapy followed by G-CSF were given, and there were no more episodes of such severe hemolysis.

Vinca-loading of platelets was originally described in the treat-

ment of idiopathic thrombocytopenia² and subsequently in autoimmune hemolytic anemia.³ We believe that the accelerated hemolysis was the result of macrophage stimulation by GM-CSF, leading to increased phagocytosis of red cells. Vinblastine binds to platelets, which concentrate vinca alkaloids because of their high concentration of tubulin. The macrophages are poisoned when they ingest platelets and are unable to continue phagocytosing red cells.

When choosing which growth factors to use to support aggressive chemotherapy, one should consider the important differences between the two available growth factors. In our patient, the stimulation of macrophage activity by GM-CSF^{4,5} was an undesirable effect in the presence of IgM cold-agglutinin-mediated hemolysis. IgM-mediated hemolysis is dependent on complement binding and activation of C3b. Although no specific receptor has been identified on human monocytes or macrophages, fixed macrophages (Kupffer cells) in the liver^{6,7} with high levels of C3b surface receptors have been called on to explain the lack of benefit of splenectomy in this situation. These cells, like all macrophages, may be stimulated by GM-CSF, but not by G-CSF, to accelerate hemolysis such as we observed in our patient.

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Letters to the Editor should be typed double-spaced (including references) with conventional margins. The length of the text is limited to 40 typewritten lines (excluding references). Abbreviations should not be used.

LEGAL ISSUES IN MEDICINE

USING GENES TO DEFINE MOTHERHOOD — THE CALIFORNIA SOLUTION

GEORGE J. ANNAS, J.D., M.P.H.

SOMETIMES (although not often) new forms of medical technology raise unique legal and social-policy issues that require new laws. In vitro fertilization, followed by the transfer of the embryo to a woman who did not contribute the ovum, is such a technique, be-

cause when the child's gestational mother is not the child's genetic mother, society must decide which is the child's legal mother. A California Court of Appeal, the first appellate court anywhere in the world to rule on this issue, decided in late 1991 that genes determine motherhood.

THE TRIAL COURT'S OPINION

Crispina Calvert was unable to bear a child because she had had a hysterectomy. She and her husband Mark negotiated a contract with Anna Johnson, a young, single nurse, who agreed to gestate an embryo composed of their ovum and sperm and to turn over the resulting child to them in exchange for a fee of \$10,000. This arrangement differs from the more typical surrogate-mother agreement in which the contracting woman is both the genetic and the gestational mother (as in the case of Baby M) and disputes involve custody battles between her and the child's father. Near the end of her pregnancy Ms. Johnson asked the court for a declaration that she was the child's mother and requested visitation rights. HLA testing confirmed that the child, Christopher, born September 19, 1990, had no genetic relationship to Ms. Johnson. After a hearing, Judge Richard N. Parslow, Jr., concluded, in an opinion delivered orally from the bench, that Crispina Calvert alone should be considered Christopher's mother:

Anna Johnson is the gestational carrier of the child, a host in a sense. . . . [S]he and the child are genetic hereditary strangers. . . . Anna's relationship to the child is analogous to that of a foster parent providing care, protection and nurture during the period of time that the natural mother, Crispina Calvert, was unable to care for the child.¹

The judge bolstered this opinion by mentioning studies of twins that implied that genetics was more important than environment, by finding that the contract was valid, and by concluding that giving custody of Christopher exclusively to the Calverts was in the best interests of the child:

I think a three-parent, two-natural-mom claim in a situation is ripe for crazy making, as they say nowadays, [and there is] a high probability of that happening in this case given the parties we have involved. . . . [T]his will create confusion in a child having a three-parent arrangement.¹

THE DECISION OF THE COURT OF APPEAL

In a unanimous decision, the Court of Appeal affirmed the trial court's ruling.² The court found it unnecessary to decide either whether the contract was enforceable or whether granting custody to the Calverts was in Christopher's best interests. Contracts for personal services are almost never specifically enforceable (the baseball player cannot be forced to pitch, nor the surgeon to operate), and enforcing an agreement by a woman to give up her parental rights to a child before she has given birth encounters additional public-policy obstacles, including laws related to adoption, the termination of parental rights, and baby-selling. Instead, the court focused exclusively on determining which of the two women was "the child's 'natural' mother. The woman who nurtures the child

in her womb and gives birth — or the otherwise infertile woman whose egg [embryo] is implanted into the woman who gave birth?"² The court decided that a blood test should determine maternity, just as it could determine paternity under California law.

Specifically, the court relied on California's 1975 Uniform Parentage Act. The act's primary purpose was to eliminate the status "illegitimate child" by defining the legal rights of children on the basis of the parent-child relationship (rather than the marital status of the parents). One part of this act provides that "insofar as practicable, the provisions of this part applicable to the father and child relationship apply" to establishing a mother-and-child relationship. The provisions relating to fatherhood provide that "the issue of a wife cohabiting with her husband, who is not impotent or sterile, is conclusively presumed to be a child of the marriage." Nonetheless, with the permission of the husband or wife, paternity can be questioned in court, and "if all the experts" agree that blood tests disclose that the "husband is not the father of the child," such tests may conclusively rule out a man as the father.

Since Ms. Johnson did not dispute the results of the HLA testing that confirmed that she was not the child's genetic mother, the court used the statute to rule her out as the child's "natural" mother:

We must "resolve" the question of Anna's claim to maternity as we would resolve the question of a man's claim to (or liability for) paternity when blood tests positively exclude him as a candidate. . . . In light of Anna's stipulation that Crispina is genetically related to the child and because of the blood tests excluding Anna from being the natural mother, there is no reason not to uphold the trial court's determination that Crispina is the natural mother. She is the only other candidate!²

Ms. Johnson asked the court to look to other California statutes to determine the question of motherhood. One provided that a parental relation "between a child and the natural mother may be established by proof of her having given birth to the child." Another provided that a sperm donor whose sperm is used to inseminate someone other than the donor's wife must be treated "in law as if he were not the natural father of a child thereby conceived." The court found both of these statutes irrelevant — the first because it used the word "may" and thus left open other possible ways to establish the relation, and the second because it was written specifically with artificial insemination by donor in mind and was not meant to apply to a case like this, in which "a husband used a new medical procedure which enabled him and his wife to have a child of their own." The court observed: "As Mark Twain once said about the difference between the right word and the nearly right word, the difference in the two procedures [artificial insemination by donor and gestational surrogacy] is the difference between lightning and the lightning bug."²

CONSTITUTIONAL ISSUES

Finally, the court concluded that California law violates no constitutionally protected liberty interest in any relation with the child that Anna Johnson might

have gained through pregnancy and childbirth. The appeals court relied exclusively on the U.S. Supreme Court case of *Michael H. v. Gerald D.* for the proposition that only liberty interests that have been “traditionally protected” have constitutional stature.³ In *Michael H.*, Justice Antonin Scalia, who wrote the Court’s plurality opinion, decided that California could constitutionally refuse to grant a paternity hearing to a man who had had a daughter with a married woman, because U.S. laws had not traditionally protected the relation between an unwed “adulterous natural father” and his child.³ Similarly, the appeals court determined that Ms. Johnson could not claim a constitutionally protected liberty interest because “our society has never ‘traditionally protected’ the right of a gestational surrogate.”²

As to a possible violation of equal protection, the court ruled that using genes instead of gestation to determine parenthood for both mothers and fathers was sex-neutral and rational because

as the evidence at the trial showed, the whole process of human development “is set in motion by the genes.” There is not a single organic system of the human body not influenced by an individual’s underlying genetic makeup. Genes determine the way physiological components of the human body, such as the heart, liver, or blood vessels operate. Also, according to the expert testimony received at trial, it is now thought that genes influence tastes, preferences, personality styles, manners of speech and mannerisms.²

IMPLICATIONS OF THE OPINION

This opinion contributes little to the resolution of whether the genetic or the gestational mother should be considered the legal mother of a child. Calling the genetic mother the “natural” mother simply begs the question; it does not answer it. The court’s equation of paternity testing with maternity testing is, of course, correct if one is trying to determine who the genetic parent is, but in this case that was never an issue. In human reproduction men contribute only genes; women contribute both genes and gestation. The question is what rules society should adopt now that these maternal contributions can be separated.

Anna Johnson never claimed to be the child’s genetic mother. The only question she asked was whether her pregnancy and childbirth gave her a mother–child relationship with Christopher. Thus, the court’s long exegesis on statutes defining parenthood that were passed before the advent of in vitro fertilization is as irrelevant as the statutes concerning motherhood that were passed before in vitro fertilization and the statutes concerning artificial insemination, passed before embryo transfer, that the court discounted. The relevant question was the relation of Ms. Johnson to Christopher; labeling Ms. Calvert Christopher’s “natural mother” does not answer it.

The appeals court acknowledged early in its opinion that words were often used to color questions regarding the new reproductive techniques. Calling a woman a surrogate, for example, tends to objectify and dehumanize her. The lower-court judge referred to Ms. Johnson as a “carrier” and as a “host” who provided a “gestational environment,” all terms that suggested an impersonal, interchangeable service role like pro-

viding a taxi or a hotel room. The appeals court, even while recognizing the potential pitfalls of language, could not help adopting the adjective “natural.” Having labeled Ms. Calvert the natural mother, the court in effect relegated Ms. Johnson to an “unnatural,” almost alien status. In this regard the case is similar to that of *Michael H.*, in which the U.S. Supreme Court, upholding the statute relied on by the appeals court, referred to a natural father as an “adulterous natural father.”³ That decision, which ignored genetics in determining paternity, has been properly criticized for adopting the indeterminate test of “traditional protection” to identify currently protected constitutional liberties.⁴ Appeal to tradition does not answer the question of which traditions merit protection. It probably escaped no one’s notice, for example, that there is no legal tradition of protecting the contributors of ova in the United States, whereas there is a long tradition of protecting gestational mothers.

The justices ultimately decided that the genetic mother is the natural mother because “the whole process of human development ‘is set in motion by the genes.’” But, of course, the same statement can be made on behalf of the gestational mother. Without her body and her pregnancy, human development would not have continued. Similarly, “there is not a single organic system” in Christopher’s body that was not influenced by Ms. Johnson’s body during the pregnancy. Thus, many of the same arguments that the Court used to favor genes over gestation could be used to uphold an opposite decision. The problem, of course, is that the genetic and gestational mothers have more in common than judges care to acknowledge. There is a tidiness in designating one the natural mother and the other an unrelated stranger. But such a designation will never be satisfactory, since whichever woman is chosen, the other is depersonalized and marginalized. The opinion of the Court of Appeal marginalizes and devalues pregnancy and childbirth, but an opposite opinion would devalue and marginalize genetics.

We currently live in an age in which genes are seen, as all the California judges in this case saw them, as the key to human existence. But what then of the large number of women who are capable of carrying a child to term but who cannot produce ova? They now rely on donated ova (rather than gestational surrogacy) to enable them to give birth to children.⁵⁻⁸ If the judges are correct, the “natural” mothers of these children are the donors of the ova, not the women who give birth to the children. This conclusion would make current ovum-donation programs unworkable.⁸ A related question involves fatherhood. Under California’s Uniform Parentage Act, if we consider the donor of the ovum the natural mother, then her husband, and not the husband of the woman who gives birth (who is also the genetic father), is the natural father of the child. Likewise under the act, if Ms. Johnson had been married, Christopher would have been “conclusively presumed” to be a child of her marriage. These results are of course the very type of “crazy making” the judges thought they were avoiding

by ignoring the claims of the gestational mother. They have done even worse than ignore her, however. They have taken part in exploiting her. As in virtually all surrogate-motherhood arrangements, Ms. Johnson was poor and needed the \$10,000 fee literally to pay her rent. Poor women will probably continue to be used by middle-class couples to perform this "service" for them.

WHAT ROLE SHOULD GENES HAVE IN DEFINING MOTHERHOOD?

It is unfair to criticize the courts too harshly for not arriving at the ultimate solution to this unique and complex question, in which three adults are intimately involved in producing a child to whose development all have contributed biologically and emotionally (if not genetically). Although the court's approach seems both misdirected and unfair, the best solution is not obvious. I have argued in the past that the traditional definition of motherhood should be maintained — that is, that the woman who gives birth to a child should be irrefutably presumed to be the mother of that child.⁹ Although she could relinquish her parental rights to the child after birth, she would have the option to raise the child if she chose. This would make commercial surrogacy less attractive, but the United States is now the only country to permit it at all. This rule would protect all women who go through pregnancy and childbirth, including the recipients of donated ova. Birth certificates would of course continue to name the gestational mother.¹⁰

At the same time, the reality of this case and others like it is that the child has two mothers, a gestational mother and a genetic mother. Society should acknowledge this biologic fact and take it into account in allocating the rights and responsibilities of parenthood.¹¹ We might decide to treat donors of ova the same way we treat sperm donors, but we cannot treat gestational mothers this way. In any event, careful consideration of visitation rights for the noncustodial mother seems essential. And while we work out the proper approach, all physicians and clinics must maintain careful records of the identities of donors of sperm and ova. Public policy must acknowledge the complexity of gamete donation and ultimately take into consideration the best interests of the child.¹⁰

The California appeals court rejected the position of the Ethics Committee of the American College of Obstetricians and Gynecologists that gestation determines motherhood, regardless of genetics.¹² The court said that the committee had failed to provide an adequate explanation for its conclusion, adding that "the operation of the Parentage Act does not depend on what a group of doctors, however distinguished and learned in their field, think the law ought to be."² On this latter point, the court is correct. But this should not dissuade medical groups from formulating policy recommendations — provided they are supported with a well-articulated rationale that focuses on the best interests of parents and children and are not self-serving. It will be especially important for physicians

to be actively involved as this issue moves from the courts to the state legislatures, which currently have the constitutional authority to enact any laws that are "rational." In reexamining the separation of genetic and gestational motherhood that technology now permits, it may be useful to recall another of Mark Twain's observations, which this case illustrates: "Man can seldom take a plain fact [in this instance, genetic relation] and get any but a wrong meaning out of it."

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BOOK REVIEWS

PRACTICAL DOPPLER ULTRASOUND FOR THE CLINICIAN

By Raymond L. Powis and Robert A. Schwartz. 187 pp., illustrated. Baltimore, Williams and Wilkins, 1991. \$55.

Early in this book, the authors lament, "'Doppler Physics' is a special incantation that turns an eager audience of students into lightly sedated glassy-eyed humans, convinced they are unable to learn such a difficult topic." I am happy to report that Drs. Powis and Schwartz have succeeded against all odds in producing a comprehensible, thorough, and eminently readable textbook on Doppler ultrasonography. They proceed in a step-by-step fashion. First, they discuss the tissue-ultrasound interaction. They then present a cogent summary of blood flow, including hydrostatics, hydrodynamics, pulsatile flow, and the effects of atherosclerosis. The focus then shifts to the Doppler equation and how the Doppler signal is produced and analyzed by ultrasound equipment. Duplex imaging is explained in a particularly effective way. The authors conclude with a useful chapter in which the Doppler display is linked to pathophysiologic events. The discussion becomes quite technical at times, and the authors do not hesitate to present mathematical equations, describe the details of ultrasound instrumentation, or analyze ultrasound artifacts.

I must admit in all honesty that at times I found the material daunting. The writing is exceptionally clear, however, and nothing is taken for granted. As presented here, this complex material can be understood by those with a rudimentary physics background. It is undeniable that more information is presented than the average Doppler ultrasound practitioner will use routinely. The great value of this book is that all the information one would ever need to use can be found in a single source accessible to readers at all levels of expertise and sophistication.

This book belongs in the department library of every subspecialty