clude that the incidence of eye problems in the present study was not excessive. No study other than the present one has followed so many patients in serial assessments over a period of years. Interesting findings were the evanescent nature of positive results in the ophthalmological tests and lack of correlation between symptoms or complaints by the patient and positive test results. There was no pattern of gradually increasing eye problems with prolonged treatment and no sign of any serious side effects at all.

References

- AUFFRET, J. (1971). *Le test de Schirmer: Experimentation sur 120 sujets*. Thesis, University of Paris.
- BAUER, G.E., BAKER, J., HUNYOR, S.N. & MARSHALL, P. (1978). Side effects of antihypertensive treatment: a placebo controlled study. *Clin. Sci. mol. Med.*, **55**, 341S–344S.
- DOLLERY, C.T., BULPITT, C.J., DANIEL, J. & CLIFTON, P. (1977). Eye symptoms in patients taking propranolol and other hypotensive agents. *Br. J. clin. Pharmac.*, **4**, 295–297.
- GALBRAITH, J.E.K. (1975). *Practolol. Med. J. Austr.*, **1**, 664.
- MACRAE, J.A. (1977). Ocular effects of beta-blocking therapy. *Trans. Ophthalmol. Soc. UK.*, **97**, 510–513.
- RAPPENNE, G. & ZENATTI, C. (1975). L'oeil sec. *Sem. Hop. Paris Therapeutique*, **51**, 557–564.
- RUPRECHT, K.W., GIERE, W. & WULLE, K.G. (1977). Statistischer Beitrag zur Symptomatik des trockenen Auges. *Ophthalmologica Basel*, **174**, 65–74.
- WAGNER, C., FILLASTRE, J.P., LETAC, B. & WOLF, L.M. (1978). Traitement prolonge par acebutolol: surveillance de l'etat oculaire. *La Nouvelle Presse Med.*, **7**, 725–730.

M.G. LYALL

Regional Eye Centre, Oldchurch Hospital, Romford, Essex.

J.G. BAINBRIDGE & R.B. KHAMBATTA

May & Baker Ltd, Dagenham, Essex.

Received May 26, 1983,

accepted June 27, 1983

EFFECT OF ETHNIC ORIGIN ON AMPICILLIN BIOAVAILABILITY IN HEALTHY SUDANESE SUBJECTS

Sudan, unlike the majority of African countries, is composed of distinctly different ethnic groups and more than 60 different tribes. The three main ethnic groups are, Arabs (mainly in the north), Negroes (mainly in the south) and Arab-Negro mixture (mainly in the west and some central regions). The influence of ethnic origin on body levels and clinical efficacy of some drugs is currently investigated, as part of our on-going research on the influence of some key factors on effective oral therapy with antimicrobial agents. Recently, studying sulphadiazine metabolic acetylation in 64 tribes, we have shown that the Sudanese were mainly slow acetylators (Ali & El-Nour, 1983). The present report describes a similar study on ampicillin, a widely used antibiotic, that occupies an extremely important place in chemotherapy. In humans, 22% of the administered dose of ampicillin was reported to be metabolized to the pharmacologically inactive, penicilloic acid (Cole *et al.*, 1973; Barza & Weinstein, 1976; Barker & Prescott, 1980).

Three groups of different ethnic origin were chosen for our study: Arabs, Negroes and Arab-Negro mixture. Following clinical and laboratory investigations, 15 healthy, adult, male subjects were selected from each group. Their average body weight and age was 63.0 kg and 28 years respectively. Each subject re-

ceived on two different occasions (wash-out period = 7 days) a single dose of ampicillin, (a) orally and (b) intravenously, of 1.0 g and 0.5 g respectively. The drug was taken, following an overnight fast, on an empty stomach and urine samples were collected at 0.5, 1.0, 2.0, 4.0, 5.0, 6.0 and 12.0 h. The 15 southern subjects, unfortunately, refused to take the drug orally. Data from 30 previous trials on Southerners were used for the comparison.

Ampicillin bioavailability was assessed using the urinary excretion method, since the drug blood levels are reflected in its urinary levels (Jusko & Lewis, 1973). The percentage dose excreted unchanged (PDE, %) in urine over 12.0 h and the maximum peak of excretion (MPE, mg/min) were used to describe the extent and rate of ampicillin bioavailability respectively (Ritschel, 1976).

Following intravenous administration of ampicillin, the PDE (%), MPE (mg/min) and time to peak (TTP, min) ranged between: 63.3% $\pm$ 1.7 to 85.0% $\pm$ 3.9 (mean $\pm$ s.e. mean = 76.6% $\pm$ 3.1); 5.7 mg/min $\pm$ 0.26 to 6.3 mg/min $\pm$ 0.51 (mean $\pm$ s.e. mean = 5.9 mg/min $\pm$ 0.38) and 15.0 min (mean $\pm$ s.e. mean = 15.0 $\pm$ 0.00) for the Northerners, Southerners and Westerners (Table 1). The three groups gave similar results, indicating that intravenously administered

Table 1 Ampicillin, percentage dose excreted unchanged (PDE) in urine (over 8.0 h), maximum peak of excretion (MPE, mg min) and the time taken to reach that peak (TTP, min) after oral and i.v. administration of 1.0 g and 0.5 g of ampicillin respectively (single doses), in healthy males from North, South and West Sudan.

Group	PDE (%)		MPE (mg min)		TTP (min)	
	Oral	i.v.	Oral	i.v.	Oral	i.v.
Northerners	29.5 ± 2.5	68.3 ± 1.7	0.77 ± 0.17	5.7 ± 0.26	97.2 ± 7.20	15.0 ± 0.00
Westerners	30.0 ± 2.7	76.5 ± 3.6	0.78 ± 0.11	5.7 ± 0.36	105.0 ± 9.60	15.0 ± 0.00
Southerners	33.0 ± 2.0*	85.0 ± 3.9	0.92 ± 0.08*	6.3 ± 0.51	110.0 ± 8.20*	15.0 ± 0.00
Mean ± s.e. mean	30.83 ± 1.09	76.6 ± 3.1	0.82 ± 0.05	5.9 ± 0.38	104.1 ± 3.72	15.0 ± 0.00

*These values were obtained from previous trials conducted on 30 Southerners other than those 15 subjects who have participated in the present i.v. trials.

ampicillin was bioavailable almost to the same extent and at the same rate in the three ethnically different groups. The extent of ampicillin bioavailability, 76.6% ± 3.1 (PDE, %, Table 1) was in good agreement with previously reported data (Cole *et al.*, 1973; Barza & Weinstein, 1976; Barker & Prescott, 1980; Sydney, 1980).

Following oral administration, the PDE (%), MPE (mg min) and TTP (min) data described in Table 1, indicate that ampicillin was almost equally bioavailable in the three different ethnic groups. The group of Southerners who received ampicillin orally was not the same one that have received ampicillin intravenously (Table 1). The results also indicate that the extent of bioavailability for orally administered ampicillin is only 41%, in agreement with previous findings (Sydney, 1980).

Based on the above results and excluding all other

factors, the bioavailability of orally and or intravenously administered ampicillin, in healthy subjects, is independent of the ethnic origin. The drug is, therefore, expected to produce similar body levels and consequently equal therapeutic efficacy in ethnically different subjects.

This work was supported in part by a grant from the DAAD (W. Germany) through the University of Khartoum (Sudan).

H.M. ALI¹, M.M.A. HOMEIDA² & I. EL-ZEIN¹

¹Department of Pharmacology, Faculty of Pharmacy, University of Kartoum, P.O. Box 1996, Khartoum, Sudan and ²Department of Medicine, Faculty of Medicine, University of Khartoum, Sudan.

Received March 16, 1983,
accepted July 4, 1983

References

- ALI, H.M. & EL-NOUR, I.B. (1983). Investigations on the acetylase phenotype of a Sudanese population using sulphadiazine. *43rd Int. Cong. Pharm. Sci.*, Montreux—Switzerland (Sept. 5–9).
- BARKER, B.M. & PRESCOT, F. (1980). *Antimicrobial agents in medicine*, 2nd Edition. Oxford: Blackwell Scientific Publications.
- BARZA, M. & WEINSTEIN, L. (1976). Pharmacokinetics of the penicillins in man. *Clin. Pharmacokin.*, **1**, 297–308.
- COLE, M., KENIG, M.D. & HEWITT, V.A. (1973). Metabolism of penicillin to penicilloic acids and 6-aminopenicillanic acid in man and its significance in assessing penicillin absorption. *Antimicrob. Agents Chemother.*, **3**, 463.
- JUSKO, W.M. & LEWIS, G.P. (1973). Comparison of ampicillin and hitacillin pharmacokinetics in man. *J. pharm. Sci.*, **62**, 69–76.
- RITSCHER, W.A. (1976). *Handbook of Basic Pharmacokinetics*, ed., Ritscher, W.A., 1st. Edition, pp. 285–294. Hamilton: Drugs Intelligence Publication Inc.
- SYDNEY, S. (1980). *The β-Lactam Antibiotics: Penicillin and Cephalosporins in Perspective*, ed., Sydney, S., 1st Edition, pp. 91–98. London, Sydney, Auckland, Toronto: Hodder and Stoughton.