E carriers showing haemoglobin E and haemoglobin A bands while samples 5 and 13 are from B-thalassaemia carriers showing bands of haemoglobin A and faint bands of haemoglobin A_2.

The number of samples that can be processed per run is 32 in a single gel plate and with mulitple gel plates, a larger number of samples can be processed in a single working day. The gel plates are easy to handle, inexpensive and give excellent separation of haemoglobins. The method is recommended for screening of carriers for haemoglobinopathies in mass survey work.

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MASCULINIZATION OF *OREOCHROMIS MOSSAMBICUS* BY ADMINISTRATION OF 17 α-METHYL-5-ANDROSTEN-3β-17β-DIOL THROUGH REARING WATER

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TILAPIAS are extensively cultured as food fish in warm waters. Elimination of uncontrolled reproduction is desirable to channelise the available energy for efficient growth and to quickly harvest marketable sized tilapias. Many approaches for controlling reproduction have been attempted and one of the most promising techniques is hormone induction of monosex population[1]. Besides mitigating unwanted reproduction, monosex male populations have greater growth potential[2].

Functional masculinization of genetic females of the cichlid *Oreochromis mossambicus* have been achieved[3,4] by supplementing the diet with steroids. However, the problems with the oral administration method are: (i) consumption of androgen-treated food will reduce in proportion to the amount of natural food consumed[5]; and (ii) high densities of try in treatment tanks cause competition and establishment of size hierarchy, resulting in differential consumption of the androgen-treated food and incomplete masculinization[6]. The desired masculinizing effect of the steroid could be realized by administering it in aquarium water[7,8]. Dissolved in ethanol, steroids like 17α-methyl-4-androsten-17β-ol-3-one or testosterone propionate become soluble in water. Paradoxically, exposure of *O. mossambicus*, *Tilapia heudeloti* and *Cichlasoma biocellatum* to water treated with one or the other steroid induces a feminizing potency[9]. Survey of literature shows that very little work has been done on sex-reversal in tilapias by exposing the fry to hormone dissolved in water and 100% masculinization[6,10,11] has not been achieved.

The present study was undertaken: (i) to determine the effect of 17α-methyl-5-androsten-3β-17β-diol on the gonad of genetic females reared in hormone dissolved water; (ii) to determine the optimum dosage and minimum duration required to ensure 100% sex reversal; and (iii) to estimate the growth efficiency of the treated tilapia. Hormone dissolved in 95% ethanol was added to rearing water at concentrations of 5 and 10 μg/litre water. The experimental fry were divided into series I: 7-day-old and series II: 10-day-old fry. Each series was further divided into two groups and each of these groups was treated with 5 or 10 μg steroid/litre until the 15, 20 or 25th day of hatching. The control and treated fry were examined for sex reversal following standard squash techniques[12].

Data presented in table 1 indicate that the female and male ratio of controls is 0.42:0.58. The administration of 17α-methyl-5-androsten-3β-17β-diol through the medium to 7 or 10-day-old *O. mossambicus* fry for periods of 11, 14, 16 or 19 days induced 100% masculinization. Testes of the sex-reversed males were identical in appearance with those of controls. When the treatment was terminated after 6 or 9 days, it failed to induce 100% sex-reversal, it resulted in the appearance of a few intersexes and female fry. It would appear that treatment between 10 and 20th days following hatching and a minimum dose of 5 μg steroid/litre water are the critical minimum requirements to ensure 100% sex reversal in *O. mossambicus*. Yamamoto[13] emphasized that the sex hormone should be administered during the

Table 1 *Effects of 17α-methyl-5-androsten-3β-17β-diol (a = 5 and b = 10 μg/l) on sex differentiation in O. mossambicus, Each experiment was commenced with a minimum of 25 fry of known percentage*

Treatment	Hormone dose (μg/l water)	Fish age at start and end of treatment (days after hatching)	Treatment duration (days)	Sex ratio ♀:Intersex:♂	Male (%)	Weight of fish (mg) ($\bar{X} \pm SD$)
Control	–	–	–	0.42:0.00:0.58	58	217 ± 17
Control with 0.005% ethanol	–	7–25	19	0.40:0.00:0.60	60	226 ± 14
Series I a	5	7–15	9	0.15:0.05:0.80	80	240 ± 19
	5	7–20	14	0.00:0.00:1.00	100	320 ± 23
	5	7–25	19	0.00:0.00:1.00	100	294 ± 29
Series I b	10	7–15	9	0.10:0.06:0.84	84	305 ± 26
	10	7–20	14	0.00:0.00:1.00	100	470 ± 16
	10	7–25	19	0.00:0.00:1.00	100	335 ± 27
Series II a	5	10–15	6	0.19:0.08:0.73	73	297 ± 21
	5	10–20	11	0.00:0.00:1.00	100	452 ± 19
	5	10–25	16	0.00:0.00:1.00	100	326 ± 25
Series II b	10	10–15	6	0.12:0.07:0.81	81	315 ± 24
	10	10–20	11	0.00:0.00:1.00	100	569 ± 20
	10	10–25	16	0.00:0.00:1.00	100	366 ± 29

sexually indifferent stage, lasting through the stages of gonadal sex differentiation. He also indicated that failure to comply with this resulted in incomplete sex-reversal. Our results confirm the observations of Yamamoto and indicate for the first time the critical minimum dose (5 μg/litre) as well as the duration (between 10th and 20th day following hatching) necessary for 100% sex reversal.

The treated fry were reared in aquarium up to the 60th day of hatching, and the hormone-treated tilapias were still considerably larger than the controls. The growth promoting effect of 17α-methyl-5-androsten-3β-17β-diol was significant ($P<0.001$) in the group exposed to 10μg/litre between 10th and 20th day of hatching. The hormone-treated fish weighed 569 mg against the control weighing 217 mg. That the steroid promotes relatively faster growth was exhibited by all the hormone-treated groups (table 1).

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