

## THE ANTI-AGING EFFECT OF PEARL OYSTER SHELL POWDER (POSP)

Tong Zhonghang      Gu Weizheng  
Zhu Gen              Zhao Yuanwei

*Institute of Endocrinology, Zhejiang Medical University*

The rates of improvement of subjective symptoms in 146 elderly people after taking pearl oyster shell powder 3.0g, 1.5g, and a placebo daily for 2 months were 94.61%, 34.18% and 4.25% respectively.

The serum  $T_4$ ,  $T_3$ uR,  $FT_4$ I and  $FT_3$ I values in 104 elderly people after taking POSP for two months were markedly lowered, while the serum  $rT_3$ ,  $T_3/T_4$ , and  $rT_3/T_4$  values became significantly higher after taking the medicine. There was no significant difference in the serum  $T_3$  values and the serum cortisol levels before and after taking the POSP. The serum FSH, T, and T/LH ratio increased, while the serum LH and  $E_2/T$  ratio decreased in 113 elderly subjects.

Pearl powder is a traditional Chinese medicine long believed to have anti-aging action. The pharmaceutical department of our university showed by chemical analysis that pearl powder and pearl oyster shell powder (prepared from the inner superficial layer of pearl oyster shell) are similar chemically. The latter is very cheap, however, and hence practical for wide application. We studied the effect of POSP on aging and the endocrines in 146 aged people from October 1984 through April 1985.

### MATERIALS AND METHODS

The 146 subjects were healthy staff members of our university, divided into three groups. Group I included 34 subjects (16 males and 18 females) of 47-80 years (mean age 57.2 years), who were given one capsule (containing 0.75g POSP) twice a day. Group II comprised 70 subjects (32 males and 38 females) of 50 to 80 (mean age 57.8 years) who were given two capsules (1.5g POSP) twice a day. Group III comprised 42 subjects (24 males and 18 females) of 50 to 76,

(mean age 57.2 years), who were given two placebo capsules (1.5g calcium carbonate) twice a day.

The subjective symptoms and the serum thyroid hormones, i.e. cortisol (F), testosterone (T), estradiol ( $E_2$ ), follicular stimulating hormone (FSH) and luteinizing hormone (LH) levels before and after two months of medication were studied.

Subjective symptoms included hypomnesia, insomnia, dreaminess, fatigue, palpitation, blurred vision, headache, constipation, muscle aching, cold feeling in the extremities, tinnitus, poor appetite, reduced sexuality, and slight edema. The severity of the symptoms was expressed in 4 degrees.

The POSP was supplied by Deqing County Aquatic Breeding Corporation, Zhejiang Province. The serum  $T_4$ ,  $T_3$  RIA kits were provided by Wuzhou Isotope Corporation, Sichuan Province, and the serum  $rT_3$  RIA kits and  $T_3$  uR RIA kits by Beijing Atomic Energy Corporation and Shanghai Chemical Reagent Research Institute. The serum cortisol RIA kits were supplied by Beijing Chemical Plant, and the serum  $E_2$  and T RIA kits by Shanghai Research Institute of Endocrinology. The serum FSH and LH RIA kits were provided by Amersham Corporation. The statistical significance of thyroid and sex hormones was tested by non-parameter method.

### RESULTS

1. The symptoms of hypomnesia, insomnia, dreaminess, fatigue and palpitation markedly improved two months after taking POSP, as were the blurred vision, headache, tinnitus, muscle

aching and cold feeling in the extremities. Appetite and sexuality were also enhanced. The improvement rates of groups taking 3.0g and 1.5g of POSP daily, and the placebo group were 94.16%, 34.18% and 4.15% respectively, showing marked differences. White hair darkened to various degrees in 4 subjects.

2. The levels of serum thyroid hormones in 104 subjects after medication are shown in Table 1. The values of serum  $T_4$ ,  $T_3$ uR,  $FT_4$ I and  $FT_3$ I significantly decreased and serum  $rT_3$ ,  $T_3/T_4$  and  $rT_3/T_4$  ratio were remarkably elevated. There was no significant difference in the serum  $T_3$  values.

3. Serum cortisol levels before and after medication are shown in Table 2. In order to compare the effect of POSP with that of Radix Ginseng on adrenal cortex we list past results of "serum cortisol determination in 200 elderly people" in Table 2. The serum cortisol values before taking POSP were  $10.68 \pm 6.06 \mu\text{g/dl}$  in 37 elderly patients compared with the serum cor-

tisol values in the healthy aged ( $10.93 \pm 8.89 \mu\text{g/dl}$ ) reported previously by our laboratory show the basic serum cortisol levels to be identical in the elderly in these two groups.

The serum cortisol levels after taking POSP were significantly different from those after taking Radix Ginseng ( $P < 0.01$ ), indicating that POSP did not noticeably elevate the serum cortisol levels as Radix Ginseng did. There was no significant difference between the serum cortisol levels before and after taking POSP ( $P > 0.05$ ), showing that POSP did not affect these levels.

4. The serum FSH, LH,  $E_2$  and T levels before and after POSP medication are shown in Table 3.

The serum FSH values were markedly elevated in both sexes, while the serum LH values were markedly decreased in males after taking POSP for two months. There was no significant difference in the serum LH values in females, with insignificant modifications in their serum  $E_2$  levels after taking POSP. The serum T levels

Table 1. Serum thyroid hormones in 104 subjects before and after POSP medication

	$T_4$ $\mu\text{g/dl}$	$T_3$ $\text{ng/ml}$	$T_3$ uR	$rT_3$ $\text{ng/dl}$	$FT_4$ I	$FT_3$ I	$T_3/T_4$	$rT_3/T_4$
Before Posp	$8.44 \pm 2.99$	$1.35 \pm 0.27$	$0.86 \pm 0.06$	$29.37 \pm 6.85$	$7.20 \pm 2.65$	$1.18 \pm 0.25$	$17.20 \pm 4.57$	$4.01 \pm 1.76$
After Posp	$6.63 \pm 1.16$	$1.26 \pm 0.26$	$0.83 \pm 0.09$	$35.04 \pm 7.94$	$5.45 \pm 1.39$	$1.04 \pm 0.30$	$29.15 \pm 6.40$	$5.54 \pm 1.70$
X <sup>2</sup>	19.47	2.64	25.25	14.82	23.89	8.99	8.89	18.89
P	< 0.001	> 0.05	< 0.001	< 0.001	< 0.001	< 0.01	< 0.01	< 0.001

Table 2. Serum cortisol levels ( $\mu\text{g/dl}$ ) before and after medication ( $M \pm SD$ )

Groups	(1) Healthy elderly N = 163	(2) elderly after taking Radix Ginseng N = 26	(3) elderly before taking POSP N = 37	(4) elderly after taking POSP N = 37
Serum cortisol	$10.93 \pm 8.89$	$74.20 \pm 78.86$	$10.68 \pm 6.06$	$10.39 \pm 7.41$
t'	$t'_1 = 0.206$	$t'_2 = 10.137$	$t'_3 = 0.190$	$t'_4 = 0.392$
P	$P_1 > 0.05$	$P_2 < 0.01$	$P_3 > 0.05$	$P_4 > 0.05$

\*  $t_0$ ,  $P_1$  for comparison between (1) and (3)  
 $t_1$ ,  $P_2$  for comparison between (2) and (4)  
 $t_2$ ,  $P_3$  for comparison between (3) and (4)  
 $t_3$ ,  $P_4$  for comparison between (1) and (4)

markedly increased in females after taking the drug, but no significant difference was found in the few males tested.

The relative regression analysis between  $E_2$  and T was as follows: before taking POSP,  $r=0.5905$ ,  $P<0.05$ ,  $Y=-1.7565+1.5683X$ ; after

taking POSP,  $r=0.587$ ,  $P>0.05$ .

5. Table 4 shows the serum  $E_2/T$  and T/LH ratios before and after medication in 23 subjects.

The serum  $E_2/T$  ratio markedly decreased while the serum T/LH ratio dramatically increased after medication in the female subjects.

Table 3 Serum FSH, LH,  $E_2$  and T level before and after taking POSP

		No.	Before POSP	After POSP	$X^2$	P
FSH (mIU/ml)	male	29	11.09±10.34	12.34±11.83	4.968	< 0.05
	female	39	48.32±20.66	60.44±29.94	26.69	< 0.001
	total	68	29.16± 2.27	24.09± 2.96	22.87	< 0.001
LH (mIU/ml)	male	29	17.43±15.12	21.31± 7.83	18.89	< 0.001
	female	37	30.45±19.48	38.06±20.32	1.36	> 0.05
	total	66	22.93± 2.07	16.60± 2.32	16.25	< 0.001
$E_2$ (pg/ml)	male	9	94.00±92.21	73.33±23.53	0.125	> 0.05
	female	28	63.75±47.33	65.11±47.90	0.962	> 0.05
	total	37	46.50± 2.25	52.06± 2.24	1.44	> 0.05
T (ng/dl)	male	9	255.22±256.18	400.44±278.44	0	> 0.05
	female	28	47.3±49.63	60.42±60.89	5.76	< 0.05
	total	37	47.12± 3.55	79.46± 3.27	4.82	< 0.05

Table 4. Serum  $E_2/T$ , T/LH ratio before and after taking POSP

	$E_2/T$			T/LH		
	Male N = 9	Female N = 18	Total N = 27	Male N = 9	Female N = 18	Total N = 27
Before POSP	0.66±0.34	3.26±2.78	1.53±0.32	10.59±4.61	2.76±7.27	1.32±5.30
After POSP	0.96±1.04	1.71±1.66	0.74±0.37	51.56±30.13	3.10±2.54	3.69±5.41
$X^2$	3.20	4.50	8.52	0.80	4.50	6.26
P	> 0.05	< 0.05	< 0.01	> 0.05	< 0.05	< 0.05

#### DISCUSSION

The results indicate that POSP promotes memory and functions of the autonomic nervous system besides stimulating appetite and sexuality. The white hair in 4 subjects becoming darker was a sign of rejuvenation. Wang Wenjian et al.<sup>1</sup> noted that elevation of  $E_2/T$  ratio could be regarded as an index of Kidney deficiency. We observed that POSP could alter the serum FSH and LH

levels and elevate the serum T concentration, lower the  $E_2/T$  ratio in the aged, which could partially explain the anti-aging mechanism. POSP may also have some effect in improving the body's immunological function,<sup>2</sup> a hypothesis warranting further investigation.

The serum  $T_3$ ,  $T_4$ ,  $FT_3I$  and  $FT_4I$  values in this series were lower than in healthy adults, as we previously reported.<sup>3</sup> The serum  $T_4$  and

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FT<sub>4</sub>I values markedly decreased after medication, while the serum rT<sub>3</sub> values rose, indicating that POSP increased the activity of 5-deiodinase and thus increased the transformation of T<sub>4</sub> to rT<sub>3</sub> in the peripheral tissues. Although the serum T<sub>4</sub> values decreased after taking POSP, the symptoms of fatigue and cold feeling were not aggravated clinically, but improved in most subjects. This was probably due to the fact that serum T<sub>3</sub> was not decreased by POSP, and that the physiological activity of T<sub>3</sub> was three to five times stronger than that of T<sub>4</sub>. It was estimated that two-thirds of the biological activity of thyroid hormones was affected by T<sub>3</sub>.

The serum cortisol levels were not correlated with the process of aging.<sup>4,5</sup> There was no noticeable change in the serum cortisol values after taking POSP, suggesting no effect on the metabolism of glucocorticoid hormones. With the sex differences, plus some women at menopause in the present series, the values of serum E<sub>2</sub>, T, FSH and LH were scattered but still significant.

The present series demonstrated that POSP elevated the serum FSH values in both sexes, decreased the serum LH values in males, increased the serum T values and serum T/LH ratio in females and decreased the serum E<sub>2</sub>/T ratio in females. The elevation of serum E<sub>2</sub>/T ratio in males

was considered an index of Kidney deficiency by some authors.<sup>1,6</sup> The inconsistency of the increase of serum T led to the difference of serum E<sub>2</sub>/T ratios in males and females. The changes in pituitary-sex gland axis hormones may provide the material base for the anti-aging effect of POSP.

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