

ADVANCES IN MEDICO-CHEMICAL GEOGRAPHY IN CHINA

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ABSTRACT: We have made progress in medico-chemical geography as follows: the correlative law of organism with geochemical environment; the geochemico-ecological classification of chemical elements; the types of formative cause of biogeochemical provinces in China; the parabolic correlation between contents of iodine in drinking water and prevalence rate of endemic goiter; the discovery and proof of the low selenium zone in China; the successive discovery of endemic fluorosis of the types of pollution from burning coal, drinking high fluoride tea and high fluoride table salt from the year 1978; the study on chemical geography of schistosomiasis and the compilation of the Atlas of Endemic Diseases and Their Environments in the People's Republic of China.

KEY WORDS: medico-chemical geography, biogeochemical province

Medico-chemical geography is the verge subject between medicine and chemical geography. Medico-chemical geography of separated from chemical geography. The investigation and study of medico-chemical geography have been carried out on a large scale in China and mighty advances have been made. They are as follows^[1-3].

1. The correlative law of organism with geochemical environment. There are linear positive correlations between earth crust and soil, earth crust and living substance, soil and plant, sea water and man, earth crust and man respectively in terms of natural logarithm values of average abundances of chemical elements, their correlation coefficients being 0.96^{***} , 0.86^{**} , 0.85^{**} , 0.84^{**} and 0.74^{*} respectively (Fig.1)^[3].

2. The geochemico-ecological classification of chemical elements. In accordance with the law of the optimum nutritional concentration and geochemico-ecological characters of chemical elements, chemical elements are divided into three types: life elements, harmful elements and unharmed elements (Table 1).

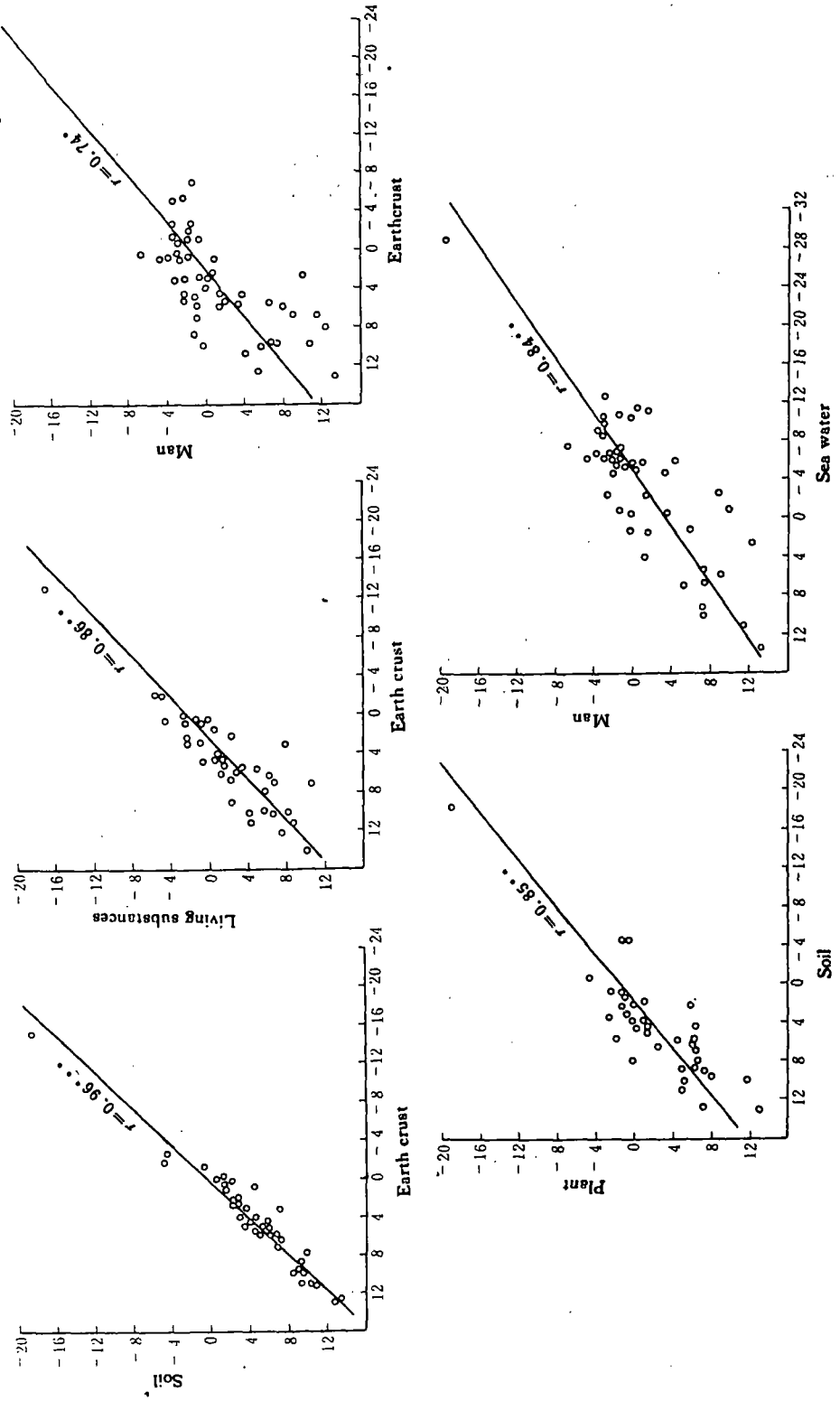


Fig. 1 Relationships between earth crust and soil, earth crust and living substance, soil and plant, sea-water and man, earth crust and man for natural logarithm values of average abundances of chemical elements

Table 1 Geochemico-ecological classification of chemical elements

(H)																				He
<u>Li</u>	<u>Be</u>											(B)	(C)	(N)	(O)	(F)				
Δ	Δ											Δ	Δ	Δ	Δ	Δ				
(Na)	(Mg)																			
Δ	Δ																Δ	Δ	Δ	
(K)	(Ca)	Sc	Ti	(V)	(Cr)	(Mn)	(Fe)	(Co)	<u>Ni</u>	(Cu)	(Zn)	Ca	Ge	<u>As</u>	(Se)	Br	Kr			
Δ	Δ				Δ	Δ	Δ	Δ	Δ	Δ	Δ				Δ	Δ				
Rb	<u>Sr</u>	Y	Z	Nb	(Mo)	Tc	Bu	Ph	Pd	<u>Ag</u>	<u>Cd</u>	Ln	(Sn)	<u>Sb</u>	Te	(I)	Xe			
	Δ				Δ					Δ	Δ			Δ		Δ				
Cs	<u>Ba</u>	La	Hf	Ta	W	Re	Os	I	Pt	Au	<u>Hg</u>	<u>Tl</u>	<u>Pb</u>	Bi	Po	At	Rn			
	Δ										Δ	Δ	Δ							
Fr	<u>Ra</u>	Ac	Th	Pa	<u>u</u>															
	Δ				Δ															

Note: (): life elements; : harmful elements; no-symbol: unharmed elements; Δ: elements which can cause biogeochemical endemia.

3. The types of formative causes of biogeochemical provinces in China. According to the leading factors of migration and accumulation of chemical elements, biogeochemical provinces in China are divided into eight types of formative causes: evaporation-concentration type, ore-deposit and mineralization layer type, mineral spring type, organism accumulation type, humid mountain type, bog peat type, sand soil type and high altitude type^[3].

The parabolic correlation between contents of iodine in drinking water and prevalence rate of endemic goitre: $Y = 114.23 - 37.09X + 2.92X^2$, $R^2 = 0.66$, $\eta_{yx} = 0.59$, $\eta_{xy} = 0.84$ (Fig.2)^[3-6]. Five percent incidence of goiter is used as the criterion to determine the endemic area, the optimum iodine concentration in drinking water can be established from the intersection of the parabolic curve with the 5% incidence line in Fig.2. As shown in Fig.2, the optimum range is approximately 10-300 r/ L, antilogarithms of $\ln(10C) = 4.6-8.0$ in Fig.2 are divided by 10. It can be seen from Fig.2 that the lower the iodine content in drinking water, the higher the incidence of endemic goiter, implying an inverse relation when it is lower than the lower limit of optimum concentration (10 r/ L); the higher the iodine content in drinking water, the higher incidence of endemic goiter, implying a positive relation when it is higher than the upper limit of optimum concentration (300r/ L). Animal tests have proven this result.

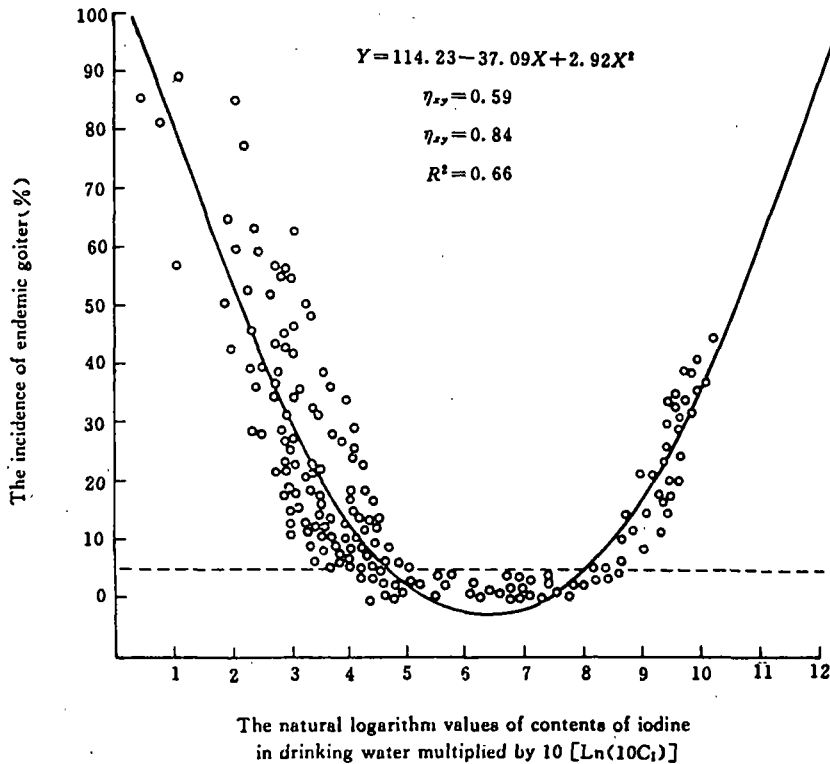


Fig.2 Relationship between the iodine content within drinking water and the incidence of endemic goiter

4. The discovery and proof of the zone of low selenium in China. Selenium content in grain is lower than 20ppb, and selenium content in human hair is lower than 110 ppb. In respect to mean selenium contents in grain and human hair, the difference between low selenium zone and normal selenium content zone is very significant ($P < 0.001$). It is found that white muscle disease for animal and Keshan disease and Kaschin-Beck disease for man, which are related to selenium deficiency, are mainly distributed in so-called low selenium zone^[7-16].

5. Successive discovery of endemic fluorosis types caused by pollution from burning coal, drinking high fluoride tea and high fluoride table salt since 1978^[17-18].

6. Study on chemico-geographical environment. Chemico-geographical environment is the essential ecological factor in epidemic of schistosomiasis. The content of trace element Sr, Ba, Rb, Sc, Cs, F, Th, Pb, Zn, Cd, Sb, Se, La, Ce, Yb, Tb, Lu in water bodies (filtered water, the water not being filtered and sediments) in endemic areas is higher than those of nonendemic areas. However the contents of V, Fe, Ni, Mo, As, Hg of water bodies in en-

demic areas is lower than those of nonendemic areas, The molal ratio of Ca to Mg of sediments in endemic areas is approximately equal to those (0.8) suitable for the existence of miracidia^[19].

7. The compilation of the Atlas of Endemic Diseases and Their Environments in the People's Republic of China^[20].

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