

Cultural Knowledge of Hygiene and Sanitation as a Basis for Health Development in Nepal

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INTRODUCTION

Resort to folk competence in health is a recent and important trend in development policy. In the field of primary health care this trend has gained force in the recognition of the cultural constraints within which any community health programme must operate. Recent research in medical anthropology has focussed on the way in which local people, acting in the light of their cultural values and folk knowledge, take up the medical facilities offered to them. From the bio-medical point of view this folk knowledge may be at variance with medical science; but even in those cases in which folk knowledge is imprecise or erroneous from a bio-medical point of view, such knowledge may still encourage adaptive behaviour. Certain public health measures in nineteenth century England were provoked by ideas of hindsight proved to be erroneous, yet these measures were bio-medically adaptive and led to improved sanitation arrangements in metropolitan areas. This paper reports on an investigation into the contexts in which folk knowledge of hygiene and sanitation in Nepal might play some role in the promotion of public health.

The investigation focussed particularly on folk knowledge of water-related diseases and of water management. The reason for this lay in the fact that the key for any improvement in public health in Nepal lies in the prevention of illness and that in the field of preventive medicine the proper management of water resources is of central importance. Numerous illnesses in Nepal are related in some way or other to water: either to drinking water (e.g. diarrhoeal diseases), bathing water (e.g. skin, eye and ear infections), or to bodies of water which serve as breeding places for the mosquito vectors of malaria and eosinophilia. Throughout Nepal may be found culturally specific ideas and practices about the importance of drinking and bathing water for the well-being of the person; and this knowledge informs their competence in hygiene and health care. The aim was to relate this knowledge to bio-medical observations on the intersection of human behavioural patterns and water-borne pathogenic agents.

METHODOLOGY

Fieldwork was carried out at the pilgrimage centre of Janakpur, administrative capital of the Dhanusa district, in the eastern Tarai of Nepal. Until the 1950s Janakpur was a cluster of three rural hamlets,

comprising the farmers, artisans, priests and clerks who worked for the three main monasteries that controlled the land. A small bazaar, only three or four streets deep, catered to the needs of local people and pilgrims. After independence in India, Janakpur expanded rapidly as a commercial centre in the import-export trade. Further expansion occurred in the 1960s with the administrative reorganization of Nepal in which Janakpur was designated capital of the Dhanusa district. With a 60% increase in population in the last two decades Janakpur is Nepal's second fastest growing town. Yet the town has developed largely along the main roads between the monasteries and the railroad station, gradually enclosing and leaving untouched the rustic neighbourhoods of poorer agricultural workers. Moreover, the entire western side of the 'town' is still taken up with ponds and paddy fields. Given the necessity of carrying out research in a town (where sufficient electricity would be available for the bacteriological tests), Janakpur had the advantage of being as much rural as urban in its population and life style.

The town, comprising some 15,000 people, affords a great variety of water sources -- both of drinking water (tubewells, open masonry wells and improved municipal water supply) and bathing water (tubewells, open masonry wells, improved municipal water supply and pond water). Water was not necessarily a problem for local inhabitants: neither in its provision nor its purity. The diversity of water sources of variable quality provided the opportunity to record, therefore, how local people evaluate water and observe what sort of water they prefer for what sort of purpose. Despite the abundance of potable water, the prevalence of water-related diseases was high. Dhanusa district has the highest incidence of malaria (and quite possibly eosinophilia) in the kingdom and diarrheal diseases are commonplace. In the recent past the region was frequently visited by cholera. In short, Janakpur was an excellent research base at which to investigate people's knowledge about water and disease.

Although administratively part of the mountainous Kingdom of Nepal, the town of Janakpur -- together with the eastern Tarai districts -- is ecologically an extension of the Gangetic basin. The land, only about one hundred metres above sea level, is more or less flat with a very slight north-south tilt from the base of the Siwalik foothills of the Himalayas to the Indian frontier state of Bihar. The climate is tropical, with a hot, dry, windy summer (April to June), a rainy season (July to September), a cool dry season (October to January) and a short spring (February to March). The upper reaches of the Tarai have sandy or gravelly soil where seasonal rivers drain the southern slopes of the Siwalik hills during the monsoon, but closer to the Indian frontier the soil is clay-like, able to retain surface water, essential in the management of paddy fields and in the rain-filled tanks used for bathing, washing and irrigation. On the whole the soil has retained some fertility as nutrients are leached from the soil in the mountains. Altogether the eastern and western Tarai of Nepal account for only 15% of the land mass of the kingdom, but it is home to 31% of the people, producing 59% of the gross national product and 76% of the government's revenue.

From a cultural point of view the majority population of Janakpur, as of the Dhanusa district, is Maithili-speaking. There are approximately one million Maithili speakers in Nepal, making it the kingdom's second largest language group. Another nineteen million speakers live in northern Bihar, India. The language is cognate with Bengali, Bhojpuri, Magahi, Oriya and Assamese; and related lexically to the languages of western India: Nepali, Avadhi, Punjabi, Kashmiri, Rajasthani, Gujarati and Marathi. Like all these Indo-Aryan languages, it has been subjected to modern Hindi and English as administrative languages. The Maithil people have been living in the eastern Tarai districts for more than one thousand years; since the 1950s the district has been increasing settlement by Nepali speakers from the hills who were attracted to the abundant land, once malaria had been brought under some measure of control. Most participants in the survey were Maithili by mother tongue, with a few Nepali speakers and one Newari. These linguistic differences are important in the ethnic politics of Nepal and India, but of little cultural significance. The similarities of Indo-Aryan peoples are greater than their differences and neighbouring languages are often mutually intelligible.

Over a period of one calendar year local knowledge of hygiene and sanitation was recorded as were local water use practices. Part of the information was collected in the course of observations in five households in which ties of fictive kinship were established; the other part of the information was collected in a survey, conducted in 174 households on the northern side of town. The northern side comprised several hamlets and neighbourhoods which offered within several acres of residential land a population of considerable diversity in religion (Hindu and Muslim), mode of livelihood (landlords, fieldhands, builders and craftsmen, merchants and clerks), castes (the high caste Maithil Brahman and Kayastha as well as various ranks of untouchables from the high, such as Sunri, to the middle, such as Khatuve, to the abject, such as the Cobblers). The economic contrast ranged from several families of wealthy landlords and merchants living in three story brick homes to the desperately poor neighbourhoods in which entire families crowded into the single room of a mud hut. Most of the upper caste families were highly educated: either in a traditional vein (Sanskrit degrees from Benaras) or a modern vein (university degree for the men, matriculation for the women). By contrast, many of the untouchable families were uneducated and illiterate.

At the same time that information on local knowledge was recorded, samples of fresh and stored water were collected which were subsequently analysed for the presence of *Escherichia coli*. *E. coli* is a coliform of the intestinal tract which serves as an indicator bacteria of faecal contamination. That is, if this particular faecal coliform is present in a water sample then one might also suspect the presence of other excreted pathogenic agents including viruses (e.g. poliomyelitis, hepatitis), bacteria (e.g. salmonella, shigella, cholera), protozoa (e.g. entamoeba, giardia) and helminths (e.g. ascaris). Much has been written about the suitability of *E. coli* as an index of faecal contamination. Let me sound here four cautionary notes. First, *E. coli* are natural inhabitants of the

intestinal tract of all warm-blooded animals; thus a bacterial analysis of the bathing or drinking water does not indicate the extent to which the faecal contamination is of animal or human origin. Second, *E. coli* are sensitive to temperature, sunlight and to other microbial life. In tropical surface waters they are subject to a rapid falling-off. Certain pathogenic bacteria and helminth eggs do not, however, experience such a rapid mortality; hence pathogenic agents may still be present in the water, even though the *E. coli* indicators have diminished considerably. Third, it must be remembered that disease is the response of the human organism to a pathogenic agent. The presence of such agents in the environment does not imply that people will fall ill. Rather other factors, such as the age, nutritional status and immune response of the person, must also be taken into account. Fourth, there is some disagreement as to what standards of water purity, given the politico-economic constraints and opportunity costs of other forms of investment in public health, are attainable in poor countries with tropical climates. World Health Organization guidelines recommend for developed countries in temperate climates that up to 10 coliforms/100 ml are acceptable for drinking water and ten times that amount for bathing water. What goals are reasonable for health workers in the different ecological zones of Nepal is, however, less clear.

THE POSITIVE QUALITIES OF WATER

Maithil people evaluate drinking water according to seven criteria: taste, turbidity, temperature, freshness, digestive properties, habitual usage and purity. These criteria, together with availability and convenience in collection, determine people's preferences for particular water sources. I discuss them, in turn, below.

Everyone agreed that drinking water should be 'sweet' to taste; no one, however, could describe the elusive quality of sweetness. Even though it was imputed objectively to the water, the evaluation was subjective and metaphorical. The taste should be refreshing and thirst quenching; that is the experience of drinking water should be pleasant, as indeed life should be pleasant. Sweet water contrasts with bitter water, which may also undergo slippage from the literal to the metaphorical: e.g. bitter experience, bitter memories. Bitterness seemed to include both the bitter and the astringent. The avoidance of bitter water underlay some informants' reluctance to drink the treated water of the municipal Water and Sewage Corporation, for it is decontaminated with bleaching powder. Similarly in decontaminating open, masonry wells, people generally used insufficient lime (less than a 1% solution) because the taste would have otherwise been unacceptable. In sum, sweetness not only guided local people's preference for water; it also limited their tolerance of chemically decontaminated water.

Water should be clean and clear (lit. 'devoid of dirt'). Water, which is observed to be turbid may be further described as sandy or muddy. Alternatively turbidity may be noticed retrospectively on the inside rim of the pot after cooking rice. Turbidity is thought to cause digestive disorders. Furthermore, since worms are thought to live in earth, the ingestion of 'dirty water' leads to worm infestation.

Ordinarily water temperature should not be out of proportion to body temperature. Otherwise the body might become shocked by the temperature difference; and shock is injurious to health. Water temperature was also judged in relation to air temperature in their combined effect upon the body. Stored water usually takes on the temperature of the surrounding air, such that it becomes cool in the cold season and warm in the hot season. Water at source, however, emerges from the earth in the winter warmer than morning air and in the summer cooler than morning air. Since health is preserved by remaining in equilibrium with the environment, fresh water is usually preferred because it counter-balances the air temperature in its influence upon the body. Water which has been stored for some time exacerbates the imbalance.

It is important that water be fresh. Water which comes from a source is always fresh. But in collecting and containing water, it 'gathers' thereby becoming stale and losing its positive qualities. Stale water cannot be made fresh; hence freshness is guaranteed only by changing stored water at regular intervals. Most domestically stored water is changed as a matter of course at least once a day: at dawn the water which was stored overnight is thrown out and replenished with water fresh from the source.

Water is thought essential to the proper digestion of food. Although men of affluence may take beer or whisky with their meal in 'hotels', nevertheless at home in the company of their family they usually drink water. Water is not drunk with the meal in sips or gulps; rather all solid food is consumed and then water is taken to enable the stomach to digest (lit. to cook) the food. The work of digestion in a healthy body takes between one and two hours, depending upon the heaviness of the food. Water varies in its ability to digest food. Food which is under-digested leads to diarrhoea; food which is over-digested leads to constipation. As long as diarrhoea is neither inconvenient (does not come 'quickly') nor worrying (entails no vomiting) then it is not thought as bothersome or serious a medical problem as constipation. With constipation foulness is retained within the body, causing illness. Local people claimed that the water in the Janakpur area had much iron in it; predisposing them to constipation. Indeed when I informed local people that I was interested in the quality of drinking water and the prevention of diarrhoeal diseases, some people told me I had come to the wrong place; their problem was constipation.

Drinking water is assimilated by the body such that it comes to constitute the very being of the person. Having integrated this water

In his body, a person's well-being is threatened by drinking water from sources to which he is unaccustomed. People who return home after several weeks abroad are said to appear thin by virtue of their not having been nourished with the water of their native place. Some old men in Janakpur continued to drink the water of their neighbourhood open well, even though they knew that the water of a nearby handpump might be more pure. They thought, however, that to change water at mid-life might shock their body causing them to fall ill. It is always best to drink the water to which one has become habituated.

In its natural, undifferentiated state water is intrinsically pure; yet water also serves as a medium of qualities such that it becomes liable to pollution by water handlers. There are both temporary and permanent sources of defilement. All Hindus experience temporary pollution during which time they may collect water for their own use, but not for others. Periods of temporary pollution include: early morning ablutions, women in menstruation, mothers in the first forty days *postpartum* and families in mourning. Permanent pollution is a fact of life for untouchables; indeed, the range of untouchable castes is defined with reference to those castes from whom local Brahmans do not accept water. While pollution is largely a ritual state, the sources of pollution range from physical waste (faeces) to the inauspicious (death) to the social (untouchability). Pollution largely affects contained water; once such water is polluted, it cannot be rendered pure again. Rather it must be discarded.

WATER AT SOURCE: THE EVALUATION OF ITS QUALITIES

The people of Janakpur have access to diverse sources of water, not all of which are used for the same purpose. These sources include water from handpumps, open masonry wells and the municipal supply ('pani tainki' water) which are used for drinking purposes as well as for bathing and for washing clothes and kitchen utensils. Additionally the numerous ponds of Janakpur are used for bathing and washing, as are two nearby streams, the Jaladh and the Dudhmati. Each of these sources is evaluated according to various criteria: cost of installation or of usage, convenience in collection, proximity to house, quality of the neighbourhood in which the water is found, etc. The purpose of this report, however, is more narrowly defined. I shall consider here only local evaluations of the quality of water at source, and the beliefs and practices connected with the preservation of those qualities.

Tube well water: By tubewell refer to handpumps which are ubiquitous and, without any doubt, the locally preferred source of drinking water. Tubewell water is fresh, and it counterbalances one's body temperature throughout the year. The filters control for turbidity. Moreover, the iron casing is not thought to affect seriously the taste. The only complaint, which is occasionally voiced, is that tubewell water has excessive iron in it; or at least the water, after boiling, leaves a

residue on the cooking pot which people attribute to iron. Water soluble iron is said to predispose one to constipation. This complaint did not, however, affect popular preference for tubewell water. It should be added that most people drink water which has been collected by women and nearly all women prefer handpumps to open, masonry wells on grounds of convenience in the drawing water out of the earth. Hence tubewells were overall best.

Local people did believe, however, that the quality of tubewell water varies seasonally. In the monsoon rain seeps down into the earth taking with it surface contamination which mixes with the 'good' water which rises from within the earth. This explanation, which presumably dates from the time that open masonry wells were commonplace, had some plausibility in the case of handpumps sunk to a shallow depth. Faecal contamination at the pump could be drawn down into the earth along the exterior of the piping and then be drawn into the well at base. Of the tests conducted on tubewell water, however, no evidence of seasonal variation was found.

Some local people were also sceptical for political reasons about the quality of tubewell water. Most public tubewells have been installed with government funds, either special project funds or the regular budgetary provision for sanitation facilities and water resources from the Panchayat Ministry. The cost of sinking a tubewell varies in relation to its depth, for the major costs are the daily wage of the labourers and the length of piping. The necessary depth varies from region to region according to the depth of the water table. In the Janakpur area local people believed that a depth of 125 feet is necessary to ensure that the water is both good and reliable. It is known that the water table rises and falls with the seasons, and that the table is liable to surface contamination. Hence the more shallow a well, the more likely it will go dry in the summer and become contaminated in the monsoon. Yet it is possible to strike water at a depth of as little as thirty or forty feet. As soon as water is struck, local sceptics believed that the contractor is tempted to make a deal with the government overseer to stop work and to share between them the unused pipe and the allocation for labour expenses. Thus I received the unsolicited advice to drink the water of a private tubewell or from a tubewell in the neighbourhood of powerful people; but not to drink the water of poor or untouchable neighbourhoods. In such neighbourhoods the people are too powerless to keep the contractors honest. The well will be shallow and the work inferior; the water will be unreliable in the hot season and contaminated in the wet. Being unable to collect valid figures on the depths of tubewells, I could not separate fact from persuasive fiction; I made no tests of the validity of local scepticism.

Local people were also sceptical of the purity of public tubewells by virtue of the fact that 'anyone' might use such water, and in so doing might contaminate it. Strangers to Janakpur, townsmen from other neighbourhoods and local children could not be counted upon to use the hand-

pump responsibly. By contrast, private tubewells, situated within the courtyard, were protected; and the purity of their water guaranteed by the family who safeguards it. Considerable tests were taken to ascertain the validity of this observation, and the data suggest that here local scepticism was well-founded. A few family handpumps were highly contaminated, but most met WHO standards for drinking water, and some were more pure at the tap than the municipal water supplied by the Water and Sewage Corporation. Public handpumps, however, were never free of contamination.

The water of open, masonry wells: Local people knew that well water was contaminated by improper use: by letting dirt fall into the well or by children throwing things into the well. But people also recognized that it was by virtue of its use that the well retained its freshness. If a sufficient amount of water was not drawn from the well each day, fresh water would not seep in and the well water would stagnate. Thus an open, masonry well is a community resource. If a tubewell is sunk in the neighbourhood and local women start to use it, the open masonry water would not be renewed at a sufficiently fast rate. Hence the quality of the water would diminish and everyone would be advised to use the tubewell, for it is only that water which is fresh by virtue of its being replenished. The implication here is that an open well is, perforce, a community resource; whereas a handpump can be either for private or public use.

The water table varies throughout the region. In Janakpur during the dry, hot season it is anywhere from ten to twenty-five feet below the surface; and at the time of the monsoon it rises nearly to the surface. As the water table rises in the monsoon people see the rain water seeping in through the sides of the brick-lined well. This is 'bad' water which has picked up foulness on the earth's surface and which is not fit for drinking. Out of necessity people drink it. Bad water was their explanation for diarrhoeal diseases, which they perceived to be more prevalent in the rainy, than in the dry season. Good water, however, is thought to rise from the bottom of the well. This was an illusion in that an empty well fills from the bottom, but it only fills up from water seeping through the brick-lined walls until the pressure in the well equals that in the earth. It seemed, therefore, that people did not have any idea of the value of earth as a natural filter of water. Rather it is undifferentiated water coming from within the earth that is pure. Water that seeps down from the earth's surface retains its impurities, rather than loses them by filtration.

Tests on seasonal variation of open well water were conducted in the untouchable Cobbler's neighbourhood throughout the summer and monsoon. After two days of heavy rain and overnight rain on the third day, the well water rose to ground level. Water samples were taken after the overnight rain which indicated 35,500 faecal coliforms per 100 ml. Two weeks later (and after a week without rain), the water level had fallen to four to five feet below ground level. The mean faecal coliform count on a 100 ml

sample was 1525. These figures suggest that the Cobblers were right in believing that monsoon rain increased contamination. It should be stressed, though, that contamination in the dry, pre-monsoon season also rose to similar heights, but for different reasons (e.g. a contaminated bucket being lowered into the well). The Cobblers, however, overlooked unseasonal sources of contamination and focussed only on the seasonal one.

The Corporation Water Supply: The municipal supply of water, managed by the Water and Sewage Corporation, is colloquially known as *pani tainki* water for the water is stored in a large elevated, concrete tank near the centre of town. The tank, with a capacity of 100,000 gallons, was constructed with Indian government aid and inaugurated in 1967. It is filled from two artesian wells, and disperses water throughout the town in underground mains, varying in size from 12 to 4 inches in diameter. Previously Corporation policy was to supply both public and private users, but the public service has been curtailed: public taps were often misused or broken, and consumption was uncontrolled. Consumption is now controlled by the provision of water on a twice daily basis: in the morning between 5.30 and 7.30 a.m. and in the evening between 6.0 and 8.0 p.m. For private customers consumption was further controlled in 1983 by the installation of domestic meters and quarterly charges. Some torty public taps (this figure, told me by a Corporation official, might be an overestimate) have survived, due to neighbourhood concern to prevent abuse of the facility; otherwise the service is now almost exclusively private and fee-paying. Water is piped directly to the homes of subscribers who pay Rs. 7 for the first 10,000 litres and then Rs. 1.20 for every additional 1000 litres. Most people in town do not have access to *pani tainki* water, for they are not in a position to afford the connection charge which varies with the distance of the house from the mains. This works out at Rs.114 for the first 100 feet and Rs. 0.75 per foot thereafter. The charge does not include the cost of the pipe and labourers to dig the ditch. Those who do benefit from the facility are merchants, administrators, and professional families; or less well-off urban dwellers living in rented accommodation whose landlords have availed themselves of the facilities. The control on consumption has enabled the Corporation to extend the service; in 1984-1985, through a World Bank loan, the mains network was extended to other areas of town.

At the local level the Corporation chief is an engineer. His concerns are largely hydrological and managerial; that is to ensure that the water is delivered effectively to subscribers and that government resources are properly administered. Bleaching powder is regularly added to the water in the tank, but no tests are carried out to ensure that the water in the central tank meets WHO standards on drinking water. Nor is there any concern about the quality of water as it emerges from public and private taps. Policy decisions concerning water supply are largely taken on engineering and economic advice, not medical advice.

Water is abundant in the Janakpur region; hence the main reason for the installation of the municipal supply was not to provide water, but to

provide clean, drinking water to urban dwellers. Local people, however, are not entirely satisfied with its quality. There are three reasons for this. First, it is believed that Corporation water is stored in the tank for a day or more; hence the water is 'stale'. Second, the 'medicine' (that is, the bleaching powder) that the Corporation adds to the water is said to ruin the taste. Corporation water is not 'sweet', like handpump water. Third, Corporation water causes bodily dis-equilibrium and may become deleterious to health. In winter the night air chills the tank, cooling the water so that by morning the water is much colder than the air temperature. In summer the noon-day sun heats the tank, rendering the water tepid and thereby reinforcing the heat of the day. By contrast, tubewell water is warm in relation to the morning air of winter and cool in relation to the midday air of summer. According to the hot-cold equilibrium theory of illness, which is pervasive in the region, tubewell water complements the air temperature and thereby sustains the drinker or bather in equilibrium; Corporation water causes disequilibrium.

For the most part people thought that the advantage of Corporation water was its 'convenience' in collection. But this was not a compelling enough reason for wealthy people to use it for drinking purposes. Families which could afford the installation costs and quarterly charges were also wealthy enough to afford a private handpump in the courtyard of their home. They drew drinking water from the handpump; and used the municipal supply for personal bathing and for washing clothes and pots. The people who relied almost exclusively on Corporation water were neither the rich nor the poor, but often the salaried middle class families whose homes are in villages and who rent rooms or flats in town in which the landlord has provided access to the municipal supply. Except in the hot season -- when people crave cool water -- women cannot be bothered to collect drinking water in pots from a neighbourhood tubewell and then carry it up several flights of stairs to their flat. They use Corporation water instead.

People were generally convinced of the purity of Corporation water at source in the water tank high above the town; there was widespread belief, however, that contamination entered the system through faults in the line. Occasionally pipes burst or a connection leaked. Should the break occur underground, a damp patch became visible on the ground above the break. Should the break occur above surface, it was clearly visible in the spray. Suspicions were enhanced by the fact that for reasons of cost most pipes that connect the mains to the household run along or in the roadside drains in front of houses (the labour cost is less because a ditch need not be dug). People believe that contamination enters the domestic supply through the underground leak or from the sewage or sillage in the ditch. Due to the water pressure in the mains, it seemed unlikely that this should be so. Tests of tap water downflow from local leaks revealed either no contamination, or if contamination then no more than in houses where there was no nearby leak in the supply.

Pondwater: People prefer to bathe in the privacy of their courtyard, but families which rely upon a neighbourhood well for drinking water often prefer to bathe in ponds. This is especially the case with women, who can wash themselves more discretely by partially submerging themselves fully clothed in pond water; by contrast at neighbourhood tubewell--where they squat under the pump or pour water over themselves--they run the risk of exposing themselves in public and compromising their reputation. Additionally pilgrims and strangers to Janakpur often bathe in the ponds for religious reasons. The ponds have additional uses. Greengrocers used ponds near market stalls to scrub their root vegetables before selling them to customers. Village dairymen arrive at Janakpur in the morning carrying large tins of fresh buffalo milk on their bicycles. After selling the milk to hotel owners they rinse out the tins with pond water, before returning to their villages in the late afternoon.

Pond water is thought to go through a seasonal cycle of purity. Most of the ponds, properly called tanks, are filled by seasonal and unseasonal rain which is retained in the tank because of the clay in the soil. On average the ponds measure superficially an acre, and they are five to eight feet deep, varying with the season. In autumn and winter pond water, if safeguarded from faecal contamination, is thought to be as pure as well water. From spring an easterly wind blows with increasing intensity as the season advances. The wind not only raises considerable dust throughout the country, but it also is said to stir the water in the ponds, thereby increasing its turbidity. Certainly the wind drives the algae across the ponds. When the monsoon arrives, the ponds become impure. The reasoning lies with the excrement which has accumulated on the banks of the ponds over the past year and is now washed into the pond by the rain. It is only when the monsoon is over in September that the foulness is said to settle at the base of the pond and to mix in with the mud so that the surface water is said to become pure again.

This local explanation, based on the observation of natural phenomena, was informed by ritual convention. First, the monsoon was likened to menstruation in that both 'floods' are thought to carry away impurities, thereby leaving the earth and the womb in a state of purity. Second, important life-cycle and lineage rituals, using Brahman priests, are suspended for much of the monsoon, starting up again at the end of the season with the offering of food and water to the ancestors. It is said that only pure water can be offered to the ancestors and since Brahmans offer water to their ancestors in late August then the water must be pure.

THE DOMESTIC STORAGE OF WATER

Although women knew of at least one method which effectively purified water, still the idea of purifying water was strange, for fresh water in its natural habitat is naturally pure. Hence the aim of many women was to safeguard that purity by collecting water from an uncontaminated source in an uncontaminated manner and storing it in the

purity of their home. If, by chance, the water should become impure, or if staleness should set in, then the water is thrown away and fresh water is collected. Two kinds of water were stored for domestic purposes: tubewell water and Corporation water.

The storage of tubewell water: For the vast majority of families in Janakpur the storage of water is a necessity; the household lacks a domestic source and is thereby obliged to rely upon the neighbourhood handpump. Rather than fetch water everytime they require it (and possibly queue at the handpump during moments of peak demand) they fill their pots with water and return to their homes where the water is used until the pot is empty or the water is no longer fresh (that is the day or the night has elapsed). For a few families storage is a matter of convenience. The households may possess a handpump in their courtyard in which case they often do not bother to store water at all, preferring instead to collect it fresh at the pump upon demand. Drinking water is normally stored in clay pots. For the poor, this is a matter of necessity. Their cost is considerably less than aluminum or brass pots. But even wealthy families preferred storage in clay pots to metal ones. The reason lay in the perception that water evaporates through the clay, and as it evaporates it cools the water in the pot. By contrast, water stored in metal pots is exactly like Corporation water--excessively cold in the cool season and excessively warm in the hot season.

Tubewell water which is stored in the home (usually on the verandah) is handled as if it were drinking water, even though it may be used for other purposes. Thus hands are not allowed to come into contact with the water: either by insertion into the pot or by pouring water over one's hands from out of the mouth of the pot. Water is never drunk from the pot; rather it is poured into a glass or a cupped hand. If the pot is small and the water is primarily for personal use, it may be poured from a distance straight into the mouth. The mouth of the drinker never comes into contact with the mouth of the pot. Should a baby's bottom have to be washed, care is taken to hold the pot in the right hand and to pour the water into the cupped left hand and then to clean the child with the left hand. In brief, bodily contact with the pot is minimal. When the pot is empty, it is taken to the handpump, rinsed with fresh water and then refilled.

Tests were carried out on stored water and the results were compared with the results of tests on the particular tubewells from which the water had been collected. The indications were that contamination increased by virtue of its storage. The results varied from household to household but it was normal to expect a faecal coliform count in the pot two to five times that of the local tubewell. When informed of the faecal contamination in their stored water, the women were taken by surprise. They were ready to believe that public tubewell water at source contaminated (see above), but not water stored in the sanctity of their home.

In observing women in the home, it seemed that the one practice which could contaminate the waterpot was the manner in which the pot was lifted from the ground. Large pots, filled with water, were heavier than an armful of library books. It was not easy to lift it off the ground. One common way was to insert the right thumb into the mouth of the pot, hook the fingers over the rim and then to yank the pot off the ground until one could support it from the base with the left hand. In this way contamination could have spread to the mouth of the pot. Moments later the water, running over the mouth where the hand had been, might pick up the contamination. But even here women were cautious in that the pot would not normally be picked up with the left hand; that is, the hand with which one performs one's ablutions.

In reflecting upon the difficulty of women to accept that stored water could become contaminated, one likely explanation lay in the fact that water is not only thought to be clean; it is also in some sense thought to be pure. Support for this notion comes from the belief that water is pure in its natural state. Furthermore upon storage in the home, the water is kept in a pure place, usually on the verandah beside the raised hearth. The hearth itself is kept scrupulously clean and ritually pure, even in the poorest of households. Women purify the hearth once or twice daily by smearing it with clay or clay mixed with cowdung. When the hearth is cleaned in the morning, the stale water -- which had been stored overnight -- is replaced with fresh. The courtyard is swept both morning and evening, and at lighting up time, a lamp -- the icon of the goddess Laxmi -- is taken around and shown the house such that the hearth becomes the object of her grace. The hearth itself is worshipped on occasion; and is, on the whole, treated with some reverence. Strangers cannot approach it, and those family members who do, treat it with the same respect as a temple (e.g. by removing of one's sandals before stepping on or around it). The purity of the waterpot, and the water it contains, is further safeguarded by separating it from persons who are in a temporary or permanent state of pollution. Women in menses do not ordinarily fetch water, nor do mothers in the first forty days *postpartum*. Upon the death of a family member, earthenpots are broken. Should an untouchable touch the earthen waterpot of a high caste Hindu, the pot must be thrown away. In brief, the cleanliness of the water is bound up with the cleanliness and purity of the household. As the home is clean and pure, so is its stored water. Moreover, to state that water in the home is impure, is to allege that women are not fulfilling their household duties. Conversely any woman who diligently keeps her house clean, has great difficulty in accepting that her stored water is contaminated.

The storage of Corporation Water: Women who rely upon Corporation water are obliged to economize their time. Tasks which require considerable amounts of water, such as personal bathing and washing clothes, are carried out during those hours in early morning and evening when water is available at tap. It follows that in many homes the tap was situated in a place convenient for bathing (out of view from the verandah so that

women might bathe in seclusion) and near the latrine; rather than near the hearth on the verandah. From the tap, water is carried to the kitchen and stored there for drinking and cooking purposes. Most kitchens and verandahs were littered with buckets, basins and pots of all description to ensure that there was sufficient water during the intervals when the supply was turned off.

Women considered Corporation water to be 'stale', 'intemperate', and 'unpleasant' to taste; but they also knew that it had been decontaminated with 'medicine' and hence that it was clean. Furthermore they knew that water becomes impure through human use. What the women did not recognize was that stored water might become contaminated even prior to use. First, they overlooked the fact that by situating the tap near the latrine, they ran the risk of contaminating the tap so that the water periodically became contaminated at source. Second, they overlooked the possibility that the buckets in which they stored water might in themselves be contaminated and that this contamination might overcome the residual effect of the bleaching powder. Some women even thought that the residual effect of the 'medicine'; lasted forever, regardless of the container in which the water had been stored. Tests showed that although the Corporation water was pure at Corporation headquarters, it was, upon storage at home, contaminated. Indeed, it was often more contaminated than the water from public and private tubewells.

A few women tried to manage their household by storing water in pots according to use. Four different uses were distinguished: drinking water; water to wash or rinse uncooked food (rice, mangoes, root vegetables, etc); water for boiling rice or lentils; and water to wash or rinse utensils and plates. Each use had different implications for the way in which the water in the pots was actually handled and how (if at all) the pots were cleaned after use.

Tests were carried out in one family to ascertain the extent to which such methods of water management also safeguard the purity of drinking water. The female head of household collected water at dawn in various pots which were then tested at regular intervals throughout the day until the evening supply came on. First, drinking water was stored in a narrow-mouthed earthenpot. Water was poured from the pot, but no one touched the lip of the pot nor immersed anything in the water. The median faecal coliform count was 3/100 ml. Second, washing and rinsing water was kept in broad-mouthed clay pot, convenient for scrubbing large fruits and root vegetables. Here food was actually immersed in the water and then washed and rinsed. The water was not changed until after the noon meal had been served; hence the pot accumulated dirt and contamination. A faecal coliform count of 1176 was recorded. After use the pot is merely rinsed clean. Third, cooking water, in this case water to boil rice and lentils, was collected in the very pots in which the food was to be cooked. The mean was 236 faecal coliforms, but since this water was boiled in use, one can assume that it became pure. At the end of the meal these pots are scoured

and rinsed clean. Fourth, plates and utensils were washed from water stored in old buckets and serviceable ghee tins. Here cupped hands are dipped into the bucket to splash water across the plates and utensils. Then they are scoured with earth, using a make-shift pad of straw. The utensils are rinsed clean by splashing or pouring more water upon them. In some cases plates are immersed in the water. These pots are not usually cleaned, scoured or rinsed after use. The mean count was 799.

In analysing these results, it cannot be said that the functional differentiation of pots necessarily improves the quality of stored water, for in homes without such an organization of pots women tended to treat all water as if it were for drinking purposes. That is, the pots were kept in a special, somewhat guarded place. Nothing was allowed to come into contact with the water; rather the water was poured or splashed out. Thus functional differentiation did not mean that women treated all water more carefully; rather it meant they were able to save time by treating some water less carefully and to protect all water no more than was necessary.

INDIGENOUS METHODS OF WATER TREATMENT

Upon storage water might become foul if it is contaminated or impure if it is handled by ritually impure persons, and in any event fresh water becomes stale after the elapse of one day. Neither foul, impure or stale water can be improved such that it becomes clean, pure or fresh. One can only throw such water away until it eventually finds its way into the undifferentiated waters of the universe. The only water that can be improved is turbid water in which case clean 'dirt' is removed by filtration, using a cotton cloth. One could, of course, treat water with 'medicine' as does the Water Corporation, but such water is unsatisfactory to the taste. None of the participants in the survey were aware of the fact that sunlight and predator bacteria are major decontaminators of water. Despite the absence of a locally acceptable notion of water treatment three local practices did have bearing on water treatment: the 'lightening' of water, the decontamination of water and the cleaning of the container and the replacement of water.

The preparation of 'light' water: Naturally occurring water is said to vary in its 'heaviness' or 'thickness'. The more heavy or thick a water is, the more difficult it is to digest. Although Maithil women could not inform us what made water heavy or thick, a local ayurvedic healer explained that the cause lies with *dosa*, a term which means stain, blemish or fault. The Hindu universe is pervaded by faults which cause disorder, decay and disease. When fresh water is sealed in a bottle and then opened a week or two later, the foul smell that emanates from the bottle is the *dosa*. Women explained to us that water becomes light or thin upon heating and that light water is more readily digestible than ordinary water. If a child suffers from diarrhoea, growth problems, or thinness, it is assumed that his digestive capacity is feeble; hence 'light' water is prescribed, rather in the manner that an Englishman who

is unwell might drink a cup of weak tea or beef bouillion until he recovers his strength. Corroboration of their reasoning came in social encounters. When I explained to our hosts that I preferred boiled water to drink with my meal, they understood, not that I was healthy and wanted to prevent diarrhaeal disease, but that I was already unwell and wanted something 'light' to drink. This was also evident in their extension of the meaning 'hot'. After having brought the water to boil the positive effect of heating (its lightness) remains, even after the water has cooled. Hence women would sometimes offer me a glass of cool water, saying that it was 'hot'.

Most women did not boil water prior to mixing it with infant formula (powdered milk, barley water, or Gripe water), but if their infant was ill or thin, they were likely to bring the water to the boil in order to 'lighten' it. At hospital and at the chemists women were often told to bring the water to the boil and to keep it boiling for fifteen minutes before mixing it with oral rehydration salts or barley water or some other tonic. Women did not grasp the concept of sterility which informed medical advice; rather they understood doctors and compounders to mean that water should be lightened. In 'lightening' water, women followed the same procedure that they used to kill off the 'faults' which turn cow's or buffalo's milk rancid. That is, they brought the water to the boil and then removed it from the stove. They did not keep the water boiling for fifteen minutes. Tests of 'light' water, taken immediately after heating, indicate, however, that the heat had been sufficient to kill off all faecal coliforms.

The cleansing of an open, masonry well and the decontamination of its water: The idea of cleaning an open, masonry well implies that water is naturally pure but that the well, as a container, accumulates impurities. To cleanse a well, all its water is withdrawn and then a man is lowered down to the base of the well to fill up buckets of mud and detritus, which are then lifted out. The brick walls of the well may also be scrubbed clean. Traditionally the cleansing takes place once a year on the occasion of the Jur Sital festival on the first day of Vaisakh. In the past the festival focussed on the worship of Sitala, the goddess of pox, and her sidekick, the demon 'fever' (jwar). Thus some sort of connection must have existed between the annual cleaning of the community well and the onset of the pox season. Since most masonry wells in Janakpur have fallen into disuse, they are no longer annually cleaned and the water renewed. Only in the untouchable Cobblers' neighbourhood was an open, masonry well cleaned.

In the case of the Cobblers' well, the water was pumped from the well, the base of the well was cleaned, and twenty-four hours later the 'new' water was decontaminated with lime. From the biomedical point of view this works by raising the pH value of the water to a point where various forms of microbial life cannot be sustained. Two kinds of lime are locally available in the Tarai. Rock lime is used in construction and in whitewashing. A second type of lime, called *situwa cun*, is made by pulverizing the shells of native molluscs and snails. *Situwa* lime, unlike

rock lime, is said not to irritate the skin; hence it is the preferred lime for spreading on betel leaf or mixing with chewing tobacco. It is also the preferred lime for decontamination.

Interestingly, *situwa* lime is used as a home remedy against intestinal worms. Worms, or their eggs, are thought to enter the body orally when someone intentionally eats earth, or inadvertently eats dirty food or water. Once inside the body, the worms thrive on the food in the host's stomach. If the stomach is empty, they may -- out of hunger -- gnaw at the stomach lining. The host may placate them for several hours by eating sugar. The only way of getting rid of worms, however, is to render the stomach an unpleasant environment such that the worms decide to leave of their own volition. In addition to distasteful, biomedical preparations (which are thought to be effective because of their distastefulness), one may resort to *situwa* lime. A 1:3 proportion of lime to water is prepared and one spoonful is taken before each meal. The lime acts to make the stomach bitter so that the worms are encouraged to leave. In sum, Maithilī people treat both their open wells and their stomachs as if they were 'pots' and *in extremis* decontaminate them with lime. In this connection it was curious that the practice of chemical decontamination did not extend to water stored in the home in earthenpots.

As for the decontamination of water by lime, locally available Indian text books on public health recommend a 1% solution; the Cobblers, however, were too concerned by the prospect of a bitter taste in the water for them to add that much lime. Instead I estimated that a 0.6% solution was attained. The tests, conducted over a period of six days (beginning the day before decontamination), were surprising, for they revealed that faecal contamination decreased the first day after decontamination, but increased to a much higher than the normal level two days later. After a further two days the faecal coliform count gradually returned to pre-decontaminated levels. These results suggest that the addition of lime in the short-term disrupts the ecology of the well and in the long-term -- after five days -- makes no measurable improvement. It is the micro-ecology of the well, not the lime, which keeps the well water relatively clean and in this micro-ecology regular withdrawal of water (with clean buckets), coupled with sunlight and predator bacteria seem to be the key factors.

The substitution of stale with fresh water: Formerly pond water in Janakpur was changed twice annually, just before the festival of the marriage of Ram with the local goddess Sita (November-December) and the birthday of Ram (March-April). The change was seen in part as the purification of the pond water prior to these auspicious events in the town's sacred history. All the ponds were linked -- one to the other -- with a channel; and the uppermost pond was linked by a channel to the Jaladh river about one mile east of town. The dam at the lowermost pond was broken, together with all the dams in the channels connecting the ponds, so that the pond water drained from the entire system. The earthen dams were then rebuilt and fresh water was brought in by opening the channel connecting the Jaladh

river with the uppermost pond. The notion which lay behind this practice is that moving water is pure and stagnant water is foul. The moving water of the Jaladh did not purify pond water; rather it replaced pond water with pure and fresh water. Purification takes place by the substitution of one type of water by another; in the same way that fresh water in the waterpot at home is substituted every day for the stale.

For various reasons this policy is no longer practicable in Janakpur. Firstly, during a monsoon storm about twenty years ago the Jaladh shifted its course further away from town. Secondly, the rapid development of the town over the last twenty-five years and the increase in real estate values has led to the encroachment of land by some households upon the channels that connect the ponds. Thirdly, a number of residents, too wealthy to bring to heel, have directed the overflow from their outdoor privies into the channels. Were the channels to be unblocked, sewage would flow into the ponds -- creating a hazard to health. It has been more than twenty-five years since the major ponds on the east side of town were replenished with Jaladh water, and about ten years since this occurred to the ponds on the rural, west side of town.

Given the present situation, the Town Council in Janakpur has taken upon itself the duty to improve the quantity and quality of water at the two main pilgrimage ponds: Ganga Sagar and Dhanusa Sar. To this purpose an artesian well was sunk between the two ponds. Pure water streams from the artesian well standpipe down a twenty-five yard long rivulet thereby diluting the contamination in the pond and at the same time raising its level. The overflow from Ganga Sagar is conducted by pipe into Dhanusa Sar where it fills that tank to the point of overflow. The Town Council's practice was a variation of the customary idea of substituting stale, stagnant water with fresh, moving water; here the idea was to perpetually dilute the 'stale' and the 'foul' with the 'fresh'.

Within several days of bringing the system into operation, the force of the artesian water at the standpipe had eroded a basin in the clay earth large enough for five or six people to bathe, and had created a twenty-five yard long rivulet to Ganga Sagar, where people began to perform their ablutions. Tests were taken of the artesian water at source and then every five yards along its course to Ganga Sagar. No faecal coliforms were registered at source; but as the water coursed down the rivulet, it picked up faecal contamination. Just before its point of entry into Ganga Sagar, the artesian water registered approximately 25,000 faecal coliforms/100 ml; or three times the level of contamination as in the pond. Thus the artesian water did not dilute the contamination in the pond water; rather the pond water diluted the contamination from the rivulet.

But what would happen if one could revert to the past and bring in the fresh water from the Jaladh river to replace the pond water? I tested the Jaladh river at four points differentiated by their rate of flow from 'still' to 'rapid'. Tests were carried out only on one day, as the enquiry was purely of academic interest. The faecal coliform count did support

local belief (e.g. stagnant water is foul) in that contamination increased in inverse relation to the rate of flow. The two middle categories of moving water (between 'still' or 'rapid') registered faecal coliform counts which were less than the contamination in the ponds on the urban eastern side of town but more than the contamination in the ponds on the rural western side. The samples from the Jaladh river were also considerably less contaminated than the artesian well water just before its point of entry into Ganga Sagar.

KNOWLEDGE OF WATER-RELATED DISEASES

There are three main types of water-related diseases at Janakpur; diseases spread by the mosquito vectors of malaria and tropical pulmonary eosinophilia; skin diseases and worm infestations spread by washing with insalubrious water; and diarrhaeal diseases transmitted by impure drinking water. The range of local diseases related to water is, of course, more extensive than this; and the tripartite division of disease by mode of transmission is unsatisfactory in that some diseases are spread by more than one mode. The distinction has value only in that it covers endemic pathogenic agents as they are encountered in the course of everyday life in Janakpur. In this report I shall restrict myself to a consideration of the latter two types of disease, for they may be brought under some measure of control by education of individual families. Diseases spread by mosquito vectors can only be controlled by better management of the town's many ponds, ditches and rain-filled pits and this, in turn, requires the political mobilization of local neighbourhoods.

It may be helpful to preface my comments on water-related diseases with some remarks on the concept of the body, for it is the body that gives sense to the experience of illness. Maithil people see the human body to be integrated by a seven stage process, likened to an alchemical process, in which heat transmutes food into increasingly refined substances, called *dhatu*, until energy -- as the *elixir vitae* -- is produced. The process begins with the ingestion of food. Grain and water collect in the stomach where they are heated by the digestive fire and transformed into style; the style is transported to the liver where in the second stage it is heated and transmuted by heat into blood. The digestive process continues with blood being transmuted by heat into flesh, flesh into fat, fat into bone, bone into marrow and marrow into semen or uterine blood, depending upon the sex of the person. As in any alchemical action a dross is produced at each stage, starting with urine and faeces in the transformation of food into style, bodily hair, finger and toenails in the formation of bones, and so on. To complete the alchemical analogy, semen and uterine blood are thought of as an *elixir vitae*, giving physical vitality, mental energy and strength of character. Longevity, and by implication health, entail on the one hand, the refinement of food into this *elixir vitae* and on the other hand, the elimination of or counterbalancing of dross within the body. The integration of the body as a digestive system turns the body into a circulatory system of sorts in

that semen or uterine blood provides the energy to digest food in the first stage of the cycle. Without such energy coming back into the system, a vicious cycle builds up in which less and less energy is available for the digestion of food such that even less energy is produced.

Equal in importance to food as a source of energy is water. Water is thought necessary for digestion to take place; additionally it animates the body, giving suppleness to movement and freshness to the complexion. Water is not drunk in the European manner, in sips throughout the meal. Rather one eats the entire meal and then downs one or two glassfuls of water, making sure to leave some air in the stomach. The food, mixed with water, is then 'cooked' in the stomach by the digestive fire. Maithil people say, "Where there is water, there is life", and they look upon ageing as a gradual process of drying out. Women at menopause are sometimes subject to morbid feelings, for they say they are 'dried out'. In a similar vein rickets in children is referred to as *sukhaniya*, literally the 'drying out (illness)'.

The centrality of the digestive system in the Hindu concept of the body underscores the importance of dietary considerations in monitoring one's health. Moreover, it gives a rationale to certain of their actions in relation to water-related diseases. For example, many families felt that oral rehydration therapy only served to produce urine. If a child is really dehydrated it is far better to resort to intravenous rehydration therapy in which case the water flows directly into the blood, bypassing the stage in which urine is produced. As was mentioned above, some townsmen were of the view that the most serious public health problem in Janakpur was the excessive iron in the ground water which they said caused constipation. For them diarrhoeal disease was a relatively minor problem, certainly not worth the ODA's attention. They were more preoccupied by the retention of stools than any looseness in their bowels, in which case the dross was at least being evacuated from the body.

Illnesses associated with washing water: Water-washed illnesses comprised primarily skin diseases, eye and ear infections and worm infestations. Many people did not think that insalubrious water was to blame, although many believed that dirty water might exacerbate the condition. The household survey revealed that on average 40% of households had at any one time at least one family member suffering from scabies, conjunctivitis, boils, skin ulcerations, ear infections, etc.

On the whole the various sorts of skin infections were thought to have two possible internal causes. Skin eruptions were explained by heat escaping the body, causing an abscess, boil or pimple. The illness proceeds in stages, likened to the ripening of a fruit. Treatment does not eliminate the source of illness; rather it hastens the ripening process, by use of mud-packs and other means, so that the sore matures faster. As for eye and ear infections, these also could be due to internal factors, but many people were willing to attribute causality to

the foulness of some of the bathing ponds in Janakpur. Permanent skin illnesses are thought to be a symptom of *kharab* (bad, spoiled, immoral) blood and as such are inherited from one's forebears. The most serious of these diseases is 'leprosy', bearing in mind that in local terms any sort of non-reversible skin disfiguration or discoloration is referred to as leprosy. Leprosy is highly stigmatic because it indicates that one's entire family carries bad blood. In sum, water was not seen as a medium of transmission for either of these two types of skin illness, although dirty water might aggravate skin eruptions.

Worms are said to live in dirt or to infest fresh fruit, vegetables and meat. Hence intestinal worms come from eating dirty food or turbid drinking water. Alternatively they come from eating uncooked fruit, vegetables or meat which is already worm-infested. Worms were, on the whole, a banal illness which many people put up with until they were severely inconvenienced. Pain in the stomach or bowels may be attributed to worms who, in their own hunger, gnaw on the gastro-intestinal lining. Treatment entails either eating sugar which mollifies the worms and wins temporary relief from pain. Alternatively one can get rid of the worms by eating food which is unpleasant to the taste: e.g. chili peppers for heat, underripe mangoes for acidity; lime paste for bitterness. The worms find the food similarly unpleasant and seek exit from the body, either from nose or mouth or from the anus.

Illnesses associated with drinking water: Given the centrality of the digestive process in integrating the body as a system and providing bodily energy, it was expected that people monitor their health in diagnosing the state of their bowels. Normal faecal matter, when observed on the ground, should contain no evidence of blood or mucus; its colour should be brown; its smell should not be too strong; and its form either 'tight' (meaning having its own form, e.g. shape of sweet potato) or 'tied' (meaning that it emerges in one long strand which heaps on the ground like a length of rope). In addition to normal faecal matter, there are certain developmental stages when diarrhoea itself is treated as normal (e.g. neonate not yet used to mother's milk or infant whose teeth are emerging); and certain dietary regimes when diarrhoea is to be expected (e.g. after eating a spicy, 'hot' meal).

More important than the form of the stool, as a sign of normalcy, was the number of bowel movements per day. Normally one should pass stools once a day, in early morning. For the pious there should be two bowel movements per day, at first light and in mid-afternoon prior to morning and evening services at the temple. To pass stools more than twice a day becomes an inconvenience, especially if the desire to defecate comes quickly. To pass stools less than once a day gives rise to concern and morbid feelings. Many people were more concerned about constipation than about diarrhoea. Diarrhoeal disease was inconvenient and annoying, but something that one puts up with, rather like back-ache in England which may be a medical complaint for the middle-class, but is

something 'normal' or 'part of life' for the working class. Indeed at any time in the course of the household survey 60% of the families had at least one member suffering from some diarrhoeal disease. Thus, diarrhoea was 'normal', especially so for the poor who registered a disproportionate share of the cases.

Given the inconvenience or the normalcy of diarrhoea then the question becomes at what stage does diarrhoea become an illness for which medical treatment is sought. Chronic diarrhoea indicates a digestive disorder, such as the stomach under-cooking its food. This may also be confirmed in thinness which is a sign of an inadequate or weak digestion. Persistent diarrhoea in children, coupled with thinness, might lead mothers to give medicine that increases the child's appetite. It may also induce her to massage the child several times a day, using mustard oil, for it is thought that the oil is absorbed by the skin and fattens the tissue.

Sudden diarrhoea was worrying for some people, especially parents of their children, yet it was largely thought to be a self-inflicted illness, brought about by under-digestion because the food was too heavy, too hot or too much to digest. Alternatively too little or too much water as drunk. As a self-inflicted illness, diarrhoea is often a self-healing one as well. These comments do not controvert the fact that 'dirty' food and water may cause diarrhoea, but here the dirt is thought to upset or tax the digestive system. Despite reports that people sometimes cut off fluids until diarrhoea is over, little evidence of this was found in Janakpur, and the remedy was suggested only by adults for adults. All testimony from parents indicated that children would still be given fluids. This was especially the case for breastfeeding mothers (which covers most infants up until 2 or 3 years of age). Feeding a child is so much part of parental control of children that it is unlikely a mother would cease to breastfeed simply because her child had an acute case of diarrhoea. Nearly all mothers in the survey reported that they would also use ORT (marketed in Nepal as Jivan Jal -- the 'water of life'). Nevertheless in one year in the field it was never seen in actual use. Because my research was seen to be part of the government and because Jivan Jal is identified with the state (both the national pharmaceutical corporation that manufactures it and Radio Nepal that advertise it), I suspect that local people thought they might please me by reporting that they would be ready to use it.

Sudden diarrhoea was not in itself cause for alarm, but acute diarrhoea with blood and mucus in the stool was cause for worry, and acute diarrhoea with vomiting cause for alarm. Vomiting was particularly anxious for mothers, for they are concerned to nourish their child. If their child cannot accept their nourishment then they almost invariably seek professional help from a medical doctor (allopathic or homeopathic), 'rustic' doctor or Vaidya. Such illnesses are known simply as *mumh-pet*, literally 'mouth and stomach', or by the word *haija*, conventionally translated as cholera yet locally used in a loose sense to refer to any acute

case of diarrhoea with vomiting. In the case of cholera health is seen to deteriorate quickly: the blood thickens, the limbs become cold, the pulse weakens and disappears, the skins become loose, the eyes become deep set, the lips turn blue, urination stops and within three days the person dies. Epidemic cholera was in the past attributed to an angry, itinerant goddess whose name is, literally, 'Death' (*marki*).

In sum, diarrhoea was, for the most part, an inconvenience, which in itself evoked few morbid feelings in the sufferer. Concern took root only when persistent diarrhoea was coupled with mucus or blood in the stool or, in the case of infants, with a perceived deficiency in growth. In either case one might modify the diet, opting for 'light', readily digestible foods and water. One might also seek treatment in the form of medicines to stop the bleeding (e.g. antibiotics for dysentery) or to enhance the powers of digestion (e.g. digestive enzymes and tonics for children). Acute diarrhoea with vomiting was a cause for immediate concern. Treatment focussed first on the cessation of vomiting then the elimination of the cause of diarrhoea.

THE ADEQUACY OF LOCAL KNOWLEDGE OF HYGIENE

It may be helpful to begin this assessment of the adequacy of cultural knowledge in health development by elucidating the ambiguous notion of culture found in the development literature. For some planners culture is a factor which influences people's decisions about possible courses of action. This sense of culture implies that a people, like health planners themselves, are pragmatists who rationally calculate their self-interest. Should a Maithil woman act in such a way as to make little sense to the health worker's calculation of her self-interest, the worker may see the presence of some cultural factor. Culture does not appear here as the totality of her experience, rather it is one factor among several (e.g. education, religion, sex) which influences her decisions about water storage and management. Here the health planner sees himself as a scientist, or as a purely rational administrator, whose own cultural background (be it Nepalese or European) does not impinge on his own professional decision-making. It is other people, lacking professional knowledge, who are influenced by 'cultural factors'.

There is, however, a second sense of the term culture. This sense implies that culture is a complex of intersecting codes by which people understand the totality of their experience. Here culture specifies the differences between peoples, bridged by the meta-understanding of the translator. Everyone has a culture, both native and health worker; the problem of planners is to translate their concerns into the understanding of local people. Policies succeed or fail depending upon a people's understanding of the programme. According to this second sense of term there is no way that policies can be successfully implemented and taken up by a people without acquiring some positive meaning in terms of their local culture.

It is this second sense of culture which informs much of the current research in development anthropology, yet the fieldwork carried out in Janakpur suggests that this sense of culture is in some respects oversimplistic. Although the expression 'cultural knowledge' serves as a convenient shorthand, it should be borne in mind that this knowledge is often unevenly distributed across a culture and it is not necessarily formulaic. Instead, it is structured by practices within family traditions. The functional differentiation of pots, the use of lime as a home cure for worms, and other such practices were part of a lore passed down through families. Some of these practices (e.g. child care, cooking, domestic rituals) were perpetuated in the patriline (even though only known to the women of the family) such that upon marriage the bride would be expected to learn the procedures of her husband's home. Other practices (e.g. home cures) might come from one's own natal family. Since marriage is village exogamous this means that Maithil practices are distributed throughout the country, but that there is considerable inter-family variation.

Of these practices some may constitute a formulaic knowledge which a particular person possesses. For example, a woman may acquire a local reputation for her knowledge of medicines, and her neighbours may come to her for advice or treatment. This knowledge is in some respects personal. She would not charge anything for her time or help, but if she were to offer, say, a home cure, she might prepare it herself rather than give away the recipe.

Other forms of knowledge are common, or at least not exclusive, and they may be exchanged for pragmatic purposes between neighbours. In this vein Maithil women told me (or showed me) the virtue of 'light' water, the benefit of massage with mustard oil for dehydration, the use of *situwa* lime in deworming, and so on; and when I asked them about such things, they assumed that I had worms or a weak stomach. Everyone had his or her own ideas about the benefits and rationale of their practices. Moreover, they were interested in what 'the people of my country' did in the treatment of water-related diseases, and they discussed and evaluated my own stock of recipes and stories. In some cases they took readily to my ideas, but they treated them as only one possible interpretation or remedy out of many. In other words, they took my ideas as ideas.

Common knowledge lacks the formality of formulaic knowledge which can be personally possessed; and insofar as it informs decisions then the knowledge itself is locally constructed and subject to the same constraints as the decisions which are locally negotiated. To revert to the 'knowledge' of decontaminating an open, masonry well, the Cobblers were clearly concerned by the prospect that the lime would turn the water bitter. All agreed that lime had to be used, but one man 'knew' that unrefined sugar would have to be added to remove the bitter taste. Other men had different ideas about the strength of the lime solution. The final outcome, a 0.6% solution, was negotiated by the participants and reflects the persuasiveness and authority with which particular members of the community advocated their solution to the problem. One might, therefore, learn the terms of the debate or the criteria by which something is evaluated,

but one cannot formalize common knowledge for it is context bound: not merely by the purpose of the action (e.g. to decontaminate well water) but also by the persons present who are negotiating the solution.

Other hygiene and sanitation practices were not, however, ideas in that they were not objects of reflection; rather one might speak of habitual practices of which the actors were not necessarily aware. Here one might include such practices as women who pour drinking water across the mouth of the pot where, moments earlier, their fingers had been. Or one might mention women who were instructed by doctors to boil water for fifteen minutes prior to mixing it with infant formula, but who, wittingly, merely brought the water to the boil, as they bring buffalo's milk to the boil, to prevent it from going rancid. Here also one might mention habitual practices of which women were quite aware, such as how to keep their house ritually pure, but which made it difficult for them to accept that the water stored in earthen pots by the hearth is 'dirty'. In such cases to tell women that their water is contaminated, is registered by them as a moral accusation, not a bacteriological observation.

CONCLUSION

In reviewing cultural knowledge of the quality of water, the evidence suggests that local beliefs and practices were, in the main, bio-medically adaptive. One might refer here to such notions as: water as a medium of contagion, the influence of surface contamination on ground water, the insalubrious nature of public wells and ponds (when contrasted with private ones), the throwing out of 'stale' water, the virtues of 'light' water for infants with digestive problems, the importance of water being regularly drawn from the well for the well water to remain fresh, the use of lime in decontamination, and so on. These local ideas and practices are powerful tools for health workers who might use them in health education or for mobilizing people for public health purposes. Such ideas make sense to local people for they are part of their culture; and by expressing public health measures and goals in such terms one restores dignity and autonomy to local people in their effort to improve their neighbourhoods.

But this leaves unanswered the problem of how health workers might introduce non-local hygiene and sanitation practices among a people where folk competence seems maladaptive. The present research, set in the context of Maithili culture, suggests that folk competence in hygiene and sanitation is based on common knowledge and habitual practices, rather than on formulaic knowledge. It seems unlikely that folk knowledge will be made 'more competent' merely by substituting it for bio-medical knowledge. In the case of common knowledge, people will take bio-medical advice as an idea which they will discuss and possibly adopt or possibly reject. The health worker's admonitions merely add to a pre-existent local interpretive activity. As for habitual practices upon which people themselves may not have reflected, the health worker's instructions about how to act 'properly' may have no effect -- not because the person 'thinks'

he is 'already acting 'properly' but rather because that person may not be aware of certain aspects of the action. In such cases, the starting point for community health workers cannot be the substitution of one item of knowledge for another; but rather the objectification of a person's practices. By enabling someone to become aware of what he is doing, his actions may come to lose their habitual nature. Rather than tell people what they *should* do, better to tell them what they are doing, and let this dialogue form the basis of the local health worker's relationship with the people.

Ultimately what became central in this investigation was not so much a people's local knowledge, but the culture of their practices and the local interpretive activity which is both conventional and creative, and hence also experimental in its application. These practices possessed a rationale which was reinforced by other practices, such that a practice made sense in many more ways than the specific purpose for which it was intended (e.g. keeping domestically stored water pure was inseparable from keeping the house clean, from the morality of the wife being seen to keep the house clean, etc). If one may speak of 'barriers' in understanding then it is practical behaviour, not language, that constitutes the barrier. To return to the example mentioned above, Maithili-speaking medical doctors in Janakpur explained in Maithili to Maithili-speaking women the importance of boiling water for fifteen minutes in order to make the water pure. There is no concept for sterile water in Maithili and Maithili women understood the doctors to be referring to 'light' water. They went home and prepared 'light' water by bringing water to the boil and then removing it from the flame. This was the same procedure that they used to prevent buffalo's or cow's milk from going rancid. In short, cultural misunderstandings occur, despite the fact that everyone speaks the same language. Hence language was not central to misunderstanding, practices were.

In reviewing all the observed hygienic practices, there are two potential areas for dialogue between local people and health workers, both of which concern the storage of drinking water. First, some educated, middle class women thought that municipal water, by virtue of its having been treated, was powerfully pure and that it retained its purity regardless of how it was stored. Second, nearly all women -- both educated and uneducated -- found it difficult to believe that the water they store in their homes is liable to faecal contamination. This latter problem would seem to be particularly intractable, not only because it violates Maithil common sense but also because it would be subject to moral interpretation, calling into question the dutifulness of the housewife.

This does not mean that in all other respects drinking and bathing water in Janakpur was up to standard; it does mean, though, that in those instances where it was not up to standard people knew that the quality was deficient. Hence the deficiency cannot be attributed to ignorance,

but rather to the inability of local people to organize themselves for appropriate action. Moreover, this does not mean that decisions based on common knowledge were wisely taken. The Town Council's decision to dilute pond water with fresh, clean water from an artesian well was unwise in that bathers contaminated the well water even before it entered the pond. But such unwise decisions cannot be attributed to folk knowledge any more than can the decisions of development experts who, in some cases, may be better informed but equally fallible.

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