

HMR Shown to Positively Influence Enterolactone's Role In Controlling Prostate Cancer Cell Proliferation

*New study validates previous findings, examines molecular mechanisms
of hydroxymatairesinol and enterolactone in prostate cancer*

LOCARNO, SWITZERLAND & EASTON, PA (May 14, 2008) -- A newly published study has shown a direct link between hydroxymatairesinol and the inhibition of prostate cancer cell proliferation by raising circulating enterolactone levels.

The study entitled, "Enterolactone restricts the proliferation of the LNCaP human prostate cancer cell line in vitro," examines the molecular mechanisms by which enterolactone may influence LNCaP proliferation. The study was published in *Molecular Nutrition & Food Research*.

According to the researchers, their latest study demonstrates clearly that a pure lignan inhibits prostate cancer proliferation, and they believe that this is the first study to examine the correlation between the expression of genes associated with prostate cancer growth, and biological end-points of proliferation in vitro.

The selection of the enterolactone concentration used in this study was based on previous work that investigated the potential bioactivity of matairesinol, secoisolariciresinol, enterolactone and enterodiol in the PC-3, DU 145 and LNCaP human prostate cancer cell lines.

The study found that treatment with a subcytotoxic concentration of enterolactone (60 μ M for 72 h) reduced:

- ▶ cell density (57.5%, SD 7.23, p a 0.001)
- ▶ metabolic activity (55%, SD 0.03, p a 0.001)
- ▶ secretion of PSA (48.50% SD 4.74, p = 0.05)

► and induced apoptosis (8.33-fold SD 0.04, $p = 0.001$) compared to untreated cells. Co-treatment with 10 μ M etoposide was found to increase apoptosis by 50.17% (SD 0.02, $p = 0.001$).

Additionally, according to the authors, the data suggests that the anti-proliferative activity of enterolactone is a consequence of altered expression of cell cycle associated genes and provides novel molecular evidence for the anti-proliferative properties of a pure lignan in prostate cancer.

Epidemiological research strongly suggests that a long-term diet rich in lignans can significantly suppress the development of prostate cancer in men. The study quotes, “The capacity of a pure mammalian lignan, enterolactone, to influence the proliferation of the LNCaP human prostate cancer cell line was investigated as a function of cell density, metabolic activity, expression and secretion of prostate specific antigen (PSA), cell cycle profile, and the expression of genes involved in development and progression of prostate cancer.”

A previous study performed at the Department of Clinical Medicine at the University of Insubria in Italy revealed that in vitro, the viability of human prostate cancer cells is impaired by the lignans’ enterolactone and, to a lesser extent, hydroxymatairesinol.

“This latest study bodes well for men who are concerned about developing prostate cancer and whom are looking to help offset that risk with natural therapies,” said Robin Ward, Vice President of Linnea. “We encourage further research of the effects and efficacy of hydroxymatairesinol and enterolactone as it relates to addressing prostate cancer.”

HMRlignan™, derived from Norway Spruce (*Picea abies*), has the highest sustainable concentration of 7-hydroxymatairesinol. “As such, it is the most economical and qualitative source for dietary supplements and functional foods,” explained Ward. “As continued research substantiates the benefits of HMR to boost enterolactone levels, HMRlignan™ remains the far superior choice for products geared to men and women who are concerned about raising enterolactone to healthy and sustainably viable levels to assist in cardiovascular protection and

protection against development of breast cancer and, as this latest study shows, prostate cancer."

About HMRLignan™

The plant lignan 7-hydroxymatairesinol is the only lignan that converts directly in the gut to enterolactone, making it the most efficient dietary enterolactone precursor. Other dietary lignans necessitate an extra conversion step in the pathway of enterolactone production.

HMRLignan™, available exclusively from Linnea, offers a convenient, low-dose and highly bioavailable solution to supplement dietary lignans intake and boost circulating enterolactone levels. HMRLignan™ is standardized to contain 80,000 mg/100 g of lignans and the daily dosage to raise enterolactone levels is 10 - 30 mg daily.

About Linnea

From its headquarters and manufacturing facility in Locarno, Switzerland, Linnea specializes in the manufacture of botanical extracts and phytochemicals, and is a leading supplier to the pharmaceutical, dietary supplement and cosmetic industries. HMRLignan™ is a proprietary, patent protected, product manufactured by Linnea SA. The company's U.S. office, Linnea Inc., is located in Easton, Pennsylvania. For more information about HMRLignan™, visit our Web site at www.hmrlignan.com or call 1-888-253-0044.

#

Reference: Mark J. McCann, et al. "Enterolactone restricts the proliferation of the LNCaP human prostate cancer cell line in vitro" *Mol. Nutr. Food Res.* 2008, 52, 000 – 000 DOI 10.1002/mnfr.200700052