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REPORT ON A CONSULTATION

on

BILMARZIA CONTROL IN SWAZILAND

(CENTER FOR ENERGY AND ENVIRONMENT RESEARCH

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[REPORT OF A CONSULTATION ON BILHARZIA CONTROL IN SWAZILAND

Environmental Health and Impact Division

Center for Energy and Environment Research

«

Fra Heights Station

San Juan, Puerto Rico

00935,

February 1979.

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Acknowledgments

This report was prepared by Dr. Cen R. Jones, Epi

Logist of the World Health Organization, and Or, William Re

Jobin of CEER. The cost of the study

ted by the

World Health Organization, the U.S. Agency for International

Development and the U.S. Det

No. Ey-76-C-05-1833,

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Sursary

From a brief survey in February 1976 It was found that

bilharzia is wide spread in Swaziland and it is estimated that

approximately 150,000 individuals are infected with one of both forms of bilharzia. The more common form of infection is due to *S. haematobium*. The intermediate snail hosts of both types of bilharzia are found throughout the Middleveld and Lowveld but have only scanty distribution in the Highveld. The sugar and rice irrigation schemes favour the distribution of these snails.

The conservation of

In the Middleveld appear to be

sites of intense bilharzia transmission as are the sugary

Flee and citrus irrigation farms.

The pri

wnt control progranme of the Ministry of Health

would app

1F to have reduced the prevalence of bilharzia in

?the Manzin{ area and in the sugar estates around Big Be

The snails control efforts in the conservation

me is not

ottective.

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Seophreteal featur

Swasiland 4a a Leva Locked coutzy of 17,400" age In situated

Detmen Hosentique and the Republic of South Africa. The country to dtyi

?nto four topogrephthcal regions each of wich rune frm Worth to South tn

roughly parallel belt

Yeld, loweld end the Tnbe-to Piatem, ?intr main cheracteristioe are

?nmmsrtsnt

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peeen atstoe dn [ites ranual rminfo0d [Eotrated popation

tone Estee fness. ea one

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{Eabonbo plete 600 % 23

rome 5599

Bovulation

?The population se extincted to be arcunt 559,900 (sta 1976) nd

?naa sm mmmunl grows rote of shout 38. Settleaeat patterns mske delivery

Of Roth preventive end curative health care difficult? as the Swazie °2 not

sive im villages but in widely diepersed honestends, Bassd on the arbitrary

?senmptin that commities having populations of 1,000 or over em be

?lassified an wren, less thon 162 40 urban end a quarter of thie urban

population resides in compery gerated toms located in treeholi Lande wlllet

?the remainder 4 under the contrel of fore Counts or Central Government.

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Water resources

Water resources are eubstmtial, represented mainly by strom a:

\$0 © teaser extent ty springs and marginally ty ground water. In the lowe
mit Tabonto platems water resources are mainly confined to the four major
rivera which traverse the area, Only etroms in the higher elevation epee
?0 be free of biiharsiad sntestation.

A feature of Swazi

4s the lange mubere of conservation ree

rvotre or dans wich have been constructed Sn the main by the tinistry of

Agriculture,

{REVI oP srUWarA mH SeArTTAND

Erevalence,

Palharsia to a matter of conser to the Government of Smasitend

4 00 much of the comtry's agricultural development depends on irrigation

echeaes.

?0 far back nn the early 1950's the medical department collected

ste cm prevalence ant the related epldeniologiced factors concerning the

cvtsblisiment and sprent of biharsia, Prevalence putters were established

Wy workers wich as Batchelor and Guulie md the latter estinated that

?hind of the population of Smastiand mas infected with §, ss wd

perhape SH with 8. nenwens. The intermediate anail hoste resonaible for

?Srmmmstenton of the Gionase mpecr to be Bulinus (Myeopets) globmus ent

Bicuuhularin Bfeittert. Syecieo identisioation of the male was nate at

Fotchefetroae University.

Tee highest rate of infections are to be found in the Madleveld

spt loweld near arrigation achones and conservation dams. Ta the Hisheeta

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?coses are found to have criginated from areas of lover altitude,

14 was mfortunate that the bulk of the recorde relating to past

surveys could not be Located. However the murvey data available at the

Bulbursi/ Malaria Unt at Mancini wae malyond by age and sex wid for top
?srepiical sones and river basins and ie contained sn appendix A. consid
foreble variations in the prevalence rates are to be found miongst school
children nd it Se mi leading to give on overall prevalence rate an the
statiation are derived from a ample of just over 20 echoote cut of « total
of nore than 400 prinary echools throughout the country. If the prevalence
?fipsren for the Isasleveld and Lowreld are subdivided into thove obtained
?fran irrigated arene ent those fron none Arrigated areas, then the country
fom Ye considered to comprioe six epidemiological mes each with character
Antic prevalence rates

AVIAGE APFEORDUGE FOEVALENCE RATES POR ScHDOL, GEILE

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Beers Te see] a ae

Yowia ffen ivigncd creas] SE ?e

?Lubomibo ab Oe a

?These prevalence estimates are taken from existing data

and the

figures quoted in Gmulie's publication,

4+ figure which will feature in future discussions is the infection

?Fate of school entrants ie, the prevalence amongst the 6-1 year age-group.

?or urinary bilharzia this figure averages 20 whilst for rectal bilharzia

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?

Hh reservoirs of infection

[If the population of Swaziland is assumed to be 500,000 then

estimated that there are

Using the most approximate prevalence rates, it is

about 140,000 people infected with one or both forms of bilhersia. This

is shown in the following way!

Prevalence can be calculated

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revalence|;Bitvitus4 prevalence S2zSvidu

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Tr age come 1k [500,00 | - (| wero | > 36,050

TE the double infection rate 4a anmed to be 19%, then approximated

160,000 tnesviducta 4m Seactlond con bo ccaridened as infectet with bilharsia,

Previous control sotivitie

Concurrently with the wurvey work already described, several mall

?Alot control projects were eutabliehed in selected areas of the country. The

Firat Large ocale attempts at control were started in the second half of 1970.

?Tee Mensint echone financed mainly ty the Mansini fom Comcil, was by focal

snail control slong water cources shere the absence of stepping stones obliged

?eeple to wate through the water ant alao where the etreme were used for

sblutions, This resulted sn en appreciable reduction in the mater of the

?stermediate matt hosts ond was followed up by nase treatzent with hycanthone,

of the infected school children attending the Mansi! schools

?Tate control work was extended to the Lonshasha area and the irrigation
Sentinel systems of Ngontnt and Big Bend in 1971. In areas of irrigation the

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?ethod of mail control was that of constant heat application using drip
feeds combined in certain areas with forage control.

In 1974 these efforts at control were expanded and applied to several

?rural areas throughout the Middeveld and the Lowveld near Naoko.

Baistive Piior commoL raocRAeE

5 hots

?he Bilharsie Unit based in Mansint, these mobile teams engaged in

mail collection, urine and stool examinations and acclimatizing, Single

examinations are carried out on both urine and stool specimens obtained from

Primary school children. Only spot prevalence rates are calculated and no attempts have been made to measure either incidence or intensity of infection.

Indeed the present resources of the unit are insufficient to carry out these more sophisticated measurements

The Ministry of Health in cooperation with the Ministry of Education

has this year started a school health programme in which four mobile teams,

one for each administrative district, examine 411 new school entrants. Each

team comprises a public health nurse and two volunteers. It is hoped that the

teams will be able to cover all the 400-odd primary schools in the year. The

physical examination includes a test for urinary bacteria and 11-9 recommended

tests in addition, the stool is examined for *S. dysenteriae* infection. In the

interim examination it will be necessary to distribute containers to the pupils

the day before the school is visited.

The average age of school entrants is seven years. It is thought

that approximately 10% of children start primary school which means that there

are some 10,000 new school entrants each year. Such a large sample would

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Provide invaluable epidemiological data from which a more causal relationship

of the national protein could be made. As the examination of a tool specifies
?A well popular end time conning procedure, a random sample of 5,000 new
sentiment for 8. mansonii infection would be large enough to provide reliable
information,

Soil control setnote

Out of the Arrtigation systems, snail control is « simple programme
carried out by a six man crew with one vehicle. Chemicals are applied
Frequently to transection sites between October and March which cover the
Ditharsia transiion winter. Such a strategy of focal transection control
is widely accepted for use in similar areas in Southern Africa

As the natural otros and water conservation reservoir, in
Locally oo malt dane, the chemical used is Bayluscite, applied some five
times per transection season at roughly seven week intervals. At the same
time the chemical is sprayed in a three metre band along the accessible part of
the shore with harbour snails. The back pack sprayers contain 30 litres of
Bayluscite to be applied along roughly
100 metres of shore line resulting in a concentration at the shore, of about
1 ROH per litre immediately after spraying. This is judged by the light
yellow colour in the water within five minutes of application,

water end 100 to 200 eae. of Baylucté

sm the rural area, Bayluscide is mprayed with the sme tectniques as in the
dana) the ettorte being concentrated at the obvious pointe of human context
vsth the mail infested portion of the streams,

Tn the natural drainage systema the mail control activities beem
ith 29 areas around Mansint and Zonshast wich embraced eight enall dane

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?md 25 onal treme, Bach arva involves one day! work for he five men anal
control team. At the begiming of nolluscicide applicstions in 1970, virtually
12 the 29 areas contained Bulinus (Eaysopsts) glsboeus the intermediate

?malt host of S- humatotiu although only two areas contained Bioephelarte
Bfeiffers the mail hoot of 8. manent. Ry 1975 the mails hel been eliminated
able 1). An enelyete of the matt

from two thirds of the areas (Appendix
ata for typical etrems showed that after 2.3 yeare of repented acllusciding
?the matte aisarpenred (Appendix C, Figure 1) and se thooe atresas were they
Dersisted they were greutly reduced in mmber. However in the mall dane
?tee control programe rarely let to ay long term decreases in the mater of
mats (Appendix 6, Figure 2). Although the atcateay of focal control doen
not msme that the matle will be eliminated, it 0 « costly proceas if the

Number of snails is not significantly reduced so that chemotherapy application

can be eventually reduced. This is especially true in dams which require large quantities of chemicals,

In 1974 molluscicide activities in rural non irrigated areas was

restricted to 20 areas and then in 1975 to an additional 14. These 20 areas

contained 47 dams and 12 main streams. Again each area is of such size that one

personnel can carry out inspection and apply chemotherapy in one work

(including travel time from Mansini). It is already apparent that there has

been no impact on the number of snails in the dams (Appendix 3, Table 2) although

it is too soon to make a complete evaluation of the work. During field surveys

in February 1976 the dams at Mbachent and at Hgcinia contained large numbers

of adult *Mysopsis* sp. and *Bionchalaria* sp. despite more than two years of

repeated molluscicide application. In contrast to the streams, the dams often contained

Bionchalaria as well as *Mysopsis*. In streams the ratio of *Mysopsis* to

Bionchalaria was 10:1 while in the dams it was 2:1 indicating that perhaps urinary

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Didymocryptus would be more common along side the streams while mixed infections

would be found in the vicinity of the dams,

?An estimate of operational costs was made for the mail control

?row at several dams during February 1976. Some four dams were treated per

days applying about 200 g/l of Bayluscide at each

?contains 100,000 cu. metres of water although only about 1,000 cu. metres

in each dam spraying was usually

limited to about 300 metres of shore line in a three metre wide bend with a

mean depth of slightly over one metre, These dams were usually surrounded by

scattered households averaging around 200 people within a reasonable walking

+ the typical dam

of mail habitat were actually tr

?distance ?na ekroular area of roughly 10 sq. kilometres

At 1976 prices wages for the men were about £ 1.50 per day, the

chemical costs £ 5.00 per 200 g/l. and the average trip of around 50 miles

at £ 0.30 per mile ~ £15.00 per day.

Labour, 5 x B 1.50 = 7.50

Cheascale, 4 dma x 0.5 ken. x B 10 per kes. = F 20.00

rmareert, 50 mites x B 0.30 = 15.00

Supervision and overhead of 109% = B 44.00

Tota dasly cost per erew for four day = 08.00

Average coat per

= 22.00

Yor eaténating purposes, cost of mail control 1s often expresoed

4% uel cost per 100 ou netres of snail habitat controlled, Thus the annual

?cout for five treatnents to a dat with 1000 m? of mail habitat, ie B 110.00

© 12,00/100 ou metres, which ie well within the umusl range which varies

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?the public health cost of mail control thie method costo wmuslly B 110.00

?Per 200 people or E 0.55 per year for each person protected frea tranesivaicny

?fairly high cost 4¢ thie method 10 to be continued for more than a few years.

Yn the mall stres: aystenc it 19 leas expensive dntially in terms

Of cost per 100 cu netres of mail habitat treated, since the aout of

chenical wed ie rougtdy half thet sprayed on the date in the aaaa period.

The eutinated cost for streus, treating shout 2000 cu netres of habitat

\$m one aay with 0.4 kgm Of chenical Ss:

Labour 6 wen xB 1.50 =F 9.00

Chenteal 0.6 gn xB 10.00/kge =B 4.00

Tronmport 50 niles x F0.30/nile = B 15.00

Supervision end overheads of 100% = 28.00

Total cost per day = P 56.00

of B 5.60 per 100 ou metres of habitat.

Thus the intted per capita coot ie algo probubly lower, at E 0.30

er year, Furthernore the expences decrease after 2 yeara to about one half

tee Snitiad figure and after five years to ebout cae fifth of the initial

wt. In comparison with treatuent of enaile in the dime, the present

Programe im strems 10 much less expensive expecially in teraa of « 1006

Fimge programe.

ail control in extoting trrington chen

he strategy of the control of mails in the irrigation schenes

near Bg Eend and Ugonint which begun in late 1970 using Preacon, wae aystea

vide trmmicsion control in which all eoail habitate were treated every

srven weeks during the tranmmission season. The object mas to reduce infected

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media without ettenpting their elininetion. A\$ the prevent the following Arr-

sgation cystons have had mail control programmes operating since 1970.

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Vrutane Sucary cotton, | 4,950 3,000

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eben Suen, citrus | 1,600 4,900

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| Matioee Retsto Sugar 200 200

?Sheen control neamres have been a joint effort of the drvigation cata
the tinistry of Beatin.

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Existing mater supply programmes

?the provision of adequate safe water to houses has teen proven to be as
?effective as muail control for internuption of bilharsia tranamission and the
extent of danestic piped water is a najor determinant of the level of traneniaat

Water supplies are provided through three Government departments while

the Irrigation authorities are responsible for the domestic supplies to their

employees.

Water and Sewerage Board Urban Supply

Ministry of Agriculture Rural Development Areas

Ministry of Health = Rare Spring Protection

Navigation fare etc, - to employees.

(The Water and Sewerage Board provides water to 14 towns and

Plans to extend their activities to 100 rural areas in the next 10 years which

will provide domestic water to 25,000 people. The Ministry of Health with a budget

(of around 30,000 per year hope to protect 45 existing springs each year and

the programme continued for the next 10 years will provide a relatively safe

source of water to another 22,000 people. If the Ministry of Agriculture were to

supply domestic water to the four existing Rural Development Areas approximately

24,000 people would be reached. they have plans for developing two more R.D.A.s

in the next two years which will take in another 20,000 people. In another 10

years the Ministry aim to double that number and 4th priority is given to domestic

Further multiply then also over \$0,000 people in the rural areas would benefit from an adequate water supply. If all the Ministries were to supplement their plans then around 126,000 people would receive a domestic water supply in 10 years.

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However none of these authorities have finalized their plans and at present at least 300,000 rural inhabitants are without piped water. Thus the present goal for 10 years development if implemented, will mean that only a third of the rural population will have a safe water supply.

The cost of rural water supply systems for bitharsia control varies with the extent of the system but in rural Middlelevel communities this will vary from £10 to £ 20.00 per capita for initial construction and perhaps £ 2.00 per capita per year for maintenance. These estimates are based on experience with very simple rural supply

in St. Lucia, Eastern Caribbean.

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?The weitere wish to express their appreciation for the kind assistance

?od full cooperation which they received from alt the Staff of the Ministry

of Health, the Minsetries of Agriculture and Education and the officiale of

?he Comoawealth Developaent Corporation.

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Appendix 8

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Appendices

Tables of prevalence

Summary of snail control programme

Snail and mollusc data

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[RESEARCH ON B. HAGIASORNS KOMRINGTON TX GKELIMEN 5-14 YEARS BY FOFOSRAMITCAL

RESOURCES AND RIVER MAs (HEALAND)

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cont.) ?2OMES AND RIVER BASINS (SWAZILAND)

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* includes 359 school children at Big Bend and Hilt who were not analysed by age

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TABLE 2: PREVALENCE OF SYPHILIS IN A SAMPLE OF 1000 CHILDREN AGED 5-14 YEARS BY
SOCIODEMOGRAPHIC

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* includes 672 individual from Big Bend, Bali

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