

Islamic Medicine and the Art of Drug-Making: A Historical Perspective

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Just as Tibb has its own theories and views regarding diseases and their aetiology, it also has its own viewpoint and system regarding the formulation of drugs. The special view which Tibb has about drug-making should not mislead one to be led to the belief that Tibb and drug-making are in any way enshrouded in mystery and that the practitioners of Tibb and its pharmacopoeia are confined to specialists who have made Tibb and its ancillary aspects their exclusive preserve, for which we tend to employ special and arcane terminology.

The fact, however, remains that we, the practitioners of the Islamic system of medicine, are not parochially inclined in calling a thing scientific. We are, however traditionists and have not been yet able to dissociate ourselves from the contention that only that which is based upon induction and deduction is scientific and that which is based upon experience and observation is not.

The evolution of knowledge and thought has

provided innumerable resources for gauging the truth in scientific knowledge and the veracity of the data of knowledge. We cannot ignore any scientific truth or fact just because, although it enjoys every support from the historical viewpoint and experience, it has not been confirmed by the methods of induction and deduction. If we accord credence to this view, this too will be mere traditionalism, and we have to move beyond the realm of traditionalism. As far as observations and experiments are concerned, they could be regarded as extremely reliable indicators for the understanding of scientific truths. And on this basis we could well stake the claim that basis of Tibb and drug-making is scientific. Every viewpoint can be expatiated at great length through reason and argument for its *raison d'être*. Tibb has a history of its own since times immemorial, and the experience on which it is based was certainly empirical in the beginning as all other scientific disciplines were. The impress upon it is not one or two centuries old but is as old as man himself, dating back to thousands of years and its effective

therapy stands established. And the search for more potent therapy on the principles of Tibb has not come to an end. It is a continuous process. As a matter of fact, the shoe is on the other foot. Just as in making machines, we imitate the laws of nature, e.g. thermo-dynamics and kinetic energy, so the modern discipline of medical sciences also took its cue from the natural drugs in the vast majority of cases. Even the very basis of the present-day anti-viral drugs still in development stage-comes from bodily metabolism.

In this brief paper I will make an attempt to highlight the historical basis of Tibb and the pharmacy of Islamic system of medicine. A few references to Tibb and the pharmaceutical system followed by it should make it clear that the basis of both is scientific and scientific data has served as its proving ground.

It is impossible to determine how and when curative medicines were discovered, which medicine was used for particular disease, and whether the first drug employed was derived from some animal, mineral or plant source. Whether the actual fact, no one can deny the reality of the fact that the concept of sickness and cure thereof is medicaments — flowers, herbs, roots, leaves of plants, animals and minerals — have served as cures from the very beginning.

A third fact which we have to concede is that, in order to satisfy his hunger, the pre-historic man took as victuals leaves and plants, of whose mal-effects he was in the beginning unaware. At times the herbs which he used as edibles suited him and at others they did not. In the latter case he discontinued the eating of such plants or foods, but this question of commission and omission does not answer the question as to how man discovered medicines. This question could perhaps be best answer by saying that when man ate something

which exercised a deleterious effect but accidentally ate something which nullified the mal-effects, he ate the same thing again and again in order to attain cure. Man is, however, by virtue of intellect higher than animals, and he gradually began to deliberately eat the things that would bring him cure. We can therefore rightly say that man concluded through his intellectual faculty that certain plants possessed curative properties and he was right. Perhaps this hypothesis would amply explain that man's relationship with medicines was accidental at first, empirical later, and scientific at the end.

Another line of approach taken by the early man to medicine was that of observation. This approach was confined to comparison with animals, but Pliny the Roman polymath has accorded so much importance to it that for him, it is primary source of man's knowledge of medicine. He has quoted different example to show how man has benefited from the actions of other animals. e.g. how man has learned the technique of cicatrization of wound from the sea-horse and from which animal he has learned how to retch in order to get rid of un wanted food stuffs which have gone in advertently into his body. Man's knowledge of animals and their habits, according to Pliny, not only provided him with knowledge about animals but also about natural cures. In the event this could be conceded as the second source of knowledge about therapy and drugs.

The fact, however, remains that man all along has been greatly assisted by observation and the twin sources of his knowledge about drugs —viz. accidents and observation — generated in man the impulse to use the things beneficial to him and extend his ambit of observations.

We have so far confined ourselves to two

source of man's knowledge about drugs — namely, accidents and observations. There is, however, another source of man's knowledge about medicine, i.e. inspiration. Whether such a source can be explained through logical or scientific explanations or not, its historical and religious significance cannot be denied. We have through the tradition of Holy Prophet (may Allah's Benedictions upon him) an authentic collection of the *materiae medicae* and the curative regimen recommended by him. Nor is there any reason for not believing in the narratives and traditions associated with other Prophets.

It becomes self-evident from our study of the history of medicine in particular and human civilization—that medicine qua a regular discipline had its gestation first in Egypt, then in Babylon, and later in Greece where full-scale scientific investigations were taken upon of-art and later on of scientific discipline. At first willy-nilly they had to response the credibility upon accidents and hearsay evidence, but found the certain drugs exercised efficacy in all circumstances. As man advanced from the neolithic age to the ages of copper and iron, he had to seek the resource to all kinds of drugs dictated by the change environmental condition. e.g. as those posed by wars, famines, journeys and epidemics. Man throughout keep on observing as to how his body would metabolically react to change circumstances. It could, for instance, be pointed out something which an enemy thought to be deleterious was administered to a person, but if the result was just the reverse it proved to be good for him. It was through sheer accident that man discovered *shangarf* (mercury). The man who was administered this strong medicine was a patient of gonorrhoea; he was cured of this disease. It was found that mercury and mercury

based compounds offer therapeutic sources for the cure of this disease.

I should like to state in this stage while we are discussing man's forays into the realm of experimentation that on occasions he arrived at curative medicine through logic. For instance, if he found that *reshai-i-khitame* (*Althaea officinalis*, root) was useful as a cure for dysentery, he reasoned that everything that released a thick exudate when chewed would be useful in this disease. Thus was laid the foundation of the science of medicine.

We cannot ignore another—and the fourth source — in the evaluation of medicine. It is that of curiosity. Man, having fallen a prey to a disease, took certain things which proved useful for him.

While discussing in brief in brief the history of *materiae medicae* I should like to draw attention to the fact that the sources which we have mentioned as regards the knowledge of medicine are authentic in the eyes of historians of science and you too will agree with me when i say that the relationship between accident and result is not unreasonable. We cannot ignore this relationship, and, if we do so, we shall be guilty of cross misunderstanding of the course of history. Nor is it possible to underrate the contribution of inspiration (and revelation in case of Prophets). Experiments, whether by men or animals, have the thread of logic running through them. We see, for instance, feline and canine animals eating grass and leaves as cures and both lick their bodies and through the release of the saliva seek the cicatrization of wounds.

Evidence regarding the history of medicine and decipherment of the Egyptian papyri have conclusively proved that Egyptian medicine had the negotiated many a milestone 1500 years prior

to the birth of Christ. They were familiar with the drugs like the aloes, hemlock (*Shukran*, gum acacia, opium, coriander, purging cassia, castor, and so on. But the real growth of materia medicae commences with the Greeks. One reason of course is that the Greeks have left literary evidence. The Greeks were familiar not only with the drugs of the Mediterranean region but also of the Orient and the Far East. The number of drugs mentioned by Pythagoras, Hippocrates, and Aristotle comes to 265.

Dioscorides, a physician in the army of Nero, wrote the first systematic work on materia medicae which served as a primary source of a centuries. Pliny has mentioned about a thousand drugs, almost twice the numbers mentioned by Dioscorides. According to Hunayn bin Ishaq, the Romans regarded Pliny as a super human being.

With the advent of Islam the study of materia medicae was pursued with far greater vigour than ever before. Their special contribution was in the discovery of succedanea, identification, linguistic equivalents in other languages, etc. Along with this approach the brought experimentation and ratiocination.

Studies by the Muslim scholars, especially down to the Thirteen century A.D., took materia medicae to its highest pinnacle. Muslim, Christian, and Jewish scholars alike wrote in Arabic. Masarjawayh, a Jewish physician, was among the first writers of materia medicae. Ibn al-Masawayh and Ibn Sarabiyun were Christians, as was the Ibadi family which was of Nestorian origin. Ibn al-Baytar in his *Jamili-Mufradat* (The corpus of Simples) and the *Kitab al-Mughni* almost quadrupled the numbers of simples mentioned by Dioscorides. Ibn al-Baytar travelled round North Africa, Asia Minor, and the Mediterranean region. He himself examined closely each and every drug

and has submitted Dioscorides to a critical examination. Ibn Juljul wrote a commentary upon Dioscorides' Book of Simples. The first most comprehensive work upon materia medicae was the *Kitab al-Nabat* by Abu Hanifia al-Dinawari. Others who made notable contributions include Ibn Wafid and Ibn al-Rumaiyah. Al-Razi's *Continens*, Ibn Sina's *Canon* and al-Biruni's *Kitab al-Saydanah fi al-Tibb* (The Book on Pharmacy and Materia Medica) are among the classics of medicine. Da'ud Antaki, Gilani, and Najib al-Din al-Samarqandi wrote in detail upon the temperament of drugs, action and formulations, and upon the pharmacology of drugs.

Arab physicians are credited with the discovery of camphor, taramix, colocynth, musk, rhubarb, and nutmeg. They also originated the art of preparation of aquas of simples. The contributions of Muslims to materia medicae and pharmacology demands separate studies. In almost every age since the advent of Islam, books have been written upon materia medicae till by the end of last century, the numbers of simple reported were over 10,000!

This period of growth had its ups and downs, but by and large the science of materia medicae grew, and this growth was not confined to the period of ascendancy of Islam but also of later periods. Books like the *Makhzan al-Adawiyyah* (The Treasure-House of Drugs) and the *Muhiti-Azam* by Hakim Khurasani and Hakim Azam Khan respectively, for instance, belong to the British period.

But it is my view that it is more in keeping with a correct perspective that a deeper study should be undertaken upon the evaluation of the pharmacy of Islamic medicine so that we are in the position to determine how scientific the whole system was and how much of it was magic, abra-

cadabra, and hearsay. In the initial stages every system had an element of hearsay and traditionalism, but Islamic science in the hands of men like al-Razi, a rationalist and scientist through and through, Ibn al-Haytham and al-Beruni, the greatest scholars of all times, did become scientific and comprehensive. Tibb, as I have stated in the beginning, has its all system of treatment. The first cardinal principle of Tibb is to bring out cure through the build-up of bodily resistance. Should this prove unsuccessful, the expulsion of malhumours is tried. It is here that the real diagnostic ability and ingenuity of the physician is in for test. In many cases antidotes are tried in order to purge the effects of strong medicines. It can, therefore, be seen that the evaluation of Tibb has followed scientific lines and no other system till modern times emphasized the clinical system and the therapy of drugs through the neutralization of the effects of the drugs which were considered too drastic. The principle of assertion-negation with respect to drugs is one of the outstanding contribution of Muslim to medicine.

The Greek formulated the concepts of four elements, viz. fire, water, air and earth. The interaction of elements goes to make for temperament, and therefore, it logically follows that each drug too will have a specific temperament. A drug will therefore be hot, moist, cold, or dry or may be a combination of these characteristics — i.e. it may be cold-dry, hot-moist, and so on. For drugs four degrees have also been suggested. A drug that is hot or cold to the fourth degree will be the most drastic.

While we are discussing the art of Islamic pharmacy, we might ask what is a drug and how many kinds of drugs are being employed in Islamic medicine?

Many definitions could be offered for a drug

but the best perhaps is that a medicine is a substance that by restoring the bodily equilibrium restores the body to a state of normalcy, no matter whether the drug is botanical, animal, or mineral.

It is the belief of the practitioner of Islamic medicine that each drug has its own temperament and in the administration of the drug its temperament has to be matched with that of the patient. This approach is at variance with that of allopaths, for the *Tabib* believe that each patient is characterized by its unique temperament and therefore specific drugs have to be selected for him.

The first comprehensive definition of temperament was offered by Ibn Sina in the *Canon* and he classified each drug that he employed according to its temperament. He made a study of over 700 such drugs.

These four kinds of temperaments of drugs react with each other through action and interaction. They are liable to break up and to break down others. For instance, if a drug that is dry is made to interact with one that is cold, is liable to generate equilibrium, and there is not single plant, animal or mineral drug which is not composed of these four elements and free from these characteristics of dryness, humidity, coldness, and hotness. It is the belief of Tibb that man's temperament is also related to these, and, when there is illness because of deterioration of the humoral condition, it is not possible for the physician to bring about cure without keeping in view the temperament of the patient.

Egyptians and Greek had made use of compound drugs. One of the most comprehensive treatises on the compounding of the drugs was al-Kindi's *Aqrabadhin* (pharmacopoeia) written during the 8th century A.D. Only a fragment of the monumental work written by "the philosopher

of Arabs” remains. Muslim practitioners of medicine have classified drug as “simples” and “compound”.

But by large we observe that more than ever in allopathic medicines, compound drugs are preferred because one ingredient may act synergistically and enhance the efficacy of the drug. When certain elements act and interact with other ingredients, a characteristics effort is brought about. This in Tibb is called the ‘primary temperament of a drug’ which is the real temperament of the drug and of first degree. It is such drugs that are denoted as the simples.

Some drugs, however, comprise different essences and ingredients, with each ingredient having its individual characteristic, but through synergistic action they bring about an identical effect. The same process operates in the drugs of the second degree. Each ingredients retains its individual identity and yet through the process of interaction the effect produced is identical.

We might here cite the instance of milk which comprises several ingredients — proteins (casein), minerals, fats and lactic acid. These ingredients can be physically and chemically separated. We know that the action of yogurt, cheese, and whole milk are different. In a medicine likewise the action of one ingredient may run counter to that of another. Such drugs are called by *Tabibs* as the *murakka-al-quwa*. Simply it can be said that a compound drug is one whose ingredients, after analysis, retain their individual properties and effects. In fact very few drugs are simples in the real sense; most, even the aquas and distillates, are compound drugs.

Shaykh al-Rais Ibn Sina has said something very important on this point. According to him, in the same drugs there may be ingredients having different properties and effects and a *Tabib* sho-

uld have necessary intellectual acuity to understand and appreciate the properties of its different ingredients, since most of the drugs are compound ones; only the mineral drugs are simple. Plants and animals drugs are compound medicines. It is the accepted principle of Tibb that the active principles (*jawhirat*) can be obtained by making infusions, decoctions, aquas, and other forms like suppositories and pills. Trituration is also restored to in order to obtain the active principle in its most active form.

But what has been said above would naturally raise the question that, if compound drugs comprise opposite effects and properties, then it is quite possible that, being compounded of different ingredients, the effect, on the whole, might lead to unnecessary complications and side effects. This might be particularly true of alkaloid-rich drugs. The patient may be cure of one disease but might fall a prey to another. It is therefore absolutely essential that the different aspects of a drug, especially with regards to its ingredients, should be pondered upon. For instance, aconite given alone will prove fatal. If administered in a very small quantity with other ingredients that would nullify its fatal effect, it can prove to be therapeutically effective. The same thing is true of hemlock and strychnine.

Several methods have been successfully tried by Muslim apothecaries for overcoming this problem. One has already been mentioned i.e. the use of ingredient that would dilute or totally obviate the deleterious effects of poisonous principle. Nature herself in most cases has provided the protective shield. Another common method is that of washing, soaking, boiling, roasting and cooling. In some cases the mode of administration is also altered. The drug may be administered as a suppository or enema. This would ensure the

obviation of poisoning. The first principle which we have mentioned, viz. the incorporation of a corrective ingredient, can be illustrated through several examples. A very detailed discussion of this aspect has been made by Najib al-Din al-Samarqandi, the 13th century physician, in the *Medical Formulary*. Some medicines may be hot to the fourth degree or very bitter. If used singly, they might give rise to suppurating boils, pustules, or pimples. But if such drugs are diluted or, according to the principles of Tibb, mixed the wax, oil, sugar or honey, their intensity will decrease and the desired effects would be achieved.

It must be emphasized that the apothecary or the physician describing a medicine has to see to it that the corrective ingredient should not be such as to nullify and negate the effects of a drug. If in order to overcome the sourness of a drug, an excess of common salt is employed, the sourness of a drug will disappear totally and the drug will become totally ineffective. Thus, while adding a corrective ingredient it is essential to bear in mind the proportion of the ingredient to be added. Here Tibb through the centuries of experience has achieved a high water-mark of excellence and ingenuity. Thus, while administering drugs with narcotic, saporific, and tranquillizing effect, the invariably administer cardiac stimulants or tonics, since they are fully cognizant of the fact that tranquillizer affect the heart which has to be revitalized. We have here briefly touched upon the principles of negating the harmful effects of a drug. It must, however, be borne in the mind that the art of pharmacy is such that other methods can always be employed for the elimination of its harmful effects.

All Islamic pharmacopoeia have especially mentioned and classified drugs which can be used for overcoming the harmful effects of a drug. We

can say without any hesitation whatsoever, that the question of which drug is harmful and which one is corrective is always open to discussions, the vies and the opinion of a classical physicians notwithstanding. Considerable difference of opinion prevails upon this point. And this aspect is open for further study.

Our main aim here is to underscore the point that the opinions of al-Razi, Ibn Sina, al-Samarqandi, and others as regards harmful effects and the adoption of corrective measures have already been questioned, and therefore it would be unjustifiable to call the Muslim physicians tied down to precedents. There is all the leeway to further study and clinical and pharmacological examination. What is basic is that the question of harmfulness of the medicament and the corrective measures adopted therefore is one which has received the full attention of practitioners of Tibb throughout.

Like any systematic and comprehensive medical system, Tibb is well aware of the fact that some drugs can become unavailable, difficult to procure, or, if procurable, so expensive that the common man is unable to buy it. Alternatively, the medicine may be so drastic and so unsuited to the temperament of the patient, that its use may be ruled out. Our pharmacy—needles to state—should be well-equipped to cope with such a situation. The patient, after all, has to be cured.

The physicians, as well as the apothecary, should have enough sense and knowledge to determine what medicine should be used as a substitute. They should have ample knowledge about the ingredients and actions of a drug, potency, and therapeutic effect, because if a succedaneum is selected, it is these criteria that would determine its use. If the physicians and the apothecary are unaware of the actions of the su-

bstitute, they will fail to achieve an alternative cure; and not only that, our state of the art will also come under suspicion. Its scientific basis and the claim it advances on its efficacy will also be regarded as doubtful. Moreover, and this is all the more dangerous—it will be shrugged off as a system of medicine that is a regional fad and geographically limited to the people of Subcontinent.

But against all this the fact remains that the practitioners of Islamic medicine, and before them the Greeks and the Egyptians have been looking for the substitutes. There is not a single medicine whose substitute they have not mentioned or discussed.

All this gives rise to another basic question. Could a drug really function as substitute in the real sense for another? If the answer is in positive, another question that raises its head is, what is the degree of the plausibility of two drugs having the same characteristics and property? Is this not against the law of Nature? This argument can be counter by the fact that certain families of plant share certain active principles. Thus the family Solanaceae is alkaloid-rich. Substitutions of the genuses in the same family is possible. Thus the onion and the garlic share many common properties. Similarly the members of *Rauwolfia* genus may differ as to potency but their general make-up is similar. And the principal idea behind the use of a substitute is that it should replace the prescribe or desired drug as regards active principles. We know, for instance, that liquorice and sebestan can be alternatively used for the cure of common cough, although they even belongs to different botanical families.

The principle to be followed in the prescription of a substitute is that primary consideration

should be given to the action and the active principle of a drug. We have a comprehensive list of substitutes, but some physicians have held gold and tobacco to be absolutely irreplaceable. In many cases the substitutes belongs to the same family and in some cases a different part of the same botanical has been mentioned as a substitute. The fact, however, remains that experience has proved the drugs can act as succedanea. But when the whole question is submitted to an objective analysis, we observe that the following criteria have to be fulfilled a succedaneum:

1. Its active principles should be the same or similar to those of the prescribed drug.
2. It should possess similar potency in the expulsion of malhumours and cure of disease.
3. It should be such as to bring about cure without proving harmful.

The above considerations naturally imply that the succedaneum of a drug should act in the same manner as the prescribed drug.

Be that as it may, the question of the use of succedanea, like the theory of the elements, requires fresh vistas for research. Nevertheless, it can be safely said that no pharmacopeia could be regard satisfactory without this question having received the fullest attention. Even today we are faced with the unavailability of certain important drugs like the musk, colchicum (the bitter variety), skink and so on. The question of the substitute s has engaged the attention of physicians for the last millennium—and it is to their credit that they have worked out the succedanea.

As we have emphasized before, the question the question of succedanea, as well as that of the elements, demands review and full sc-

scale investigation. Physicians of the classical times were fully aware of this problem. Wars and strife's were something quite common in those times. Al-Beruni has himself narrated an incident according to which a physician of Khwarizm charged on un conscionable price for the supply of prescription that incorporated the substitute. But there were also aware of the basic and inalienable fact that these problems were subject to the mounting of new ideas and review that their judgment were those of human beings and not divine fiats. Ibn Sina himself has said: "The elements are four in number; but this problem belongs more to the realm of philosophy than medicine".

It was on the four-element theory that he built up an edifice comprising the temperament, humors, diseases, aetiology of the disease, therapy and medicine. It is not aim here to discuss the differences of the viewpoints that have arisen academic and theoretical levels. What I should like to state here is that the art of drug-making has emphasized the temperament of a drug as well as that of the patient. Those who differ from this fundamental aspect of Tibb are free to advance their views, but they themselves have not been able to understand how this problem of substitute and temperament can be circumvented.

It has been claimed, for instance, that cancer might be caused by smoking. South Africans are amongst the heaviest smokers in the world, and yet the incidence of a cancer is less than in Western, Europe and the U.S.A., where the incidence of smoking is less. The question of cancer is also relate to temperament. In a person with the history of stone formation in the family a vegetable like the tomato might lead to stone formation, while in other with no such family history the tomato will exercise no such effect w-

hatsoever. Examples like these could be multiplied. How is it that in some patients the injection of antibiotics exercise in allergic reaction, while in other there is no such indication. Similarly in some cases the drug will exert quicker actions than in others in whom the antibodies function sluggishly or whose genetic make-up is resistant to the action of drugs. In such cases an altogether different medicinal regimen will have to be devised.

We have presented here a theoretical view of the art of drug making so that the scientific approach of Tibb may be emphasized. It is of course possible to discuss at length the number of ingredients in medicinal preparation, the degrees of the temperament of drugs, quantities, action, dosage, and the mode of administration. There are drugs that incorporate up to more than 150 ingredients. Discussion could also be mounted upon the making of drugs in the form of fermented medicines (*khamiras*), powders, electuaries, pills and capsules, suppositories, aquas, syrups, ointments, but we have confined ourselves to theoretical discussion. The Hamdard Foundation Pakistan has published the *pharmacopeia of Eastern Medicine* in which the weight of ingredients have been standardized and the drugs classified according to form and mode of administration. The dosage has also been described and specified. Standardization is the another aspect of problem, particularly when in certain drugs the number of ingredient is more than 150. Reckonable work on the pharmacology of certain drugs like *Khamirah Abresham Hakim Arshadwala* has been undertaken by the House of Hamdard.

As I have emphasized earlier, it is not my intension here to encroach upon your valuable time by dwelling upon the details of Muslim pharmacy but to confine myself to the basic theo-

retical essentials. Ibn Sina has drawn attention to a point which is related to principle of therapy, but which is as well as concerned with the art or call it you will, the science of pharmacy. He has said:

“Every body — and in fact every organ — possesses the characteristics of being affected by a medicine, but at other times such a drug or a drug familiar nature does not affect it”.

We must appreciate the fact that the point adumbrated by Ibn Sina relates to the state of the patient and not of the drug. What Ibn Sina implies is that it is not only the therapy of drug that has been vitiated or found wanting, since its properties and characteristics are the same and the body and the organ are also identical. We have therefore to see the reaction of patient and to examine how his vitality functions. It is an established fact that the same patient may find a drug effective on one occasion, but the same drug may fail to exercise a positive effect on another.

We could easily derive the conclusion from the foregoing discussion that if the practitioners of Islamic medicine were so careful about the different aspects of Tibb, they must have been equally conscious of the need and necessity for the preservation of medicines and must have evolved certain principles for this purpose, because no pharmacopeia can be considered to complete until and unless the medicines used in the system are indemnified against the loss of potency along scientific lines. It is a matter of pride for us that Muslim physicians from the very beginning have made the preservation of medicines into a discipline and have forged upon its anvil discussions upon the methods and procedures to be adopted for the preservation of the potency of drugs.

It is not possible for me to discuss here in detail aspect. But I should like to present before you the basic principles that are followed. You s-

ould be able to appreciate from this as to how comprehensive, how close to nature, and how scientific Tibb is.

We ought to bear in mind the fact that a drug, whether of plant, animal, or mineral origin, is not to be found everywhere. Another corollary to this fact is that the same drug may be more potent in one region than in another. It has therefore to be determined as to what regions produce the best varieties, and that they should be procured at a time when their growth is at its maximum.

Muslim physicians have already described the characteristics of the best drugs through the manifestation of their color and odor. It has been specified at what stage they are to be used. Sometimes they are employed when fully mature. At others they are plucked in the raw state and dried in the sun or desiccated in the absence of humidity. Besides the plucking of flowers, the culling of blossoms, leaves, uprooting of roots, trimming of boughs, debarking and the gathering of plant exudates and the resins has also been described together with the methods of their preservation, the time-scale of their effectiveness and the modality adopted for their preservation. These directions relate to plant drugs, but about animal drugs it should be kept in mind that the animals from which these drugs are obtained should be young, healthy, and free from ailments.

Fragrant drugs have to be kept away from the air. Aquas, syrups, powders, electuaries, fermented medicaments, etc. should be kept in jars and sugar should be added to them.

It could be a gross folly to mix one drug with another. Drugs should be, as far as possible, kept away from moisture. Some powders and fermented medicines are liable to lose their potency in summer and during the rainy season. They should be kept in cool places as sunlight, heat, and

the air are liable to reduce the effectiveness of drugs.

Honey and sugar, making the drug viscous, enhance the lives of drugs. Drugs are lightly to forfeit their potency if the principles of preservation are not followed. It is, however, true that certain drugs, because of peculiar geographical situations, are adversely affected, the methods of preservation notwithstanding. Their structure and composition is liable to change through climatic effects. Nevertheless, changes in methodology of preservation techniques can be succeed in the preservation of drugs.

The simple principle adumbrated for the determination of the potency and effectiveness of drugs is that as long as they retain their external characteristics, viz. color, odor, taste, appearance, weight, uniformity and freshness, they are bound to be effective. Should the case be otherwise, they would be considered to have forfeited their potency. Mineral drugs last longer, but calcined drugs (*kushtahs*) are liable to undergo reactions, having metallic content. Only gold constitutes an exception.

Scholars of Islamic medicine believe that the potency of *zangar* (*verdigris*) begins to decrease after a year. The life of lime lasts for six years, while that of copper sulphate lasts indefinitely. The same thing is true for pearls. This does not mean that their life does not end; all that we have implied is that they are long lasting.

I have mentioned these aspects as this is my aim to emphasize that experimentation and observation have always received due and full attention throughout the history of pharmacy in the Muslim world.

Although contributions to materia medicae have accrued from every nook and corner of the world, nevertheless on the whole, most on the work on materia medicae has been done in Egypt

the subcontinent and Iran. When we see the classics on materia medicae and medicine by different physicians, we cannot but laud their contribution. Many of them are still in manuscript stage and it is a matter of great pride for us that many of these MSS., are in the libraries of Egypt. Sami Khalaf Hamarneh in his famous treatise, *Tarikh al-Tibb w-al-Saydalah 'ind al-Arab*, has identified more than 26 important MSS., in the Al-Zahiryyah library in Cairo. I should like to refer to a few of them so as to etch out the contribution of Egypt in the history of medicine. It should be noted that Moses Maimonides wrote his *Sharh al-Asma' al-Uqqar* in Egypt, and much of Ibn al-Baytar's study of medicinal plants was conducted in Egypt.

1. Yusuf bin-Isma'il who is also known as Ibn al-Katbi al-Madani wrote *Malayasa 'u al-Tabib Jihlah* which is a major work on compound drug and pharmacy in ca. 711 A.H. It is an old work and its MS., to be found in the Al-Zahiryyah library.
2. Yahyah bin Jazlah wrote in the middle of the 11th century A.D. an excellent book on pharmacy. Its MS., is extant. in it are described the basic principles of pharmacy.
3. Muhammad Said al-Rumi wrote the *Du' al-Misbah* in 1780 A.D. It is a very important book on pharmacy. He was appointed the Qadi al-Qadah in Istanbul. It is a thesaurus of pharmacy and describes the making of pills, syrups, aquas and hubub (seeds). It describe the weights in which the different ingredients should be incorporated. A special feature of the work is that it describes the substances and the link to be used it the decoration of pharmaceutical works.
4. Ibn Sina wrote work under the title, *Sikanjabin*. In this work he has compared the use of sugar and honey in the preparation of oxymel. He has proved through the remarkable

series of arguments that it is honey which confers greater strength upon oxymel. Oxymel is prepared from honey, and the practice has been followed from the days of Arab physicians down to our own time. Because, the discussion is of academic and scholarly nature, the importance of this MS., is considerable.

5. Muhhadab al-Din Abu al-Hasan 'Ali bin Ahmad al-Baghdadi (d. 610 A.H.) wrote a book *Al-Mukhtar fi al-Tibb*. Ibn Abi al-Usaybiah in his *Tabaqat* has alluded to this physician's profound knowledge of materia medicae. It is said to be a considerable work on therapy and offers new knowledge about the compounding and preparation of drugs. The MS., is also to be found in Egypt.

6. The name of Ibn al-Nafis al-Qureshi is associated with the degree of the principle of circulation of blood. Especially as the author of the *Mujiz al-Qanun*, his services to the cause of Tibb are memorable. But even in the realm of materia medicae his name serves as authority. He wrote a commentary on the *Fusul al-Buqrat* and indited a book of materia medicae, the *Kitab al-Nabat*. Two chapters, the second and the third, are especially worthy of note. They are to be found as MSS., in Egypt.

I have briefly described a few MSS., and have left out many. This does not mean that those omitted here are not important. All that I have done is to have alluded to some of them as specimens. The fact, however, remains that innumerable works have been indited in Arabic, Persian and Urdu, and for the centuries the sci-

ence of pharmacy has drawn succour from them.

Some physicians wrote memoranda in connection with their pharmaceutical and clinical observations. They served as the linchpin for the art of making registries of drugs or pharmacopeia. These memoranda are important enough to be referred to in the making of drugs. It would be unconscionable not to mention Persian works like the *Makhzan-i-Hikmat*, *Iksir-i-Azam*, *Muhit-i-Azam*, *Ghina wa Muna*, *Qarabadin-i-Qadri* etc.

In sum, on the basis of experience enshrined in centuries upon the therapy of drugs, a study of their ingredients and active principles, and the art of drug-making, we could justifiably claim that the Islamic system of pharmacy is a comprehensive, scientific and reliable system.

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