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AYURVEDIC ASPECT OF BACTERIA AND BACTERIAL FOOD POISONING

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ABSTRACT: Bacterial Food Poisoning' is a common name given to predominantly gastro-intestinal infections which arise after the consumption of food or drink that is contaminated with disease-causing bacteria. Over 250 organisms are known to cause food borne illnesses. *Ayurveda* is an ancient medical science & has described the food poisoning indirectly in the form of *Anna Vishaktata*. The aims of present study are to collect, elaborate, evaluate & discuss the Bacteria and Bacterial Food Poisoning in aspect of *Ayurveda*. In *Ayurveda* there are so many words are used for bacteria like invisible *krimi*, *Vaikaric krimi*, *Agantuj*, *Rakshasa*, *Bhut* and *Pisacha* directly, indirectly. In the 19th century Acharya Gannath Sen translate the word bacteria in the form of *Jeevanu* which is causative factor for many diseases. The infectious food poisoning which may be due to ingestion of food/water contaminated with poisons of *Agantuj* (pathogens including bacteria) is also found in *Ayurveda*. The infectious disease is given under *Aupasargik Vyadhi* & Epidemiology is elaborated under the heading of *Janapadadhwanasa* in *Ayurveda*. The utilization of unhygienic utensil, uncooked, semi cooked food, decomposed meats etc. are the causes of food poisoning as per *Ayurveda* which is similar as described in Modern Medicine. There are abundant of herbal, mineral and herbo-mineral *ayurvedic* drug useful for bacterial food poisoning which having significant *in vitro* antibacterial efficacy on enteric pathogens. The method described for the prevention in *Ayurveda* is equally important as Modern Medicine with some addition.

INTRODUCTION: Food poisoning is a common, usually mild, but sometimes deadly illness. Several factors could contribute to food poisoning. Food poisoning comes from eating foods that contain germs like pathogenic bacteria or toxins, which are poisonous substances. Food borne illnesses are prevalent in all parts of the world, and the toll in terms of human life and suffering is enormous. Contaminated food contributes to 1.5 billion cases of diarrhea in children each year, resulting in more than three million premature deaths, according to the World Health Organization (WHO) ¹.

Those deaths and illnesses are shared by both developed and developing nations. The World Health Organization (WHO) reports that each year two billion illnesses are caused by unsafe food; globally this number is growing. In Asia 700,000 people have dies each year as a result of food poisoning illnesses ². Under the Integrated Disease Surveillance Project (IDSP) in India, food poisoning outbreaks reported from all over India in 2009 increased to more than double as compared to the previous year (120 outbreaks in 2009, as compared to 50 in the year 2008) ³.

According to the *Sushruta Krimidosh* is one of cause of *Atisar*, which mean micro-organism affect the human being and cause many infectious diseases. Many time these organism cause massive effect on community. *Yajurveda* also mention the Food Poisoning caused due to eating in unhygienic utensils. *Ayurveda* has described the pathogenic

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micro-organism indirectly in the form of invisible *krimi* responsible for producing many diseases. *Ayurveda* has also described herbal, mineral and herbo-mineral compound for such infectious disease including bacteria along with food poison prevention.

MATERIAL & METHOD:

The material about Bacteria and Bacterial Food Poisoning collected from the text books of *Atharva Veda*, *Yajurveda*, *Kautilaya Arthashastra*, *Brihatrayi & Laghutrayi*. The research article of concerns subjects published in national-international journals are referred & discussed. The text book of Modern Medicine also referred whenever necessary.

Ayurvedic Concept of Infectious Disease:

Acharya Charak stated that there are two factor responsible for disease one is internal factor mean *doshavikriti* and second is external factor mean *Agantuj* (contaminated water, food, microbes, trauma)⁴. *Acharya Susruta* has described that the diseases like *kustha* (Leprosy), *Jwara* (pyrexia), *Shosha* (kock's or tuberculosis) are contagious and spreads or occurring direct contact or by use of contaminated objects. all forms of *Prasnaga* (contacts), *Gatra Sansparsha* (direct contacts), eating together, sleeping together (including sexual contact), sharing and using of others cloths, ornaments, ointments etc. leads to diseases like *Kustha*, *Jwara*, *Shosha*, *Netrabhishyanda* (conjunctivitis), and in this manner the disease spread from person to person, which is called as an *Aupsargic disease*⁵.

Acharya Charaka has described role of *Vayu* (air), *Udak* (Water), *Desha* (soil & area), *Kala* (Time) responsible for *Janapadodhwansa* (epidemics), most of the infectious disease and contamination of physical, chemical & biological factors in occurrence of disease⁶. *Dalhan* in his commentary on *sushruta* stated that *upsargaja* means micro-organism affect the human being and cause many infectious diseases. Many times these organism cause massive effect on community.⁷ *Acharya sushruta* also described the causative animal, clinical feature of *Jalsantras* which is very much similar to hydrophobia which approved today that it is a viral disease⁸.

Ayurvedic Concept of Bacteria:

In *Athrvaveda* two types of *krimi* (organism) described- *Drisyā* (visible) and *Adrisya* (invisible)⁹ and minute form of *krimi* is called "*Kshullaka*"¹⁰. *Athrvaveda* has also mentioned that there are two type of *krimi* namely *Durnam* which mean pathogenic and *sunam* which means non-pathogenic¹¹. In *Mahabharata Maharshi Veda Vyasa* mentioned that there are abounded of microbes which will identify by conclusion¹². *Acharya charak* also stated 2 type of *krimi* one is *vaikaric* means pathogenic and second is *sahaj* which means non-pathogenic¹³. In *Charak samhita* three major division of disease i.e. *Agantuj Vyadhis* are caused also due to *krimi*¹⁴. Today bacteriologist also classified the pathogenic and nonpathogenic bacteria.

In 19th century *Acharya Gananath Sen* has translated the bacteria as a *Jeevanu* which is responsible most of the infectious disease and Enteric fever under the heading of *Antrik Jwar &* stated that it is due to ingestion of bacterial contaminated food and water which is spread by stool & urine¹⁵.

Ayurvedic Concept of Bacterial Food Poisoning:

According to *Atharvaveda jantu* (organism) can originate anywhere in the environment. They grow on the earth, in forest, water air, soils also in medicinal plant, food material, drinks also in bird's animals etc. These organisms may grow where ever they get favorable conditions¹⁶. Spreading of *krimis* taken placed through food, gruel, milk and water¹⁷. *Athrvaveda* also stated that microbes may invade uncooked; semi cooked food and contaminates them. If an individual consumes such food material it has potential to harm the body¹⁸.

Ayurvedic Aspect of Nidan (Causes) of Bacterial Disease and Bacterial Food Poisoning:

Charak, *Sushrut* and *Vagabhat* have been accepted that food material whether fresh or rotten, is one of the causative factors for *krimiroga*. *Charak* further stated that *Puti ahara* (fetid), *Klinna ahara* (Putrefied) *Sandust ahara* (ill disposed) and *Asuchi ahara* (foul) are the synonym, which are used for rotten and contaminated food^{19, 20, 21}. Such food material is a good vehicle for *Krimi* (micro-organism) to get enter in host. *Athrava Veda*

mentioned the microbes may invade uncooked; semi cooked food and contaminates them. If an individual consumes such food material it has potential to harm the body ²². *Gananath Sen* has mentioned the diarrhea caused due to ingestion of *Jeevanu* (translated for bacteria) and its toxin contaminated food and waters. He also stated that *Anna Visa* (food poisoning) one of the cause of diarrhea ²³.

Ayurvedic Aspect of Samprapati (Pathogenesis):

Jeevanu (Micro-organism) and its toxin causes vitiation of entire *Doshas* and then irritation, inflammation to *Annavaaha* and *Purishvah Srotas* (gastro intestinal tract) which produce vomiting, loose motion, colic pain and fever generally.

Bacterial Etiology of Food Poisoning As Per Modern Medicine:

Bacterial food poisoning may be divided into two groups 1. Infection Type- This results from ingestions of viable micro-organisms that multiply in the gastrointestinal tract producing infections as, for example, salmonella group of organisms 2. Toxin Type- This results from ingestions of the micro-organisms which presents in the food & produces toxin before or after being ingested. Bacteria are tiny organisms that can cause infections of the GI tract.

TABLE 1: EXAMINATION OF CONTAMINATED LIQUID FOOD (MILK) AS PER AYURVEDA

Sr.	Name of Examination	Observation
1	Examination by means of touch	Slimy, insect laden, disagreeable to teeth, hot or thick feeling.
2	Examination by means of appearance	Discolored, insanitary & frothy.
3	Examination by means of taste	Distasteful, tasteless, sour & salty.
4	Examination by means of smell	Fowl or flesh

Touch of the contaminated water will be slimy, insect laden, disagreeable to teeth, hot or thick feeling and discolored, insanitary & frothy in appearance. Taste of this water will be distasteful, Tasteless; Sour & Salty while Fowl or Flesh in smell ^{27, 28, 29, 30}.

Examination of Contaminated Food as Per Ayurveda:

Poisoned food burns making loud cracks, and when cast into the fire it assumes the colour of a peacock's throat, becomes unbearable, burns in severed and disjointed flames and emits irritating fumes and it cannot be speedily extinguished ³¹. Preparations of potherbs, soups, boiled rice and

Clinical Feature of Bacterial Food Poisoning As Per Ayurveda:

Acharya Trimal Bhatt mentioned the clinical manifestation like diarrhea, vomiting, abdominal pain, fever of *Agantuj Jwar* (Exoteric) due to *Visjanya Abhisang* (Exotoxin) which is mimics to bacterial food poisoning ²⁴. *Gananath Sen* in his commentary *Siddanth Nidan* mentioned *Anna Visaj Atisar* (Food Poisoning) and its clinical manifestation like diarrhea, vomiting, abdominal pain, fever, thirst which are exactly similar to bacterial food poisoning ²⁵. *Sushrita* again stated that Food mixed with poison, when it reaches the *Amasaya* (stomach) gives rise to vomiting, *Atisara* (loose motion), and distention of the abdomen, a burning sensation, shivering and a derangement of the sense-organs & Syncope ²⁶.

Clinical Feature of Bacterial Food Poisoning as Per Modern Medicine:

Patients with food borne illnesses typically present with gastrointestinal tract symptoms (example-vomiting, diarrhea, abdominal pain); however nonspecific symptoms & neurologic symptoms may occur. When someone does not drink enough fluids to replace those that are lost through vomiting and diarrhea, dehydration can result.

cooked meat are instantaneously decomposed, and become putrid, tasteless and omit little odour when in contact with poison. All kinds of food become tasteless, odourless and colorless when in contact with poison ³².

Ayurvedic Management of Bacterial Food Poisoning:

Rigveda has mentioned the physician called *Rakshoha* who manage the invisible minute *krimi* ³³. *Atharvaveda* has mention that *Agni* ³⁴ and *Surya* ³⁵ has *Rakshoghn* properties which will be helped to destroy the invisible minute *krimi*. *Acharya charak* has described the *YuktiVyapaashrya Chikitsa* which is unique three fold management

for the disease esp. occurring due to any infections. Further Charaka Acharya has described the three different modalities in management of Krimi (micro & macro organisms tend to produce disease)

– *Apakarshana* (removal of the causative factor), *Prakriti Vighata* (interruption in the nature of causative factor) and *Nidaana Parivarjana* (escaping of causative factor)³⁶.

TABLE 2: CHIEF INGREDIENT OF HERBAL AND HERBO-MINERAL COMPOUND USED FOR BACTERIAL FOOD POISONING WITH SPECIAL REFERENCE TO ATISAR

Sr.no.	Compound	Chief ingredient
1	<i>Rasanjanadi Churna</i> ³⁷	<i>Berberis aristata, Aconitum heterophyllum, Holarrhena antidysenterica, Woodfordia fruticosa</i>
2	<i>Kapitthadi Churna</i> ³⁸	<i>Woodfordia fruticosa, Zingiber officinale, Piper longum, Piper nigrum</i>
3	<i>Piplyadi Yog</i> ³⁹	<i>Piper longum, Plumbago zeylanica</i>
4	<i>Kutaj Phanit</i> ⁴⁰	<i>Holarrhena antidysenterica</i>
5	<i>Atisarhar Yog</i> ⁴¹	<i>Glycyrrhiza glabra, Aegle marmelos</i>
6	<i>Atisarhar Twak</i> ⁴²	<i>Terminalia arjuna, Manjifera indica, Syzygium cumini, Boswellia serrata</i>
7	<i>Kapitthastak Churna</i> ⁴³	<i>Limonia acidissima, Zingiber officinale, Piper longum, Piper nigrum, Plumbago zeylanica</i>
8	<i>Darimaastak Churna</i> ⁴⁴	<i>Punica granatum, Zingiber officinale, Piper longum, Piper nigrum</i>
9	<i>Jambvadi Patra Swaras</i> ⁴⁵	<i>Syzygium cumini, Manjifera indica, Phyllanthus emblica</i>
10	<i>Babul Patradi Ras</i> ⁴⁶	<i>Acacia nilotica, Holarrhena antidysenterica</i>
11	<i>Ankot Kalk</i> ⁴⁷	<i>Alengium Salvifolium</i>
12	<i>Laghu Gangadhar Churna</i> ⁴⁸	<i>Cyperus rotundus, Holarrhena antidysenterica, Aegle marmelos, Symplocos racemosa, Woodfordia fruticosa, Salmalia malbarica</i>
13	<i>Dhanya Panchak quath</i> ⁴⁹	<i>Coriandrum sativum</i>
14	<i>Gangadhar Churna</i> ⁵⁰	<i>Salmalia malbarica, Cyperus rotundus</i>
15	<i>Satavari Kalk</i> ⁵¹	<i>Asparagus racemosus</i>
16	<i>Chittrakadi Quath</i> ⁵²	<i>Plumbago zeylanica</i>
17	<i>PurnChandrodayRas</i> ⁵³	<i>Hartal, Lauha, Abhrak, Murcury, Zingiber officinale, Piper longum, Piper nigrum</i>
18	<i>Vrihad Gagansunder Ras</i> ⁵⁴	<i>Parad, Abhrak, Lauha, Aconitum heterophyllum</i>
19	<i>JatiphalaRas</i> ⁵⁵	<i>Mercury, Abhrak, Holarrhena antidysenterica, Tankan, Zingiber officinale, Piper nigrum</i>
20	<i>AbhaynrisinghoRas</i> ⁵⁶	<i>Hingul, Aconitum ferox, Zingiber officinale, Piper nigrum, Tankan, Mercury, Abhrak</i>
21	<i>KarpurRas</i> ⁵⁷	<i>Hingul, Papaver somniferum, Cyperus rotundus, Holarrhena antidysenterica, Myristica fragrans, Karpura</i>
22	<i>AtisarVarnoRas</i> ⁵⁸	<i>Hingul, Karpura, Cyperus rotundus, Holarrhena antidysenterica</i>
23	<i>Kanadhay Lauha</i> ⁵⁹	<i>Zingiber officinale, Piper longum, triphala (Terminalia chebula+Terminalia belrica+ Phyllanthus emblica), Zingiber officinale, Piper longum, Piper nigrum,</i>
24	<i>AnandbhairavRas</i> ^{60,61}	<i>Hingul, Aconitum ferox, Suhaga, Piper nigrum, Piper longum</i>
25	<i>SudhasarRas</i> ⁶²	<i>Mercury, Holarrhena antidysenterica, Aconitum ferox, Zingiber officinale</i>
26	<i>RasotamRas</i> ⁶³	<i>SudhasarRas + Zingiber officinale, Cyperus rotundus</i>
27	<i>LaghulaiChurna</i> ⁶⁴	<i>Mercury, trikatu</i>
28	<i>MritSanjivanRas</i> ⁶⁵	<i>Mercury, Abhrak, Piper longum, Holarrhena antidysenterica</i>

As the causative organisms of Atisar (diarrhoea) and bacterial food poisoning are nearly similar. Hence the herbal and herbo-mineral compound mention in Ayurveda for treatment of Atisar will be used for treatment of bacterial food poisoning.

The commonly used herbs as an ingredient of Ayurvedic compounds used for treatment of Atisar are *Berberis aristata, Aconitum heterophyllum, Holarrhena antidysenterica, Woodfordia fruticosa, Limonia acidissima, Piper longum, Piper nigrum, Zingiber officinale, Plumbago zeylanica, Aegle marmelos, Syzygium cumini, Punica granatum, Acacia nilotica, Alangium salviifolium, Cyperus*

rotundus, Coriandrum sativum, Asparagus racemosus.

The antimicrobial activity of aqueous and ethanolic extracts of *Berberis aristata* and berberine, an active principle of *Berberis aristata* shows the zone of inhibition on enterogenic pathogen like *Staphylococcus aureus, Staphylococcus epidermidis, Pseudomonas aeruginosa, Escherichia coli* and *Bacillus subtilis*⁶⁶. Another study showed the strong antibacterial potential against gram negative bacteria including *Pseudomonas aeruginosa, Proteus Vulgaris* and *Enterobacter aerogenes*⁶⁷.

The antibacterial study revealed that antibacterial activity of *Aconitum heterophyllum* alkaloids from root shows synergistic effect of different alkaloids⁶⁸. It was observed that methanolic extract of *Aconitum heterophyllum* was the most potent extract which showed significant inhibition of the growth of Gram positive bacteria, *Staphylococcus aureus* and *Bacillus subtilis*⁶⁹.

The antimicrobial study showed that extracts of bark, seed and callus of *Holarrhena antidysenterica* possess nearly similar potential for antibacterial activity against pathogenic bacteria like *Staphylococcus aureus*, *Salmonella typhimurium* and *Escherichia coli*⁷⁰. The antimicrobial activity of *H. antidysenterica* bark extract has been reported against enteropathogens like enteroinvasive *Escherichia coli*, *Salmonella typhimurium*, *Salmonella enteritidis*, *Shigella flexneri*, *Sh. boydii* and *Vibrio cholera*⁷¹.

Extract prepared from leaf and flower samples of *Woodfordia fruticosa* showed antimicrobial property against *Bacillus subtilis*, *Staphylococcus aureus*, *Salmonella Typhi*, *Salmonella paratyphi*, *Citrobacter freundii*, *Pseudomonas aeruginosa*, *Escherichia coli*, *Proteus mirabilis*, *Klebsiella pneumoniae*, *Shigella dysenteriae*, *Enterobacter* spp., *Acenitobacter* spp.⁷².

The methanolic extract of Pulp of *Limonia acidissima* was found to possess highest antibacterial activity against *Staphylococcus epidermidis* followed by *Staphylococcus aureus* and *Bacillus subtilis*⁷³.

The study showed that *Zingiber officinale* (ginger) has antimicrobial activities on the *Pseudomonas aeruginosa* and *Escherichia coli* due to its inhibitory effect⁷⁴. Another study showed that two extracts of *Zingiber officinale* had antimicrobial activity, methanol extract was superior than n-hexane extract against the same tested microorganisms- *Staphylococcus epidermidis*, *Staphylococcus aureus*, *Klebsiella* sp., *Escherichia coli*, *Proteus* sp. *Enterococcus* sp. and *Pseudomonas fluorescent*⁷⁵.

In the antimicrobial study Piperine (chemical constituent of *Piper nigrum*) was evaluated for its

antimicrobial activity against *Staphylococcus aureus*, *Bacillus subtilis*, *Pseudomonas aeruginosa* and *Escherichia coli*⁷⁶. In another study the extract of *Piper nigrum* was evaluated for antibacterial activity. The results indicate excellent inhibition on the growth of gram positive bacteria like *Staphylococcus aureus*, followed by *Bacillus cereus* and *Streptococcus faecalis*⁷⁷.

The antimicrobial study showed that among the entire gram positive bacteria *Staphylococcus aureus* was highly sensitive in presence of ethyl acetate extract of fruit of *Piper longum*⁷⁸. In another study the antimicrobial activity of *P. longum* extracts has been evaluated *in vitro* against two gram positive bacteria stains such as *Streptococcus faecalis*, *Streptococcus pyogenes* and two gram negative bacteria such as *E. coli* and *Salmonella paratyphi*⁷⁹.

The antimicrobial effect of *Plumbago zeylanica* Linn. (Plumbaginaceae) leaf extract was evaluated on microbial strains like gram positive species *Staphylococcus aureus*, and *Bacillus subtilis* and gram negative species *Escherichia coli* and *Pseudomonas aeruginosa*⁸⁰.

The *in vitro* antimicrobial activity of petroleum ether, chloroform and methanol extracts from leaves of *Aegle marmelos* exhibited broad spectrum antimicrobial activity against bacteria: *Staphylococcus aureus*, *Streptococcus haemolyticus*, *Proteus mirabilis*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, *Escherichia coli* and *Salmonella typhi*⁸¹. The another antibacterial study showed that the methanolic extract from the leaves, bark and fruit of *A. marmelos* has significant antibacterial activity against *Bacillus subtilis*, *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Proteus mirabilis*, *Escherichia coli*, *Salmonella paratyphi* A and *Salmonella paratyphi* B⁸².

The methanol and aqueous extracts of the leaves of *Syzygium cumini* showed the antimicrobial activity against *Salmonella enteritidis*, *Salmonella typhi*, *Salmonella typhi* A, *Salmonella paratyphi* A, *Salmonella paratyphi* B, *Pseudomonas aeruginosa*, *Escherichia coli*, *Bacillus subtilis*, and *Staphylococcus aureus*⁸³.

The *in vitro* antibacterial activities of different extracts of pomegranate fruit peels and arils (with seeds) were investigated *Escherichia coli*, and *Salmonella typhimurium* against food-related bacteria (*Bacillus subtilis*, *Staphylococcus aureus*)⁸⁴.

The methanolic extract of leaf of the plant *Acacia nilotica* showed significant antibacterial activity against *Bacillus subtilis*, *Escherichia coli*, *staphylococcus aureus* and *pseudomonas fluorescense*⁸⁵. Ethanolic extract of different plant parts of *Alangium salviifolium* Linn, showed significant antibacterial activity against *Escherichia coli*, *Pseudomonas aeruginosa*, and *Staphylococcus aureus*⁸⁶.

The Antibacterial activity of *Cyperus rotundus* oil was shown a remarkable activity against microorganisms (*Staphylococcus aureus*, *Klebsiella pneumoniae*, *Proteus vulgaris*, *Streptococcus pyogenes*, *Escherichia coli* and *Pseudomonas aeruginosa*)⁸⁷.

Antimicrobial effects of seed extract of coriander (*Coriandrum sativum*) was showed inhibitory activity on *Pseudomonas aeruginosa*, *Mycobacterium smegmatis*, *Klebsiella pneumoniae*, *Staphylococcus aureus*, *Escherichia coli*, *Salmonella typhimurium*, *Enterococcus faecalis* and *Micrococcus luteus*⁸⁸.

Methanolic extract of *Asparagus racemosus* was found to be effective against bacterial Strains: *Klebsiella pneumoniae*, *Escherichia coli*, *Pseudomonas alkaligenes*, *Proteus specie*, *Shigella*, *Salmonella typhi*, *Vibrio cholera* and *Staphylococcus aureus*⁸⁹. Hingul, Parad, and Gandhak are the chief ingredient of herbo-mineral ayurvedic compound along with herbal medicine. *Hingul* have significant antimicrobial efficacy with special reference to enterogenic pathogens and bacteria causing Food Poisoning⁹⁰. Metal chelates of mercury have been screened for antimicrobial activity on *Escherichia coli*, *Bacillus subtilis* and *Staphylococcus aureus*⁹¹. The herbs used in this compound having *Usna*, *Tikshna*, *Katu* and *Tikta* in properties which will helped to remove the bacteria and its toxins from human body.

Ancients Method of Prevention of Bacterial Food Poisoning:

In his famous book *Arthshastra*, *Kautilya* stated and warned to public not to permit to sale the contaminated, putrefied and decomposed meat of any animals which are cute outside of slaughter house and died due to any disease. The person who will infracted this rule he will be punished with penalty of twelve *Panha* (*Moryakalin* currency)⁹². *Sushrit* stated about the mode of preparing the soup that the flesh of a *Godha*, *mongoose*, or deer should be cooked and spiced with pasted *Pdlindi* (*Trivrit*), *Yashti-madhu* and sugar.

The flesh of a peacock should be similarly cooked and spiced with sugar, *Ativisha* and *Sunthi* and that of a *Prishata* deer with *Pippali* and *sunthi*. The soup of *S'imbi* taken with honey and clarified butter should, similarly, be deemed beneficial (as being possessed of similar antitoxic properties). A king should always use food and drink of poison destroying properties⁹³. *Sushrita* has mentioned the guideline for the *Rajavaidya* (Doctor) that *Pakashala* (kitchen) for the King should be constructed in *Agneya* (south-eastern) direction & excellent environments. Further he stated that vessels used in kitchen should be clean & neat, so that bacterial & any other contamination will be prevented⁹⁴.

Current Method of Prevention of Bacterial Food Poisoning:

Food borne illnesses can be prevented by properly storing, cooking, cleaning, and handling of edible foods. It is need to take the fresh foods always in dinner, lunch or breakfast. The remaining foods should be keep in refrigerator by setting below 40 degree F and freezer on 0 degree F. The raw foods like meat should be cooked long enough at high temperature to kill the harmful bacteria that causes illness. The chop of beef, pork and lamb should be roasted on 145 degree and 165 degree for poultry. Cold foods should be kept in cold pot and hot foods should be kept in hot pot. People should wash their hands for at least 20 seconds with warm, soapy water before and after handling raw meat, poultry, fish, shellfish, produce, or eggs. Utensils and surfaces should be washed with hot, soapy water before and after they are used to prepare food⁹⁵.

DISCUSSION: *Ayurveda* has also found the description about the infectious & contagious diseases under the heading of *Aupsargik* & *Sankramak Vyadi* respectively along with *Janapadadhwansa* (Epidemiology) of infectious & other disease. Though the description of *Sukshmajeeva* (micro-organism) has known to our ancient *Rishimunies* & *Acharya* which is found in *Veda* & *Ayurveda*, the term 'Jeevanu' has been used to translate Bacteria at first time in the 19th century. As such direct description of food poisoning & bacterial food poisoning is not found in any texts of *Veda* & *Ayurveda*, but the *Atharva Veda* stated about the contaminations due to microbes may invade uncooked, semi cooked, cooked food.

Acharya Gananath Sen also mentioned the *Atisar* (Diarrhea) due to ingestion of *Jeevanu-janya Anna* (bacterial contaminated food) and its clinical feature similar to bacterial food poisoning. The examinations stated in *Ayurveda* for poisonous & contaminated food are very important & practical because it may be helped to decide whether the food having contaminated or not and may help to prevent the poisoning. *Charaka* describes in three different modalities in management of *Krimi* (micro & macro organisms tend to produce disease) like *Apakarshana*, *Prakriti Vighata* and *Nidaana Parivarjana*.

Apakarshana is the process of removal of disease producing *Krimi* (micro & macro organisms) out of body using therapeutic purification. But Bacterial Food Poisoning having already vomiting and purgation and micro-organism, its toxin removed out in this process. So there is no need to have further induce emesis and purgation in Bacterial Food Poisoning. *Prakriti Vighata* is a very unique medicament described by *Charaka* that uses the drugs which stops growth of disease producing microbes by creating an unfavourable condition of growth of these organisms.

In *Prakriti Vighata* drugs having *Katu*, *Tikta*, *Kashaaya*, *Kshra*, *Ushna* etc. *Gunas* (properties) are utilized which decreases *Kapha* and *Malas* on which these microorganisms leading to disease. As increased number of the microbes will increase toxin load and also uses body physiological mechanism in increasing the number more, thus

disease progress and if this chain is blocked at this level, disease even though occurs will be of mild form, requires very less medication, reduces toxicity & complications and early recovery.

Thus load on the medical management may be decreased. *Nidaana Parivarjana* is the most efficient method of managing the disease condition. Stopping the invasion of pathogenic organisms into the body will cease the chances of getting disease. The herbal and herbo-mineral compound described in *Ayurveda* for *Atisar* can be used as antimicrobial agent for bacterial food poisoning, as the maximum ingredients like *Hingula*, *Parada*, *Piper longum*, *Piper nigrum*, *Berberis aristata*, *Aconitum heterophyllum*, *Holarrhena antidysenterica*, *Woodfordia fruticosa*, *Limonia acidissima*, *Zingiber officinale*, *Plumbago zeylanica*, *Aegle marmelos*, *Syzygium cumini*, *Punica granatum*, *Acacia nilotica*, *Alangium salviifolium*, *Cyperus rotundus*, *Coriandrum sativum*, *Asparagus racemosus* having antimicrobial activity with special reference to enteric pathogens.

The matter of prevention of mass from contaminated, decomposed of meat has also found in *Kautilaya Arthashastra* which is much practical to prevent epidemiology.

CONCLUSION: Food Poisoning caused by Bacteria can be managed & prevented successfully by applying the basic concept & Drugs of *Ayurveda*.

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