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Chemical composition, traditional and modern uses of meat of animals-a review

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SUMMARY

Meat of animals has used as a foodstuff for humans from the origin. Formerly, human being hunted fauna for meat and other products, but today, various animals utilized for foodstuff as well as sold for trade. Meat is composed of water, nitrogenous compounds, lipids, non-nitrogenous compounds, glycogen, lactic acid, sodium, magnesium, calcium, chlorine, potassium, iron and phosphorus. Beef, poultry, lamb, fish and pork the major sources of meat worldwide. However, in few countries, especially in arid and semi-arid regions, camel meat is known as a main source of animal protein that equals and in some cases surpasses other meats in commercial importance. Meat of birds, herptiles, mammalian and avian are utilized in different folk therapies Abscesses, Acidity, allergy, anemia, aphrodisiac, asthma, blindness, body strength, breathing trouble, bronchitis, carbuncle, CNS, cold, constipation, delay dentition (child). diabetes, diarrhea, dysentery, Edema, enhance memory, epilepsy, erectile dysfunction, eruption of new teeth in children, erysipelas, eye tonic, eye-problems, fever, flu, fractures, gall bladder stone, gas trouble, hemoglobin, hepatitis B and C, immune enhancer, impotency, infertility, jaundice, joint pain, joints problem, kidney problems, lumbago, lungs infection, maturity in girls, menorrhagia, menstrual disorder, morning sickness, muscle fatigue , muscular pain, nourishing food, paralysis, pile, postpartum bleeding, puberty in young girls, paralysis, rheumatism, scarlet fever, scorpion bite, skin burn and crack, skin diseases, snake bite, sore throats, sterility, swellings, tonsillitis, toothache, tuberculosis, urine problem, vision, weakness, wheezing trouble, whooping cough and wound healing.

Keywords: Meat, Fish, Folk medicine, Birds, Mammals

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INTRODUCTION

Meat has consumed as a food source for human being. Humans have used meat all over the past because it is known as a significant source of proteins, vitamins, iron, minerals and other nutrients. Generally, human being hunted vertebrate animals for meat and other products, but at present, vertebrate animals utilized for foodstuff and sold for trade(Boler and Woerner, 2017). Human communities who select to consume meat frequently quote three explanations. The first quote explanation for eating meat is that it has good taste and desirable flavor. Second quote explanation, meat

utilization is frequently linked with community rank or is enjoyed during times of special occasions. Third quote explanation, meat is utilized because it has advantageous nutritional supports and benefits health of human (McNeill, 2014; O'Connor *et al.*, 2017). Protein is that offers essential amino acids (Boler and Woerner, 2017).

Vertebrate animals like birds, fish and mammals are used for meat and products. Other muscle foods like oysters, clams and mollusks are in the phylum Mollusca and crayfish, crabs, shrimp and lobster are in the phylum Arthropoda. Variations in type of fiber impact the rate of growth and characteristics of postmortem like pH decline, onset of rigor mortis, water-holding capacity, color and tenderness, the functional properties of various animal meat (Zhang *et al.*, 2017). Composition of meat is diverse cause of the impacts of various internal factors and environmental such as animal species, breed sex, feeding, etc (Cheung and Mehta, 2015). Fish, pork, beef, poultry and lamb the main sources of meat universal. However, in some countries, particularly in semi-arid and arid and areas, meat of camel is recognized as a major source of protein (Williams, 2007; Schönfeldt and Gibson, 2008; Abrhaley and Leta, 2018).

CHEMICAL COMPOSITION OF MEAT

Meat consists of almost 72 to 75 percent water, 21 percent nitrogenous compounds (1.5 percent non-protein and 19 percent proteins nitrogen compounds like creatinine, creatine, peptides and nucleotides), 2.5 to 5 percent lipids, one percent vitamins and carbohydrates and one percent ash (magnesium, calcium, sodium, chlorine, iron, potassium and phosphorus). The highly variable compounds are lipids, that can vary between 1 percent and 15 percent (Keeton and Eddy, 2004; Hui, 2012). Meat composition is variable due to the impacts of various external and internal factors like feeding, muscle, animal species, breed sex, etc (Cheung and Mehta, 2015).

TRADITIONAL USES OF MEAT TO TREAT OF VARIOUS DISEASES

Meat of different species i.e. *Coturnix Coturnix, Francolinus francolinus, Egretta garzetta*, *Columba livia*, *Columba rupestris*, *Streptopelia orientalis Spilopelia chinensis, Eudynamys scolopaceus, Upupa epops, Trochalopteron lineatum, Acridotheres tristis, Acridotheres ginginianus, Passer domesticus, Passer cinnamomeus, Anas platyrhynchos, Gallus gallus domesticus, Nothura boraquira, Aratinga cactorum, Mimus saturninus, Dicrurus macrocercus, Ammoperdix heyi, Rana clamitans, Serpentes* spp., *Rana clamitans, Calotes versicolor, Hystrix indica, Macaca mulatta, Vulpes vulpes, Bubalus bubalis, Camelus dromedaries, Capra aegagrus hircus, Ovis aries, Funnambulus pennant, Bos taurus, Equus caballus, Pterocarpus giganteus, Lepus nigricollis, Suncus murinus, Ctenopharyngodon idella, Cyprinus carpio, Cirrhinus mrigala, Labeo rohita, Oreochromis niloticus, Channa marulius, Rita rita, Bagarius bagarius, Wallago attu* and *Lepidocephalichthys thermalis* are utilized in different folk therapies Abscesses, Acidity, allergy, anemia, aphrodisiac, asthma, blindness, body strength, breathing trouble, bronchitis, carbuncle, CNS, cold, constipation, delay dentition (child). diabetes, diarrhea, dysentery, Edema, enhance memory, epilepsy, erectile dysfunction, eruption of new

teeth in children, erysipelas, eye tonic, eye-problems, fever, flu, fractures, gall bladder stone, gas trouble, hemoglobin, hepatitis B and C, immune enhancer, impotency, infertility, jaundice, joint pain, joints problem, kidney problems, lumbago, lungs infection, maturity in girls, menorrhagia, menstrual disorder, morning sickness, muscle fatigue , muscular pain, nourishing food, paralysis, pile, postpartum bleeding, puberty in young girls, paralysis, rheumatism, scarlet fever, scorpion bite, skin burn and crack, skin diseases, snake bite, sore throats, sterility, swellings, tonsillitis, toothache, tuberculosis, urine problem, vision, weakness, wheezing trouble, whooping cough and wound healing (Table 1).

Table 1: Traditional uses of meat to treat of various diseases

Species name	**Diseases cure**	**References**
Coturnix coturnix (Linnaeus, 1758) Common Quail	Skin diseases, sexual power, fever, enhance memory, body weakness, anemia	(Vijayakumar *et al.*, 2015a; Altaf *et al.*, 2017)
Francolinus francolinus (Linnaeus, 1766) Black Francolin	Bronchitis	(Arshad *et al.*, 2014)
Egretta garzetta (Linnaeus, 1766) Little Egret	Asthma, body strength, breathing trouble, immune enhancer	(Vijayakumar *et al.*, 2015a; Altaf *et al.*, 2017)
Columba livia (Gmelin, 1789) Common Pigeon	Wound healing, anemia, epilepsy, puberty, paralysis, menorrhagia, infertility, bronchitis	(Arshad *et al.*, 2014; Vijayakumar *et al.*, 2015a; Altaf *et al.*, 2017)
Columba rupestris Pallas, 1811 Hill Pigeon	Wound healing	(Mughal *et al.*, 2020)
Streptopelia orientalis (Latham, 1790) Oriental Turtle Dove	Maturity in girls, sexual tonic	(Altaf *et al.*, 2017; Altaf *et al.*, 2018)
Spilopelia chinensis (Scopoli, 1786) Spotted Dove	Maturity in girls, sexual tonic	(Altaf *et al.*, 2017; Altaf *et al.*, 2018)
Eudynamys scolopaceus (Linnaeu, 1758) Asian Koel	Spleen problem	(Mughal *et al.*, 2020)
Upupa epops (Linnaeus, 1758) Common Hoopoe	Gall bladder stone, kidney problems	(Altaf *et al.*, 2017; Altaf *et al.*, 2018)
Trochalopteron lineatum (Vigors, 1831) Streaked Laughingthrush	Paralysis, flue and fever	(Hakeem *et al.*, 2017)
Acridotheres tristis (Linnaeus, 1766) Common Myna	Whooping cough, weakness	(Altaf *et al.*, 2017)
Acridotheres ginginianus (Latham, 1790)	Whooping cough	(Altaf *et al.*, 2018)

Bank Myna		
Passer domesticus (Linnaeus, 1758) House Sparrow	Wound healing, weakness, paralysis, impotency, increase sexual desire, gas trouble, fever, constipation, chickenpox, aphrodisiac, allergy	(Arshad *et al.*, 2014; Vijayakumar *et al.*, 2015b; Altaf *et al.*, 2017; Mughal *et al.*, 2020)
Passer cinnamomeus (Temminck, 1836) Russet Sparrow	Paralysis, joints problem	(Rauf *et al.*, 2017)
Anas platyrhynchos domesticus (Linnaeus, 1758) Duck	Erectile dysfunction, scarlet fever, body strength, weakness	(Vijayakumar *et al.*, 2015a; Altaf *et al.*, 2018)
Gallus gallus domesticus (Linnaeus, 1758) Hen	Sprains, nourishing bronchitis, diabetes, asthma, Indigestion, sinusitis, bronchitis, CNS, rheumatism, weak bones, sore throat, furuncle, flu, burns, otic infection	(Haileselasie, 2012; Chellappandian *et al.*, 2014; Altaf, 2016; Altaf *et al.*, 2018)
Nothura boraquira Spix, 1825 White-bellied Nothura	Cold	(Bezerra *et al.*, 2013)
Aratinga cactorum Kuhl, 1820 Cactus Parakeet	Eruption of new teeth in children	(Bezerra *et al.*, 2013)
Mimus saturninus Lichtenstein, 1823 Chalk-browed Mockingbird	morning sickness during pregnancy	(Bezerra *et al.*, 2013)
Dicrurus macrocercus (Vieillot,1817) black drongo	Rheumatism, Edema	(Vijayakumar *et al.*, 2015a)
Ammoperdix heyi Desert partridge	Stomach	(Lev, 2006)
Rana clamitans (Latreille, 1801) Frog	Rheumatism	(Mootoosamy and Mahomoodally, 2014)
Serpentes spp. (Linnaeus, 1758) Snake	Sore throats	(Mootoosamy and Mahomoodally, 2014)
Rana clamitans (Linnaeus, 1758) green frog	Rheumatism, Fever	(Vijayakumar *et al.*, 2015a)
Calotes versicolor (Daudin, 1802) Oriental garden lizard	Rheumatism	(Vijayakumar *et al.*, 2015b)

Hystrix indica (Kerr, 179) Indian crested porcupine	Weakness, muscle fatigue, asthma	(Aloufi and Eid, 2016; Altaf *et al.*, 2017; Borah and Prasad, 2017; Altaf *et al.*, 2018)
Macaca mulatta (Zimmermann, 1780) Rhesus Macaque	Weakness, asthma	(Padmanabhan *et al*., 2008)
Vulpes vulpes (Linnaeus, 1758) Red fox	Lungs infection	(Karma *et al*., 2017)
Bubalus bubalis (Linnaeus, 1758) Buffalo	Wound ascites, pain, joint pain, osteoporosis	(Chellappandian *et al.*, 2014)
Camelus dromedaries (Linnaeus, 1758) Camel	Acidity, hepatitis B and C	(Arshad *et al.*, 2014; Altaf *et al.*, 2018)
Capra aegagrus hircus (Linnaeus, 1758) Goat	Asthma, fever, TB, menstrual problem, anemia, jaundice, bronchitis, blindness	(Arshad *et al.*, 2014; Chellappandian *et al.*, 2014; Mootoosamy and Mahomoodally, 2014; Bagde and Jain, 2015; Vijayakumar *et al.*, 2015a; Altaf *et al.*, 2018)
Ovis aries (Linnaeus, 1758) Sheep	Fractures, sterility, flu, joint pain, skin problems, swellings, weakness	(Vats and Thomas, 2015; Vijayakumar *et al.*, 2015b; Altaf *et al.*, 2018)
Funambulus pennant Wroughton, 1905 Northern palm squirrel	Epilepsy	(Altaf *et al.*, 2017)
Bos Taurus (Bojanus, 1827) Cow	Postpartum bleeding, cold, chesty cough, lung problems	(Mootoosamy and Mahomoodally, 2014)
Equus caballus (Linnaeus, 1758) Horse	Skin infection	(Kim and Song, 2014)
Pterocarpus giganteus (Linnaeus, 1758) Large flying fox	Asthma, bronchitis	(Mishra and Rout, 2009; Vijayakumar *et al.*, 2015b)
Lepus nigricollis Cuvier, 182 black-naped hares	Wheezing trouble	(Vijayakumar *et al.*, 2015b)
Suncus murinus (Linnaeus, 1766) Asian house shrew	Snake bite	(Vijayakumar *et al.*, 2015b)
Ctenopharyngodon idella (Valenciennes, 1844), Grass carp	Treat cold, enhance memory, energy and sexual power, joint pain	(Altaf *et al.*, 2017; Altaf *et al.*, 2018)
Cyprinus carpio Linnaeus,	CNS, erysipelas, lumbago,	(Vallejo and González, 2014;

1758 Common carp	enhance memory, energy sexual power, reduce overweight, and treat cold	Altaf *et al.*, 2018)
Cirrhinus mrigala (Hamilton, 1822) Mrigal carp	Joint pain, CNS, impotency, energy	(Arshad *et al.*, 2014; Altaf *et al.*, 2018)
Labeo rohita (Hamilton, 1822), Rohu	Stomachache, , rheumatic pain, urine problem, weakness, CNS, impotency,	(Arshad *et al.*, 2014; Borah and Prasad, 2017; Altaf *et al.*, 2018)
Oreochromis niloticus (Linnaeus, 1758) Nile tilapia	Abscesses, enhance memory, carbuncle, vision, bite and impotency	(Vallejo and González, 2014; Altaf *et al.*, 2018; Altaf *et al.*, 2020)
Channa marulius (Hamilton, 1822) Great snakehead	Enhance sex power, CNS, rheumatic pain, hemoglobin	(Arshad *et al.*, 2014; Muhammad *et al.*, 2017; Altaf *et al.*, 2020)
Rita rita (Hamilton, 1822) Catfish	CNS, energy, impotency, common cold	(Arshad *et al.*, 2014; Altaf *et al.*, 2018; Altaf *et al.*, 2020)
Bagarius bagarius (Hamilton, 1822) Goonch	Body pain, burn, stomach pain	(Altaf *et al.*, 2020)
Wallago attu (Bloch and Schneider, 1801) Wallago catfish	Pile, joint pain, liver, CNS, sexual power, liver problems, cold	(Altaf *et al.*, 2018; Altaf *et al.*, 2020)
Lepidocephalichthys thermalis (Valenciennes, 1846) Spotted loach fish	Weight loss	(Vijayakumar *et al.*, 2015a)

MODERN USES OF MEAT

A new technique of using efficiently the waste of goat slaughter is documented with a confidence that deceased fauna and/or organ and their tissue wastes too can take part in synthesis of nanoparticle. This attempt may assist in calculating the pollution of environmental and afterward the various diseases. An environment friendly protocol, using the broth of goat slaughter waste produced “ZnO nanoparticles”. Transmission electron microscopy and X-ray analyses are carried out to determine the development of “ZnO nanoparticles”. Nanoparticles and some aggregates having the size of 3 to 11 nm is create and also, the reaction protocol is monitored utilizing “UV-visible spectroscopy”. Therefore, the experimentation entire span has been planned in the appearance of a model of mathematical. The surface plasmon resonance is documented at 359 nm and possible concerned mechanism for the biosynthesis of “ZnO nanoparticles” has also been planned (Jha and Prasad, 2016).

The Muslims are more conscious of the food. This consciousness is enhanced along with enhancing adulteration. Therefore, meat has become a main concern for researchers and consumers. Lots of methods for distinguished “Halal meat” have been

developed to tackle problems with meat verification, like GCMS, PCR, HPLC and FTIR. Nanobiotechnology has currently shown high potential in sensing applications for "Halal meat". Cheaper materials and rapid testing of gold nanoparticle-based biosensors are projected to alter conventional biosensing of "Halal meat". Selected types of meat were one of the objectives for developing gold nanoparticles in the recognition. Detection of meat products using gold nanoparticles is based on the color changed of its optical properties. In addition, gold nanoparticles demonstrate high potential to recognize specific meats in products of meat. Many folk and modern processed meat products have been verified on the use of gold nanoparticles, like meat burgers. Conversely, verification of meat on foodstuff samples should be completed prior to the commercialization. Gold nanoparticles provide new substitute to luxurious method. Furthermore, particular detector for various meats of need to be planned (Subara and Jaswir, 2018).

REFERENCES

Abrhaley, A., S. Leta. 2018. Medicinal value of camel milk and meat. Journal of applied animal research. 46: 552-558.

Aloufi, A., E. Eid. 2016. Zootherapy: A study from the northwestern region of the kingdom of Saudi Arabia and hashemite kingdom of Jordan. Ind J Trad Knowledge. 15: 561-569.

Altaf, M. 2016. Assessment of Avian and Mammalian Diversity at Selected Sites along river Chenab University of Veterinary and Animal Sciences, Lahore-Pakistan.

Altaf, M., A.M. Abbasi, M. Umair, M.S. Amjad, K. Irshad, A.M. Khan. 2020. The use of fish and herptiles in traditional folk therapies in three districts of Chenab riverine area in Punjab, Pakistan. J Ethnobiol Ethnomed. 16: 1-21.

Altaf, M., A. Javid, M. Umair, K.J. Iqbal, Z. Rasheed, A.M. Abbasi. 2017. Ethnomedicinal and cultural practices of mammals and birds in the vicinity of river Chenab, Punjab-Pakistan. Journal of ethnobiology and ethnomedicine. 13: 1-24.

Altaf, M., M. Umair, A.R. Abbasi, N. Muhammad, A.M. Abbasi. 2018. Ethnomedicinal applications of animal species by the local communities of Punjab, Pakistan. Journal of ethnobiology and ethnomedicine. 14: 1-25.

Arshad, M., M. Ahmad, E. Ahmed, A. Saboor, A. Abbas, S. Sadiq. 2014. An ethnobiological study in Kala Chitta hills of Pothwar region, Pakistan: multinomial logit specification. J Ethnobiol Ethnomed. 10: 13.

Bagde, N., S. Jain. 2015. Study of traditional man-animal relationship in chhindwara district of Madhya Pradesh, India. Journal of Global Biosciences. 4: 1456-1463.

Bezerra, D.M.M., H.F.P. de Araujo, Â.G.C. Alves, R.R.N. Alves. 2013. Birds and people in semiarid northeastern Brazil: symbolic and medicinal relationships. Journal of ethnobiology and ethnomedicine. 9: 3.

Boler, D.D., D.R. Woerner. 2017. What is meat? A perspective from the American Meat Science Association. Animal Frontiers. 7: 8-11.

Borah, M.P., S.B. Prasad. 2017. Ethnozoological study of animals based medicine used by traditional healers and indigenous inhabitants in the adjoining areas of

Gibbon Wildlife Sanctuary, Assam, India. Journal of ethnobiology and ethnomedicine. 13: 1-13.

Chellappandian, M., P. Pandikumar, S. Mutheeswaran, M.G. Paulraj, S. Prabakaran, V. Duraipandiyan, S. Ignacimuthu, N. Al-Dhabi. 2014. Documentation and quantitative analysis of local ethnozoological knowledge among traditional healers of Theni district, Tamil Nadu, India. Journal of ethnopharmacology. 154: 116-130.

Cheung, P.C.K., B.M. Mehta. 2015. Handbook of food chemistry. Springer Berlin Heidelberg.

Haileselasie, T.H. 2012. Traditional zootherapeutic studies in Degu'a Tembien, Northern Ethiopia. Current Research Journal of Biological Sciences. 4: 563-569.

Hakeem, F., M. Altaf, S. Manzoor, K. Rauf, B. Mumtaz, M. Bashir, R. Haider, S.I. Farooq, L. Safdar, M. Altaf. 2017. Assessment of behavioral study, human activities impacts and interaction with Streak laughingthrush (*Trochalopteron lineatum*) in district Bagh, Azad Jammu and Kashmir-Pakistan. Journal of Wildlife and Ecology. 1: 1-7.

Hui, Y.H. 2012. Handbook of meat and meat processing. CRC press.

Jha, A.K., K. Prasad. 2016. Synthesis of ZnO nanoparticles from goat slaughter waste for environmental protection. International Journal of Current Engineering and Technology. 6: 147-151.

Keeton, J.T., S. Eddy. 2004. Chemical composition. In: W. Jensen, C. Devine and M. Dikeman (eds.) yclopedia of meat sciences. Enc. Elsevier Academic Press, Oxford.

Kim, H., M.-J. Song. 2014. Analysis of ethnomedicinal practices for treating skin diseases in communities on Jeju Island (Korea).

Lev, E. 2006. Healing with animals in the Levant from the 10 th to the 18 th century. Journal of ethnobiology and ethnomedicine. 2: 11.

McNeill, S.H. 2014. Inclusion of red meat in healthful dietary patterns. Meat science. 98: 452-460.

Mishra, N., S. Rout. 2009. Ethno-zoological studies and medicinal values of Similipal Biosphere Reserve, Orissa, India. African Journal of Pharmacy and Pharmacology. 5: 6-11.

Mootoosamy, A., M.F. Mahomoodally. 2014. A quantitative ethnozoological assessment of traditionally used animal-based therapies in the tropical island of Mauritius. Journal of ethnopharmacology. 154: 847-857.

Mughal, S., M. Pervaz, S.M. Bashir, S.S. Shamashad. 2020. Assessment of diversity and ethnopharmacological uses of birds in Chakar, Hattian Bala district, Azad Jammu and Kashmir -Pakistan. Journal of Wildlife and Ecology. 4: 35-44.

Muhammad, N., A.M. Khan, M. Umair, A. Qazi, A, M. Yaqoob, S. Ashraf, Q. khan, M. Farooq. 2017. Assessment of distribution and ethnocultural uses of the Sol (*Channa marulius*) in Punjab, Pakistan. Journal of Wildlife and Ecology. 1: 35-41.

O'Connor, L.E., J.E. Kim, W.W. Campbell. 2017. Total red meat intake of≥ 0.5 servings/d does not negatively influence cardiovascular disease risk factors: a

systemically searched meta-analysis of randomized controlled trials. The American journal of clinical nutrition. 105: 57-69.

Rauf, K., M. Altaf, B. Mumtaz, M. Altaf, R. Haider, B. Safeer, S.I. Farooq, L. Safdar, M. Manzoor, S. Yasrub, S.M. Bashir, A. Iftikhar. 2017. Assessment of behavior, distribution, ecology and interaction study of Cinnamon Tree Sparrow (*Passer rutilans*) in district Bagh-Pakistan. Journal of Wildlife and Ecology. 1: 43-49.

Schönfeldt, H.C., N. Gibson. 2008. Changes in the nutrient quality of meat in an obesity context. Meat science. 80: 20-27.

Subara, D., I. Jaswir. 2018. Gold Nanoparticles: Synthesis and application for Halal Authentication in Meat and Meat Products. International Journal on Advanced Science, Engineering and Information Technology. 8: 1633-1641.

Vallejo, J.R., J.A. González. 2014. Fish-based remedies in Spanish ethnomedicine: a review from a historical perspective. Journal of ethnobiology and ethnomedicine. 10: 37.

Vats, R., S. Thomas. 2015. A study on use of animals as traditional medicine by Sukuma Tribe of Busega District in North-western Tanzania. Journal of ethnobiology and ethnomedicine. 11: 1-11.

Vijayakumar, S., S. Prabhu, J.M. Yabesh, R. Prakashraj. 2015a. A quantitative ethnozoological study of traditionally used animals in Pachamalai hills of Tamil Nadu, India. Journal of ethnopharmacology.

Vijayakumar, S., J.M. Yabesh, S. Prabhu, M. Ayyanar, R. Damodaran. 2015b. Ethnozoological study of animals used by traditional healers in Silent Valley of Kerala, India. Journal of ethnopharmacology. 162: 296-305.

Williams, P. 2007. Nutritional composition of red meat. Nutrition & Dietetics. 64: S113-S119.

Zhang, X., C.M. Owens, M.W. Schilling. 2017. Meat: the edible flesh from mammals only or does it include poultry, fish, and seafood? Animal Frontiers. 7: 12-18.

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