not consider that vasostomy can be dispensed with until such time as post-operative infection has been eliminated. Incidentally, we agree with Caine's view that the administration of antibiotics after operation has no prophylactic value whatsoever. (Epididymitis occurred in equal numbers in the antibiotic and non-antibiotic group.)

We have also attempted to evaluate two methods of performing vasostomy: division and ligation *vis-à-vis* the application of diathermy forceps to the vas. The diathermy method was used as a routine on the left vas, whereas the right was divided and ligated. It was concluded that there was little to choose between the two procedures, but that, on balance, the division and ligation method appeared to be the more satisfactory.

Temporary Suprapubic Leak

In the present series there was no case of incisional hernia, a fact we attribute to the routine use of a transverse suprapubic incision. In fact, since adopting this incision several years ago only one incisional hernia has been seen, and we do not think that it is justifiable to perform prostatectomy through a vertical midline incision in aged and debilitated patients. On the other hand, in 27% a suprapubic leak developed. The leak was of a temporary character and healed after a few days' catheter drainage. Only in one patient was it found necessary to excise and resuture the wound. Urinary leaks occurred especially in aged and feeble patients who had concomitant medical diseases, such as coronary or cerebral thrombosis, or who presented with the troublesome combination of chronic uraemia and secondary anaemia.

In an attempt to prevent this complication it is our practice to suture the bladder wall with three rows of continuous suture in the Wilson Hey operation, and to suture the prostatic capsule with two rows of sutures in the retropubic operation, using an eyeless needle on No. 1 twenty-day catgut.

Conclusions

The increasing number of aged and feeble patients submitted to prostatectomy inevitably produces a group of post-operative complications which require special investigations and special treatment.

In an attempt to evaluate these complications a study has been carried out in a series of 100 patients subjected to prostatectomy.

A temporary incontinence was noted in approximately a quarter of the present series. A simple method of "sphincterometry" was used in the assessment of this incontinence.

Post-meatal stricture appears to have been largely eliminated by discarding the red rubber catheter. With the use of a latex catheter only 2% developed a urethral stricture.

Post-operative infection continues to be the most obstinate problem, *E. coli* and *Pr. vulgaris* preponderating. It is suggested that back-pressure and hydronephrosis before operation are factors in encouraging infection. It is also pointed out that the peak period of infection occurs during the first four weeks, during which the prostatic cavity is in the process of epithelizing.

The incidence of epididymitis with vasostomy was 7% in this series.

A temporary suprapubic leak occurs in a proportion of patients, and is probably due to a lack of healing ability in elderly and debilitated patients.

REFERENCES

- Caine, M. (1953). *Brit. J. Urol.*, **25**, 9.
 — (1954). *Ibid.*, **26**, 205.
 — and Edwards, D. (1958). *Ibid.*, **30**, 41.
 Johnston, J. H. (1953). *Ibid.*, **25**, 155.
 Miller, A., Gillespie, W. A., Linton, K. B., Slade, N., and Mitchell, J. P., (1958). *Lancet*, **2**, 608.
 Ross, J. C. (1936). *Brit. med. J.*, **2**, 1297.
 — (1954). *Ibid.*, **2**, 1201.
 — Gibbon, N. O. K., and Damanski, M. (1957). *Lancet*, **2**, 520.
 — (1958). *Brit. J. Urol.*, **30**, 204.
 Tinckler, L. F. (1955). Ch.M. Thesis. Liverpool.
 Webster, C. U. (1958). *Lancet*, **2**, 1036.

TOILET TRAINING AND ENURESIS

BY

S. B. DIMSON, M.D., M.R.C.P.

Consultant Paediatrician, Sydenham Children's Hospital,
 East Ham Memorial Hospital, London Jewish Hospital,
 and Queen Mary's Hospital, Stratford

It has often been claimed that a major factor in the production of enuresis is the method of toilet training. Some workers—for example, Anderson (1930), Stockwell and Smith (1940), and Bakwin (1949)—found that most enuretics had received insufficient training, but others followed Huschka (1943), who incriminated coercive methods, including early training. Bostock and Shackleton (1951, 1952) supported Huschka at first, but in 1956 they claimed that early training alone was fundamental when they discovered that some enuretics had received gentle training.

Controls using normal children had been rarely studied in sufficient numbers to establish a pattern with which enuretics could be compared. In the U.S.A., for example, Despert (1944) could compare 60 normal children with 14 bedwetters, but found early training rare in both groups. In two larger series, Davis and Havighurst (1946) found that bowel training began in the lower classes below the age of 6 months in 23% of cases, and Klatskin (1952) reported that it began under the age of 1 year in 66%. The largest survey in this country revealed a marked difference. Douglas and Blomfield (1958) found that 60% of 3,990 children, in all social groups, born in 1946 began to be "potted" within the first two weeks of life but that enuresis occurred more often with those who began later.

Sufficient conflict of opinion exists both as regards the ages at which toilet training begins and as regards its relationship to enuresis to justify reassessment and at the same time to present additional data. It was felt to be particularly misleading to study the enuretic outside the context of the family unit with respect to toilet training, since a comparison with the dry siblings was thought essential.

Method and Scope of Investigation

Children were defined as enuretic who were still wet at night at the age of 4 years in the absence of any discoverable organic cause.

Their mothers were closely questioned personally regarding the age at which toilet training was begun, whether it was carried out strictly or not, whether it was resisted or resented, and the ages at which bladder and bowel control were achieved, if at all. The position of the child in the family was noted, and the same questions

were posed concerning the siblings if over 2 years old, since by that age complete data on control might be expected in most cases. If the answers were vague owing to a poor memory the entire family was excluded. In any event, it was considered unreasonable to expect accuracy regarding children who were 10 or over, and so only families with the eldest child under 10 were accepted. In this manner dry siblings between 2 and 10 years of age acted as controls for the enuretics in their family. Children with encopresis with or without enuresis were thought to constitute a separate allied problem, and they and their families have therefore been excluded from this survey but will be the subject of a further report.

After these selections had been made there remained for consideration 175 children between the ages of 4 and 10 who had been persistently wet since birth and who came for treatment of this condition to four hospitals and two local-authority clinics in east and south-east London. The great majority belonged to the working or artisan classes. A further 50 enuretics, past or present, were discovered in their families, bringing the total to 225. There were 174 dry siblings to act as controls.

However useful these dry children were for purposes of comparison, they cannot be regarded as representative of the child population at large, if only because the strong family history of enuresis so often present might make mothers anxious to avoid its appearance in their offspring. Therefore a further control series was obtained from consecutive out-patients between the ages of 2 and 10, provided their mothers possessed reliable memories and provided also there was no personal or family history of enuresis or encopresis. It was felt necessary to exclude those families with one or more children who did not become clean—that is, achieve bowel control—until 2½ or dry at night until 3, since the latter would be considered enuretic and the former encopretic by some workers in this field.

After this selection there remained 174 families comprising 202 dry children seen at the out-patients department, together with 182 normal siblings in the same age range (total 384), to act as a contrast group to the "enuretic families." These children are referred to as the "controls," although it must be admitted that the data on these dry children may not accurately reflect current training practice or achievement, for among the children were some with psychosomatic symptoms, abdominal pain, asthma, etc.

Distribution of Enuretics in Families

Among the 165 families with 225 enuretics, there were 142 boys and 83 girls with 83 boys and 91 girls among the dry siblings. Table I shows the family ranking of the wet and the dry children in these "enuretic families." It would appear that the larger the family the higher the proportion of enuretics among the siblings, so that with four siblings or over there were almost two cases per family. (In one family, not included in this survey because of the wide age limits of the seven children, all had been enuretic, five clearing up between 7 and 8, one at 11, and the youngest being still wet at 7 years of age.) With regard to sex differences, whereas in 2-sibling families boy enuretics outnumber girls by 2 to 1, this disparity disappears as families become progressively larger, with a decreasing proportion of boys becoming enuretic. This finding

TABLE I.—*Congenital Enuresis: Family Position of Cases*

Family Size		Total Families	Family Ranking						Total Cases
			1st	2nd	3rd	4th	5th	6th	
Only children	Wet	28	28						28
2 siblings	Wet	78	44	45					89
	Dry		34	33					67
3 "	Wet	35	20	23	16				59
	Dry		15	12	19				46
4 "	Wet	12	4	5	6	7			22
	Dry		8	7	6	5			26
5 "	Wet	10	4	5	3	5	6		23
	Dry		6	5	7	5	4		27
6 "	Wet	2	1	1	1	0	1	0	4
	Dry		1	1	1	2	1	2	8
Total ..		165	165	137	59	24	12	2	399

may be explained to some extent by the larger families to be found among the lowest social classes, in which Douglas and Blomfield found enuresis among girls nearly as common as among boys.

From Table I it may also be deduced that the eldest child is not more likely to be wet than the second-born; this constitutes some evidence against sibling jealousy being an important factor, but in families of three siblings and over there is a slightly greater tendency for the second-born to be enuretic, so that the question of jealousy must remain undecided. It may also be relevant to point out that the inexperience of mothers in handling their first-born children does not appear to make them more liable to bed-wetting.

Time of Beginning Toilet Training

The age at which potting began was readily given as a rule, but even to such a simple question a few mothers referred to the initial attempt, which was quickly abandoned when found to be of "no use." No differentiation between bladder and bowel training could usefully be made. In this survey toilet training refers to a routine even if carried out irregularly, and not to the perfunctory trial which can only be regarded as a brief experiment. Perhaps this difference in interpretation may partly explain the 60% of children potted within the first two weeks of life in the series of Douglas and Blomfield. In any event, training under the age of 9 months (at the earliest) can only refer to "catching" a stool, usually after a feed, or to urine, after a nap, in order to save laundering but more often to "get the baby used to the feel of the potty"—that is, to condition him. It is therefore a tribute to the mother's skill in anticipation.

Although mothers gave the onset of training to the nearest month, in order to make comparisons easier the various ages have been grouped in Table II into three

TABLE II.—*Relationship Between Time of Beginning Training and Family Ranking of Enuretics, Dry Siblings, and Controls*

	Training Periods			
	Early (< 3 Months)	Middle (3–9 Months)	Late (> 9 Months)	Total
Enuretics:				
First-born and only	27 (27%)	42 (42%)	31 (31%)	100
Later-born ..	37 (30%)	47 (38%)	41 (33%)	125
Dry siblings:				
First-born ..	26 (41%)	26 (41%)	12 (19%)	64
Later-born ..	26 (24%)	52 (47%)	32 (29%)	110
Controls:				
First-born and only	62 (32%)	83 (43%)	48 (25%)	193
Later-born ..	53 (28%)	80 (42%)	58 (30%)	191
Total ..	231 (30%)	330 (42%)	222 (28%)	783

periods only: early (under 3 months), middle (3–9 months), and late (over 9 months). It will be seen that no significant difference exists in all groups of children in the percentage trained in each of the three age periods except for earlier training in first-born dry siblings ($P<0.05$). Later-born children tend towards later training except in the enuretic group in which even the first-born tend slightly towards later training. This trend towards somewhat later training in the enuretic group supports the finding of Douglas and Blomfield and rejects early training as a factor in producing enuresis.

Late training is also unlikely to be a factor because the proportion of enuretics who were trained in the late period is not significantly greater than that noted in the later-born dry siblings and controls. Only five mothers thought the late training of their first-born enuretic children was involved in causing enuresis and therefore changed to a much earlier start with subsequent offspring, but among the controls six mothers did likewise, though for different reasons.

Strictness

Training is here regarded as strict if rigidly performed at given intervals, usually with punishment—for example, slapping, scolding, and arousal of disgust. One mother trained her baby as she did her puppy, by thrusting his excreta in his face, while more than one propped the baby up on the potty with pillows and left him there until something happened, however long it took. Non-strict training is defined as following a more haphazard routine without punishment of any kind, but included in this definition is the lax "training" given by mothers who potted only when they had the time or inclination; this method was prevalent in large families, with twins, and when one baby quickly followed another. Wide latitude was thus left in the interpretation of non-strict training in order to concentrate on those mothers who used coercion as an ancillary aid. Almost certainly some mothers prevaricated for fear of criticism, and therefore the results can only be regarded as approximately true.

When early training is decided upon it is likely to be more strict than with later training in all groups of children, and this tendency is particularly marked among the enuretics who are first-born or only children. For later-born children no difference between enuretic and dry children appears. It is difficult to believe that strictness *per se* can be a factor in producing enuresis solely in the first-born, and then only if training is started early. It is more likely that, expecting trouble from a family history of enuresis, some mothers would train especially their first-born more strictly, but many others seemed to prefer later training combined with laxity.

That increased leniency also has little bearing on the aetiology of enuresis is shown by the finding that if training began after nine months the low incidence of strictness was the same in the first-born enuretics and controls and in the later-born enuretics and dry siblings.

Some mothers of enuretic children openly believed their methods of training were at fault, and decided, after the first-born was enuretic, to change in the direction of greater strictness (14% of mothers did so, against only 3% of the controls), but more thought they had been too strict. Such variations indicative of the perplexity of some mothers of enuretics were rarely seen in the control series, in which the same pattern of

training was carried out in all children irrespective of family rank. But, in any case, greater strictness or greater leniency alone does not appear to be responsible for the persistence of bed-wetting.

Resistance

Whether coercion was used or not, many babies resisted their training by the time they were able to walk. They expressed their disapproval by screaming or struggling at the sight of the potty (active resistance), or, in fewer cases, by calmly sitting on it until the mother became tired, releasing their sphincters the moment the potty was removed (passive resistance)—"He did not know what the potty was for." The reaction of some mothers to rebellion was to intensify their efforts and to try to impose their will by force—that is, by strict training—but many others accepted the situation, and, in spite of questioning, denied they applied any form of punishment.

It is probable that it is this resistance which made some mothers believe that their methods had been ill-conceived, and so, through feelings of guilt, may not have given accurate replies to questions related to the strictness or otherwise of their training. But the impression gained was that they were truthful and frank when it came to answering questions regarding resistance.

The total number of children who resisted actively or passively was 151 out of 783, distributed in Table III

TABLE III.—*Relation Between Strictness of Training and Resistance*

	Training Periods						Total Resisted
	Early		Middle		Late		
	No.	Resisted	No.	Resisted	No.	Resisted	
Enuretics:							
Lenient	35	7 (20%)	59	18 (31%)	59	18 (31%)	28% } 37%
Strict	29	12 (41%)	30	19 (63%)	13	9 (69%)	
Dry sibs:							
Lenient	33	2 (6%)	59	3 (5%)	39	2 (5%)	5% } 9%
Strict	19	2 (11%)	19	6 (32%)	5	0	
Controls:							
Lenient	76	11 (14%)	132	15 (11%)	81	9 (11%)	12% } 14%
Strict	39	10 (26%)	31	5 (16%)	25	3 (12%)	
Total	231	44 (19%)	330	66 (20%)	222	41 (18%)	19%

according to the declared strictness or leniency of the training. It will be seen that there is a highly significant difference ($P<0.01$) between the resistance put up by enuretics (37%) and that shown by the dry siblings and controls. The percentage for the controls is higher than for the dry siblings, perhaps because among them were children suffering from psychosomatic illness to which methods of toilet training may have been related (Huschka, 1943).

Enuretics resisted even lenient training more than did the other two groups, but were twice as likely to resist if trained strictly. This was also true for the controls, but only if trained early; while with the dry siblings most resistance was demonstrated with training in the middle period. Least resistance was shown by enuretics if trained early, suggesting again that early training is not more conducive to enuresis than later training.

With regard to family ranking, in all three groups the later-born showed a slight trend towards less resistance than the first-born, with the exception of the dry siblings, among whom, in the middle period only, the converse was true.

In general, however, it may be concluded that resistance to training plays a more important part than any of the other factors so far considered.

Sex Differences

It is well known that enuresis is more prevalent among boys than among girls. The only differences detected in this series with regard to toilet training is a slight tendency towards later and more lenient training among girls. This applied to the controls as well as to the enuretics, but the converse was true in the case of the dry siblings. Resistance was shown in all groups equally except in the late training period, in which twice as many boys resisted as girls.

Time of Achievement of Sphincter Control

Table IV shows the effect of resistance to training on bowel and bladder control. It was found that the dry

TABLE IV.—*Relationship Between Time of Beginning Training, Resistance, and Sphincter Control (in Months)*

		Resistance	Training Periods			Average
			Early	Middle	Late	
Enuretics	Clean ..	No	18	19	23	20
		Yes	23	21	23	22
	Dry by day ..	No	22	25	28	25
		Yes	27	29	29	28
Controls and dry sibs	Clean ..	No	15	15	17	16
		Yes	18	20	22	20
	Dry by day ..	No	17	17	20	18
		Yes	20	22	23	22
	Dry by night	No	19	19	21	20
		Yes	23	25	24	24

siblings and controls were almost identical in their achievement of control, and so in this table they have been grouped together. All children, both dry and wet, show a tendency towards later sphincter control if training is begun late—a finding which confirms that of Douglas and Blomfield.

Table IV also shows that enuretics become clean and dry by day (if at all) later than the controls even if they do not resist training. In addition, both enuretics and controls were later in becoming clean and dry if there was resistance to training irrespective of when training began. These results would have been even more striking if those enuretics who delayed bowel control until the age of 2½ had been included, but, being thought possibly encopretic, they were omitted from this survey.

With regard to family ranking, later-born children of all groups became clean and dry by day and by night (if not enuretic) about a month earlier than the first-born. Girls likewise were earlier to achieve control, becoming clean two months earlier on the average and dry by day one and a half months sooner than boys; if trained early they became dry by night two and a half months sooner, but only one month earlier if trained late. This finding confirms the well-known fact that boys are "harder to train." Despert (1944) has attributed the relative success of girls to the fact that boys have to learn two methods of micturition, sitting and standing, but the greater aggressive tendencies of boys may be a more important factor.

Strictness in training in all groups showed a slight tendency towards earlier control, provided, however, that no resistance was demonstrated.

Discussion

The earliest frustrating experiences of infancy include unsatisfied hunger, napkin-changing, and toilet training. But, whereas infant-feeding is becoming more and more permissive, this is not yet the rule with regard to excretion habits, although in the past decade propaganda directed towards non-strict and later training has been in some measure successful, more so in the United States than in this country.

Douglas and Blomfield put forward the startling claim that 60% of the babies born in Great Britain in 1946 were potted within a fortnight of birth. This is at variance with the results in the present study, in which 30% of children began their training under the age of 3 months, and conflicts also with the tendency towards even later training in the U.S.A. described in the series of Davis and Havighurst (1946), Huschka (1943), and Klatskin (1952).

A further discrepancy is seen when the time of onset of training of enuretics is considered. Whereas Douglas and Blomfield found they had begun training later than the average, Huschka discovered the converse was true among her problem children, but she admitted the absence of "normal" controls. In the present series it was found that 72% of children had begun their training under the age of 9 months irrespective of whether they later became enuretic or not.

The period between birth and 10 months has been termed "early" by Huschka, and is included among her criteria for coercive training. This viewpoint has been accepted by virtually all psychiatrists up to the present day, although controls had not been studied; Prugh (1954), almost alone among them, separated early training from coercive methods, but even he found a high correlation between them. Huschka was, however, on more certain grounds when she specified the various punitive measures, both physical and psychological, adopted by many mothers, and included them among her criteria for coercive toilet training.

Whatever the nature of training, many variables are involved, including parental attitudes and aspirations, social prejudices, environmental factors, and maternal psychopathology, but the number of children studied in this investigation precluded consideration of these factors, important though they are; and, furthermore, made it impossible to determine the personality of each child in an adequate manner. Whatever the conscious or unconscious motives behind the method of training adopted by the mother, coercion was admitted in this survey in 38% of first-born enuretics but in a smaller percentage of later-born enuretics, dry siblings, and controls. In all groups the earlier the training started the more likely was it found to be conducted strictly, so that one might expect enuresis to be seen most commonly in those children who were trained below the age of 3 months; yet the converse was found to be the case, and most enuretics were discovered among those who began to be trained later.

Although only a minority of children had been trained strictly, this is not to deny that there may be some indirect relationship between strict training and enuresis, because resistance was met with twice as often in the enuretics receiving strict training as in those trained leniently. On the other hand, so many enuretics resisted who had been trained leniently that the part which strictness plays is an uncertain one, and suggests that it

is the resistance shown by a child at 1-1½ years of age rather than the timing or method of training which bears a closer connexion with enuresis.

Resistance was also noted in a relatively small number of dry siblings and controls, so that bed-wetting cannot be said to be its only outcome; encopresis is even more closely related to it, and Huschka has shown that some behaviour problems may be an alternative undesirable reaction to coercion. But even in these dry children resistance has been shown to be related to a delay in sphincter control of about four months; it is interesting to speculate whether some were on their way to becoming enuretic or encopretic but lacked the genetic factor (Hallgren, 1957) involving autonomic imbalance which would allow these conditions to develop.

The question to which no certain answer can be provided is the cause of the resistance encountered, particularly in many of the enuretics of this series. It is commonly believed that the mother is to blame, and this is probably true in so far as coercive measures play their part, but most children accept such training without demur and with no obvious side-effects. It may be the inborn personality of the child, in whom aggression and negativism are prominent features, which is more important than rigidity of method. But whichever interpretation is correct, toilet training is conducted so smoothly and effectively in the majority of children, whether enuretic or not, that it cannot be regarded as more than a contributory factor in some cases. On the evidence provided, little support can be given to those who maintain that, just as acquired (or onset) enuresis is largely determined by psychological stress after a child has become dry at night, so enuresis may persist from birth onwards because of the stress of coercive training.

Summary and Conclusions

A retrospective inquiry concerning toilet training was undertaken into 165 "wet" families comprising 225 enuretic children and 174 dry siblings, and the findings were compared with 174 "dry" families containing 384 children as controls. The results were as follows.

1. The age at which "potting" began was virtually the same in the enuretics, dry siblings, and controls (30% under 3 months, 42% between 3 and 9 months, and 28% over 9 months). It was concluded that the time of beginning training bears no relation to the problem of enuresis.

2. Strict methods were adopted in a minority of children, but were more prevalent if training began below the age of 3 months and more common in enuretics who were first-born or "only" children; nevertheless, enuresis was found less often among those trained very early. Later-born enuretics were not trained more strictly than their dry siblings or the controls. For these reasons it is doubtful whether coercive training is an important factor in the production of enuresis.

3. Children trained in the later period (over 9 months) were handled leniently as a rule, but no difference in this respect was found between the enuretic and control groups, indicating that lax methods were likewise not more conducive to enuresis.

4. Strict training was more often associated with resistance, both active and passive, in all children. Enuretics resisted much more often than the controls even if training had been lenient; most resistance was encountered if potting began after 3 months of age. It

is inferred that this resistance is more closely related to enuresis than early training, but coercive methods played some part in producing it.

5. Early training seemed to lead to earlier sphincter control, but if resisted at any training period some delay occurred not only in enuretics but in dry children as well. Possible reasons for this delay and for the resistance apparently causing it have been tentatively put forward.

It was concluded that, while toilet training has no fundamental bearing on the causation of enuresis, resistance to training is often a contributory factor.

My thanks are due to Dr. Stuart Morrison, of the M.R.C. Social Medicine Research Unit, for statistical and other valuable help, and to Dr. Doyne Bell for his comments.

REFERENCES

- Anderson, F. N. (1930). *Amer. J. Dis. Child.*, **40**, 591.
 Bakwin, H. (1949). *J. Pediat.*, **34**, 249.
 Bostock, J., and Shackleton, M. G. (1951). *Med. J. Aust.*, **2**, 110.
 ——— (1952). *Ibid.*, **1**, 357.
 ——— (1956). *Ibid.*, **1**, 1042.
 Davis, A., and Havighurst, R. J. (1946). *Amer. sociol. Rev.*, **11**, 698.
 Despert, J. L. (1944). *Psychosom. Med.*, **6**, 294.
 Douglas, J. W. B., and Blomfield, J. M. (1958). *Children under Five*. Allen and Unwin, London.
 Hallgren, B. (1957). *Acta psychiat. scand.*, **32**, Suppl. 114.
 Huschka, M. (1943). *Psychosom. Med.*, **5**, 254.
 Klatskin, E. H. (1952). *Amer. J. Orthopsychiat.*, **22**, 52.
 Prugh, D. G. (1954). *Ann. N.Y. Acad. Sci.*, **58**, 355.
 Stockwell, L., and Smith, C. K. (1940). *Amer. J. Dis. Child.*, **59**, 1013.

SOME OBSERVATIONS ON SALIVARY SECRETION AND FLUID ABSORPTION BY MOUTH

BY

K. C. McKEOWN, M.Ch., F.R.C.S., F.R.C.S.Ed.
*Senior Consultant Surgeon, Darlington Memorial Hospital
 and Friarage Hospital, Northallerton*

AND

G. H. DUNSTONE, F.R.C.S., F.R.C.S.Ed.
Surgical Registrar, Friarage Hospital, Northallerton

The secretion of saliva in normal healthy subjects is under nervous control, and there is no evidence of a specific hormonal mechanism. In the resting state the output of saliva is at a low level, but a marked increase occurs when the gland is activated as the result of a wide variety of reflexes, which may be unconditioned or acquired.

Substances placed in the mouth initiate the unconditioned salivary reflex. The stimulus may be produced by inedible objects and be purely of a mechanical nature, in which case the afferent pathway is by the lingual, buccinator, and palatine branches of the fifth nerve, and the pharyngeal branches of the vagus. Movements of the tongue and jaw have similar effects. Edible substances produce their effect by stimulating the taste fibres of the chorda tympani, and of the glossopharyngeal nerve.

Mechanical stimulation of the lower end of the oesophagus causes an increase in salivary secretion by means of the oesophago-salivary reflex. Similarly, the introduction of food into a gastrostomy produces a salivary response by the gastro-salivary reflex. Both these responses depend on the integrity of the vagi.

Salivary secretion which occurs when the mouth is empty is due to a wide variety of acquired reflexes. The