

women worldwide, reliable data on hormone concentrations exist.

Contributors: GJ wrote the paper, compiled the data on hormone concentrations, and is guarantor for the paper. IT provided the epidemiological data and co-edited the paper.

Funding: Norwegian Cancer Society grant number TP-49258/001.

Competing interests: None declared.

- 1 Jasienska G, Thune I, Ellison PT. Energetic factors, ovarian steroids and the risk of breast cancer. *Eur J Cancer Prev* 2000;9:231-9.
- 2 Vitzthum VJ, Ellison PT, Sukalich S, Caceres E, Spielvogel H. Does hypoxia impair ovarian function in Bolivian women indigenous to high altitude? *High Altitude Med Biol* 2000;1:39-49.
- 3 Friedenreich CM, Thune I, Brinton AA, Albanes D. Epidemiologic issues related to the association between physical activity and breast cancer. *Cancer* 1998;83(suppl):600-10.

(Accepted 13 December 2000)

## RESEARCH POINTERS

# Light eye colour linked to deafness after meningitis

Bacterial meningitis is the most common cause of profound deafness acquired in childhood. Previously there have been no strong indicators of why some survivors of meningitis experience hearing loss whereas others recover fully.

The link between pigmentation and damage to hearing after exposure to ototoxic substances and noise is well documented. People with brown eyes are more likely to experience hearing loss after exposure to cisplatin. It is assumed that people with dark eyes also have more melanin in the inner ear than those with light eyes, and melanin causes the retention of ototoxic derivatives within the cochlea.<sup>1</sup> A higher melanin content in the cochlea also protects against the effects of noise; those with dark eyes are less likely to develop hearing loss associated with noise.<sup>2</sup>

## Participants, methods, and results

Eye colour was examined in 133 deaf patients with cochlear implants, either by the author's direct observation or by requesting the information by mail. Results were obtained for 130 patients aged from 2 to 80 years (mean 28 years); three patients failed to reply after two letters. The classification of eye colour is subjective; shades of blue, green, grey, and hazel are difficult to distinguish. The classification I used was therefore simply "dark" or "light." "Dark" included pure brown eyes, usually of non-white people, and all other shades of brown. "Light" included blue, green, grey, and hazel eyes.

Overall, 32 patients were deafened by meningitis (table). Of the 98 patients whose deafness was not due to meningitis, 26 (27%) had dark eyes and 72 (73%) had light eyes. This is almost identical to figures obtained from the National Study of Hearing (A Davis, personal communication). From that sample of 1598 adults in the United Kingdom, 447 (28%) had dark eyes and 1151 (72%) had light eyes.

Only two (6%) of the patients in the meningitis group, however, had dark eyes, with 30 (94%) having light eyes. The difference in proportions of eye colour between the survivors of meningitis and the UK adult population was significant. The odds ratio showed that people with light eyes were 5.8 times as likely to be deafened by meningitis than those with dark eyes (95% confidence interval 1.4 to 24.4).

Types of meningitis causing deafness in 32 patients

Type of meningitis	Number of patients
Pneumococcal	20
<i>Haemophilus influenzae</i>	3
Meningococcal	2
Tuberculosis	2
Streptococcal	1
Bacterial, unknown type	1
Viral	1
Unknown	2

## Comment

People with light eyes are more likely to be deafened by meningitis than those with dark eyes. I propose that a higher melanin content protects the inner ear from damage caused by meningitis. However it is possible that the data are misleading. Perhaps people with light eyes are more vulnerable to meningitis or those with dark eyes are more likely to die from meningitis, thus skewing the data for eye colour in the survivors. There is much published evidence that black people have a higher incidence of meningitis than white people,<sup>3</sup> although the reasons for this may be unrelated to pigmentation. Further research may suggest a genetic basis; perhaps the genes encoding eye colour are in linkage disequilibrium with the genes determining the inflammatory response to infection.

I thank ME Lutman for advice, RL Booth for statistics assistance, G Jones for microbiology input, and GP Clarke for initial motivation of my interest in this topic.

Funding: None.

Competing interests: None declared.

1 Wendell Todd N, Alvarado CS, Brewer DB. Cisplatin in children: hearing loss correlates with iris and skin pigmentation. *J Laryngol Otol* 1995;109:926-9.

2 Barrenäs M-L, Lindgren F. The influence of inner ear melanin on susceptibility to TTS in humans. *Scand Audiol* 1990;19:97-102.

3 Henneberger PK, Galaid EL, Marr JS. The descriptive epidemiology of pneumococcal meningitis in New York City. *Am J Epidemiol* 1983;117:484-91.

(Accepted 23 November 2000)

## Correction

*Systematic review of long term anticoagulation or antiplatelet treatment in patients with non-rheumatic atrial fibrillation*

In this paper by Taylor et al (20 January, pp 321-6) the name of the drug used in antiplatelet treatment should have been indobufen, not indoprofen. Indoprofen was withdrawn from use worldwide after reports of carcinogenicity in animal studies.

**People with light eyes are more prone to deafness after meningitis than those with dark eyes**

Hearing and Balance Centre, Institute of Sound and Vibration Research, University of Southampton, SO17 1BJ

Helen E. Cullington  
audiological scientist

Correspondence to:  
H E Cullington  
hec@isvr.soton.ac.uk

BMJ 2001;322:587