Adaptive reasons for variation in sex ratios

Ray and colleagues[1] present data on variation in birth sex ratios among Ontario newborns, showing a significant male-biased sex ratio at birth among multiparous Indian and South Korean mothers. The authors suggest that women from these countries may be using prenatal sex determination and selective termination. However, there are plausible, adaptive reasons for variations in both individual- and population-level sex ratios.

Although even sex ratios seem to be a natural consequence of chromosomal sex determination, such accounts fail to explain why natural selection favours such sex ratios. Fisher[2] first argued that parents who overproduce the rarer sex will have greater evolutionary success. If such overproduction was transmitted genetically to offspring, then the rarer sex would become increasingly common over time and the advantage of producing the rarer sex would decrease, eventually disappearing when neither sex was rare (even sex ratio).

Fisher's reasoning has been generalized to explain biased birth sex ratios, like those seen in humans. Besides differential, sex-specific mortality,[3,4] biased sex ratios are an expected evolutionary response to inbreeding,[4] competition or cooperation among relatives,[4] and heritable, fitness-enhancing traits of parents.[4] The latter explanation has been used to account for differential production of sons and daughters in humans.[3,4] Furthermore, such adaptive responses can be achieved through a variety of physiological mechanisms, not simply feticide, and can result in sex-ratio bias at the population level[5] similar to that observed by Ray and colleagues.

Given the multiplicity of factors that could contribute to adaptive variation in sex ratios,[4] the results presented by Ray and colleagues seem less surprising, and possibly less troubling. From an evolutionary perspective, interpreting these results with caution — especially when they might have significant social and public-policy implications — seems wise.

João Alpedrinha MSc, Geoff Wild PhD
The Department of Zoology, University of Oxford, Oxford, UK (Alpedrinha); and the Department of Applied Mathematics, the University of Western Ontario, London, Ont. (Alpedrinha, Wild)

References

1. Ray JG, Henry DA, Urquia ML. Sex ratios among Canadian liveborn infants of mothers from different countries. *CMAJ* 2012;184:E492-6.
2. Fisher RA. *The genetical theory of natural selection*. Oxford (UK): Clarendon Press; 1930.
3. Lazarus J. Human sex ratios: adaptations and mechanisms, problems and prospects. In: Hardy ICW, editor. *Sex ratios: concepts and research methods*. Cambridge (UK): Cambridge University Press; 2002. p. 287-311.
4. West SA. *Sex allocation*. Princeton (NJ): Princeton University Press; 2009.
5. Wild G, West SA. A sex allocation theory for vertebrates: combining local resource competition and condition-dependent allocation. *Am Nat* 2007;170: E112-28.

***CMAJ* 2012. DOI:10.1503/cmaj.112-2070**

Minimizing injection pain

We enjoyed the "Five things" article by Strazar and Lalonde.[1] Their tips on minimizing pain during administration of local anesthesia are very useful and easily applied. As ophthalmologists and oculoplastic surgeons operating in the exquisitely sensitive periocular skin, we are particularly interested in minimizing pain during injection — both to maximize patient comfort and to prevent serious complications, up to and including vision loss, which can occur with sudden patient movement and intraocular needle penetration. We would like to add 2 more "things to know" about minimizing injection pain associated with local anesthesia.

First, we have found an alternative additive to the local anesthetic to be more effective than sodium bicarbonate at reducing pain during infiltration. We mix all of our lidocaine for local infiltration 1:1 with 0.9% bacteriostatic saline (containing benzyl alcohol). Pain is reduced predominantly by the inherent anesthetic property of benzyl alcohol rather than by changes in pH as occurs with bicarbonate buffering.[2]

Second, an additional technique that has been shown to be effective is application of a vibrating device in the vicinity of the injection.[3] The precise underlying neurophysiological mechanisms remain incompletely understood, but can be simplified conceptually as a competing regional signal being simultaneously interpreted by the central nervous system, decreasing the perception of pain. These additional tips can be considered when infiltrating anesthesia into sensitive areas of the body.

Also, we would like to caution the readership about perpendicular injections in the eyelid tissue. The skin in this area is very thin (especially in elderly patients), and to avoid unintentional globe penetration we believe the needle should be inserted parallel to the skin.

Michel J. Belliveau MD, David R. Jordan MD
Ophthalmology resident (Belliveau), Queen's University, Kingston, Ont.; and Professor of Ophthalmology (Jordan), University of Ottawa Eye Institute, Ottawa, Ont.

References

1. Strazar R, Lalonde D. Minimizing injection pain in local anesthesia. *CMAJ* 2012 Apr. 30 [Epub ahead of print].
2. Yuen VH, Dolman PJ. Comparison of three modified lidocaine solutions for use in eyelid anesthesia. *Ophthal Plast Reconstr Surg* 1999;15:143-7.
3. Fayers T, Morris DS, Dolman PJ. Vibration-assisted anesthesia in eyelid surgery. *Ophthalmology* 2010;117:1453-7.

***CMAJ* 2012. DOI:10.1503/cmaj.112-2071**

Federal Aboriginal health programs

A recent *CMAJ* news article, "Aboriginal health programming under siege, critics charge,"[1] did not include key facts that would have provided a balanced view of federal Aboriginal health programs.

I would like to make your readers aware of the following:

- Our government is investing signifi-

cantly in the health of all Canadians, including Aboriginal people.
- During a time of deficit reduction, funding was maintained for all federally funded front-line health care services, including nursing, in First Nation and Inuit communities.
- Contrary to the claims made in your article, our government is making sure Aboriginal voices are heard when it comes to health research that is supposed to benefit their communities.
- I recently announced an additional $25 million to support research addressing suicide, tuberculosis, oral health and obesity as part of the Pathways to Health Equity for Aboriginal Peoples initiative. The pathways program requires researchers to work collaboratively with community leadership to help avoid situations where studies are created in ivory towers of academia and don't have any positive impact on the lives of actual people.

As a Northerner, I am well aware of the health challenges faced by Aboriginal people in this country. Our government is investing strategically to help narrow the health gap between Aboriginal and non-Aboriginal Canadians.

Leona Aglukkaq PC MP
Minister of Health, Health Canada,
Ottawa, Ont.

Reference

1. Webster PC. Aboriginal health programming under siege, critics charge. *CMAJ* 2012; 2012 Sept. 4 [Epub ahead of print].

***CMAJ* 2012. DOI:10.1503/cmaj.112-2072**

The author responds

I am grateful to Health Minister Leona Aglukkaq for her response[1] to my article.[2]

I am concerned, however, that the minister indicates that the article "did not include key facts," including what she describes as "$25 million to support research addressing suicide, tuberculosis, oral health and obesity as part of the Pathways to Health Equity for Aboriginal Peoples initiative."

The article clearly states that "the federal government … is shifting Aboriginal health research funding under the rubric of the Canadian Institutes of Health Research … CIHR has invested $151.5 million in health research related to Aboriginal peoples' health since 2006, including $31 million in fiscal 2010/11 … CIHR launched a $25 million initiative aimed at understanding how to reduce Aboriginal health inequities."

CMAJ clearly reported the facts the minister suggests were omitted.

Paul Christopher Webster
Regular contributor, *CMAJ*

References

1. Aglukkaq L. Federal Aboriginal health programs. *CMAJ* 2012;184:1715-16.
2. Webster PC. Aboriginal health programming under siege, critics charge. *CMAJ* 2012; 2012 Sept. 4 [Epub ahead of print].

***CMAJ* 2012. DOI:10.1503/cmaj.112-2073**

Farm-grown superbugs?

The *CMAJ* editorial by Barbara Sibbald was interesting and highlighted the threat of antibiotic use in animals leading to antibiotic resistance in humans.[1] However, despite the ban on antibiotic use for growth promotion in Sweden for many years, and more recently in Denmark and the European Union in general, no evidence is presented that these bans are having any influence on the amount of animal-derived antibiotic resistance in humans. The author of the editorial[1] presents no hard evidence in support of the thesis that widespread antibiotic bans in animals have any widespread beneficial effects for human health.

I have followed this debate for the last 40 years; the agriculture industry appears to me to be more of a scapegoat for poor medical practices than poor agricultural practices. The value of this debate would improve if it were to move beyond speculative assumptions and toward an effort to quantify the benefits of more restrictive policies on antibiotic use in animals.

Brad Hicks DVM
Feed manufacturer, Langley, BC

Reference

1. Sibbald B. Farm-grown superbugs: While the world acts, Canada dawdles. *CMAJ* 2012;184: 1553.

***CMAJ* 2012. DOI:10.1503/cmaj.112-2074**