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Chemical composition, ethnomedicinal and industrial uses of bones-a review

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SUMMARY

Bone consists of the highest ratio of the connective tissue mass of animal body. Matrix of bone is mineralized as well as continually regenerated the whole lifespan as a result of bone turnover. It consists of calcified cartilage, cartilaginous, marrow, cancellous and cortical structures. This body part has "mineralized" as well as "non mineralized" parts of the "cancellous" and "cortical aregions" of bones. The structure of the crystalline calcium phosphate is solid phase in bone. Bone is composed of water, lipids, collagen, mineral and noncollagenous proteins. Different ethnobiologists noted that different species of animals i.e. cinereous vulture (*Aegypius monachus*), goat (*Capra aegagrus*), alpine musk deer (*Moschus chrysogaster*), crow (*Corvus* spp.), Crab-eating macaque (*Macaca fascicularis*), common carp (*Cyprinus carpio*), pig (*Sus* spp.), fruit bat (*Pteropus* spp.), deer (*Cervus* spp.), horse (*Equus ferus caballus*) and Indian gagata (*Gagata cenia*) used for different ailments like improves heart strength, wound, digestion, ear ache, cough, lumbago, skin, eye infection, chest pain, neuralgia and urine problem.

Keywords: Ethnomedicine, Bone, Animal, Ailments

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INTRODUCTION

Bone consists of the highest ratio of the connective tissue mass of animal body. Matrix of bone is mineralized as well as continually regenerated the whole lifespan as a result of bone turnover. It consists of calcified cartilage, cartilaginous, marrow, cancellous and cortical structures. This body part has "mineralized" and "non mineralized components" of the "cancellous" and cortical "aregions" of bones. The structure of the crystalline calcium phosphate is solid phase in bone (De Jong, 1926; Fernandez-Moran and Engström, 1957).

CHEMICAL COMPOSITION OF BONE

Bone is composed of water, lipids (Goldberg and Boskey, 1996; Mroue *et al.*, 2016), collagen (Garnero, 2008), mineral (Robey and Boskey, 2008; Boskey and Robey, 2013) and noncollagenous proteins (Schäfer *et al.*, 2003; Boskey and Villarreal-Ramirez, 2016).

Lipids are composed of less than 2% mass of bone; though, lipids have few major impacts on bone possessions. The lipid droplet on the exterior of collagen filament in compact bone which emerge to be linked through the mineral were recognized as triglycerols (Goldberg and Boskey, 1996; Mroue *et al.*, 2016).

The major building complex of the bone's organic and inorganic component fiber connection is type I collagen, that is triple helical particle comprising two identical "αl(1)" chains and a formational alike, but heritably dissimilar, "αl(2)" chain (Bilezikian *et al.*, 2008). Collagen "α" chains are identified by a "Gly-X-Y" recurring trinity and by many post-translational alterations. Quantification of such bone-deduced collagen networks in urine has verified to be a fine estimate of bone desorption (Garnero, 2008).

The mineral part of bone is a nano-sized, extremely alternative cognate of the naturally existing deposit, hydroxyl-apatite. The chief replacements are amid carbonate, magnesium, and acid phosphate, next to by means of further mark out essentials, the matter of which relies on diet and surroundings. While the clear-cut chemical character of the preliminary deposit produced has been deliberated (Dey *et al.*, 2010; Akiva *et al.*, 2016), current records put forward the first mineral retainers are disarrayed and assorted (Robey and Boskey, 2008; Boskey and Robey, 2013).

Non-collage nous proteins (NCPs) comprise ten to fifteen percent of the entire protein of bone. NCPs are diversified; possess part in sorting the ECM, harmonizing "cyto-matrix" and "mineral-matrix" connections, and synchronizing the conversion of organic compounds into inorganic compounds. Roughly one-fourth of the entire NCP material originates externally. Such division is mainly made up of serum-derived proteins, like albumin and α2-HS-glycoprotein, that are acidic in their composition and stick to bone collagen for the reason that their resemblance in favor of hydro-xyapatite. Even though such proteins are not originated internally, these proteins may strive impacts on conversion of organic compounds into inorganic compounds of matrix and bone cell multiplication (Schäfer *et al.*, 2003; Boskey and Villarreal-Ramirez, 2016). Proteoglycans are complex molecules which enclose acidic monosaccharide unit in form of shorter chain (glycosaminoglycans) connected near middle interior protein. Bone collagen encloses numerous components of this category. Glycosylated proteins among various purposes proliferate inside bone. Particularly distinctive feature of bone development is the manufacturing of elevated amounts of alkaline phosphatase. Bone cells manufacture round about 12 proteins to facilitate can arbitrate cell connection: components of the little integrin-obligating ligand, "N-glycosylated protein", "fibronectin, type I collagen", "thrombospondin", "fibrillin", "vitronectin" and osteoadherin (Bilezikian *et al.*, 2008; Boskey and Robey, 2013).

ETHNOMEDICINAL USES OF BONES

Different ethnobiologists noted that different species of animals i.e. cinereous vulture (*Aegypius monachus*), goat (*Capra aegagrus*), alpine musk deer (*Moschus chrysogaster*), crow (*Corvus* spp.), Crab-eating macaque (*Macaca fascicularis*), common carp (*Cyprinus carpio*), pigs (*Sus* spp.) fruit bat (*Pteropus* spp.) Deer (*Cervus* spp.), Horse (*Equus ferus caballus*) and Indian gagata (*Gagata cenia*) used for different ailments like improves heart strength (Yeshi *et al.*, 2017), wound (Altaf

et al., 2018), digestion (Yeshi *et al.*, 2017), ear ache (Vijayakumar *et al.*, 2015b; Altaf *et al.*, 2017), Cough (Vijayakumar *et al.*, 2015b), lumbago (Vallejo and González, 2014), skin (Bullitta *et al.*, 2018), eye (Ghosh *et al.*, 2013), chest pain (Ghosh *et al.*, 2013), neuralgia (Vijayakumar *et al.*, 2015a) and urine problem (Altaf *et al.*, 2020) (Table 1).

Table 1: Ethnomedicinal uses of bones.

Species name	**Ailment**	**References**
Cinereous vulture (*Aegypius monachus*)	Improves heart strength	(Yeshi *et al.*, 2017)
Goat (*Capra aegagrus*)	Wound	(Altaf *et al.*, 2018)
Alpine musk deer (*Moschus chrysogaster*)	Digestion	(Yeshi *et al.*, 2017)
Crow (*Corvus* spp.)	Ear ache	(Vijayakumar *et al.*, 2015b; Altaf *et al.*, 2017)
Crab-eating macaque (*Macaca fascicularis*)	Cough	(Vijayakumar *et al.*, 2015b)
Common carp (*Cyprinus carpio*)	Lumbago	(Vallejo and González, 2014)
Pigs (*Sus* spp.)	Skin	(Bullitta *et al.*, 2018)
Fruit bat (*Pteropus* spp.)	Eye	(Ghosh *et al.*, 2013)
Deer (*Cervus* spp.)	Chest pain	(Ghosh *et al.*, 2013)
Horse (*Equus ferus caballus*)	Neuralgia	(Vijayakumar *et al.*, 2015a)
Indian gagata (*Gagata cenia*)	Urine problem	(Altaf *et al.*, 2020)

INDUSTRIAL USES OF BONES

There are many implications in favor of each component of bones, the derivative of the animal protein deal, in different divisions of manufacturing. Moreover the straight make use of bones used for such items like buttons, knife-handles, and so forth, at hand is a great variety of priceless derived goods. The mineral substance phosphates, lime is of worth like synthetic compost and the same as a constituent of porcelain; the fat is agitated via soap manufacturer and bursar, furthermore the jellylike components are the basis of a large amount of the stick and gelatin of selling. Supplementary, through dried out distillation, not merely bone charcoal, a priceless refining standard, other than ammonia and bone-tar are secured. Individually, for the most part precious harvest as of bones is animal charcoal that is acquired the same as a deposit on or after the carbonization of scoured bones elsewhere get in touch with environment. The bones are carbonized in respond extremely alike in plan to coal-gas respond. The vaporous yield include a gas appropriate intended for lighting and warm-up, a tar, and ammonia water containing alcohol (G.I., 2011).

REFERENCES

Akiva, A., M. Kerschnitzki, I. Pinkas, W. Wagermaier, K. Yaniv, P. Fratzl, L. Addadi, S. Weiner. 2016. Mineral formation in the larval zebrafish tail bone occurs via an acidic disordered calcium phosphate phase. Journal of the American Chemical Society. 138: 14481-14487.

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: 41.

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: 55.

Bilezikian, J.P., L.G. Raisz, T.J. Martin. 2008. Principles of bone biology. Academic press.

Boskey, A.L., P.G. Robey. 2013. The composition of bone. Primer on the metabolic bone diseases and disorders of mineral metabolism. 49-58.

Boskey, A.L., E. Villarreal-Ramirez. 2016. Intrinsically disordered proteins and biomineralization. Matrix Biology. 52: 43-59.

Bullitta, S., G.A. Re, M.D.I. Manunta, G. Piluzza. 2018. Traditional knowledge about plant, animal, and mineral-based remedies to treat cattle, pigs, horses, and other domestic animals in the Mediterranean island of Sardinia. Journal of ethnobiology and ethnomedicine. 14: 1-26.

De Jong, W. 1926. La substance minerale dans les os. Recueil des Travaux Chimiques des Pays-Bas. 45: 445-448.

Dey, A., P.H. Bomans, F.A. Müller, J. Will, P.M. Frederik, G. de With, N.A. Sommerdijk. 2010. The role of prenucleation clusters in surface-induced calcium phosphate crystallization. Nature materials. 9: 1010-1014.

Fernandez-Moran, H., A. Engström. 1957. Electron microscopy and X-ray diffraction of bone. Biochimica et biophysica acta. 23: 260-264.

G.I. 2011. Industrial Uses of Bone. http://gluedideas.com/Encyclopedia-Britannica-Volume-3-Baltimore-Braila/Industrial-Uses-of-Bone.html.

Garnero, P. 2008. Biomarkers for osteoporosis management. Molecular diagnosis & therapy. 12: 157-170.

Ghosh, T., R. Singhamahapatra, F. Mandal. 2013. Traditional use of animals among Santhals of Bankura district. International Journal of Latest Research in Science and Technology. 2: 95-96.

Goldberg, M., A.L. Boskey. 1996. Lipids and biomineralizations. Progress in histochemistry and cytochemistry. 31: III-187.

Mroue, K.H., J. Xu, P. Zhu, M.D. Morris, A. Ramamoorthy. 2016. Selective detection and complete identification of triglycerides in cortical bone by high-resolution 1 H MAS NMR spectroscopy. Physical Chemistry Chemical Physics. 18: 18687-18691.

Robey, P.G., A.L. Boskey. 2008. The composition of bone. Primer on the metabolic bone diseases and disorders of mineral metabolism. 7: 32-38.

Schäfer, C., A. Heiss, A. Schwarz, R. Westenfeld, M. Ketteler, J. Floege, W. Müller-Esterl, T. Schinke, W. Jahnen-Dechent. 2003. The serum protein α 2–Heremans-Schmid glycoprotein/fetuin-A is a systemically acting inhibitor of ectopic calcification. The Journal of clinical investigation. 112: 357-366.

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: 1-31.

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.

Yeshi, K., P. Morisco, P. Wangchuk. 2017. Animal-derived natural products of Sowa Rigpa medicine: Their pharmacopoeial description, current utilization and zoological identification. Journal of ethnopharmacology. 207: 192-202.

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