the 1960s. Access was given to the employe-
ees' roll although employment details were not.
the war were virtually non-existent. We think
that the information gathering process when
taken together with the records of the coroner
and the histopathology review was as detailed
as any other similar study in exist-
ence.
As the "non-exposed" group was classi-
cified as such by history it is obvious to most
readers that we are unable to state how they
acquired excessive amounts of amphibole fibres
within their lung tissues. If these eight
cases with high amphibole concentrations are
deducted the rate of mesothelioma becomes 1·6
million a year which is similar to the
generally estimated background rate.
Greenberg seems to be unaware that
high aspect ratio amphibole fibres have been
found in the pleura. By contrast with ani-
mal studies, which rely on the administra-
tion of enormous doses and overload of the
respiratory defences, human studies have
been remarkably consistent in showing a
strong association between amphibole expo-
sure and mesothelioma whereas during
chrysotile it has been weak or non-existent.1,2
Even in chrysotile miners and millers, in
which there have been few mesotheliomas, the
evidence indicates that they were related to
transmission rather than chrysotile expo-
sure.3,4 To the best of our knowledge the
forthcoming review of chrysotile by the
International Programme on Chemical Safety
will not present any new evidence although
it might give a different opinion. Other
reviews conclude that amphibole has a
much greater potency than chrysotile for
producing mesothelioma.5-7

ERIC S JOHNSON
School of Public Health and Preventive Medicine,
Tulane University Medical Centre,
New Orleans, Louisiana, USA
1 Ong CN, Kok PW, Ong HY, Shi CY, Lee BL,
Phoon WH, Tan KT. Biomarkers of expo-
sure to low concentrations of benzene: a
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Muconic acid in urine: a reliable indicator of
occupational exposure to benzene. Am J Ind
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acid as an indicator of exposure to benzene.

Author's reply—The overall objective of our
article was to evaluate the usefulness of five
current and three new (i.e. urinary low level
0·05 to 0·25 ppm) exposure to benzene and as stup-
ulated in the conclusion all the biomarkers
were unable to provide sufficient specificity
for biomonitoring at the low concentration
range. All data collected that it is not
useful for estimation of exposure to low level
environmental exposure to benzene,
particularly <0·25 ppm. Our earlier data2 showed a trans-muconic acid could be useful
for environmental exposure to benzene >0·5 ppm;
with a calculated exposure to 1 ppm benzene,
about 0·9·1 mg/g creatinine would be expected at
the end of eight hours of exposure.

A T EDWARDS
Royal Halifax Infirmary, Halifax, Nova Scotia
D WHITAKER
Queen Elizabeth II Medical Centre,
Perth, Western Australia
K BROWNE
Formerly Medical Advisor to Cape Industries,
Leicester House, North Craigs, Norfolk
P D POOLEY
School of Engineering,
Division of Materials and Minerals,
University of Wales, Cardiff
Department of Histopathology and Environmental
Lung Disease Research Group,
Llandough Hospital,
Penarth, South Glamorgan
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Biomarkers of exposure to low concentra-
tions of benzene: a field assessment
Editor—Ong et al present data on the rela-
tion between concentration of benzene in
ambient air and urinary muconic acid con-
centration. With the formula they provided in
figure 3, the urinary concentration of mu-
conic acid is equivalent to exposure to 1
part per million (ppm) is 144-4 or 128-6

ng/mg creatinine, depending on whether log
or the base 10 or natural log is used, respec-
tively. This number seems to be very low
compared with that given in many studies
which are usually in the range of 3> 1000
ng/mg creatinine.8 It will be helpful if Ong
et al could provide an explanation for this
apparent discrepancy.

CHOLON-NAM ONG
Department of Community, Occupational,
and Environmental Medicine,
National University of Singapore
1 Ong CN, Kok PW, Ong HY, Shi CY, Lee BL,
Phoon WH, Tan KT. Biomarkers of expo-
sure to low concentrations of benzene: a
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Offspring sex ratios and reproductive
hazards
Editor—Weijin and Olsen write 'A con-
cession closely associated with ovulation has
been suggested to result in more boys'.
There seems to be an error here because to substantiate this statement, these authors
cite France et al who write 'The birth sex
ratio favored males when intercourse pre-
ceded ovulation/fertilization by two days or
longer'. Indeed the data of France et al give
some corroboration to the conclusion of
Gray's who, after a meta-analysis of human
data, suggested that the regression of off-
spring sex ratio (proportion male) on time of
insemination within the cycle is U shaped.
I have cited evidence that:
(1) There is a positive relation between offspring sex ratio and parental coital rate in
several mammalian species (including humans).
(2) Under some models, coital rate would determine the time of fertilization
within the cycle.
(3) Distributions of the sexes within litter
of several mammalian species suggest that Fm/( the probability that a zygote
male) varies from one zygote to another
within litters.
Interpretation of the data is not estab-
lished, but it seems likely that the variation of
Pzg, with time across the female cycle is
partially controlled by the varying female
hormone concentrations across that time.
In particular such an interpretation can be
construed to explain Weijin and Olsen's report
of a significant decline of offspring sex ratio
with waiting time to pregnancy. This
confirms the data of Renkonen9 and may be
caused by the different mean times of fertili-
sation within the cycle associated with differ-
ent coital rates (which decline very rapidly
during the first year of marriage10).
If I am right, the sexes of mammalian
(including human) offspring are partially
controlled by the hormone concentrations of
both parents across the female menstrual
hormonal cycle.

WILLIAM J HAMES
The Gallow Laboratory,
University College London,
Worpleton House, 4 Stephenson Way,
London NW1 2HE
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indicator of reproductive hazards. Occup
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ratios at birth are partially controlled by
parental hormone levels at the moment of

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